



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Korean Society of
Nursing Science

Contents lists available at ScienceDirect

Asian Nursing Research

journal homepage: www.asian-nursingresearch.com

Research Article

Factors Influencing Emergency Nurses' Burnout During an Outbreak of Middle East Respiratory Syndrome Coronavirus in Korea



Ji Soo Kim, RN, PhD, Jeong Sil Choi, RN, MPH, PhD, APICN *

College of Nursing, Gachon University, Incheon, South Korea

ARTICLE INFO

Article history:

Received 19 May 2016

Received in revised form

3 August 2016

Accepted 11 October 2016

Keywords:

coronavirus infections
emergencies
nurses
professional burnout

SUMMARY

Purpose: Emergency department (ED) nurses suffer from persistent stress after experiencing the traumatic event of exposure to Middle East respiratory syndrome coronavirus (MERS-CoV), which can subsequently lead to burnout. This study aimed to assess ED nurses' burnout level during an outbreak of MERS-CoV and to identify influencing factors in order to provide basic information for lowering and preventing the level of burnout.

Methods: Study participants were ED nurses working in eight hospitals designated for treating MERS-CoV-infected patients in Korea. We performed multiple regression analysis to explore the factors influencing burnout.

Results: The ED nurses' burnout was affected by job stress ($\beta = 0.59, p < .001$), poor hospital resources for the treatment of MERS-CoV ($\beta = -0.19, p < .001$) and poor support from family and friends ($\beta = -0.14, p < .05$). These three variables explained 47.3% of the variance in burnout.

Conclusions: ED nurses taking care of MERS-CoV-infected patients should be aware that burnout is higher for nurses in their divisions than nurses in other hospital departments and that job stress is the biggest influential factor of burnout. To be ready for the outbreak of emerging contagious diseases such as MERS-CoV, efforts and preparations should be made to reduce burnout. Job stress should be managed and resolved. Working conditions for mitigating job stress and systematic stress management programs should be provided, and hospital resources for the treatment of MERS-CoV need to be reinforced. Moreover, promoting support from family and friends is required.

Copyright © 2016, Korean Society of Nursing Science. Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

The Middle East respiratory syndrome coronavirus (MERS-CoV) is an emerging infectious disease that infects the respiratory system. Since its first outbreak in Saudi Arabia, the number of affected countries has been increasing [1,2]. Korea had its first MERS-CoV infected patient in May 2015. As of July 30, 2015, the total number of patients in the country diagnosed with the disease was 186. Of these, 33 patients have died, and 153 patients have been treated [3].

Most MERS-CoV-infected patients first visit a hospital's emergency department (ED). Consequently, ED nurses are the first healthcare professionals to care for patients infected with the novel contagious disease. In fact, there were many cases of exposure to the disease in EDs during the MERS-CoV outbreak [3]. Compared to

nurses in other areas, ED nurses are faced with hectic, unpredictable, and ever-changing situations [4]. Because they deal with various diseases, traumatic events, and urgent situations, they do not have enough time for recovery, putting them under persistent stress. As a result, ED nurses are reported to experience much higher burnout than nurses in other hospital departments [5–7]. Burnout is a long-term consequence of prolonged exposure to certain job demands and a reaction that appears when a person can no longer endure the stress they have been undergoing [8]. It is a syndrome of physical, mental, and emotional exhaustion that includes a negative self-concept and work attitude, and a reduced interest in patients [8]. It has also been strongly associated with working conditions in nursing [5–8], leading it to be the focus of many nursing studies [4–10].

Previous studies of ED nurses' burnout have focused on the severity of burnout or its influencing factors [4–7]. According to a systematic review of 17 reports on emergency room (ER) nurses' burnout published over the past 25 years, 26.0% of them suffered from burnout [5]. Although varying between studies, the factors influencing burnout have been largely divided into individual factors and work-related factors [5,9]. Individual factors reported in

* Correspondence to: Jeong Sil Choi, RN, MPH, PhD, APICN College of Nursing, Gachon University, 191 Hambakmoero Yeonsu-dong, Yeonsu-gu, Incheon, 406-799, South Korea.

E-mail address: jschoi408@empas.com

previous studies include demographic characteristics such as gender, age, religion, education level [5,9], having children, living with family [10], job stress [7,11], personality, coping strategies, and job attitude [5,9]. Major work-related influencing factors are exposure to traumatic events, level of wages, social support, staffing, and lack of material resources [5,9].

A nationwide outbreak of MERS-CoV is an unfamiliar traumatic event for ED nurses, so there has been little research into MERS-CoV-related burnout. Similarly, when severe acute respiratory syndrome such as SARS spread rapidly, most nurses experienced severe stress, and some nurses refused to care for patients [12,13]. In addition, the factors influencing nurses' desire to leave their jobs during an outbreak of SARS were identified as the perceived risk of fatality from SARS, tenure, work stress, and social relationships [13]. When H5N1 avian flu spread rapidly, Taiwanese nurses' fear of infection from the disease was a significant factor influencing their willingness to care for patients infected with the avian flu [14]. Since an emerging respiratory infectious disease such as MERS-CoV can happen anywhere in the world, nursing managers need to pay attention to ED nurses' burnout in association with their experiences of a nationwide MERS-CoV outbreak. However, not even a basic survey has been conducted on the level of burnout experienced by ED nurses, who are in the front line taking care of MERS-CoV patients, or factors of burnout that consider the specific nature of MERS-CoV. Thus, this study attempted to assess ED nurses' burnout level during an outbreak of MERS-CoV and to identify influencing factors in order to provide basic information for lowering and preventing the level of burnout.

Methods

Study design

This was a cross-sectional design study conducted to identify the factors influencing MERS-CoV-related burnout in ED nurses who had experienced an outbreak of MERS-CoV in Korea.

Setting and sample

During the outbreak of MERS-CoV in Korea, 15 hospitals designated for treating MERS-infected patients in Seoul, Gyeonggi-do, and Incheon, Korea. The participants were drawn from nurses working in the EDs of these hospitals. This study used convenience sampling to select eight EDs, all of which gave their consent to the survey. The sample size was estimated using G*Power 3.1 [15]. With an input α at .05, a medium effect size of .15, power of .90, and the number of predictors at 18 for a linear multiple regression analysis, the minimum sample size required for this study was 183. However, for an even distribution of the participants among the hospitals selected, this study sampled 30 ED nurses from each institution by simple random sampling, for a total of 240 ED nurses. Of all the participants, 223 replied to the survey (response rate 92.9%). After unanswered questionnaires were excluded, 215 questionnaires were used as valid data in this study.

Ethical consideration

Approval for conducting this study was obtained from the Institutional Review Board of Gachon University in Korea (no. 1044396-201504-HR).

Measurements

Burnout [16] and job stress [17] were measured with a scale from previous studies, which was translated into Korean, validated, and used by Choi et al [18]. Other scales were developed by the

researcher through a literature review [5,9,13,14] and the developed tools were tested for content validity by two infection control nurse practitioners, one infectious disease specialist (doctor), and one nursing professor. The developed tools were translated into Korean by two PhD-prepared bilingual nursing faculty and then back translated into English. Back translation was performed by a separate professional translator, who did not have prior information about the scale. In addition, the scales were tested through a pilot study with 15 ED nurses.

MERS-CoV-related burnout

MERS-CoV-related burnout was assessed using the Oldenburg Burnout Inventory (OLBI) developed by Demerouti et al [16]. In order to limit the study to burnout related to MERS-CoV, the phrase "caused by MERS-CoV" was added to each item. The OLBI consists of 16 items in two subdomains: emotional exhaustion and disengagement from work. Each item is answered on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with a high score meaning a high level of burnout. Cronbach α of the scale was .78 in the previous study, .78 in the preliminary survey, and .80 in the main survey.

MERS-CoV-related job stress

MERS-CoV-related job stress was assessed by measuring the pressure from time and anxiety with a scale developed by Parker and DeCotiis [17]. In order to limit the study to job stress related to MERS-CoV, the phrase "caused by MERS-CoV" was added to each item. This scale consists of nine items, with each item answered on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A high score means a high level of stress. Cronbach α of the scale was .78 in the previous study, .90 in the preliminary survey, and .93 in the main survey.

Fear of MERS-CoV infection

The scale for fear of MERS-CoV infection was developed by the researcher based on a previous study of nurses' fear during the outbreak of H5N1 avian flu [14]. This scale has just one item, "I am afraid of being infected with MERS-CoV," which is answered on a 10-point visual analogue scale. A high score means a high fear of MERS-CoV infection.

Hospital resources for the treatment of MERS-CoV

The scale for measuring hospital resources for the treatment of MERS-CoV was developed by the researcher based on previous studies reporting material resources as one of the influencing factors of burnout [5,9,13,14]. In this scale, each item is answered on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), with a high score meaning satisfactory hospital resources for the treatment of MERS-CoV are available. The three items of this scale are as follows: "My hospital is equipped with facilities sufficient for preventing the spread of MERS-CoV," "My hospital applies the best infection control guideline for preventing the spread of MERS-CoV," and "My hospital discusses how to prevent MERS-CoV regularly." Cronbach α of the scale was .78 in the preliminary survey and .81 in the main survey. Content validity index was .95.

Support from family and friends

The scale for measuring support from family and friends was developed by the researcher based on previous studies reporting social support as one of the influencing factors of burnout [5,9,13,14]. In this scale, each item is answered on a 4-point scale ranging from 1

(strongly disagree) to 4 (strongly agree), with a high score meaning high support from family and friends. The four items of this scale are as follows: “My friends will avoid me if they find that I have cared for MERS patients,” “My friends will support me caring for MERS patients,” “My family will avoid me if they find that I have cared for MERS patients,” and “My family will support me caring for MERS patients.” Cronbach α of the scale was .76 in the preliminary survey and .80 in the main survey. Content validity index was .90.

Data collection

Data were collected during the period from July 20, 2015 to July 31, 2015, about 2 months after the outbreak of MERS-CoV and when the disease had not yet been controlled. The researcher visited the eight convenience-sampled hospitals designated for treating MERS-CoV patients, explained the purpose of this study, obtained their consent, and delivered the questionnaires. The charge nurse of the relevant department in each hospital explained the purpose of the study to the nurses, obtained their written consent, and then distributed and collected the questionnaires. The whole process of the survey was conducted anonymously, and all personal information was kept confidential.

Data analysis

The data were collected and analyzed using SPSS for Windows version 21.0 (IBM Corp., Armonk, NY, USA), and the normal distribution of the main variables was confirmed before analysis (Kolmogorov-Smirnov test). The participants' general characteristics, MERS-CoV-related burnout, job stress, fear of MERS infection, available hospital resources for the treatment of MERS-CoV, and support from family and friends were analyzed with frequencies, percentages, means, and standard deviations. Scale reliability was assessed with Cronbach α . Differences in burnout according to general characteristics were analyzed using independent *t* tests, analysis of variance, and Scheffe's post hoc test. Correlation was computed using Pearson's correlation test. Multiple regression was performed using the enter method with input variables found to be

significant in the difference testing and correlation analysis, to explore factors influencing MERS-CoV-related burnout.

Results

General characteristics and differences in MERS-CoV-related burnout

The participants' mean age was 28.17 years, and 201 (93.5%) were female. In addition, 172 (80.0%) were unmarried, and 128 (59.5%) had at least a bachelor's degree. The mean length of clinical experience was 2.58 years. Most of the participants (183, 85.1%) were working under the three-shift system, and 119 (55.3%) had actual experience in caring for MERS-CoV-infected or MERS-CoV-suspected patients. The mean number of hospital beds was 857.37.

The level of MERS-CoV-related burnout was found to be significantly higher in nurses who worked a three-shift system, and in those who had nursed MERS-CoV-infected or MERS-CoV-suspected patients than those who did not ($p < .05$) (Table 1).

Characteristics and correlation among the main variables

The mean score of MERS-CoV-related burnout was 3.02 out of 5; MERS-CoV-related job stress was 3.25 out of 5; fear of MERS-CoV infection was 6.71 out of 10; hospital resources for the treatment of MERS-CoV was 2.88 out of 4; support from family and friends was 2.49 out of 4 (Table 2).

MERS-CoV-related burnout was significantly correlated with MERS-CoV-related job stress, fear of MERS-CoV infection, availability of hospital resources for the treatment of MERS-CoV, and support from family and friends ($p < .05$). However, it was not significantly correlated with age, number of beds, or length of clinical experience.

Factors influencing MERS-CoV-related burnout

MERS-CoV-related job stress was found to be the biggest influencing factor of MERS-CoV-related burnout ($\beta = .59, p < .001$), with the level of MERS-CoV-related burnout higher when job stress

Table 1 General Characteristics and Differences in MERS-CoV-related Burnout ($N = 215$).

Variables	Characteristics	<i>n</i> (%)	Burnout Mean \pm SD	<i>t</i> or <i>F</i> (<i>p</i>)
Sociodemographic characteristics				
Gender	Female	201 (93.5)	3.02 \pm 0.46	0.04 (.841)
	Male	14 (6.5)	3.04 \pm 0.47	
Age (yr, Mean \pm SD, range)		28.17 \pm 5.45 (22.00–46.00)		
Marital status	Single	172 (80.0)	3.04 \pm 0.45	2.59
	Married	43 (20.0)	2.92 \pm 0.47	(.109)
Child	Yes	29 (13.5)	2.96 \pm 0.46	0.65
	No	186 (86.5)	3.03 \pm 0.46	(.422)
Religion	Yes	67 (31.2)	3.01 \pm 0.43	0.08
	No	148 (68.8)	3.03 \pm 0.48	(.779)
Education level	Diploma	87 (40.5)	3.09 \pm 0.48	3.01
	BSN	99 (46.0)	3.01 \pm 0.45	(.052)
	\geq MSN	29 (13.5)	2.84 \pm 0.41	
Live with family	Yes	127 (64.2)	3.02 \pm 0.48	0.02
	No	88 (35.8)	3.02 \pm 0.43	(.978)
Work-related characteristics				
Hospital beds (Mean \pm SD, range)		857.37 \pm 494.40 (250.00–1,737.00)		
Length of clinical experience (yr, Mean \pm SD, range)		2.58 \pm 2.33 (0.10–9.00)		
Monthly salary (10,000 won)	< 300	172 (80.0)	3.04 \pm 0.47	1.43
	\geq 300	42 (20.0)	2.94 \pm 0.39	(.233)
Position	Staff	184 (85.6)	3.04 \pm 0.45	2.06
	Charge or higher	31 (14.4)	2.91 \pm 0.52	(.152)
Three-shift system	Yes	183 (85.1)	3.07 \pm 0.46	12.99
	No	32 (14.9)	2.76 \pm 0.38	(< .001)
Experience in caring for MERS-CoV-infected or MERS-CoV-suspected patients	Yes	119 (55.3)	3.09 \pm 0.48	6.34
	No	96 (44.7)	2.93 \pm 0.42	(.013)

Note. MERS-CoV = Middle East respiratory syndrome coronavirus; BSN = Bachelor of Science in Nursing; MSN = Master of Science in Nursing.

Table 2 Characteristics of Main Variables (N = 215).

Variables	Mean (SD)	Observed range
MERS-CoV-related burnout	3.02 (0.46)	1.00–5.00
MERS-CoV-related job stress	3.25 (0.81)	1.00–5.00
Fear of MERS-CoV infection	6.71 (1.74)	0.00–10.00
Hospital resources for treatment of MERS-CoV	2.88 (0.63)	1.00–4.00
Support from family & friends	2.49 (0.46)	1.00–4.00

Note. MERS-CoV = Middle East respiratory syndrome coronavirus.

was high. In addition, poor hospital resources for the treatment of MERS-CoV ($\beta = -0.19, p < .001$) and poor support from family and friends ($\beta = -0.14, p < .05$) increased MERS-CoV-related burnout. These three variables explained 47.3% of the variance in MERS-CoV-related burnout (Table 3).

The regression analysis satisfied the basic assumption of the model. The Durbin-Watson statistic was 1.75, indicating that there was no autocorrelation. Tolerance was .78–.98, which was higher than .10; the variance inflation factor was 1.02–1.55, which was smaller than 10, indicating that there was no multicollinearity problem.

Discussion

This study was meaningful in that it surveyed factors influencing MERS-CoV-related burnout in ED nurses who experienced the traumatic event of a MERS-CoV outbreak. The study adapted scales from previous studies to measure fear of MERS-CoV infection [13,14], social support, and lack of material resources [5,9]. During the outbreak of MERS-CoV in Korea, one super-spreader (a host, an organism infected with a disease that infects disproportionately more secondary contacts than other hosts also infected with the same disease) had contact with 594 people in an emergency department and transmitted MERS-CoV to 85 of them [3]. As such, it is highly likely that ED nurses who dealt with him or her then were more inclined to experience burnout when other enduring stress situations arise [13].

The burnout level in ED nurses who experienced the MERS-CoV outbreak was 3.02 on a 5-point scale (60.4 on a 100-point scale). The OLBI, a burnout scale suggested by Demerouti et al [18], is an adequate scale for assessing the emotional aspects of exhaustion, including its physical and cognitive elements [16,18–20]. The study of Hopper et al [6], which surveyed ER nurses' burnout level using Maslach's Burnout Inventory, reported that 22.4% and 19.2% of ED nurses experienced a high level of burnout, respectively. In particular, a systematic review of 17 studies that surveyed burnout in ED nurses reported that 25.9% of them experienced emotional exhaustion exceeding the cut-off score [5]. Another study reported that burnout among ordinary nurses, midwives and nurses with some sort of specialization surveyed using the OLBI, was 2.40 on a 5-point scale [21]. Accordingly, the burnout level surveyed in this study using the OLBI shows that the participants' experience of burnout was above

average compared to other nurses dealing with burnout in general. This suggests a need to pay particular attention to burnout in ER nurses who are on the front line in treating MERS-CoV-infected or MERS-CoV-suspected patients. This also suggests the necessity for programs designed to help manage and control burnout levels in ED nurses during the outbreak of an infectious disease like MERS-CoV.

In the univariate analysis, MERS-CoV-related burnout was significantly higher in nurses working under the three-shift system and in those with experience in caring for MERS-CoV-infected or MERS-CoV-suspected patients. In the multiple regression analysis, the three-shift system was not a significantly influential factor of burnout. Shift work is a major factor in increasing MERS-CoV-related burnout not only for ER nurses but also for nurses in other departments [22]. However, in some studies, shift work was not a factor influencing burnout [5,9]. In this study, although shift work did not show a significant relationship with MERS-CoV-related burnout for ED nurses, it may have an indirect effect on MERS-CoV-related burnout. Therefore, the ED nurses who came into contact with MARS-CoV-related patients, their burnout need to be monitored by reducing their shift work. Previous studies have reported that repeated exposure to traumatic events causes burnout in nurses [23,24]. It has also been found that when ED nurses have been exposed to traumatic events, they experience higher emotional exhaustion than those without such exposure [25]. Consistent with previous reports, the burnout level in this study was significantly higher in ED nurses who cared for MERS-CoV-infected or MERS-CoV-suspected patients during the nationwide outbreak of the disease. This finding supports the proposal that the outbreak of MERS-CoV was a traumatic event for which nurses' burnout needs to be managed.

Previous studies have reported demographic characteristics such as gender, age, religion, education level [5,9], having children, and living with family [10] as factors influencing burnout. In other studies, however, burnout was not significantly correlated with gender, age, experience, shift work, education level, or religion [6], and financial reward was not an influencing factor for ED nurses' burnout [1]. Because previous studies report conflicting results related to gender, age, education level, and experience, replication studies should be continuously conducted [5,9].

Stress is a significant influencing factor that correlates with burnout in previous studies [7,11]. In this study, job stress induced by the outbreak of MERS-CoV was also found to be the biggest influencing factor, showing a correlation with burnout, that is, the burnout level was higher when job stress was high. Thus, during the outbreak of an emerging infectious disease such as MERS-CoV, the continuous inflow of patients and the highly infectious nature of the disease increase ED nurses' stress, which in turn, aggravates their burnout [7]. In order to manage ED nurses' burnout, efforts should be made to find the sources of stress and to resolve them.

In addition to MERS-CoV-related job stress, the second and third biggest influencing factors increasing MERS-CoV-related burnout were poor hospital resources for the treatment of MERS-CoV and poor support from family and friends. This finding is consistent with

Table 3 Linear Regression Analysis for Influencing MERS-CoV-related Burnout (N = 215).

Variables	B	SE	β	t (p)	CI	F (p)	R ²	Adjusted R ²
Constant	1.86	0.25		7.36 (< .001)		28.49 (< .001)	.481	.473
Three-shift system (yes)	0.11	0.07	.09	-1.61 (.103)	(-0.25, 0.03)			
Experience in caring for MERS-CoV-infected or MERS-CoV-suspected patients (yes)	0.05	0.05	.05	1.01 (.303)	(-0.05, 0.15)			
MERS-CoV-related job stress	0.34	0.03	.59	11.07 (< .001)	(0.28, 0.40)			
Fear of MERS-CoV infection	0.01	0.02	.01	-0.24 (.808)	(-0.02, 0.17)			
Hospital resources for treatment of MERS-CoV	0.14	0.04	.19	-3.72 (< .001)	(-0.22, -0.05)			
Support from family & friends	0.14	0.06	.14	-2.50 (.013)	(-0.22, -0.06)			

Note. CI = confidence interval; MERS-CoV = Middle East respiratory syndrome-coronavirus.

the systematic review [5] and literature review [7], which reported that hospital resources and support from family and friends were major influencing factors for ED nurses' burnout [5,7]. In particular, a lack of material resources is reported to be correlated with a high level of burnout [22]. These findings suggest that, in preparation for the outbreak of an emerging infectious disease, hospitals should prepare facilities for preventing infection, establish systematic infection control guidelines, and continue discussions about preventive measures [13,14]. What is more, support from family and friends experienced as more extensive social support, was found to be another influencing factor, as reported in previous studies [5,9]. In the context of employment, typical sources of social support are coworkers, supervisors, and the organization in general.

Social support from one's supervisor and colleagues is found to provide a buffering effect that directly or indirectly reduces job stress [5,9,12,14]. Accordingly, it is suggested that the aspect of social support from an employee's supervisor and colleagues should be taken into consideration for further research in future studies. If social support is provided in consideration of national and cultural factors, it may reduce burnout in nurses caring for patients in such a national crisis as the outbreak of MERS-CoV [12,14].

The principles of MERS-CoV infection prevention and control strategies associated with healthcare suggest the need for administrative controls and hospital resources [2]. In addition, if the government, with strong leadership, develops stronger and more resilient health systems in preparation against emerging contagious diseases such as MERS, ED nurses' MERS-CoV-related burn out and job stress will decrease.

One limitation of this study is that the scope of research was confined to the outbreak of MERS-CoV in one country. As such, it is necessary to expand the number of study participants for comparison with cases in other countries. Furthermore, as most of the survey respondents were female, future studies need to include more male nurses so as to examine gender characteristics. In addition, factors such as personality, coping strategies, and job attitude could be surveyed as additional influencing factors of burnout. Lastly, we also suggest that a mixed-method research design combining cross-sectional surveys and in-depth interviews be adopted for an in-depth inquiry into MERS-CoV-related burnout.

Conclusion

During the outbreak of an emerging infectious disease such as MERS-CoV, nursing managers need to pay attention to burnout in ED nurses, who are the first to treat patients. The participants' MERS-CoV-related burnout was higher than the average of nurses dealing with burnout in general. The biggest influencing factor of MERS-CoV-related burnout was MERS-CoV-related job stress, followed by availability of hospital resources for the treatment of MERS-CoV and support from family and friends. These three variables explained 47.3% of the variance in MERS-CoV-related burnout. The outcome of this study is expected to provide basic information related to ED nurses' burnout in connection to an outbreak of an emerging infectious disease such as MERS-CoV and to contribute to programs and strategies for reducing burnout. In order to lower the level of burnout, nursing managers need to make efforts to reduce job stress, to reinforce hospital resources for the treatment of MERS-CoV, and to promote support from family and friends. Particularly in the area of ED nursing, it is essential that we develop effective and systematic burnout management programs for monitoring and preventing burnout in preparation against possible future outbreaks of infectious diseases.

Conflicts of interest

The authors declared no conflict of interest.

Acknowledgments

The authors wish to thank all the ED nurses who so willingly participated in this study.

References

- Centers for Disease Control and Prevention. Middle East respiratory syndrome (MERS) [Internet]. Atlanta (GA): U.S. Department of Health and Human Services; 2016 [cited 2016 July 13]. Available from: <http://www.cdc.gov/coronavirus/mers/faq.html>
- World Health Organization. Clinical management of severe acute respiratory infection when Middle East respiratory syndrome coronavirus (MERS-CoV) infection is suspected [Internet]. Geneva (Switzerland). 2015 [cited 2016 Jun 1]. Available from: http://apps.who.int/iris/bitstream/10665/178529/1/WHO_MERS_Clinical_15.1_eng.pdf
- Korea Centers for Disease Control and Prevention. Middle East respiratory syndrome (MERS) [Internet]. Seoul. 2015 [cited 2015 Jun 10]. Available from: <http://www.mers.go.kr/mers/html/jsp/main.jsp#>
- Gates DM, Gillespie GL, Succop P. Violence against nurses and its impact on stress and productivity. *Nurs Econ*. 2011;29(2):59–66. quiz 67.
- Adriaenssens J, De Gucht V, Maes S. Determinants and prevalence of burnout in emergency nurses: a systematic review of 25 years of research. *Int J Nurs Stud*. 2015;52(2):649–61. <http://dx.doi.org/10.1016/j.ijnurstu.2014.11.004>
- Hooper C, Craig J, Janvrin DR, Wetsel MA, Reimels E. Compassion satisfaction, burnout, and compassion fatigue among emergency nurses compared with nurses in other selected inpatient specialties. *J Emerg Nurs*. 2010;36(5):420–7. <http://dx.doi.org/10.1016/j.jen.2009.11.027>
- Potter C. To what extent do nurses and physicians working with emergency department experience burnout: a review of the literature. *Australas Emerg Nurs J*. 2006;9(2):57–64. <http://dx.doi.org/10.1016/j.aenj.2006.03.006>
- Maslach C, Schaufeli WB, Leiter MP. Job burnout. *Annu Rev Psychol*. 2001;52:397–422.
- Hunsaker S, Chen HC, Maughan D, Heaston S. Factors that influence the development of compassion fatigue, burnout, and compassion satisfaction in emergency department nurses. *J Nurs Scholarsh*. 2015;47(2):186–94. <http://dx.doi.org/10.1111/jnu.12122>
- Escribà-Agüir V, Martín-Baena D, Pérez-Hoyos S. Psychosocial work environment and burnout among emergency medical and nursing staff. *Int Arch Occup Environ Health*. 2006;80(2):127–33. <http://dx.doi.org/10.1007/s00420-006-0110-y>
- Khamisa N, Peltzer K, Oldenburg B. Burnout in relation to specific contributing factors and health outcomes among nurses: a systematic review. *Int J Environ Res Public Health*. 2013;10(6):2214–40. <http://dx.doi.org/10.3390/ijerph10062214>
- Brug J, Aro AR, Oenema A, de Zwart O, Richardus JH, Bishop GD. SARS risk perception, knowledge, precautions, and information sources, the Netherlands. *Emerg Infect Dis*. 2004;10(8):1486–9. <http://dx.doi.org/10.3201/eid1008.040283>
- Shiao JS, Koh D, Lo LH, Lim MK, Guo YL. Factors predicting nurses' consideration of leaving their job during the SARS outbreak. *Nurs Ethics*. 2007;14(1):5–17.
- Tzeng HM, Yin CY. Nurses' fears and professional obligations concerning possible human-to-human avian flu. *Nurs Ethics*. 2006;13(5):455–70.
- Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis power analysis program for the social, behavior, and biomedical sciences. *Behav Res Methods*. 2007;39(2):175–91.
- Demerouti E, Bakker AB, Vardakou I, Kantas A. The convergent validity of two burnout instruments: a multitrait-multimethod analysis. *Eur J Psychol Assess*. 2003;19(1):12–23. <http://dx.doi.org/10.1027//1015-5759.19.1.12>
- Parker DE, DeCotiis TA. Organizational determinants of job stress. *Organ Behav Hum Perform*. 1983;32:160–77. [http://dx.doi.org/10.1016/0030-5073\(83\)90145-9](http://dx.doi.org/10.1016/0030-5073(83)90145-9)
- Demerouti E, Mostert K, Bakker AB. Burnout and work engagement: a thorough investigation of the interdependency of both constructs. *J Occup Health Psychol*. 2010;15(3):209–22. <http://dx.doi.org/10.1037/a0019408>
- Choi JS, Jang IS, Park SM. Affecting factors of nurses' burnout in secondary general hospitals. *J Korean Acad Nurs Adm*. 2011;17(4):474–83. <http://dx.doi.org/10.1111/jkana.2011.17.4.474>
- Crawford ER, Lepine JA, Rich BL. Linking job demands and resources to employee engagement and burnout: a theoretical extension and meta-analytic test. *J Appl Psychol*. 2010;95(5):834–48. <http://dx.doi.org/10.1037/a0019364>
- Innstrand ST, Langballe EM, Falkum E, Aasland OG. Exploring within- and between-gender differences in burnout: 8 different occupational groups. *Int Arch Occup Environ Health*. 2011;84(7):813–24. <http://dx.doi.org/10.1007/s00420-011-0667-y>
- García-Izquierdo M, Rios-Risquez M. The relationship between psychosocial job stress and burnout in emergency department: an exploratory study. *Nurs Outlook*. 2012;60(5):322–9. <http://dx.doi.org/10.1016/j.outlook.2012.02.002>
- Donnelly E, Siebert D. Occupational risk factors in the emergency medical services correspondence. *Prehosp Disaster Med*. 2009;24:422–9.
- Mealer M, Burnham EL, Goode CJ, Rothbaum B, Moss M. The prevalence and impact of post traumatic stress disorder and burnout in nurses. *Depress Anxiety*. 2009;26(12):1118–26. <http://dx.doi.org/10.1002/da.20631>
- Alexander DA, Klein S. Ambulance personnel and critical incidents: impact of accident and emergency work on mental health and emotional well-being. *Br J Psychiatry*. 2001;178(1):76–81.