ORIGINAL ARTICLE

Burnout syndrome among Thai intensivists and nurses in pre-COVID19 era

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The data and code were available upon reasonable request (Petch Wacharasint, email address: Wacharasint@hotmail.com).

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ABSTRACT:

Background: Burnout syndrome (BOS), a work-related constellation of symptoms and signs, causes individuals emotional stress and is associated with increasing job-related disillusionment. ICU-BOS among Thai intensivists and ICU nurses has never been clarified.

Methods: We performed a multicenter, prospective cross-sectional study in 17 hospitals in Thailand. BOS-related data were collected from full time ICU physicians and ICU nurses using electronic questionnaires. ICU-BOS was defined when participants exhibited at least 1 of 3 aspects (depersonalization, emotion exhaustion and personal accomplishment) regarding the Maslach Burnout Inventory. Primary outcome was prevalence of ICU-BOS among intensivists and ICU nurses, and secondary outcomes were risk factors for ICU-BOS.

Results: After a total of 193 electronic surveys were sent, 171 responders (ICU physicians n=66, ICU nurses n=105) were included in this analysis (88.6%). Overall prevalence of ICU-BOS was 62.6%. Using multivariate analysis, the risk factors for ICU-BOS among intensivists were 1) income <20,000 THB, 2) feeling of quitting caring for patients in an ICU within the past year, 3) need >2 holidays/wk and 4) patient's ICU-LOS >5 days (adjusted odd ratio (OR) of 31.5, 15.9, 7.4, 14.9; p =0.04, 0.007, 0.035, 0.004 respectively). Risk factors for ICU-BOS among ICU nurses were 1) age >40 years, 2) ICU experience >5 years, 3) patient's ICU-LOS >5 days, 4) nurse to patient ratio lower than 1:1 5) feeling assignments in the ICU were too numerous and 6) feeling of quitting caring for patients in an ICU within the past year (adjusted OR of 15.7, 4.6, 10.0, 68.7, 4.3, 5.3; p =0.009, 0.04, 0.004, 0.004, 0.04, 0.007 respectively).

Conclusion: In this study, we found a high prevalence of ICU-BOS among Thai intensivists and ICU nurses. Co-independent risk factors for BOS were patient's ICU-LOS >5 days and feeling of quitting caring for patients in an ICU within the past year.

Keywords: Burnout syndrome, Emotion exhaustion, Depersonalization, Personal accomplishment

INTRODUCTION

Burnout syndrome (BOS) is a state of boredom. Physical, mental, and emotional exhaustion (EE) is caused by being in situations involving emotional needs for extended periods of time [1]. BOS causes negative effects both physically and mentally, such as deteriorating health, becoming nonfunctioning, easily angered, irritable mood, unenthusiastic, and lacking initiative leading to depression. In addition, BOS can be so severe to the point of reigning from work causing problems for the participants, resulting in the deteriorating performance of the organization [2]. Lerthattasilp T. [3] studied BOS among Thai psychiatrists. The results showed that Thai psychiatrists experienced a high level of EE (17.1%). The factor that increased EE was overall dissatisfaction with work, fewer of years working as a psychiatrist, being single, widowed or divorced and lack of co-worker support. The Medical Council of Thailand conducted a study on reasons for medical resignation in 2015 by surveying the opinions of medical students to understand the problems and the reasons to resign. A retrospective survey of 4 years was conducted involving fresh graduates. The three main reasons were related: the compensation received was too low, the burden of responsibility was overload and the requirement to working in remote areas [4].

BOS is now widely recognized. The US reported 45.8% concerning overall BOS. Substantial differences in BOS were observed by specialty, with the highest rates among physicians at the front line of care access (family medicine, general internal medicine, and emergency medicine) [6]. The study by the European General Practice Research Network Burnout Study Group, including 1,400 family physicians in 12 European countries, revealed the following: 43% of respondents scored high for EE, 35% for depersonalization (DP) and 32% for low personal accomplishment (PA), while 12% of participants suffered from burnout in all three dimensions [7]. Another study that included more than 500 physicians in the UK demonstrated that at least one third of the physicians revealed burnout features [8]. However, the prevalence and factors leading to BOS have not been reported in the Thai subspecialty of critical care medicine and nurses caring for patients in Thai ICUs. Therefore, the researcher was interested in studying the prevalence of BOS and related factors among physicians and nurses caring for ICU patients. The study aimed to provide information, explore ways to prevent burnout, correct and direct care of physicians and nurses to perform their duties happily with maximum abilities.

METHODS

This research comprised a cross-sectional analytic study. Data were collected by using electronic surveys. We included physicians and nurses in the survey by simple random sampling from email register in Thai Society of Critical Care Medicine and Thailand Nursing and Midwifery Council that could be contacted and was working in Thailand from 2017 to 2018. The Institutional Review Board, Royal Thai Army Medical Department Ethics Committee approved this study. Volunteers participating in the research project comprised physicians specializing in the

KEY MESSAGES:
- BOS was high among Thai physicians and nurses working in the ICU. The risk factors found to be similar among physicians and nurses were length of stay of patients in the ICU and feeling of quitting caring for patients in an ICU within the past year.

subspecialty of critical care medicine and full-time nurses caring for patients in medical or surgical ICUs working in Thailand in a medical school ICU, provincial hospital, hospital center or large private hospital including fellows in the subspecialty of critical care medicine, who could be contacted. Exclusion criteria included 1) individuals under 18 years of age, 2) individuals not consenting to the questionnaire and 3) physicians not graduating from or studying in the subspecialty of critical care medicine and caring for patients in ICUs.

Sample Size Calculation

The sample population was calculated from a literature review by Lerthatthasilp T. [3] investigating BOS among Thai psychiatrists. The study found that Thai psychiatrists reported a high level of EE (17.1%).

$$n = \frac{Z_{\frac{\alpha}{2}} P(1-P)}{d^2}$$

n = sample size
P = prevalence burnout syndrome in Thailand = 0.171
d = errors < 5% (0.05)
$Z_{\frac{\alpha}{2}}$ = 1.645

Therefore, several sample sizes were required of least 154 cases in this study. After being approved by the Human Research Ethics Committee, the researcher selected subjects meeting the selection criteria. The objectives of the research were clarified, and participants were asked to join the research project by providing a voluntary consent form. The tool used to collect data comprised a self-report questionnaire. We conducted an electronic survey-based study. The questionnaire consisted of four parts described below (Table S1).

1.1) Basic information consisted of 8 items, consisting of general information such as age, sex, status, hospital characteristics, position, type of ICU, experience working in the ICU and salary received.

1.2) Work characteristics comprised 25 items such as total number of beds in the ICU, average number of patients admitted to the ICU, number of patients requiring care per nurses, total number of patients in one shift, number of patients requiring ventilator, number of terminally ill patients, average number of ICU deaths monthly, number of patients who died in the last week, number of nurses and nursing assistants in the ICU, number of intensive care physicians on duty in the ICU or not, and the average number of hours required to work both during and outside office hours.

1.3) Personal data consisted of 9 items.

1.4) Maslach Burnout Inventory-Human Services Sur-

vey Thai version (MBI-HSS) consisted of 22 items, divided in criteria, graded on seven levels, and dividing the evaluation results in three aspects as detailed below.

A. EE means feeling tired, having no strength in the face of daily work.

B. DP means having negative feelings or not understanding the patient, lack of connection to others or treating the patients without dignity.

C. PA means feeling ineffective, unable to manage tasks or care for patients.

The questionnaire's item answers were rated on a 7-level scale, with scoring criteria shown in Tables S2 and S3.

Those scoring in the top third of each scale (reversed for PA) were considered to exhibit burnout syndrome. We used the Thai version of the MBI-HSS translated by Sammawart S. [9] that was verified by experts and tested for reliability using Cronbach's coefficient alpha: EE 0.92, DP 0.66, and PA 0.65, which were rated as acceptable to excellent. The questions for EE numbered 1, 2, 3, 6, 8, 13, 14, 16, 20. The questions for DP numbered 5, 10, 11, 15, 22. The questions for PA numbered 4, 7, 9, 12, 17, 18, 19, 21.

Statistical Analysis

Fundamental data, behavior information, personal information, and data on fatigue at work were presented as using percentage, mean, and standard deviation. The prevalence of BOS was determined among physicians and nurses working in ICUs when any one of these, compatible with severe

BOS, was presented. Factors associated with BOS were analyzed using univariate/multivariate logistic regression analyses and use variance inflation factor (VIF) was used to detect multicollinearity, indicating that correlations between the results of the factors did not cause any discrepancy with the logistic-regression analyses. The correlation level used adjusted odd ratio (OR) and 95%CI and statistical significance was set at p value <0.05. Data were analyzed from baseline and consequent behaviors, selecting important values for multivariate logistic regression analysis, and p value <0.2. The reliability of the MBI Thai version was tested using the Cronbach's alpha method (α>0.7, reliable). In this study, the analysis value was calculated using STATA Program, Version 12.

RESULTS

The number of physicians and nurses who could be contacted since the establishing of the Thai Society of Critical Care Medicine until 2017 totaled 150 physicians and 4,214 nurses. A sample population of 17 hospitals was collected receiving a total of 171 responses of 193 by electronic survey-based, representing an 88.6%, response rate divided among 66 physicians and 105 nurses. The survey was sent to 75 physicians and 118 nurse by simple random sampling from 150 physicians, of which 66 responded (88%) and 118 nurses, of which 105 responded (88.98%).

Table 1. Baseline characteristics.

Characteristic	Physicians (N = 66)	Nurses (N = 105)	Total (N = 171)
Sex, no. (%)			
Male	35 (53.03)	7 (6.67)	42 (24.56)
Female	31 (46.97)	98 (93.33)	129 (75.44)
Age, yr			
Mean	34.06±3.73	32.50±8.36	33.10±6.98
Status, no. (%)			
Single	47 (71.21)	72 (68.57)	119 (69.59)
Divorced	0 (0.00)	2 (1.90)	2 (1.17)
Childless	8 (12.12)	10 (9.52)	18 (10.53)
Married with children	11 (16.67)	21 (20.00)	32 (18.71)
Workplaces, no. (%)			
Medical school	52 (78.79)	63 (60.00)	115 (69.59)
Provincial hospital	1 (1.52)	10 (9.52)	11 (1.17)
Hospital center	6 (9.09)	17 (16.19)	23 (10.53)
Private hospital	7 (10.61)	10 (9.52)	17 (18.71)
Other	0 (0.00)	5 (4.76)	5 (18.71)
ICU type, no. (%)			
Medical	31 (46.97)	54 (51.43)	85 (49.71)
Surgical	8 (12.12)	33 (31.43)	41 (23.98)
Medical-Surgical	23 (34.85)	13 (12.38)	36 (21.05)
Trauma-ER	4 (6.06)	1 (0.95)	5 (2.92)
Other	0 (0.00)	4 (3.81)	4 (2.34)

Table 1. (Continued) Baseline characteristics.

Characteristic	Physicians (N = 66)	Nurses (N = 105)	Total (N = 171)
Work experience in the ICU, no. (%)			
<1 years	10 (15.15)	11 (10.48)	21 (12.28)
1-5 years	46 (69.70)	44 (41.90)	90 (52.63)
6-10 years	8 (12.12)	15 (14.29)	23 (13.45)
11-15 years	0 (0.00)	11 (10.48)	12 (7.02)
16-20 years	1 (1.52)	15 (14.29)	16 (9.36)
Monthly income from the ICU, no. (%)*			
<10,000 THB	3 (4.55)	0 (0.00)	3 (1.75)
10,001-20,000 THB	6 (9.09)	30 (28.57)	36 (21.05)
20,001-30,000 THB	27 (40.91)	43 (40.95)	70 (40.94)
30,001-40,000 THB	13 (19.7)	22 (20.95)	35 (20.47)
40,001-50,000 THB	3 (4.55)	6 (5.71)	9 (5.26)
50,001-60,000 THB	3 (4.55)	3 (2.86)	6 (3.51)
60,001-70,000 THB	1 (1.52)	0 (0.00)	1 (0.58)
>70,000 THB	10 (15.15)	1 (0.95)	11 (6.43)
Average number of patients admitted to the ICU monthly, no. (%)			
<20	2 (3.03)	9 (8.57)	11 (6.43)
21-40	33 (50.00)	32 (30.48)	65 (38.01)
41-60	20 (30.3)	46 (43.81)	66 (38.6)
61-80	6 (9.09)	6 (5.71)	12 (7.02)
81-100	3 (4.55)	8 (7.62)	11 (6.43)
>100	2 (3.03)	4 (3.81)	6 (3.51)
Average length of stay for a patient in the ICU, no. (%)			
<2	1 (1.52)	1 (0.95)	2 (1.17)
2-5	17 (25.76)	22 (20.95)	39 (22.81)
6-10	35 (53.03)	33 (31.43)	68 (39.77)
11-15	12 (18.18)	21 (20.00)	33 (19.3)
16-20	1 (1.52)	20 (19.05)	21 (12.28)
>20	0 (0.00)	8 (7.62)	8 (4.68)
Nurse to patient ratio			
Mean	NA	1:2.20±1.09	NA
Average number of patients requiring ventilator in the ICU monthly, no. (%)			
<20	7 (10.61)	10 (9.52)	17 (9.94)
21-30	27 (40.91)	28 (26.67)	55 (32.16)
31-40	14 (21.21)	19 (18.10)	33 (19.30)
41-50	10 (15.15)	32 (30.48)	42 (24.56)
51-60	3 (4.55)	6 (5.71)	9 (5.26)
61-70	2 (3.03)	1 (0.95)	3 (1.75)
71-80	3 (4.55)	3 (2.86)	6 (3.51)
81-90	0 (0.00)	0 (0.00)	0 (0.00)
>90	0 (0.00)	6 (5.71)	6 (3.51)
Average number of end-of-life care patients monthly, no. (%)			
<2	13 (19.70)	19 (18.10)	32 (18.71)
2-5	30 (45.45)	49 (46.67)	79 (46.20)
5-10	21 (31.82)	26 (24.76)	47 (27.49)
>10	2 (3.03)	11 (10.48)	13 (7.60)

Table 1. (Continued) Baseline characteristics.

| Characteristic	Physicians (N = 66)	Nurses (N = 105)	Total (N = 171)
Average number of ICU deaths monthly, no. (%)			
<2	3 (4.55)	13 (12.38)	16 (9.36)
2-5	34 (51.52)	42 (40.00)	76 (44.44)
6-10	22 (33.33)	36 (34.29)	58 (33.92)
11-15	5 (7.58)	11 (10.48)	16 (9.36)
16-20	2 (3.03)	2 (1.90)	4 (2.34)
>20	0 (0.00)	1 (0.95)	1 (0.58)
In one month, how many shifts did you have to care for a patient overtime?, no. (%)			
Mean	8.33±7.20	8.21±5.50	8.26±6.19
How many rest days do you receive on average weekly?, no. (%)			
Mean	1.18±0.83	1.39±0.66	1.31±0.74

*1 USD = 33.9227 THB (average exchange rate in 2017)

Demographic data

This study included 171 subjects totaling 66 physicians (38.6%) and 105 nurses (61.4%). The average age was 33.10 ± 6.98 years; 42 were males (24.56%). Most subjects were single, 119 (69.59%). Most workplaces were medical schools, 115 subjects (69.59%). Most ICU types were medical, 85 subjects (49.71%). Most work experience was 1 to 5 years, 90 subjects (52.63%). Monthly income was 20,001 to 30,000 THB for 70 subjects (40.94%). The greatest number of patients admitted to the ICU monthly was 41 to 60 cases (38.6%). In all, 68 patients were admitted to the ICU for 6 to 10 days on average (39.77%). The average number of nurse-to-patient ratio was 1:2.20+1.09. The average number of patients requiring ventilator in the ICU was 21 to 30 days (32.16%). The average number of terminally ill patients monthly was 2 to 5 cases (46.2%). The number of patients who died in the ICU average totaled 2 to 5 cases monthly (44.44%). In one month, physi-

cians and nurses had to care for patients overtimes at an average 8.26 ± 6.19 shifts and in 1 week had rest days on an average of 1.31 ± 0.74 days.

Healthcare provider personal data

The majority thought that the rest days weekly was insufficient (68.42%). The average number of days of rest required weekly was 2.22 ± 0.55 days. In all, 56.14% felt that the tasks assigned to the ICU were too numerous. Altogether 91.81% felt that they had no time for their family. Totally, 48.54% felt that they were unfit for a job in the ICU. In total, 47.37% felt that they wanted to stop caring for patients in the ICU within the past year. Fully, 53.22% had conflicts with the patient care team. Exactly, 25.73% had conflicts with families of ICU patients and 47.95% were on duty at the ICU the last night before answering this questionnaire.
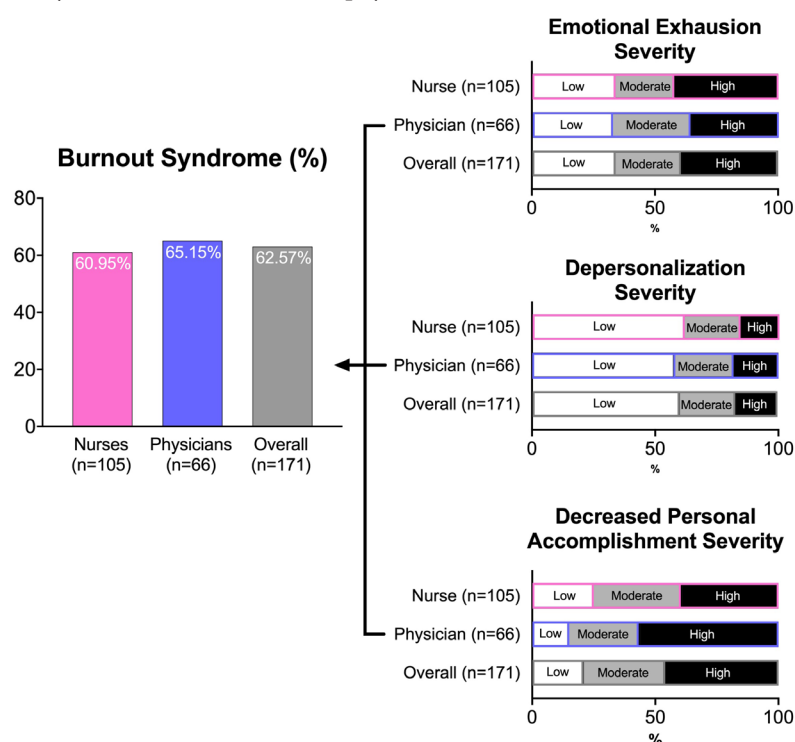
Figure 1. Incidence of burnout syndrome (BOS) among critical care providers (left panel) and the proportion of critical care providers presented with component of BOS, classified by its severity, including emotional exhaustion (upper right panel), depersonalization (middle right panel) and decreased personal accomplishment (lower right panel).

Incidence of BOS

Altogether. 107 participants or 62.57% experienced BOS, from EE at a high level 67 (39.18%) participants, from DP 28 (16.37%) participants and from decreased PA 78 (45.61%) participants. Of 66 physicians, 43 (65.15%) experienced BOS, from EE at a high level 23 (34.85%), from DP 12 (18.18%) and from decreased PA 37 (56.06%). Of 105 nurses, 64 (60.95%) experienced BOS, from EE at a high level 44 (41.9%), from DP 16 (15.24%) and from decreased PA41 (39.05%). The proportion of critical care providers presented with component of BOS, classified by its severity is shown in Fig 1.

Univariate logistic regression analysis for BOS

The factors affecting BOS among physicians were 1) average length of stay of patients in the ICU >5 days vs <5 days [OR (95%CI) 4.71 (1.49-14.90), p=0.008], 2) feeling they were unsuitable for a job in the ICU (yes/no) [OR (95%CI) 5.00 (1.57-15.97), p=0.007] and 3) feel like quitting caring for an ICU patient within the past year (yes/no) [OR (95%CI) 4.33 (1.42-13.20), p=0.01] as shown in Table 2. Whereas the factors affecting BOS in nurses were 1) average length of stay of patients in the ICU >5 days vs <5 days [OR (95%CI) 3.71 (1.22- 8.24), p=0.018], 2) nurse to patient ratio 1:1 vs lower than 1:1 [OR (95%CI) 6.38 (1.26-32.45), p=0.025], 3) feeling they were unsuitable for a job in the ICU (yes/no) [OR (95%CI) 4.25 (1.78-10.12), p=0.001], 4) feel like quitting caring for an ICU patient within the past year (yes/no) [OR

(95%CI) 5.20 (1.42-13.20), p=<0.001] and 5) ever had a conflict wit family members of an ICU patient (yes/no) [OR (95%CI) 2.28 (1.02-5.07), p value = 0.044] as shown in Table 3.

Multivariate logistic regression analysis for BOS

The factors affecting BOS for physicians included 1) the income received from working in the ICU <20,000 THB [31.46 (1.13- 874.61), p=0.042], 2) feel like quitting caring for an ICU patient within the past 1 year [15.9 (2.11-119.56), p=0.007], 3) number of rest days required in 1 week >2 days [7.4 (1.15-47.74), p=0.035] and 4) length of stay in the ICU >5 days [14.86 (2.37-93.28), p=0.004] as shown in Table 4. Whereas the factors affecting BOS for nurses were 1) age >40 years [15.69 (1.98-124.16), p=0.009], 2) ICU work experience >5 years [4.56 (1.05-19.78), p=0.043], 3) number of ICU beds >10 [0.12 (0.03-0.53), p=0.005], 4) average duration of patient admission to ICU >5 days [10.04 (2.12-47.54), p=0.004], 5) nurse to patient ratio lower than 1:1 [68.75 (3.73-1266.18), p=0.004], 6) number of ICU deaths 2 to 5 patients monthly [0.05 (0.01-0.56), p=0.014], 7) number of ICU deaths 6 to 10 patients monthly [0.03 (0.00-0.39), p=0.007], 8) feeling they had too many assignments in the ICU [4.25 (1.04-17.39), p=0.044] and 9) feeling like quitting caring for an ICU patient within the past year [5.33 (1.58-18.01), p=0.007] as shown in Table 5.

Table 2. Univariate logistic regression analysis for physicians.

Variable	BOS		Crude OR	P-value
	No (N=23)	Yes (N=43)	(95%CI)	
Sex, no. (%)				
Male	11 (35.48)	20 (64.52)	1	
Female	12 (34.29)	23 (65.71)	1.05 (0.38-2.90)	0.919
Age, no. (%)				
< 35 years	18 (35.29)	33 (64.71)	1	
> 35 years	5 (33.33)	10 (66.67)	1.09 (0.32-3.69)	0.889
Status, no. (%)				
Single	17 (36.17)	30 (63.83)	1	
Married	6 (31.58)	13 (68.42)	1.23 (0.39-3.82)	0.723
Workplaces, no. (%)				
Private hospital	2 (28.57)	5 (71.43)	1	
Medical school	19 (36.54)	33 (63.46)	0.69 (0.12-3.94)	0.681
Other	2 (28.57)	5 (71.43)	1.00 (0.10-10.17)	1.000
ICU type, no. (%)				
Nonmedical ICU	14 (40.00)	21 (60.00)	1	
Medical ICU	9 (29.03)	22(70.97)	1.63 (0.58-4.56)	0.352
Work experience in the ICU, no. (%)				
<1 yr	1 (10.00)	9 (90.00)		
1-5 yr	17 (36.96)	29 (63.04)	0.19 (0.02-1.63)	
>5 yr	5 (50.00)	5 (50.00)	0.11 (0.01-1.24)	0.074

Table 2. (Continued) Univariate logistic regression analysis for physicians.

Variable	BOS		Crude OR	P-value
	No (N=23)	Yes (N=43)	(95%CI)	
Work experience in the ICU, no. (%)				
<1 yr	1 (10.00)	9 (90.00)		
1-5 yr	17 (36.96)	29 (63.04)	0.19 (0.02-1.63)	
>5 yr	5 (50.00)	5 (50.00)	0.11 (0.01-1.24)	0.074
Income from the ICU, no. (%)*				
≥40,001 THB	7 (41.18)	10 (58.82)	1	
≤20,000 THB	1 (11.11)	8 (88.89)	5.60 (0.57-55.43)	0.141
20,001-40000 THB	15 (37.50)	25 (62.5)	1.17 (0.37-3.72)	0.794
Number of beds in the ICU, no. (%)				
≤10 beds	17 (41.46)	24 (58.54)	1	
>10 beds	6 (24.00)	19 (76.00)	2.24 (0.74-6.80)	0.153
Average number of patients admitted to the ICU monthly, no. (%)				
≤40 persons	11 (31.43)	24 (68.57)	1	
41-60 persons	5 (25.00)	15 (75.00)	1.38 (0.40-4.74)	0.614
≥61 persons	7 (63.64)	4 (36.36)	0.26 (0.06-1.08)	0.065
Average length of stay of patients in the ICU, no. (%)				
<5 days	11 (61.11)	7 (38.89)	1	
>5 days	12 (25.00)	36 (75.00)	4.71 (1.49-14.90)	0.008
Average number of patients in one shift, no. (%)				
≤5 persons	5 (50.00)	5 (50.00)	1	
6-10 persons	15 (39.47)	23 (60.53)	1.53 (0.38-6.22)	0.550
>10 persons	3 (16.67)	15 (83.33)	5.00 (0.87-28.86)	0.072
Average number of patients requiring ventilator in the ICU monthly, no. (%)				
<30 days	14 (41.18)	20 (58.82)	1	
31-50 days	7 (29.17)	17 (70.83)	1.70 (0.56-5.18)	0.351
>50 days	2 (25.00)	6 (75.00)	2.10 (0.37-11.96)	0.403
Average number of end-of-life care patients monthly, no. (%)				
≤5 persons	15 (34.88)	28 (65.12)	1	
>5 persons	8 (34.78)	15 (65.22)	1.00 (0.35-2.91)	0.993
Average number of ICU deaths monthly, no. (%)				
≤5 persons	14 (37.84)	23 (62.16)	1	
6-10 persons	8 (36.36)	14 (63.64)	1.07 (0.36-3.18)	0.910
>10 persons	1 (14.29)	6 (85.71)	3.65 (0.40-33.59)	0.253
In one month, how often did you need to care for a patient overtime, no. (%)				
≤5 days	10 (40.00)	15 (60.00)	1	
>5 days	13 (31.71)	28 (68.29)	1.44 (0.51-4.05)	0.494
Do you think that one week's rest days are sufficient?, no. (%)				
Yes	15 (33.33)	30 (66.67)	1	
No	8 (38.10)	13 (61.90)	2.82 (0.98-8.10)	0.054
Average number of rest days you need in one week, no. (%)				
≤2 days	20 (40.00)	30 (60.00)	1	
>2 days	3 (18.75)	13 (81.25)	2.89 (0.73 - 11.45)	0.131
Do you feel that your assignments in the ICU are too many?, no. (%)				
No	4 (57.14)	3 (42.86)	1	
Yes	19 (32.20)	40 (67.80)	2.81 (0.57-13.81)	0.204
Have you ever felt that you were unsuitable for a job in the ICU?, no. (%)				
No	18 (50.00)	18 (50.00)	1	
Yes	5 (16.67)	25 (83.33)	5.00 (1.57-15.97)	0.007

Table 2. (Continued) Univariate logistic regression analysis for physicians.

Variable	BOS		Crude OR	P-value
	No (N=23)	Yes (N=43)	(95%CI)	
Have you ever felt like quitting caring for an ICU patient within the past year?, no. (%)				
No	17 (50.00)	17 (50.00)	1	
Yes	6 (18.75)	26 (81.25)	4.33 (1.42-13.20)	0.010
Have you ever had a conflict with a patient care team (physicians, resident, nurses) in the ICU?, no. (%)				
No	13 (38.24)	21 (61.76)	1	
Yes	10 (31.25)	22 (68.75)	1.36 (0.49-3.77)	0.552
Have you ever had a conflict with the family members of an ICU patient?, no. (%)				
No	17 (37.78)	28 (62.22)	1	
Yes	6 (28.57)	15 (71.43)	1.5 2(0.49-4.66)	0.466

* 1 USD = 33.9227 THB (average exchange rate in 2017).
P < 0.05 considered to indicate statistical significance.
Bold values represent items attaining statistical significance.

Table 3. Univariate logistic regression analysis for nurses.

Variable	BOS		Crude OR	P-value
	No (N=41)	Yes (N=64)	(95%CI)	
Sex, no. (%)				
Female	38 (38.78)	60 (61.22)	1	
Male	3 (42.86)	4 (57.14)	0.84 (0.18-3.98)	0.831
Age, no. (%)				
<40 yr	37 (43.02)	49 (56.98)	1	
>40 yr	4 (21.05)	15 (78.95)	2.83 (0.87-9.24)	0.085
Status, no. (%)				
Single	27 (36.49)	47 (63.51)	1	
Married	14 (45.16)	17 (54.84)	0.7 (0.30-1.63)	0.407
Workplaces, no. (%)				
Private hospital	5 (50.00)	5 (50.00)	1	
Medical school	26 (41.27)	37 (58.73)	1.42 (0.37-5.42)	0.605
Other	10 (31.25)	22 (68.75)	2.20 (0.52-9.36)	0.286
ICU type, no. (%)				
Nonmedical ICU	22 (43.14)	29 (56.86)	1	
Medical ICU	19 (35.19)	35 (64.81)	1.40 (0.64-3.07)	0.404
Work experience in the ICU, no. (%)				
>5 yr	20 (40.00)	30 (60.00)	1	
<5 yr	21 (38.18)	34 (61.82)	1.08 (0.49–2.36)	0.160
Income from the ICU, no. (%)*				
≥40,001 THB	5 (50.00)	5 (50.00)	1	
≤20,000 THB	9 (30.00)	21 (70.00)	2.33 (0.54-10.1)	0.257
20,001-40000 THB	27 (41.54)	38 (58.46)	1.41 (0.37-5.34)	0.616
Number of beds in the ICU, no. (%)				
≤10 beds	15 (51.72)	14 (48.28)	1	
>10 beds	26 (34.21)	50 (65.79)	2.06 (0.86-4.91)	0.103
Average number of patients admitted to the ICU monthly, no. (%)				
≤40 persons	16 (39.02)	25 (60.98)	1	
41-60 persons	17 (36.96)	29 (63.04)	1.09 (0.46-2.60)	0.843
≥61 persons	8 (44.44)	10 (55.56)	0.80 (0.26-2.46)	0.697

Table 3. (Continued) Univariate logistic regression analysis for nurses.

Variable	BOS		Crude OR	P-value
	No (N=41)	Yes (N=64)	(95%CI)	
Average length of stay of patients in the ICU, no. (%)				
<5 days	14 (60.87)	9 (39.13)	1	
>5 days	27 (32.93)	55 (67.07)	3.17 (1.22-8.24)	0.018
Nurse to patient ratio, no. (%)				
1:1	7 (77.78)	2 (22.22)	1	
lower than 1:1	34 (35.42)	62 (64.58)	6.38 (1.26-32.45)	0.025
Average total number of patients in one shift, no. (%)				
< 2 persons	4 (28.57)	10 (71.43)	1	
> 2 persons	37 (40.66)	54 (59.34)	0.58 (0.17-2.00)	0.392
Average number of patients requiring ventilator in the ICU monthly, no. (%)				
<30 days	12 (31.58)	26 (68.42)	1	
31-50 days	20 (39.22)	31 (60.78)	0.72 (0.3-1.73)	0.458
>50 days	9 (56.25)	7 (43.75)	0.36 (0.11-1.19)	0.095
Average number of end-of-life care patients monthly, no. (%)				
≤5 persons	28 (41.18)	40 (58.82)	1	
>5 persons	13 (35.14)	24 (64.86)	1.29 (0.56-2.96)	0.545
Average number of ICU deaths monthly, no. (%)				
< 2 persons	2 (15.38)	11 (84.62)	1	
2-5 persons	21 (50.00)	21 (50.00)	0.18 (0.04-0.92)	0.040
6-10 persons	14 (38.89)	22 (61.11)	0.29 (0.05-1.49)	0.136
>10 persons	4 (28.57)	10 (71.43)	0.45 (0.07-3.04)	0.416
In one month, how often did you need to care for a patient overtime, no. (%)				
≤5 days	18 (50.00)	18 (50.00)	1	
>5 days	23 (31.71)	46 (66.67)	2.00 (0.88- 4.55)	0.099
Do you think that one week's rest days are sufficient?, no. (%)				
Yes	14 (46.67)	16 (53.33)	1	
No	27 (36.00)	48 (64.00)	1.56 (0.66-3.67)	0.313
Average number of rest days you need in one week, no. (%)				
≤2 days	28 (37.33)	47 (62.67)	1	
>2 days	13 (43.33)	17 (56.67)	0.78 (0.33-1.84)	0.570
Do you feel that your assignments in the ICU are too many?, no. (%)				
No	19 (54.29)	16 (45.71)	1	
Yes	22 (31.43)	48 (68.57)	2.59 (1.12-5.97)	1.416
Have you ever felt that you were unsuitable for a job in the ICU?, no. (%)				
No	31 (53.45)	27 (46.55)	1	
Yes	10 (21.28)	37 (78.72)	4.25 (1.78-10.12)	0.001
Have you ever felt like quitting caring for an ICU patient within the past year?, no. (%)				
No	32 (55.17)	26 (44.83)	1	
Yes	9 (19.15)	38 (80.85)	5.20 (2.13-12.68)	<0.001
Have you ever had a conflict with a patient care team (physicians, resident, nurses) in the ICU?, no. (%)				
No	23 (50.00)	23 (50.00)	1	
Yes	18 (30.51)	41 (69.49)	2.28 (1.02-5.07)	0.044
Have you ever had a conflict with the family members of an ICU patient?, no. (%)				
No	36 (43.90)	46 (56.10)	1	
Yes	5 (21.74)	18 (78.26)	2.82 (0.95-8.32)	0.061

* 1 USD = 33.9227 THB (average exchange rate in 2017).

P < 0.05 considered to indicate statistical significance.

Bold values represent items attaining statistical significance.

Table 4. Multivariate analysis among 66 physicians, considering variables included in the model: sex, age, type of ICU at work and excluded p >0.2 from univariate analysis.

Variable	BOS		Adjusted HR	P-value
	No (N=23)	Yes (N=43)	(95%CI)	
Sex, no. (%)				
Male	12 (34.29)	23 (65.71)	Reference	
Female	11 (35.48)	20 (64.52)	0.77 (0.19 - 3.20)	0.722
Age, no. (%)				
≤35 years	18 (35.29)	33 (64.71)	Reference	
>35 years	5 (33.33)	10 (66.67)	1.06 (0.85 - 1.33)	0.588
ICU type, no. (%)				
Nonmedical ICU	14 (40.00)	21 (60.00)	Reference	
Medical ICU	9 (29.03)	22 (70.97)	1.73 (0.41 - 7.32)	0.458
Income from the ICU, no. (%)*				
≥40,001 THB	7 (41.18)	10 (58.82)	Reference	
≤20,000 THB	1 (11.11)	8 (88.89)	31.46 (1.13-874.61)	0.042
20,001-40000 THB	15 (37.50)	25 (62.50)	0.59 (0.11 - 3.16)	0.540
Have you ever felt like quitting caring for an ICU patient within the past year?, no. (%)				
No	17 (50.00)	17 (50.00)	Reference	-
Yes	6 (18.75)	26 (81.25)	15.90 (2.11-119.56)	0.007
Average number of rest days you need in one week, no. (%)				
≤2 days	20 (40.00)	30 (60.00)	Reference	
>2 days	3 (18.75)	13 (81.25)	7.40 (1.15 – 47.74)	0.035
Average length of stay of patients in the ICU, no. (%)				
≤5 days	11 (61.11)	7 (38.89)	Reference	
>5 days	12 (25.00)	36 (75.00)	14.86(2.37-93.28)	0.004

* 1 USD = 33.9227 THB (average exchange rate in 2017).
P < 0.05 considered to indicate statistical significance.
Bold values represent items attaining statistical significance.

DISCUSSION

In this study, BOS was investigated. The results showed that the prevalence of BOS among Thai physicians and nurses diagnosed by three aspects was high, and at a high level of EE, DP, and PA. From this study, the major risk factors in the multivariate analysis differed between physicians and nurses. Among physicians, the major risk factors were low income, feelings of wanting to stop caring for patients in the ICU in the past year, the number of rest days needed >two days, and the average length of stay of patient in the ICU for >5 days. Among nurses, the major risk factors were age over 40 years, ICU work experience of >5 years, number of ICU beds >10, nurse to patient ratio <1:1, feeling of working too many ICU assignments and feelings of wanting to stop caring for patients in the ICU in the past year but the protective factor was number of patients who died 2 to 10 persons monthly.

BOS was first described in the 1970s as a work-related condition causing signs and symptoms to appear [10]. Diagnosis is based on the MBI questionnaire, consisting of 22 questions and seven levels of severity, calculated as a score and then diagnosed [11]. However, the diagnostic value of personnel working in an ICU in each study differed. This made it difficult to compare individual studies. A study compiled in 2016 found that the main risk factors included young age, being male, single or childless status, little work experience, working hours and caring for patients at the end of life [12].

The prevalence of BOS among physicians was 45% and about 25 to 33% among nurses in several related studies [12-14]. From this study, 43 physicians (65.15%) had BOS, divided in EE 34.85%, DP 18.18% and PA 56.06%. The BOS study in 2011 by Lerthattasilp T. among Thai psychiatrists found that EE accounted for 17.1% on DP 5.5% and PA 7.7%. The 1989 BOS study by Summawart S. among staff nurses in Ramathibodi Hospital found that EE accounted for 68.1% DP, 53.7% and PA, 56.5% [9].

Comparing this study with related studies in Thailand revealed that physicians working in the ICU experienced more BOS than physicians working in psychiatry units. This may be due to the difference in patient care between inpatients of ICU physicians and outpatients of psychiatrists: the higher the mortality rate among ICU patients, the higher the severity of the disease, different compensations, different rest days; and therefore, different outcome data. However, when compared with physicians working in ICUs in other countries, more BOS cases were found among Thai physicians. This was most likely due to much lower pay and less rest time. Nurses working in the ICU

Table 5. Multivariate analysis among 105 nurses, considering variables in the model including sex, age, type of ICU at work and excluded p >0.2 from univariate analysis.

Variable	BOS		Adjusted HR	P-value
	No (N=23)	Yes (N=43)	(95%CI)	
Sex, no. (%)				
Male	3 (42.86)	4 (57.14)	Reference	
Female	38 (38.78)	60 (61.22)	0.99 (0.11 - 9.19)	0.993
Age, no. (%)				
≤ 40 years	37 (43.02)	49 (56.98)	Reference	
>40 years	4 (21.05)	15 (78.95)	15.69 (1.98-124.16)	0.009
ICU type, no. (%)				
Nonmedical ICU	22 (43.14)	29 (56.86)	Reference	
Medical ICU	19 (35.19)	35 (64.81)	1.99 (0.57 - 6.94)	0.278
Work experience in the ICU, no. (%)				
≤5 years	21 (38.18)	34(61.82)	Reference	
>5 years	20 (40.00)	30 (60.00)	4.56 (1.05 - 19.78)	0.043
Number of beds in the ICU, no. (%)				
≤10 beds	26 (34.21)	50 (65.79)	Reference	
>10 beds	15 (51.72)	14 (48.28)	0.12 (0.03 - 0.53)	0.005
Average length of stay of patient in the ICU, no. (%)				
≤5 days	14 (60.87)	9 (39.13)	Reference	
>5 days	27 (32.93)	55 (67.07)	10.04 (2.12 - 47.54)	0.004
Nurse to patient ratio, no. (%)				
1:1	7 (77.78)	2 (22.22)	Reference	
lower than 1:1	34 (35.42)	62 (64.58)	68.75 (3.73-1266.18)	0.004
Average number of ICU deaths monthly, no. (%)				
<2 persons	2 (15.38)	11(84.62)	Reference	
2-5 persons	21 (50.00)	21 (50.00)	0.05 (0.01 - 0.56)	0.014
6-10 persons	14 (38.89)	22 (61.11)	0.03 (0.00 - 0.39)	0.007
≥11 persons	4 (28.57)	10 (71.43)	0.23 (0.01 - 3.63)	0.293
Do you feel that your assignments in the ICU are too many?, no. (%)				
No	19 (54.29)	16 (45.71)	Reference	
Yes	22 (31.43)	48 (68.57)	4.25 (1.04 - 17.39)	0.044
Have you ever felt like quitting caring for an ICU patient within the past year?, no. (%)				
No	32 (55.17)	26 (44.83)	Reference	
Yes	9 (19.15)	38 (80.85)	5.33 (1.58 - 18.01)	0.007

P < 0.05 considered to indicate statistical significance.
Bold values represent items attaining statistical significance

were less tired from work than nurses caring for inpatients. The difference may be due to the different nature of work. Caring for patients in the past would have been more difficult than today with fewer assistive devices such as automatic blood pressure monitors, food feeder devices, intravenous pump devices including the drugs used were less effective as the present, different mortality rates, etc. Nonetheless, when compared with nurses working in ICUs in other countries, Thai nurses experienced higher BOS. The reason was probably from the environment in the organization and receiving too many assignments.

From the results of the risk factors among physicians, the income of physicians in Thailand compared with the responsibilities and duties received were quite low and when mistreatment occurred, serious lawsuits arose. In addition, factors included having less rest time on average, 1.18±0.83 days, due to having to stay on duty continuously and dealing with the shortage of physicians. These constituted important risk factors and corresponded to the study of the Medical Council of Thailand concerning the reasons doctors resigned. The first two reasons were from compensation issues and the burden of responsibility being too heavy.

As for the length of time the patient was admitted to the ICU, if it exceeded five days, it indicated that the patients were likely to present severe symptoms. They may not re-

spond to treatment or respond slowly to the treatment they received, causing them to stay in the ICU for long periods of time and causing the attending physician to think that he or she was ineffective in caring for the patient or they must take time to advise patients or futile care, and the risk of BOS occurred through intensive care. Moreover, a feeling of quitting caring for a patient in an ICU within the past year, indicated that physicians were already at risk for BOS.

The results indicated risk factors of nurses included being older, having more work experience and feeling they had too many assignments in the ICU. These three factors increased the risk of BOS. The researcher reasoned that the causes may have been due to the need for close supervision by nurses in intensive care, taking notes on multiple monitors and caring for multiple patients averaging 2.20±1.09 per nurse. Due to the shortage of ICU nurses in Thailand and as they became older, executive jobs, hospital quality jobs or teaching nursing juniors added many extra duties to their regular work. Other factors comprised coordinating with many physicians, emotional support for both the physicians and the patient and having a high degree of responsibility. These were probably the main causes of BOS. However, this study did not determine any specific cause. Further, a feeling of quitting caring for a patient in an ICU within the past year indicated that nurses were already at risk for BOS.

Some protective factors were found among nurses included the number of patients who died monthly, 2 to 10 deaths and number of beds >10 resulting in a reduced risk of BOS. The investigators thought that when patients died in the ICU <2 patients monthly, maybe the patient was stable in the ICU for a long time or the patient's symptoms improved quickly and was discharged early from the ICU. When patients were stable in the ICU for a long time, this lengthened the medical treatment, and the patient may not have clearly improved. Possibly the patient was admitted and discharged from the ICU too early creating heavy workloads on nurses to care for each patient, causing the nurses to have BOS. However, >10 deaths monthly meant the patients' symptoms in the ICU may be very severe or the treatment received may was insufficient to ensure the patient's survival. The nursing nurses may feel that they were not caring sufficiently or doing their best after the patient's death. The number of beds >10 reduced the risk of BOS, and investigators thought that the larger ICU size, the presence of colleagues, organizations, or ICU systems played an important role in reducing BOS. Nevertheless, this research was unable to determine the exact cause. Also, choosing a population with selection bias may have influenced the findings, so studying additional populations would be advisable before using the data in the future.

This constituted the first study in Thailand to examine physicians and nurses working in the ICU. Risk factors for physicians and nurses were examined separately because their work was not the same even in the same ICU. Research conducted in many public and private hospitals makes the data more diverse than that in a single institution. Multivariate analysis was performed for all variables in the study to determine the significant risk of developing BOS. However, this research was limited in terms of its small population. The questionnaire did not address the exact cause of BOS, but only stated that such factors involved a risk. In responding to questionnaires, response bias may have occurred be-

cause they comprised personal data or were caused by the researcher himself in selecting the population to answer the questionnaire. Our results may be biased by over or under representation of BOS because we surveyed using personal contacts by simple random sampling. Risk factors for BOS may be greater than those the questionnaire proposed. Finally, the information was obtained from many ICUs and hospitals. Therefore, the applying the results in any hospital may be limited.

CONCLUSION

BOS was high among physicians and nurses working in the ICU. The major risk factors among physicians included income received from work, number of rest days required, length of stay of patients in the ICU, and the feeling of quitting caring for a patient in an ICU within the past year. The major risk factor among nurses consisted of old age, work experience, length of stay of patients in the ICU, nurse to patient ratio lower than 1:1, too many assignments in the ICU, and feeling of quitting caring for a patient in an ICU within the past one year. Nonetheless, the protective factors comprised number of ICU beds >10 and number of ICU deaths 2 to 10 patients monthly. The risk factors found to be similar among physicians and nurses were length of stay of patients in the ICU and feeling of quitting caring for a patient in an ICU within the past year.

AUTHORS' CONTRIBUTIONS
Chatchai Laopakorn: Conceptualization, Methodology, Investigation, Writing Original draft, Writing Review & Editing, Visualization, Project administration. Pimsai Kunakorn: Data curation, Writing Review & Editing. Petch Wacharasint: Software, Supervision, Data Curation

SUPPLEMENTARY MATERIALS
none

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SUPPLEMENTARY APPENDIX

Table S1 Questionnaire and MBI-HSS (Thai language)

ส่วนที่ 1 ข้อมูลปัจจัยด้านบุคคล   รหัสแบบสอบถาม_____
คำชี้แจง แบบสอบถามนี้มีทั้งหมด 8 ข้อ โปรดตอบคำถามที่ตรงกับข้อเท็จจริงเกี่ยวกับตัวท่านมากที่สุด หรือเติมข้อมูลลงในช่องว่าง
1. ที่อยู่อีเมล...
2. อายุ..............ปี
3. เพศ   ชาย   หญิง
4. สถานภาพ   โสด   หย่าร้าง   สมรสไม่มีบุตร   สมรสมีบุตร
5. ลักษณะโรงพยาบาลที่ปฏิบัติงาน
        โรงเรียนแพทย์
        โรงพยาบาลจังหวัด
        โรงพยาบาลศูนย์
        โรงพยาบาลเอกชน
        อื่นๆ
6. ชนิดของ ICU ที่ทำงาน
        อายุรกรรม
        ศัลยกรรม
        อายุรกรรม-ศัลยกรรม
        อุบัติเหตุและฉุกเฉิน
7. ประสบการณ์การทำงานใน ICU
        น้อยกว่า 1 ปี
        1-5 ปี
        6-10 ปี
        11-15 ปี
        16-20 ปี
        มากกว่า 20 ปี
8. เงินเดือนที่ได้รับจากการทำงานใน ICU
        น้อยกว่า 10,000 บาท
        10,001-20,000 บาท
        20,001-30,000 บาท
        30,001-40,000 บาท
        40,001-50,000 บาท
        50,001-60,000 บาท
        60,001-70,000 บาท
        มากกว่า 70,000 บาท
ส่วนที่ 2 ข้อมูลลักษณะการทำงาน
คำชี้แจง แบบสอบถามนี้มีทั้งหมด 25 ข้อ และแบ่งเป็นส่วนเฉพาะแพทย์ตอบข้อ 10-16 และเฉพาะพยาบาลตอบข้อ 17-25 โปรดตอบ
คำถามที่ตรงกับข้อเท็จจริงเกี่ยวกับตัวท่านมากที่สุดหรือเติมข้อมูลลงในช่องว่าง
ท่านเป็น   แพทย์   พยาบาล
1. จำนวนเตียงใน ICU (เตียง) ....
2. จำนวนผู้ป่วยที่รับเข้ามาดูแลใน ICU โดยเฉลี่ยต่อเดือน (คน)
น้อยกว่า 40 คน
21 – 40 คน
41 – 60 คน
61 – 80 คน
81 – 100 คน
มากกว่า 100 คน
3. ระยะเวลาที่ผู้ป่วยเข้ารับการรักษาใน ICU โดยเฉลี่ย (วัน)
น้อยกว่า 2 วัน
2-5 วัน
6-10 วัน
11-15 วัน
16-20 วัน
มากกว่า 20 วัน
4. จำนวนผู้ป่วยที่ต้องดูแลต่อพยาบาล 1 คน (คน)
        1 คน
        2 คน
        3 คน
        4 คน
        5 มากกว่า 4 คน
5. จำนวนผู้ป่วยทั้งหมดใน 1 เวร โดยเฉลี่ย (คน) ....
6. จำนวนผู้ป่วยที่ต้องใช้เครื่องช่วยหายใจใน ICU โดยเฉลี่ยต่อเดือน (คน)
        น้อยกว่า 20 คน
        21-30 คน
        31-40 คน
        41-50 คน
        51-60 คน
        61-70 คน
        71-80 คน

81-90 คน
มากกว่า 90 คน
อื่นๆ ....
7. จำนวนผู้ป่วยระยะสุดท้าย (End of life care) โดยเฉลี่ยต่อเดือน (คน)
        < 2 คน
        2-5 คน
        6-10 คน
        มากกว่า 10 คน
8. จำนวนผู้ป่วยที่เสียชีวิตใน ICU โดยเฉลี่ยต่อเดือน
        น้อยกว่า 2 คน
        2-5 คน
        6-10 คน
        11-15 คน
        16-20 คน
        มากกว่า 20 คน
9. จำนวนผู้ป่วยเสียชีวิตภายใน 1 สัปดาห์ที่ผ่านมา
        ไม่มีเลย
        1 – 2 คน
        3 – 5 คน
        6 – 8 คน
        9 – 10 คน
        มากกว่า 10 คน
        อื่นๆ..........................
เฉพาะแพทย์ ตอบข้อ 10-16
10. ใน 1 ปี ท่านดูแลผู้ป่วยใน ICU กี่สัปดาห์ (โดยเฉลี่ย) ....
11. เดือนที่ท่านปฏิบัติงานใน ICU ใน 1 วัน ท่านต้องดูแลผู้ป่วยในเวลาทำการกี่ชั่วโมง..........................
12. เดือนที่ท่านปฏิบัติงานใน ICU ใน 1 สัปดาห์ ท่านต้องดูแลผู้ป่วยในเวลาทำการกี่วัน..........................
13. เดือนที่ท่านปฏิบัติงานใน ICU ใน 1 สัปดาห์ ท่านต้องดูแลผู้ป่วยนอกเวลาทำการ ช่วงวันหยุดกี่เวร..........................
14. เดือนที่ท่านปฏิบัติงานใน ICU, ใน 1 สัปดาห์ท่านต้องดูแลผู้ป่วยนอกเวลาทำการ ช่วงเวลา 16.00 น.-08.00 น. (ไม่รวมวันหยุด) กี่เวร..........................
15. ใน 1 เดือน ท่านต้องดูแลผู้ป่วยนอกเวลาทำการ (OT) กี่เวร..........................
16. ใน 1 สัปดาห์ มีวันพักผ่อนโดยเฉลี่ยกี่วัน..........................
เฉพาะพยาบาล ตอบข้อ 17-25
17. จำนวนพยาบาลทั้งหมดใน ICU กี่คน
18. จำนวนผู้ช่วยพยาบาลทั้งหมดใน ICU กี่คน
19. ใน 1 วัน ท่านต้องเข้าเวรดูแลผู้ป่วยใน ICU กี่เวร
20. ใน 1 สัปดาห์ ท่านต้องเข้าเวรดูแลผู้ป่วยใน ICU กี่เวร
21. ใน 1 สัปดาห์ ท่านต้องเข้าเวรดูแลผู้ป่วยใน ICU ช่วงเวลา 08.00-16.00 กี่เวร
22. ใน 1 สัปดาห์ ท่านต้องเข้าเวรดูแลผู้ป่วยใน ICU ช่วงเวลา 16.00-24.00 กี่เวร
23. ใน 1 สัปดาห์ ท่านต้องเข้าเวรดูแลผู้ป่วยใน ICU ช่วงเวลา 24.00-08.00 กี่เวร
24. ใน 1 เดือน ท่านต้องดูแลผู้ป่วยนอกเวลาทำการ (OT) กี่เวร..........................
25. ใน 1 สัปดาห์ มีวันพักผ่อนโดยเฉลี่ยกี่วัน..........................
ส่วนที่ 3 ข้อมูลส่วนบุคคล
1. ท่านคิดว่าวันพักผ่อนใน 1 สัปดาห์ เพียงพอหรือไม่
        เพียงพอ
        ไม่เพียงพอ
2. จำนวนวันพักผ่อนที่ท่านต้องการใน 1 สัปดาห์โดยเฉลี่ย (วัน)
....
3. ท่านรู้สึกว่างานที่ได้รับมอบหมายใน ICU มากเกินไปหรือไม่
        ใช่
        ไม่ใช่
4. ท่านเคยรู้สึกว่าไม่มีเวลาให้ครอบครัวหรือไม่
        เคย
        ไม่เคย
5. ท่านเคยรู้สึกว่าตนเองไม่เหมาะกับงานใน ICU หรือไม่
        เคย
        ไม่เคย
6. ท่านเคยรู้สึกว่าอยากเลิกดูแลผู้ป่วยใน ICU ภายใน 1 ปีที่ผ่านหรือไม่
        เคย
        ไม่เคย
7. ท่านเคยมีความขัดแย้งกับทีมที่ร่วมดูแลผู้ป่วย (แพทย์, แพทย์ประจำบ้าน, พยาบาล) ใน ICU หรือไม่
        เคย
        ไม่เคย
8. ท่านเคยมีความขัดแย้งกับครอบครัวของผู้ป่วยใน ICU หรือไม่
        เคย   ไม่เคย
ส่วนที่ 4 แบบวัดภาวะความเหนื่อยล้าในการทำงานฉบับภาษาไทย (MBI-HSS Thai version)

ข้อความเกี่ยวกับความรู้สึก	ไม่เคยรู้สึก เช่นนั้น	ปีละ 2-3 ครั้ง	เดือนละ 1 ครั้ง	เดือนละ 2-3 ครั้ง	สัปดาห์ละ 1 ครั้ง	สัปดาห์ละ 2-3 ครั้ง	ทุกๆวัน
1.ฉันรู้สึกจิตใจท่อเหี่ยวจากการทำงาน							
2.ฉันรู้สึกหมดแรงเมื่อสิ้นสุดเวลาทำงาน							
3.ฉันรู้สึกเพลียเมื่อตื่นนอนตอนเช้าและรู้ว่าต้องเผชิญกับการทำงานอีกวัน							
4.ฉันสามารถเข้าใจถึง ความรู้สึกของผู้ป่วยที่มีต่อสิ่งต่างๆได้ง่าย							
5.ฉันรู้สึกว่าฉันได้ปฏิบัติต่อผู้ป่วยบางคนเสมือนเขาเป็นสิ่งไร้ชีวิตจิตใจ							
6.การทำงานเกี่ยวกับการบริการผู้คนตลอดวันเป็นสิ่งที่เครียดสำหรับฉัน							
7.ฉันสามารถแก้ปัญหาของผู้ป่วยได้อย่างมีประสิทธิภาพ							

ข้อความเกี่ยวกับความรู้สึก	ไม่เคยรู้สึก เช่นนั้น	ปีละ 2-3 ครั้ง	เดือนละ 1 ครั้ง	เดือนละ 2-3 ครั้ง	สัปดาห์ละ 1 ครั้ง	สัปดาห์ละ 2-3 ครั้ง	ทุกๆวัน
8.ฉันรู้สึกเหนื่อยหน่ายในภาระงานของฉัน							
9.ฉันรู้สึกแน่ใจว่างานของฉันมีอิทธิพลต่อชีวิตของผู้อื่น							
10.ฉันเปลี่ยนเป็นคนหยาบกระด้างและไร้ความเมตตาต่อผู้คนมากขึ้นตั้งแต่เป็นแพทย์/พยาบาล							
11.ฉันวิตกกังวลว่าความกำลังทำให้จิตใจของฉันแข็งกระด้างขึ้น							
12.ฉันรู้สึกเปี่ยมไปด้วยพลัง							
13.ฉันรู้สึกคับข้องใจในการทำงาน							
14.ฉันรู้สึกว่าฉันกำลังทำงานที่หนักเกินไป							
15.ฉันไม่เคยใส่ใจว่าอะไรจะเกิดขึ้นกับผู้ป่วยบางคน							
16.การทำงานกับผู้ป่วยโดยตรงทำให้ฉันเครียดมากเกินไป							
17.ฉันสามารถสร้างบรรยากาศที่ผ่อนคลายในการให้การรักษาผู้ป่วยได้ง่าย							
18.ฉันรู้สึกเป็นสุขใจภายหลังการให้การรักษาผู้ป่วยอย่างใกล้ชิด							
19.ฉันได้สร้างสรรค์สิ่งที่มีคุณค่ามากมายในการให้การรักษาผู้ป่วย							
20.ฉันรู้สึกสิ้นหวัง							
21.ในการทำงานฉันสามารถเผชิญปัญหาทางอารมณ์ได้อย่างสงบ							
22.ฉันรู้สึกว่าได้รับการตำหนิจากผู้ป่วยในปัญหาบางอย่างที่เกิดขึ้น							

Table S2 Scoring criteria for MBI-HSS with 7-level scale.

How often?	Points
Never	0
Had a feeling like that 2-3 times yearly	1
Had a feeling like that once monthly	2
Had a feeling like that 2-3 times monthly	3
Had a feeling like that once weekly	4
Had a feeling like that 2-3 times weekly	5
Had a feeling like that every day	6

Table S3 The interpretation of the scores was as follows.

MBI subset	High	Moderate	Low
Emotional exhaustion (EE)	> 27	17-26	< 16
Depersonalization (DP)	> 13	7-12	< 6
Decreased personal accomplishment (PA)	< 31	32-38	> 39

The 22-question assessment evaluates and scores the three dimensions of burnout: EE, DP, and PA. Scores are termed as low
(EE = 0–16, DP = 0–6, PA ≥39), moderate (EE = 17–26, DP =7–12, PA = 32–38) or high (EE ≥27, DP ≥13, PA = 0–31)

Table S4 Personal data of the total population, physicians and nurses.

Personal data	Physicians (N=66)	Nurses (N=105)	Total (N=171)
Do you think that one week's rest days are enough?, no. (%)			
Yes	24 (36.36)	30 (28.57)	54 (31.58)
No	42 (63.64)	75 (71.43)	117 (68.42)
Average number of vacation days you need in one week (days)			
Mean	2.20 ± 0.61	2.23 ± 0.50	2.22 ± 0.55
Do you feel that your assignments in the ICU are too many?, no. (%)			
Yes	26 (39.39)	70 (66.67)	96 (56.14)
No	40 (60.61)	35 (33.33)	75 (43.86)
Do you feel that you don't have time for your family?, no. (%)			
Yes	59 (89.39)	98 (93.33)	157 (91.81)
No	7 (10.61)	7 (6.67)	14 (8.19)

Personal data	Physicians (N=66)	Nurses (N=105)	Total (N=171)
Have you ever felt that you were unsuitable for a job in the ICU?, no. (%)			
Yes	36 (54.55)	47 (44.76)	83 (48.54)
No	30 (45.45)	58 (55.24)	88 (51.46)
Have you ever felt like quitting caring for an ICU patient within the past year?, no. (%)			
Yes	34 (51.52)	47 (44.76)	81 (47.37)
No	32 (48.48)	58 (55.24)	90 (52.63)
Have you ever had a conflict with a patient care team (physicians, resident, nurses) in the ICU?, no. (%)			
Yes	32 (48.48)	59 (56.19)	91 (53.22)
No	34 (51.52)	46 (43.81)	80 (46.78)
Have you ever had a conflict with the family members of an ICU patient?, no. (%)			
Yes	21 (31.82)	23 (21.90)	44 (25.73)
No	45 (68.18)	82 (78.10)	127 (74.27)
Did you attended the ICU last night before answering this questionnaire?, no. (%)			
Yes	15 (22.73)	67 (63.81)	82 (47.95)
No	51 (77.27)	38 (36.19)	89 (52.05)

Table S5 shows the data on the work description of the total population, physicians and nurses.

Work description	Physicians (N=66)	Nurses (N=105)	Total (N=171)
Number of beds in the ICU			
Mean	11.13±6.43	9.6±4.35	10.20±5.28
How many nurses are working in the ICU?			
Mean	-	21.46±8.43	-
How many total nursing assistants working in the ICU?			
Mean	-	6.71 ± 3.93	
Number of shifts daily?			
Mean	-	1.52 ± 0.52	
Number of shifts weekly?			
Mean	-	7.37 ± 2.84	
Number of shifts monthly?			
Mean	-	24.93 ± 8.59	
In one year, how many weeks do you care for an ICU patient (on average)?			
Mean	25.83 ± 14.95	-	
In the last month working in the ICU, how many hours did you care for a patient daily?			
Mean	8.78 ± 1.52	-	
In the last month you worked in the ICU, how many business days did you have to take care of the patient weekly?			
Mean	5.70 ± 1.07	-	
In the last month you worked in the ICU, how many shifts did you care for a patient out of office hours in one week?			
Mean	1.41 ± 0.63	-	
In the last month you worked in the ICU, how many times did you need to care for patients out of office hours from 16:00 - 8:00 (excluding holidays)?			
Mean	2.52 ± 1.75	-	
In one week, how many times did you need to care for patients in the ICU from 08.00 - 16.00?			
Mean	-	3.79 ± 2.01	
In one week, how many times did you need to care for patients in the ICU from 16.00 - 24.00?			
Mean	-	3.20 ± 1.93	
In one week, how many shifts did you need to care for patients in the ICU from 24.00 - 08.00?			
Mean	-	2.86 ± 1.83	