

Spouses as trained ICU doulas have significant effects on the psychological outcomes of intensive care survivors: A retrospective secondary analysis

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Abstract

The purpose of this study was to investigate the effect of psychological support provided by the patient's spouse as trained ICU doula on mental disorders after 12 months of hospital discharge. This retrospective secondary analysis was conducted on married patients (patient- and patient's spouse as a unit) with no history of mental disorders. In this study, three groups of patients were compared with each other; ICU survivors with trained spouse as ICU-doula (n = 359, 29%), ICU survivors without trained spouse (n = 461, 37.3%) and discharged patients from general wards without trained spouse (n = 416, 33.7%). In multivariate binary logistic regression, the odds ratio (OR) of mental disorders based on WHO-5 index (OR: 0.344, 95% CI: 0.265–0.446, P < 0.001), HADS-depression score (OR: 0.762, 95% CI: 0.593–0.979, P = 0.033), HADS-anxiety score (OR: 0.372, 95% CI: 0.287–0.481, P < 0.001) and IES-R score (OR: 0.367, 95% CI: 0.184–0.875, P < 0.001), were significantly decreased in the ICU survivor with trained spouse as ICU-doula compared with the ICU survivors without doula. However, there was no statistically significant difference was found between ICU survivors without doula and no ICU patients without doula. Our data suggest that the patient's spouse as trained ICU doula could feasibly and successfully provide psychological support in the ICU setting. Since psychologist support by patient's spouse is not associated with any adverse effects, implementing this service should be considered.

Introduction

Millions of people around the world have survived intensive care units (ICUs) and the number of survivors is rising ¹. While these patients have survived a life-threatening illness, most of them suffer from long-term impairment in physical, cognitive, and psychological function, collectively referred to as post-intensive care syndrome (PICS) ^{2–4}. PICS following hospitalization characterized by symptoms of anxiety, depression, and post-traumatic stress disorder (PTSD) that affect over a third of all critical illness survivors post discharge ^{5–7}. PICS is a major burden for patients, their families, and the health-care system because of high rates of institutionalization, frequent repeat hospitalizations, higher health-care costs and increased health-care utilization ^{8,9}. Early physical rehabilitation of ICU patients and systematic strategies for delirium prevention demonstrated improvement in physical and cognitive outcomes ^{10,11}. In addition to these measures, psychological support of these patients to treat mental health disorders related to PICS is becoming an important target to improve quality of life ^{12,13}. However, the prevention of psychological complications has not been adequately addressed ^{14,15}.

Most interventions to reduce psychological complications are performed in the months following discharge from intensive care and hospital. They include follow-up clinics, rehabilitation services, patient diaries and psychiatric recovery sessions led by a nurse ^{16–18}. While disturbing memories of frightening and delusional experiences seem to be a major potential risk factor for future psychological complication in ICU patients ^{5,19}. Therefore, introducing psychological support as soon as possible after admission to the ICU and providing it in parallel with ongoing medical care can be more effective. Given this, a therapeutic approach called psychological support based on positive suggestions (PSBPSs) was

designed to communicate with the critically ill^{20,21}. PSBPS can involve one-way and two-way communication and therefore can be performed regardless of the level of patient participation, because semantic processing continues in altered states of consciousness²². However, the participation of intensive care nurses or even the availability of psychotherapists as those who can attend the intensive care unit is very limited.

Due to the limited staff, the large workload, the endless care, and the need constant monitoring by ICU care team members, there is little time left to address the patient's emotional, mental, and physical needs. The role of nurse as supporter is considered both effective and valuable by patients, but evidence suggest that even with ideal 1-to-1 staffing ratios nurses are able to devote only a small percentage of their time to providing supportive care. In addition, clinical psychologists are rarely present in the ICU. Based on previous evidence and familiarity with doula as a trained person who provide continuous physical, emotional, and informational support to women during labor, birth, and the immediate postpartum period^{23,24}, which is similar to what is needed in the ICU environment. Therefore, we explored the training of a patient's partner (spouse) as an alternative provider to provide initial psychological support in the ICU. The aim of this study was to investigate the effect of psychological support of the patient's spouse as trained ICU-doulas on mental disorders after 12 months of hospital discharge. For this purpose, three groups of patients were compared with each other; ICU survivors with trained spouse as ICU-doulas, ICU survivors without trained spouse and discharged patients from general wards without trained spouse.

Results

Study population

A total of 1,236 patients with their spouses as unit were included in the analysis, 359 (29%) ICU survivor's patients whose spouses were trained as ICU-doulas, 461 (37.3%) ICU survivor's patients without a trained spouse, and 416 (33.7%) patients discharged from general wards of hospital without a trained spouse. Comparison of demographics and clinical characteristics between three study groups are presented in Table 1. Demographic characteristics such as age ($P = 0.605$), gender ($P = 0.849$), comorbidities ($P = 0.221$) were similar between three groups of study. Also, in terms of some variables such as high alarm silence strategy ($P = 0.261$), physical restraint ($P = 0.196$), sleep disturbance ($P = 0.068$) and the mean total of hospital length of stay [LOS] ($P = 0.370$) were not significant difference between two groups of study. However, in terms of severity of illness based on Acute Physiology and Chronic Health Evaluation (APACHE) IV score ($P < 0.001$), dose of sedation ($P = 0.016$) and nursing care ($P = 0.002$) a significant difference was observed between the three groups.

Table 1
Comparison of demographics and clinical characteristics between three study groups

Characteristics		ICU survivors with doulas (n = 359)	ICU survivors without doulas (n = 461)	No ICU patients without doulas (n = 416)	P-value
Age (years)	Mean ± SD	67.11 ± 11.08	67.70 ± 11.31	67.90 ± 11.51	0.605
Gender	Male (%)	159 (44.3)	212 (46)	192 (46.2)	0.849
	Female (%)	200 (55.7)	249 (54)	224 (53.8)	
Comorbidities	Yes (%)	85 (23.7)	87 (18.9)	83 (20)	0.221
	No (%)	274 (76.3)	374 (81.1)	333 (80)	
Comorbidities types	Cardiovascular disease (%)	5 (1.4)	12 (2.6)	6 (1.4)	0.856
	CHF/cardiomyopathy (%)	14 (3.9)	10 (2.2)	10 (2.4)	
	Diabetes (%)	14 (3.9)	13 (2.8)	10 (2.4)	
	Chronic kidney disease (%)	19 (5.3)	11 (2.4)	14 (3.4)	
	Chronic liver disease (%)	7 (1.9)	14 (3.0)	14 (3.4)	
	Chronic pulmonary disease (%)	6 (1.7)	3 (0.7)	8 (1.9)	
	Liver cancer (%)	8 (2.2)	4 (0.9)	5 (1.2)	
	Gastrointestinal cancer (%)	5 (1.4)	4 (0.9)	7 (1.7)	
	Brain cancer (%)	4 (1.1)	11 (2.4)	3 (0.7)	
	Hypertension (%)	2 (0.6)	3 (0.7)	3 (0.7)	
	Arthritis (%)	1 (0.3)	2 (0.4)	3 (0.7)	
	APACHE IV	Mean ± SD	15.69 ± 2.48	16.79 ± 2.45	
(Range)		(11–22)	(15–22)	(11–19)	

* P-value < 0.05 considered as significant, Abbreviations: APACHE IV means Acute Physiology and Chronic Health Evaluation IV, LOS means length of stay

Characteristics		ICU survivors with doulas (n = 359)	ICU survivors without doulas (n = 461)	No ICU patients without doulas (n = 416)	P value
Physical restraint	Yes (%)	142 (39.6)	210 (45.6)	172 (41.3)	0.196
	No (%)	217 (60.4)	251 (54.4)	244 (58.7)	
Sedation	Low (%)	124 (34.5)	120 (26)	90 (21.6)	0.016*
	Moderate (%)	187 (52.1)	249 (54)	240 (57.7)	
	High (%)	48 (13.4)	92 (20)	86 (20.7)	
Nursing Care	Low (%)	132 (36.8)	125 (27.1)	118 (28.4)	0.002*
	Moderate (%)	175 (48.7)	230 (49.9)	198 (47.6)	
	High (%)	52 (14.5)	106 (23)	100 (24)	
Sleep disturbance	Yes (%)	256 (71.3)	300 (65.1)	266 (63.9)	0.068
	No (%)	103 (28.7)	161 (34.9)	150 (36.1)	
Alarm silence	Low (%)	33 (9.2)	33 (7.2)	35 (8.4)	0.261
	Moderate (%)	289 (80.5)	363 (78.7)	330 (79.3)	
	High (%)	37 (10.3)	65 (14.1)	51 (12.3)	
Hospital LOS	Mean \pm SD	17.57 \pm 11.17	16.70 \pm 10.17	16.61 \pm 9.92	0.370
	(Range)	(3–95)	(2–92)	(2–70)	

* Pvalue < 0.05 considered as significant, Abbreviations: APACHE IV means Acute Physiology and Chronic Health Evaluation IV, LOS means length of stay

Comparison of outcomes between two groups of study

Comparison of outcomes based on WHO-5 index, HADS-depression/anxiety scores and IES-R score between the three study groups are presented in Table 2. According to the results, the mean WHO-5 index in the ICU survivors with doulas was significantly higher than the ICU survivors (68.57 \pm 27.47 vs. 50.80 \pm 15.75, P < 0.001) and no ICU patients without doulas (68.57 \pm 27.47 vs. 50.42 \pm 16.20, P < 0.001), which the higher scores indicate better well-being. The mean HADS-anxiety scores and HADS-depression scores in the ICU survivors with doulas was significantly lower than the both groups without doulas (P < 0.001), so that lower scores indicate normality. The mean scores of three subscales IES-R score; IES-R intrusion,

IES-R avoidance and IES-R hyperarousal scores was significantly higher in both groups without doulas than the ICU survivors with doulas ($P < 0.001$). The mean total IES-R score was 41.58 ± 5.82 , 50.48 ± 10.75 and 50.06 ± 10.33 in the ICU survivors with doulas, the ICU survivors without doulas and no ICU patients without doulas, respectively (≥ 33 signifies distress). IES-R score was significantly lower in the ICU survivors with doulas than the both groups without doulas ($P < 0.001$). However, there was no statistically significant difference in terms of WHO-5 index, HADS-depression/anxiety and IES-R scores between ICU survivors without doulas and no ICU patients without doulas ($P > 0.05$).

Table 2
Comparison of outcomes between three study groups

Outcomes		ICU survivors with doulas (n = 359)	ICU survivors without doulas (n = 461)	No ICU patients without doulas (n = 416)	P-value
WHO-5 index score	Mean ± SD	68.57 ± 27.47	50.80 ± 15.75	50.42 ± 16.20	< 0.001*
	Median (IQR)	84 (40–92)	52 (36–64)	48 (36–64)	
	(Range)	(20–100)	(24–80)	(24–80)	
WHO-5 index categorized	Low and moderate (%)	117 (32.6)	276 (59.9)	248 (59.6)	< 0.001*
	High (%)	242 (67.4)	185 (40.1)	168 (40.4)	
HADS depression score	Mean ± SD	7.18 ± 2.60	9.05 ± 4.30*	8.60 ± 3.95*	< 0.001*
	Median (IQR)	7 (5–9)	8 (5.5–12)	8 (5–11)	
	(Range)	(3–14)	(3–21)	(3–21)	
HADS depression categorized	Normal (< 8 score)	198 (55.2)	207 (44.9)	204 (49)	< 0.001*
	Abnormal (≥ 8 score)	161 (44.8)	254 (55.1)	212 (51)	
HADS anxiety score	Mean ± SD	8.96 ± 4.48	11.20 ± 5.13*	11.06 ± 4.98*	< 0.001*
	Median (IQR)	8 (6–12)	11 (7–15)	11 (7.25–14)	
	(Range)	(3–21)	(3–21)	(3–21)	
HADS anxiety categorized	Normal (< 8 score)	171 (47.6)	116 (25.2)	104 (25)	< 0.001*
	Abnormal (≥ 8 score)	188 (52.4)	354 (78.4)	312 (75)	
IES-R intrusion score	Mean ± SD	13.07 ± 3.19	14.75 ± 5.33	14.64 ± 5.10	< 0.001*

* P-value < 0.05 considered as significant, World Health Organization- Five Well-Being (WHO-5) index that low scores (20–53) indicate distress and high scores (54–100) indicate well-being, Hospital Anxiety and Depression Scale (HADS) scores that cutoff < 8 scores indicates normality and ≥ 8 scores shows anxiety and depression disorders, Event Scale-Revised (IES-R) score that cutoff < 33 scores showed normality and ≥ 33 scores showed Post-traumatic stress disorder (PTSD)

Outcomes		ICU survivors with doulas (n = 359)	ICU survivors without doulas (n = 461)	No ICU patients without doulas (n = 416)	<i>P</i> - value
	Median (IQR)	13 (11–15)	13 (11–18)	13 (11–18)	
	(Range)	(8–21)	(8–32)	(8–32)	
IES-R avoidance score	Mean ± SD	15.37 ± 3.79	18.62 ± 6.42	18.39 ± 6.04	< 0.001*
	Median (IQR)	15 (12–18)	17 (14–23)	17 (14–22)	
	(Range)	(8–32)	(8–32)	(8–32)	
IES-R hyperarousal score	Mean ± SD	13.14 ± 3.43	17.10 ± 7.05	17.02 ± 7.02	< 0.001*
	Median (IQR)	13 (11–16)	16 (11–23.5)	16 (11–23)	
	(Range)	(8–31)	(8–32)	(8–32)	
IES-R total score	Mean ± SD	41.58 ± 5.82	50.48 ± 10.75	50.06 ± 10.33	< 0.001*
	Median (IQR)	42 (38–46)	50 (42–58)	50 (42–57)	
	(Range)	(25–58)	(29–84)	(27–84)	
IES-R total score categorized	Normal (< 33 score)	22 (6.1)	8 (1.7)	16 (3.8)	< 0.001*
	Abnormal (≥ 33 score)	337 (93.9)	453 (98.3)	400 (96.2)	
* <i>P</i> -value < 0.05 considered as significant, World Health Organization- Five Well-Being (WHO-5) index that low scores (20–53) indicate distress and high scores (54–100) indicate well-being, Hospital Anxiety and Depression Scale (HADS) scores that cutoff < 8 scores indicates normality and ≥ 8 scores shows anxiety and depression disorders, Event Scale-Revised (IES-R) score that cutoff < 33 scores showed normality and ≥ 33 scores showed Post-traumatic stress disorder (PTSD)					

Multinomial logistic regression finding

Univariate and multivariate multinomial logistic regression analysis to find effects of variables on WHO-5 index, IER-S and HADS-depression/anxiety scores are presented in Table 3–6. Multivariate analysis showed that the risk of well-being over the mental distress were significantly decreased in patients with comorbidities (OR: 0.661, 95%CI: 0.46–0.94, *P* = 0.024), those required more nursing care (OR: 0.701,

95%CI: 0.491–0.99, $P = 0.050$), and who received the high dose of sedations (OR: 0.513, 95%CI: 0.35–0.74, $P < 0.001$). However, the OR well-being was significantly increased in the ICU survivors with doulas than the ICU survivors without doulas (OR: 3.614, 95% CI: 2.65–4.91, $P < 0.001$) and no ICU patients without doulas (OR: 2.231, 95% CI: 1.49–3.33, $P < 0.001$). However, the risk of medium score of WHO-5index over the low score of WHO-5 index was decreased in the ICU survivors with doulas compared with ICU survivors without doulas (OR: 0.451, 95% CI: 0.308–0.661, $P < 0.001$) and no ICU patients without doulas (OR: 0.244, 95% CI: 0.172–0.347, $P < 0.001$) (Table 3).

Table 3

Univariate and multivariate multinomial logistic regression analysis to find effects of variables on WHO-5 index

Variables	Univariate				Multivariate			
	High scores		Moderate scores		High scores		Moderate scores	
	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value
WHO-5 Index								
Age ≥ 66	0.953 (0.72– 1.25)	0.727	0.947 (0.72– 1.24)	0.697	-	-	-	-
Sex (male vs. female)	0.847 (0.64– 1.11)	0.235	0.808 (0.61– 1.06)	0.128	-	-	-	-
Comorbidities (yes vs. no)	0.622 (0.44– 0.87)	0.007*	0.713 (0.50– 1.01)	0.059	0.661 (0.46– 0.94)	0.024*	0.712 (0.49– 1.01)	0.062
APACHE II ≥ 15	0.882 (0.66– 1.17)	0.392	0.787 (0.59– 1.03)	0.335	-	-	-	-
Physical restraint (yes vs. no)	0.727 (0.55– 0.95)	0.024*	0.830 (0.63– 1.09)	0.185	0.751 (0.56– 1.00)	0.054	0.821 (0.62– 1.08)	0.166
Sedation (high vs. low/moderate)	0.457 (0.32– 0.65)	< 0.001*	0.843 (0.57– 1.24)	0.389	0.513 (0.35– 0.74)	< 0.001*	0.515 (0.36– 0.73)	< 0.001*
Nursing care (high vs. low/moderate)	0.623 (0.44– 0.87)	0.006*	0.852 (0.6– 1.21)	0.374	0.701 (0.491– 0.99)	0.05*	0.664 (0.47– 0.92)	0.071*
Sleep disturbance (yes vs. no)	0.91 (0.67– 1.22)	0.529	1.326 (0.99– 1.76)	0.054	-	-	-	-

* *P*-value < 0.05 considered as significant, for the WHO-5 index; high scores from 65 to 100 (represents of the best well-being) and moderate scores (44–64) compared to low scores between 20–43 (represents of distress) as a reference group,

Variables	Univariate				Multivariate			
	High scores		Moderate scores		High scores		Moderate scores	
	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value
Alarm silence strategy (high vs. low and moderate)	0.882 (0.58–1.33)	0.553	0.983 (0.64–1.49)	0.935	-	-	-	-
Groups (ICU survivors with doulas vs. ICU survivors without doulas)	4.092 (2.88–5.81)	< 0.001*	0.448 (0.30–0.67)	< 0.001*	3.614 (2.65–4.91)	< 0.001*	0.451 (0.308–0.661)	< 0.001*
Groups (ICU survivors with doulas vs. no ICU patients without doulas)	3.872 (2.72–5.49)	< 0.001*	0.560 (0.37–0.84)	0.005*	2.231 (1.49–3.33)	< 0.001*	0.244 (0.172–0.347)	0.001*
Groups (ICU survivors without doulas vs. no ICU patients without doulas)	0.946 (0.66–1.35)	0.760	1.249 (0.92–1.68)	0.149	-	-	-	-
* <i>P</i> -value < 0.05 considered as significant, for the WHO-5 index; high scores from 65 to 100 (represents of the best well-being) and moderate scores (44–64) compared to low scores between 20–43 (represents of distress) as a reference group,								

In terms of total IER-S score, multivariate analysis showed that the risk of partial PTSD over the high risk of PTSD was significantly increased in the ICU survivors with doulas compared with ICU survivors without doulas (OR: 2.650, 95% CI: 1.45–4.81, $P < 0.001$). In addition, the risk of moderate IER-S score was significantly increased in the ICU survivors with doulas compared with ICU survivors without doulas (OR: 2.703, 95% CI: 1.961–3.72, $P < 0.001$) and no ICU patients without doulas (OR: 3.103, 95% CI: 2.07–4.64, $P < 0.001$) (Table 4).

Table 4

Univariate and multivariate multinomial logistic regression analysis to find effects of variables on total IES-R score

Variable	Univariate				Multivariate			
	Low scores		Moderate scores		Low scores		Moderate scores	
	OR (95% CI)	<i>P</i> - value						
Total IES-R score								
Age ≥ 66	0.981 (0.54– 1.77)	0.949	1.07 (0.78– 1.46)	0.669	-	-	-	-
Sex (male vs. female)	0.986 (0.54– 1.78)	0.962	0.888 (0.64– 1.21)	0.460	-	-	-	-
Comorbidities (yes vs. no)	0.937 (0.45– 1.9)	0.860	1.028 (0.69– 1.51)	0.890	-	-	-	-
APACHE II > 15	0.845 (0.45– 1.5)	0.591	1.198 (0.85– 1.68)	0.298	-	-	-	-
Physical restraint (yes vs. no)	0.828 (0.45– 1.51)	0.540	0.730 (0.52– 1.00)	0.056	-	-	-	-
Sedation (high vs. low and moderate)	0.291 (0.08– 0.94)	0.040*	0.76 (0.49– 1.16)	0.206	0.319 (0.09– 1.04)	0.059	0.836 (0.54– 1.28)	0.418
Nursing care (high vs. low and moderate)	0.828 (0.41– 1.65)	0.595	0.963 (0.65– 1.41)	0.848	-	-	-	-
Sleep disturbance (yes vs. no)	0.720 (0.39– 1.31)	0.285	1.136 (0.81– 1.59)	0.458	-	-	-	-

* *P*-value < 0.05 considered as significant, for the total IES-R; low scores between 24–32 (represents of partial PTSD) and moderate scores between 33–38 (represents of PTSD) compared to high scores ≥ 39 (represents of high PTSD) as a reference group

Variable	Univariate				Multivariate			
	Low scores		Moderate scores		Low scores		Moderate scores	
	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value	OR (95% CI)	<i>P</i> - value
Alarm silence strategy (high vs. low and moderate)	0.758 (0.33–1.73)	0.511	0.848 (0.53–1.33)	0.478	-	-	-	-
Groups (ICU survivors with doulas vs. ICU survivors without doulas)	4.391 (1.92–10.01)	< 0.001*	2.493 (1.72–3.60)	< 0.001*	2.650 (1.45–4.81)	0.001*	2.703 (1.961–3.72)	< 0.001*
Groups (ICU survivors with doulas vs. no ICU patients without doulas)	1.985 (1.02–3.85)	0.043*	3.059 (2.05–4.56)	< 0.001*	1.866 (0.95–3.63)	0.067	3.103 (2.07–4.64)	< 0.001*
Groups (ICU survivors without doulas vs. no ICU patients without doulas)	0.425 (0.19–1.07)	0.071	1.227 (0.803–1.87)	0.344	-	-	-	-

* *P*-value < 0.05 considered as significant, for the total IES-R; low scores between 24–32 (represents of partial PTSD) and moderate scores between 33–38 (represents of PTSD) compared to high scores ≥ 39 (represents of high PTSD) as a reference group

Multivariate analysis showed that the risk of lower score of HADS-depression over higher score of HADS-depression (normality vs. depression disorders) were significantly decreased in patients with comorbidities (OR: 0.676, 95% CI: 0.47–0.96, *P* = 0.029), sleep disturbance (OR: 0.591, 95% CI: 0.44–0.79, *P* < 0.001) and high alarm silence strategy (OR: 0.466, 95% CI: 0.31–0.69, *P* < 0.001). However, the risk of lower and moderate score of HADS-depression over higher score of HADS-depression (normality and suspected to depression disorders vs. definite diagnosis of depression disorders) were significantly increased in the ICU survivors with doulas compared with ICU survivors without doulas (OR: 2.731, 95% CI: 1.91–3.89, *P* < 0.001) and (OR: 3.722, 95% CI: 2.52–5.48, *P* < 0.001), and no ICU patients without doulas (OR: 2.512, 95% CI: 1.69–3.71, *P* < 0.001) and (OR: 3.570, 95% CI: 2.30–5.54, *P* < 0.001), respectively (Table 5)

Table 5

Univariate and multivariate multinomial logistic regression analysis to find effects of variables on HADS-depression

Variable	Univariate				Multivariate			
	Low scores		Moderate scores		Low scores		Moderate scores	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
HADS-depression score								
Age ≥ 66	1.061 (0.81–1.38)	0.667	1.152 (0.84–1.57)	0.377	-	-	-	-
Sex (male vs. female)	0.765 (0.58–1.00)	0.051	0.822 (0.60–1.12)	0.222	-	-	-	-
Comorbidities (yes vs. no)	0.695 (0.49–0.97)	0.036*	0.960 (0.63–1.44)	0.843	0.676 (0.47–0.96)	0.029*	1.002 (0.65–1.52)	0.994
APACHE II > 15	0.985 (0.76–1.34)	0.934	0.878 (0.63–1.22)	0.443	-	-	-	-
Physical restraint (yes vs. no)	0.876 (0.66–1.15)	0.342	0.916 (0.66–1.26)	0.590	-	-	-	-
Sedation (high vs. low and moderate)	0.937 (0.66–1.33)	0.718	0.860 (0.57–1.27)	0.455	-	-	-	-
Nursing care (high vs. low and moderate)	0.907 (0.65–1.25)	0.552	0.709 (0.47–1.05)	0.088	-	-	-	-
Sleep disturbance (yes vs. no)	0.579 (0.43–0.76)	< 0.001*	0.960 (0.69–1.32)	0.803	0.591 (0.44–0.79)	< 0.001*	1.029 (0.73–1.43)	0.864

* *P*-value < 0.05 considered as significant, for the HADS depression score; low scores ≤ 7 (no depression) and moderate scores between 8–10 (suspected of depression) compared to high scores ≥ 11 (definitive diagnosis of depression) as a reference group

Variable	Univariate				Multivariate			
	Low scores		Moderate scores		Low scores		Moderate scores	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
Alarm silence strategy (high vs. low and moderate)	0.447 (0.30– 0.66)	< 0.001*	0.66 (0.42– 1.02)	0.065	0.466 (0.31– 0.69)	< 0.001*	0.693 (0.44– 1.08)	0.111
Groups (ICU survivors with doulas vs. ICU survivors without doulas)	3.216 (2.20– 4.70)	< 0.001*	3.992 (2.61– 6.10)	< 0.001*	2.731 (1.91– 3.89)	< 0.001*	3.722 (2.52– 5.48)	< 0.001*
Groups (ICU survivors with doulas vs. no ICU patients without doulas)	2.581 (1.75– 3.80)	< 0.001*	3.485 (2.25– 5.39)	< 0.001*	2.512 (1.69– 3.71)	< 0.001*	3.570 (2.30– 5.54)	< 0.001*
Groups (ICU survivors without doulas vs. no ICU patients without doulas)	0.803 (0.592– 1.08)	0.157	0.873 (0.601– 1.26)	0.475	-	-	-	-

* *P*-value < 0.05 considered as significant, for the HADS depression score; low scores ≤ 7 (no depression) and moderate scores between 8–10 (suspected of depression) compared to high scores ≥ 11 (definitive diagnosis of depression) as a reference group

Table 6

Univariate and multivariate multinomial logistic regression analysis to find effects of variables on HADS-anxiety score

Variable	Univariate				Multivariate			
	Low scores		Moderate scores		Low scores		Moderate scores	
	OR (95% CI)	<i>P</i> - value						
HADS-anxiety score								
Age ≥ 66	0.917 (0.71– 1.18)	0.503	0.853 (0.63– 1.15)	0.298	-	-	-	-
Sex (male vs. female)	0.932 (0.72– 1.20)	0.590	0.741 (0.54– 1.00)	0.053	-	-	-	-
Comorbidities (yes vs. no)	0.666 (0.48– 0.91)	0.010*	0.799 (0.55– 1.16)	0.239	0.695 (0.50– 0.95)	0.025*	0.810 (0.55– 1.17)	0.270
APACHE II > 15	0.395 (0.13– 1.44)	0.512	0.863 (0.63– 1.18)	0.359	-	-	-	-
Physical restraint (yes vs. no)	0.872 (0.67– 1.12)	0.297	0.883 (0.65– 1.19)	0.424	-	-	-	-
Sedation (high vs. low and moderate)	0.966 (0.69– 1.34)	0.839	0.906 (0.62– 1.32)	0.611	-	-	-	-
Nursing care (high vs. low and moderate)	0.847 (0.62– 1.15)	0.291	0.993 (0.68– 1.44)	0.970	-	-	-	-
Sleep disturbance (yes vs. no)	0.969 (0.73– 1.27)	0.822	0.883 (0.64– 1.20)	0.437	-	-	-	-
* <i>P</i> -value < 0.05 considered as significant, for the HADS anxiety score; low scores ≤ 7 (no anxiety) and moderate scores between 8–10 (suspected of anxiety disorders) compared to high scores ≥ 11 (definitive diagnosis of anxiety) as a reference group								

Variable	Univariate				Multivariate			
	Low scores		Moderate scores		Low scores		Moderate scores	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
Alarm silence strategy (high vs. low and moderate)	0.864 (0.58–1.27)	0.459	0.791 (0.49–1.26)	0.328	-	-	-	-
Groups (ICU survivors with doulas vs. ICU survivors without doulas)	3.093 (2.24–4.25)	< 0.001*	1.556 (1.06–2.28)	0.024*	3.050 (2.30–4.04)	< 0.001*	1.504 (1.06–2.12)	0.021*
Groups (ICU survivors with doulas vs. no ICU patients without doulas)	3.073 (2.21–4.26)	< 0.001*	1.468 (0.99–2.16)	0.054	3.044 (2.19–4.23)	< 0.001*	1.461 (0.98–2.16)	0.057
Groups (ICU survivors without doulas vs. no ICU patients without doulas)	0.993 (0.722–1.36)	0.968	0.944 (0.667–1.33)	0.744	-	-	-	-
* <i>P</i> -value < 0.05 considered as significant, for the HADS anxiety score; low scores ≤ 7 (no anxiety) and moderate scores between 8–10 (suspected of anxiety disorders) compared to high scores ≥ 11 (definitive diagnosis of anxiety) as a reference group								

In terms of HADS-anxiety score, multivariate analysis showed that the having comorbidities was associated with a decreased the risk of normality vs. anxiety disorders (OR: 0.695, 95% CI: 0.50–0.95, *P* = 0.025). However, in the ICU survivors with doulas the risk of normality vs. definite diagnosis of anxiety was increased compared with ICU survivors without doulas (OR: 3.050, 95% CI: 2.30–4.04, *P* < 0.001) and no ICU patients without doulas (OR: 3.044, 95% CI: 2.19–4.23, *P* < 0.001). In addition, the risk of suspected of anxiety disorders vs. definitive diagnosis of anxiety was significantly increased in the in the ICU survivors with doulas compared with ICU survivors without doulas (OR: 1.504, 95% CI: 1.06–2.12, *P* = 0.021).

Binary logistic regression finding

Univariate and multivariate binary logistic regression analysis to find effects of variables on outcomes (WHO-5 index, HADS-depression/anxiety scores and IES-R score) are presented in Figs. 1 to 4. In terms of WHO-5 index, multivariate analysis showed that the required more nursing care was associated with an

increased the risk of mental distress (OR: 1.455, 95%CI: 1.089–1.944, P = 0.011). However, in the ICU survivor with doula the risk of mental distress was significantly decreased compared with the ICU survivors without doula (OR: 0.344, 95% CI: 0.265–0.446, P < 0.001) and no ICU patients without doula (OR: 0.332, 95% CI: 0.246–0.448, P < 0.001) (Fig. 1B). As we can see in the Fig. 2B related to the HADS-depression score, comorbidities (OR: 1.481, 95% CI: 1.115–1.967, P = 0.007), sleep disturbance (OR: 1.721, 95% CI: 1.349–2.196, P < 0.001), and alarm silence strategy (OR: 1.821, 95% CI: 1.276–2.6, P < 0.001) were associated with an increased the risk of depression disorders. However, the risk of depression disorders was decreased in the ICU survivor with doula than the ICU survivors without doula (OR: 0.762, 95% CI: 0.593–0.979, P = 0.033). In terms of HADS-anxiety, multivariate analysis showed that the comorbidities were associated with an increased the risk of anxiety disorders (OR: 1.348, 95%CI: 1.004–1.812, P = 0.047). However, the risk of anxiety disorders was decreased in the ICU survivor with doula than the ICU survivors without doula (OR: 0.372, 95% CI: 0.287–0.481, P < 0.001) and no ICU patients without doula (OR: 0.370, 95% CI: 0.273–0.501, P < 0.001) (Fig. 3B). According to the results of multivariate analysis related to the IES-R score, the OR of PTSD significantly decreased in the ICU survivor with doula than the ICU survivors without doula (OR: 0.367, 95%CI: 0.184–0.875, P < 0.001) (Fig. 4B).

Discussion

This retrospective secondary analysis demonstrate that the patient's spouse as trained ICU doula could feasibly and successfully provide psychological support in the ICU setting to their patients. Our results showed a significant lower mental disorder based on WHO-5 index (mental distress), HADS-depression score (depression disorders), HADS-anxiety score (anxiety disorders) and IES-R score (PTSD) in the ICU survivor with trained spouse as ICU-doula compared with the ICU survivors without doula and no ICU patients without doula. However, there was no statistically significant difference was found between ICU survivors without doula and no ICU patients without doula.

Critical illness is associated with a high rate of significant, negative psychologic and psychiatric outcomes that are often associated with PICS. The major mental disorders experienced by intensive care survivors are long-term cognitive impairments, depression (approximately 30% of survivors), anxiety (up to approximately 70%), and PTSD (10%-50%)^{2,3}. Despite these data, there are only a limited number of programs for the mental health care of patients after ICU discharge, such as rehabilitation and follow-up clinics^{17,18}. Patients often do not receive mental health care during ICU admission, although evidence is growing that receiving emotional and psychological support in parallel with receiving treatment is very effective for patients^{25,26}. Although training psychotherapists to provide emotional support to patients admitted to the ICU is very effective in reducing patients' psychological problems²⁷⁻²⁹, the availability of trained psychotherapists, the cost of full-time employment in the ICU, and the length of their training limit the generalization of these results. For this reason, we considered alternative options by training the patient's spouse as ICU doula to provide supportive care in the ICU.

The interaction between the patient and their family reflects the environmental and cultural context of that community³⁰. Certainly, in a culture where the family is the most influential institution in a person's life, the patient can receive the most love and emotional support from their family. In Eastern societies, love for the family and responsibility towards the family are very important³¹. As a results, family members of critically ill patients increase their support, love, inner energy and responsibility when one of their members is admitted to the ICU³², those are positive and dynamic processes that provides emotional support to the patient that can easily be used to improve the patient's condition. Family members become very helpless when their loved ones are hospitalized, especially when their patients are in the ICU, in this case they are desperately looking for information about their loved ones' health care status³³. Therefore, knowing the patient's condition helps them to successfully cope with their loved ones' hospital stay, and the ICU patient may experience better health outcomes. When the patient's spouse becomes aware of the patient's condition during admission to the ICU, he/she can better understand the situation, feel valued, be satisfied with more interaction with ICU care members, and provide better engagement and psychological support, the patients may experience better mental health outcomes. Empowering patients' families or spouses may help them overcome inadequacies and meet their own and patients' acknowledged needs³⁴.

Considering the patient with his/her spouse as a "unit" was the main strength of this research. Assessing the mental status of patients and patient's spouse in the past and at the time of hospitalization, as well as their one-year follow-up after discharge from the hospital were other strengths of this study. Nevertheless, this study is not without limitations. First, this study was a retrospective secondary analysis and thus, was not specifically designed for the given research question. Second, the WHO-5 index scores, the HADS-depression scores and the HADS-anxiety scores at the admission time were not available to comparison before and after within the group as well as between groups. However, in order to prevent confounding factors, the three study groups were matched in terms of age, gender, and comorbidities.

In summary, this retrospective secondary analysis demonstrate that the patient's spouse as trained ICU doulas could feasibly and successfully provide psychological support in the ICU setting to their patients. Our results showed a significant lower mental disorder based on WHO-5 index (mental distress), HADS-depression score (depression disorders), HADS-anxiety score (anxiety disorders) and IES-R score (PTSD in the ICU survivor with trained spouse as ICU-doulas compare with the ICU survivors without doulas and no ICU patients without doulas. However, there was no statistically significant difference was found between ICU survivors without doulas and no ICU patients without doulas. Although, further randomized clinical trial research is needed to strengthen the evidence base.

Methods

Study design and setting

This retrospective secondary analysis is part of a large project³⁵ that was conducted on patients from two academic teaching hospitals in Tehran, Iran, to compare the psychiatric outcomes of patients supported by their spouse as ICU-trained doula to those without trained spouse as doula after 12 months of hospital discharge. The study protocol was approved by the Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran, with code IR.UMSHA.REC.1400.552. Written informed consent was obtained from the patient with his/her spouse or only from the patient's spouse as his/her legal guardian to participate in the study, which was attained at the time of the main project. The manuscript was prepared in accordance with the "Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement"³⁶. In addition, the study was conducted in accordance with the Declaration of Helsinki and subsequent³⁷.

Study population

The study population consisted of three groups; ICU survivors with trained spouse as ICU-doulas, ICU survivors without trained spouse and discharged patients from general wards without trained spouse. In terms of age, gender, and comorbidities, individuals in three study groups were matched. Inclusion criteria included married patients (patient- and patient's spouse as a unit), no history of mental disorders in the past and also at the time of enrollment (all units in three groups were examined by a psychologist and a psychiatrist through clinical interview at the time of admission), and staying more than 48 hours in ICU for the ICU survivors and also history more than 48 hours of hospitalization for patients discharged from general wards. Exclusion criteria included a history of recent ICU admission or hospitalization (within 6 months), severe metabolic encephalopathy, and status epilepticus.

Patient's spouse training

The patient's spouse training consisted of two phases. Family members are desperately seeking information about their loved ones' health care status while simultaneously feeling helpless as their loved one is in the ICU³³. Therefore, the first phase of the training was based on increasing the awareness of patients' spouses about the situation of their loved ones in the ICU. The purpose of the awareness was initially to reduce the stress and anxiety of spouses so that they can better support their loved ones. The awareness was given to the patient's spouses in three steps. In the first step, we informed the patient's spouse about the patient's condition and the reason for the patient being admitted to the ICU (assurance and knowledge of the patient's condition). In the second step, we explained the ICU care and the nature of the treatment to the patients' spouses. Third step was performed when the patient's condition was stable and ready for discharge and transfer to the ward. At this step, the focus was on the explanations that patients' spouses should be aware of after being transferred to the ward and during recovery. After raising the awareness of patients' spouses, in the second phase of training, we asked them to be present at their patients' beds daily [family engagement which is defined as the non-continuous presence of the spouse at the patient's bedside for more than 2 hours a day³⁸], and to inform them about the treatment process and to encourage them to play a more active role in their recovery.

Data collection

Age, gender, comorbidities [based on Charlson comorbidity index ^{39, 40}], severity of illness [based on Acute Physiology and Chronic Health Evaluation (APACHE) IV score ⁴¹], sedation [based on published recommendations ⁴²⁻⁴⁴], nursing care [determined based on number of nursing hours needed per 8-h shift: high \geq 8 h, moderate 4–8 h, low $<$ 4 h], physical restraint ⁴⁵, sleep disturbance [based on Pittsburgh Sleep Quality Index (PSQI)] ⁴⁶, alarm silence strategy [assessed using the TES 1352A sound level meter (SLM) device (TES Electrical Electronic Corp., Taiwan) with a range of 30–130 decibel (dB). It has a 1.27 cm electret condenser microphone and accuracy of \pm 1.5 dB (ref 94 dB@1KHz) ⁴⁷ and total hospital length of stay (LOS) include ICU plus non-ICU LOS for ICU survivors and only non-ICU LOS for discharged patients from general wards.

Outcome measures

Any PICS-related mental disorders as the outcomes, 12 months after hospital discharge, was recognized based on three psychometric questionnaires includes World Health Organization- Five Well-Being Index (WHO-5) ⁴⁸, Hospital Anxiety and Depression Scale (HADS) ⁴⁹, and Impact of Event Scale Revised (IES-R) ⁵⁰.

The 5-item of the WHO-5 well-being index are associated with positive mood, vitality, and general interests and each of the items is rated on a 6-point Likert scale from 5 for (all of the time) to 0 for (no time) ⁴⁸. The raw score is calculated by totaling the figures of the five answers and ranges from 0 to 25, 0 representing worst possible and 25 representing best possible quality of life. To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4. The Persian version of the WHO-5 was available at the WHO website in 2017 ⁵¹. In addition, the study by Dadfar et al. ⁵², in Iran reported a Cronbach's alpha of 0.91 for WHO-5 index.

The Hospital Anxiety and Depression Scale (HADS) assesses the anxiety and depression through 14-item, seven items for the anxiety subscale (HADS anxiety) and seven for the depression subscale (HADS depression). HADS Anxiety focus mainly on symptoms of generalized anxiety disorder and HADS depression is focused on anhedonia, the main symptom of depression ⁴⁹. Each item is scored on a response-scale with four alternatives ranging between 0 and 3. After adjusting for six items that are reversed scored, all responses are summed to obtain the two subscales. Recommended cut-off scores according to Zigmond & Snaith ⁵³, 8–10 scores for doubtful cases and \geq 11 scores for definite cases. An optimal balance between sensitivity and specificity was found using a cut-off score of 8 or above for both HADS Anxiety and HADS depression ⁵⁴.

The Event Scale-Revised (IES-R) is a self-report, short, and easily administered questionnaire to assess post-traumatic stress disorder (PTSD) based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) ^{50, 55}. This scale consists of 22 items with three subscales: intrusion with 8-item (difficulty in staying asleep, dissociative experiencing, similar to flashbacks), avoidance with 8-item (the tendency to avoid thoughts or reminders about the incident), and hyperarousal with 6-item (irritated feeling, angry, difficulty in sleep onset) ⁵⁶. The IES-R is scored on a 5-point Likert-type

scale from 0 (not at all) to 4 (extremely) (26) which means that the total score range calculated is between 0 and 88 and the cut-off of 33 indicates a high risk of PTSD symptomatology⁵⁷. In addition, we classified the IES-R score into three groups and interpretation as; 24–32 score (Those with scores do not have full PTSD will have partial PTSD or at least some of the symptoms)⁵⁸, 33–38 score (this represents the best cutoff for a probable diagnosis of PTSD)⁵⁷, and 39 and above score (this is high enough to suppress your immune system's functioning)⁵⁹.

Statistical analysis

Categorical variables are presented as number and percentage, and continuous variables are presented as mean and standard deviation (SD) or median and interquartile range (IQR) as appropriate. The baseline characteristics between three study groups were compared using the Chi-Square and Fisher's exact tests for binary variables and the one-way analysis of variance (ANOVA) for normally distributed continuous variables. In addition, to compare the two pairs group we used Bonferroni Post-Hoc test. We performed univariate and multivariate binary logistic regression and multinomial logistic regression analysis on the outcomes (based on WHO-5 index, HADS-depression/anxiety and IES-R), for each independent variable to estimate the odds ratios (ORs) and 95% confidence intervals (CIs). In the univariate model, each variable was entered in the model. In the multivariate model, all variables with $P < 0.05$ in univariate model were entered in the multivariate model. All P-values were two-tailed, and a $P < 0.05$ indicated a statistically significant difference. All analyses were performed using IBM® SPSS® 21.0 (IBM Corp., Armonk, NY) (Kline RB, 1998) and GraphPad Prism 8© (GraphPad Software Inc., La Jolla, CA).

Declarations

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Ethical Approval

The study protocol was approved by the Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran, with code IR.UMSHA.REC.1400.552, in accordance with the Declaration of Helsinki of the World Medical Association. Written informed consent from the patient or designated surrogate was required for participation in the parent study. The manuscript was prepared in accordance with the "Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement".

Authors' contributions

A.V-A, A.S, and F.R-B conceptualized the study. A.V-A, L.K, H.A, I.J-I and F.R-B collected the data. A.V-A, H.J, and M.I carried out the analyses. A.V-A, A.S, A.GH, S.B and FRB prepared the draft. All authors contributed to the revision of the manuscript and approved the final version.

Availability of data and material

All data collected and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have no conflicts of interest to disclose related to this study.

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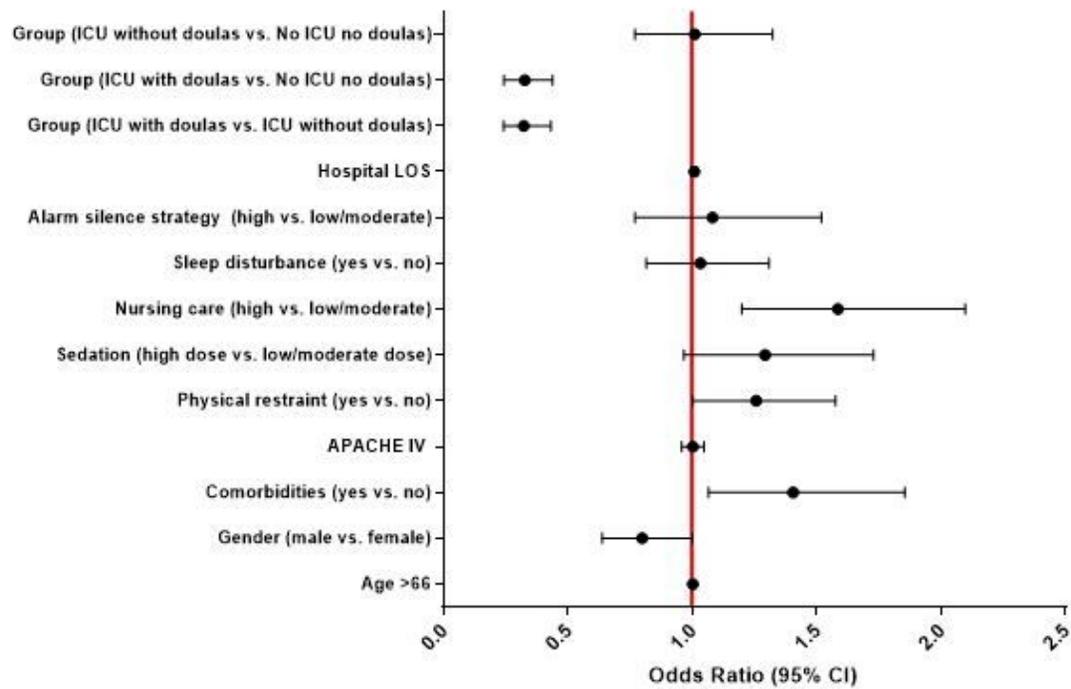
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Figures

A



B

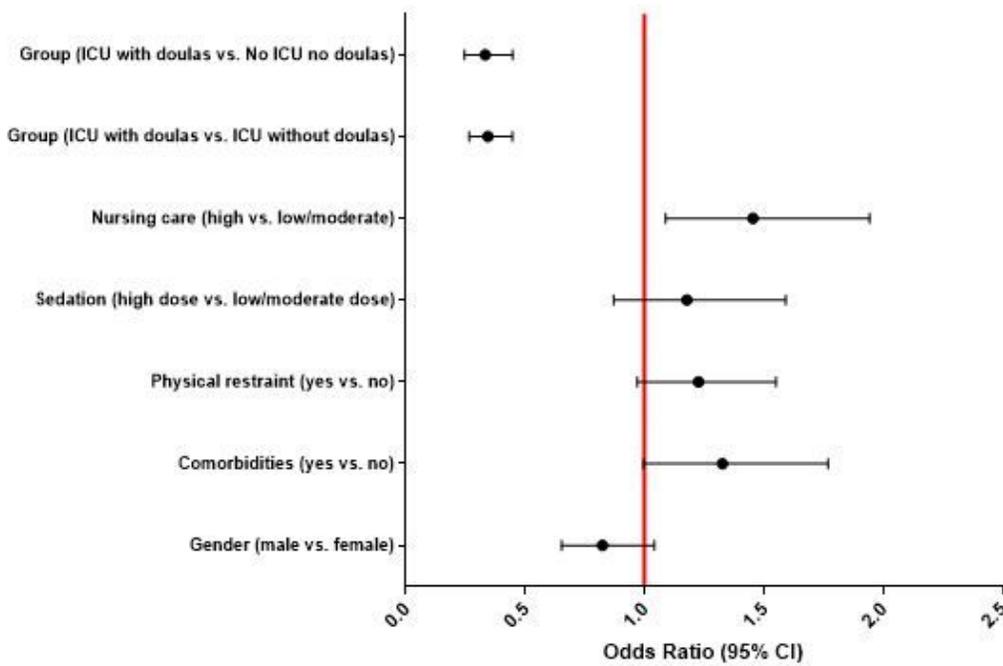
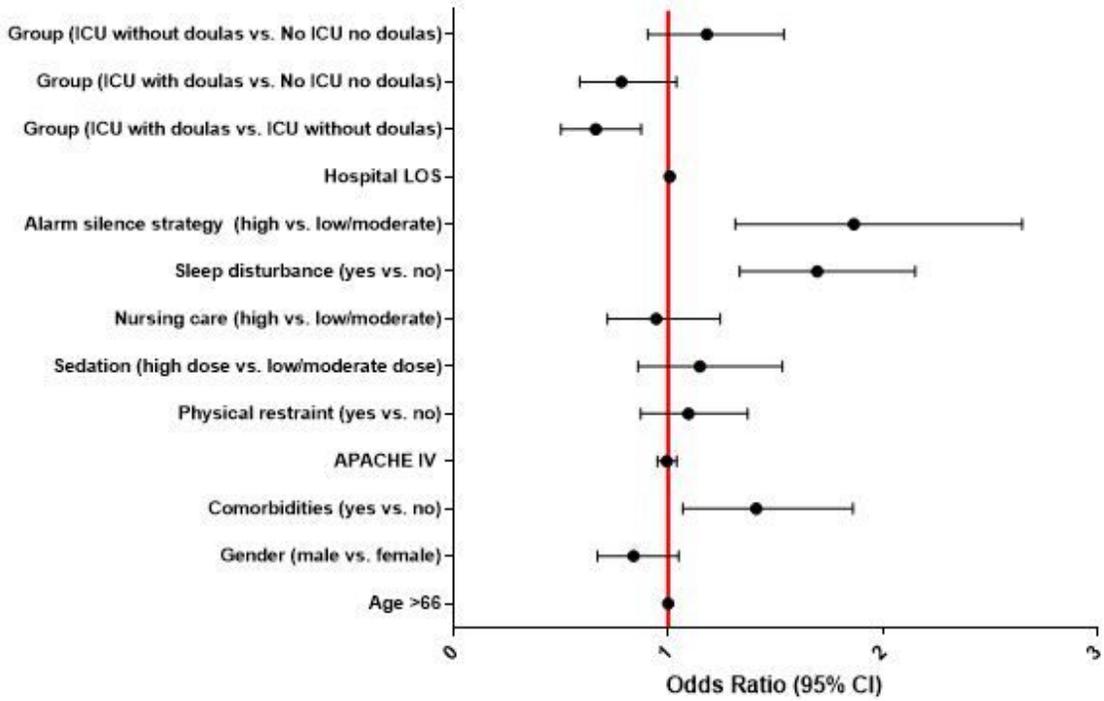


Figure 1

Binary logistic regression analysis to find effects of variables on low WHO-5 scores (represents of distress) (A) univariate and (B) multivariate

A



B

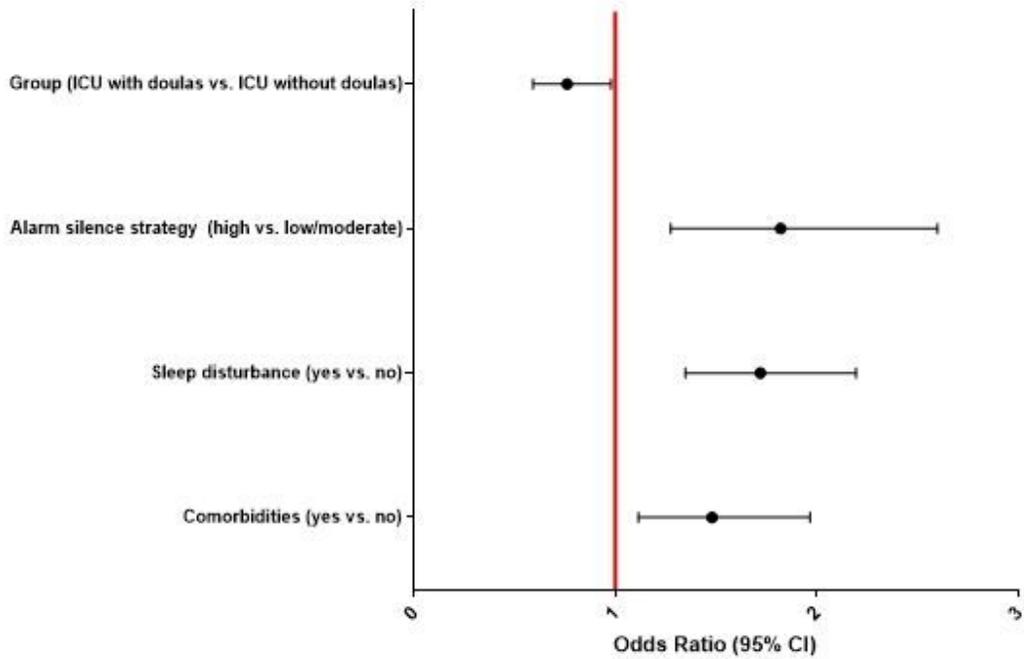
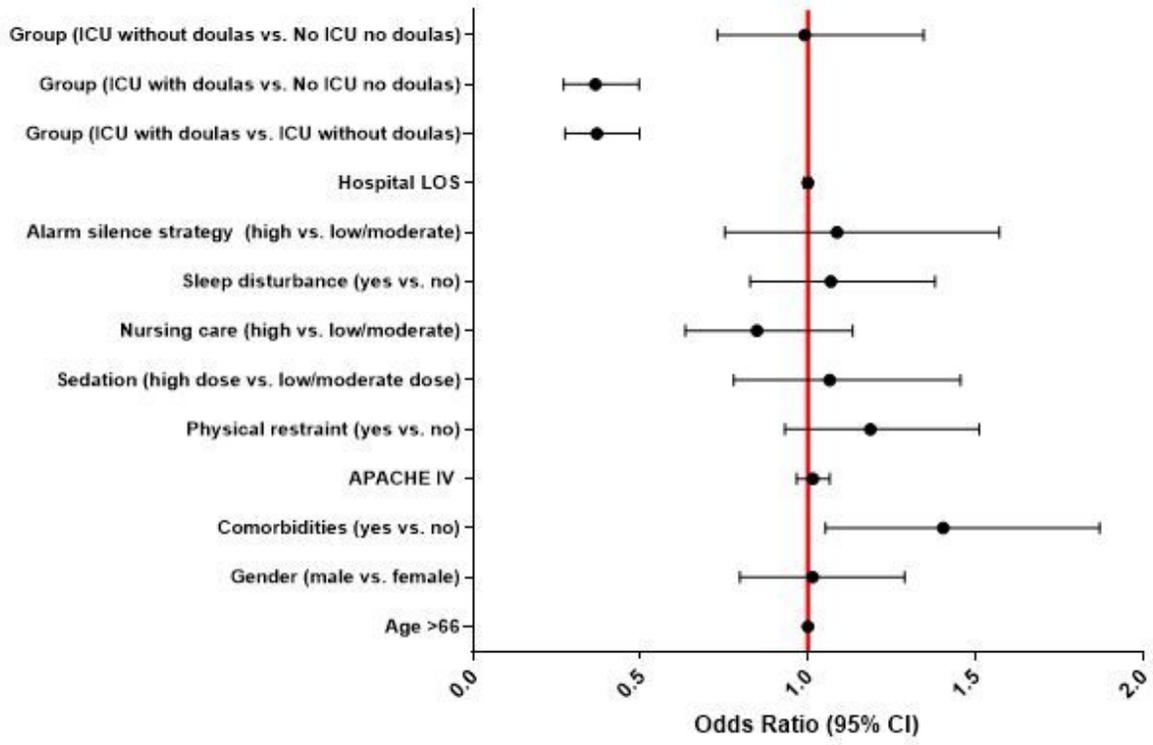


Figure 2

Binary logistic regression analysis to find effects of variables on high HADS-depression scores (represents of depression disorders) (A) univariate and (B) multivariate

A



B

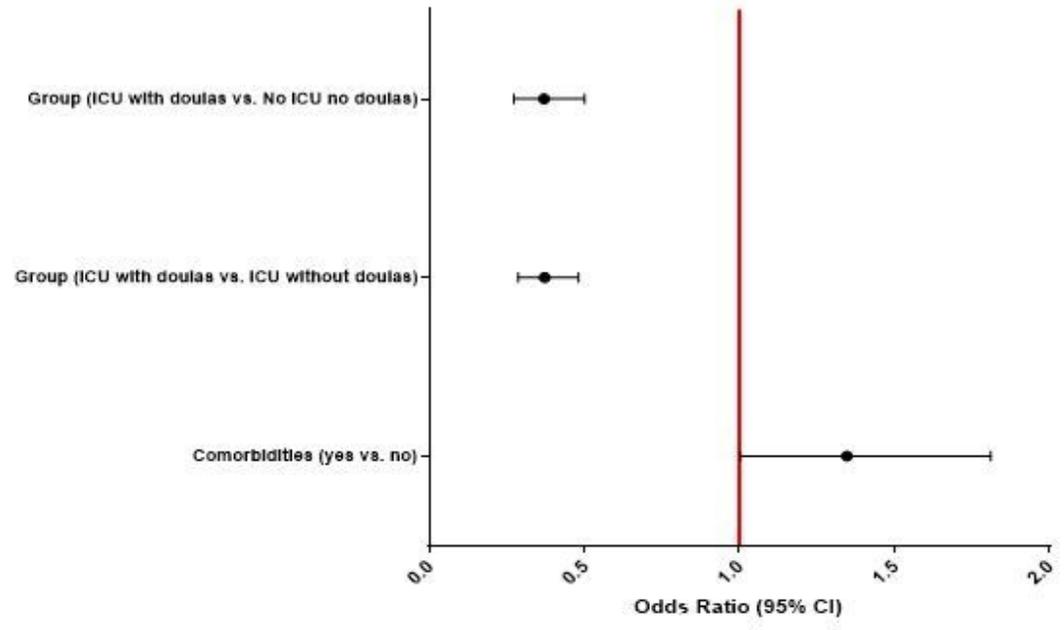
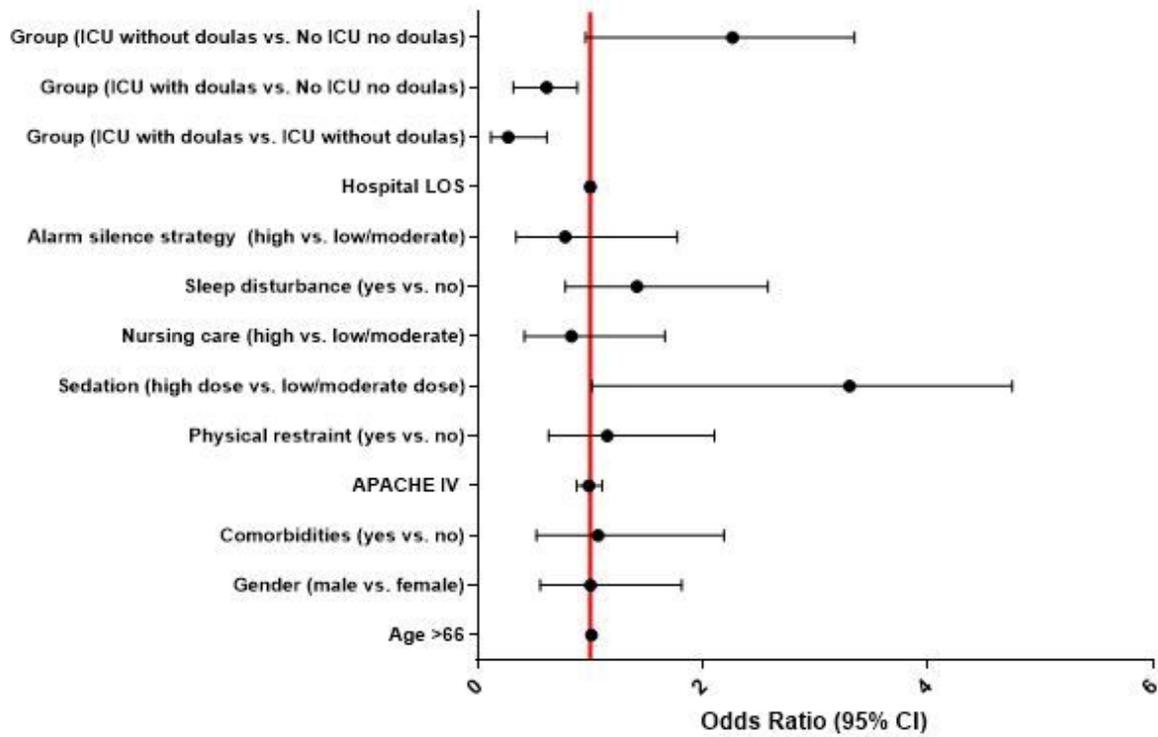


Figure 3

Binary logistic regression analysis to find effects of variables on high HADS-anxiety scores (represents of anxiety disorders) (A) univariate and (B) multivariate

A



B

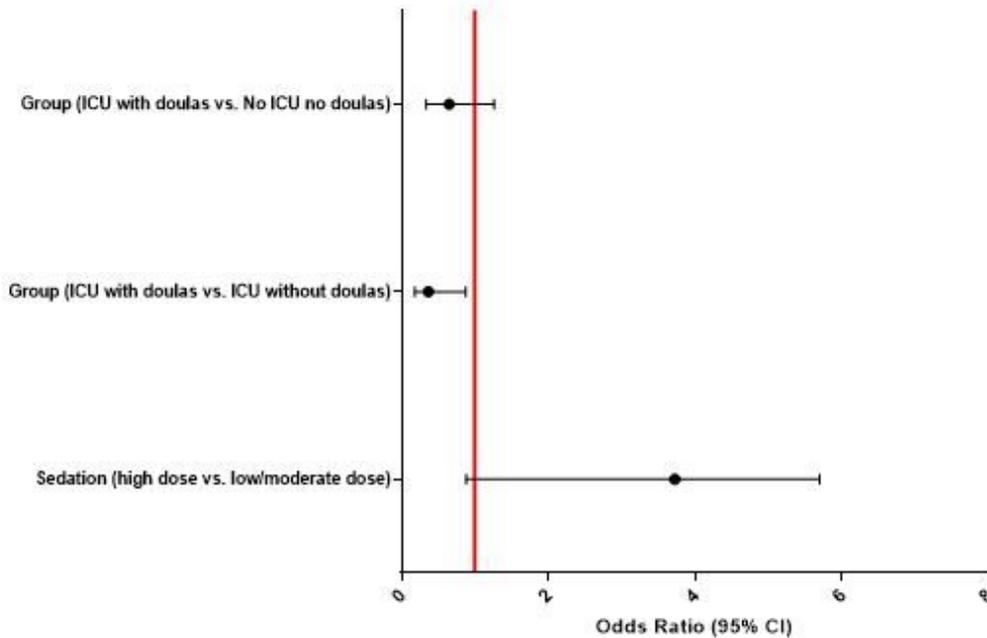


Figure 4

Binary logistic regression analysis to find effects of variables on total IES-R high scores (represents of PTSD) (A) univariate and (B) multivariate