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RESEARCH ARTICLE

THE EVALUATION OF THE QUALITY OF LIFE IN SURVIVORS OF CRITICAL ILLNESS AFTER DISCHARGE FROM INTENSIVE CARE UNIT: A PROSPECTIVE COHORT STUDY

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Abstract

Background: Admission to the Intensive Care Unit (ICU) constitutes a substantial psychophysical burden for patients and their relatives. Individuals who are critically ill and receive care in the ICU frequently exhibit numerous physical and mental issues stemming from the primary ailment, its complications, and subsequent treatments.

Aim: This study aimed to assess the quality of life (QoL) for ICU patients in the first and third month after ICU discharge and identify any issues arising from their ICU hospitalization.

Method and Material: This was a prospective cohort study. The study participants were adult medical or surgical patients admitted to ICUs in three public hospitals in the region of Attica in Greece, from August 2020 to December 2021. The short form (SF)-36 was used to measure QoL. Data collection was performed through telephone interviews during the first and third month after ICU discharge.

Results: The study included 43 patients. The mean age was 59.63 ± 13.06 years. The average value of the two main categories in the 1st month was: Physical health: 53.72 ± 15.92 , and Mental health: 69.03 ± 26.02 , while in the 3rd month, it was 62.42 ± 20.45 and 72.81 ± 16.47 , respectively. The duration of mechanical ventilation, high-flow oxygen therapy, and spontaneous breathing in days seemed to be correlated with the "Physical Functioning", "Pain", and "Limitation of the role due to Physical health" subscales of SF-36, respectively (p-value <0.05). The total length of hospitalization seemed to have a statistically significant weak negative correlation with "Physical Function" and "Physical Health" subscales (p-value<0.05).

Conclusions: An improvement in patients' QoL was demonstrated three months after discharge from the ICU.

Keywords: Quality of life, ICU patients, critical care, survivors, post-discharge, assessment.

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INTRODUCTION

Admission to the Intensive Care Unit (ICU) significantly burdens patients and their relatives both physically and psychologically.¹ Critically ill individuals in the ICU often develop multiple physical and mental complications due to their primary illness, its complications, and the treatments administered.¹ Despite many recovering from severe conditions, ICU patients frequently encounter persistent post-discharge issues such as dyspnea, debilitation, anxiety, depression, sleep disturbances, concentration difficulties, post-traumatic stress, and pain.¹ These challenges can disrupt daily activities, work, education, personal relationships, social interactions, and financial stability for both the patient and their family.¹ Furthermore, Post-Intensive Care Syndrome (PICS) profoundly affects ICU survivors' quality of life, manifesting through physical, cognitive, and psychological difficulties.² Physical symptoms may include muscle weakness and fatigue, while cognitive impairments can affect memory and attention. PICS often includes psychological symptoms like anxiety, depression, and PTSD, largely attributed to the stressful ICU experience.² These multifaceted issues significantly hinder patients' return to normal daily and professional activities, highlighting the need for comprehensive post-ICU care that addresses all dimensions of PICS.² Therefore, ICU hospitalization is not only a critical medical event but also a significant disruptor of a patient's overall well-being.

Historically, the primary objective of ICUs was to help patients manage their critical health conditions and transition back to the general nursing ward for ongoing care.³ In those days, the mere transfer of a patient to the nursing ward, irrespective of the often imminent death, was considered a success of ICU treatment.⁴ However, as medicine and nursing science have advanced over time, these circumstances have transformed, altering the ultimate aim of care administered in ICUs.⁵ Presently, the focus is on providing the highest quality of intensive care, enabling patients not only to survive but also to return to their pre-illness state with minimal complications and disabilities.^{5,6}

This progress and the necessity for comprehensive care have prompted questions about the quality of life for patients following ICU and hospital discharge.⁷ In essence, there emerged a need to track these patients' subsequent lives in the community,

document the novel challenges they face in their daily routines, and determine whether these challenges enable the patients to be functional.⁸ These challenges encompass any acquired disabilities, life support measures (such as mechanical ventilation or feeding devices), as well as psychosomatic consequences like fatigue, stress, and post-traumatic stress disorder (PTSD) resulting from hospitalization.⁹ Naturally, monitoring a patient's progress during the post-discharge period should also take into account their immediate surroundings, including their family.¹⁰ The family environment, which encompasses the patient, must adapt to the new circumstances and may potentially assume the role of a caregiver or supporter, significantly contributing to the patient's recuperation.¹¹

Research at an international level has indicated that the quality of life (QoL) for patients who survive ICU hospitalization is still uncertain.^{3,12,13} In Greece, there have been limited efforts to evaluate the impact of ICU hospitalization on patients' quality of life.¹⁴⁻¹⁶

Consequently, the study's objective was to assess the QoL for ICU patients in the first and third month after ICU discharge and identify any issues arising from their ICU hospitalization.

METHODOLOGY

Study Design and Participants

This was a prospective cohort study conducted in three public hospitals in the Attica region of Greece the study participants were adult medical or surgical patients admitted to Intensive Care Units (ICUs) from August 2020 to December 2021. Inclusion criteria for the participation in the study were (1) patients needed to be over 16 years old; (2) had received mechanical ventilation for at least 1 hour; (3) were expected to survive ICU care after stabilization as determined by clinicians' assessments; and (4) had satisfactory Greek reading and writing skills. The study did not include patients with an ICU stay shorter than 24 hours or a diagnosed mental illness. Convenience sampling was employed, and patients were enrolled either during their ICU stay or after being transferred out of the ICU but before hospital discharge.

Data collection

For all included patients, the following data were collected: age, gender, educational background, marital status, the reason for admission, type of tracheotomy (Surgical procedure or percutaneous technique), duration of mechanical ventilation, length of stay in ICU, length of hospitalization, patient outcome (discharged or deceased), and any readmission within 30 days from hospital discharge.

The short form (SF)-36 was used to measure QoL. SF-36^{17,18} is a 36-item patient-reported outcome questionnaire that covers eight health domains: physical functioning (10 items), pain (2 items), role limitations due to physical health (4 items), role limitations due to personal or emotional problems (4 items), emotional well-being (5 items), social functioning (2 items), energy/fatigue (4 items), and general health (5 items). Scores for each domain range from 0 to 100, with a higher score defining a more favorable health state. SF-36 has demonstrated reliability, validity, and responsiveness in the post-ICU population¹⁷ and is one of the most common instruments used for assessing health status in this patient cohort.^{19,20}

Three research nurses assessed the quality of life using a telephone assessment of SF-36. The three research nurses piloted the interview technique in 20 patient telephone interviews. The patients completed the SF-36 questionnaires one month and three months after ICU discharge.

Ethical issues

Regarding the ethics of this study, it has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).²¹ The study was approved by the hospitals' review boards (Ref No 83/26-2-2020, 37/10-2-2020, and 27/25-2-2020). Data collection and analysis were conducted after obtaining informed, written consent from all patients or their relatives during ICU care and from all patients once they regained competency. The patients' personal data and the hospitals' names remained anonymous at all stages of the study.

Statistical analysis

The Shapiro-Wilk statistical test was used to check the normality of the data. Mean (M), Standard Deviation (SD), and range were used to describe the quantitative variables, while absolute (n)

and relative frequencies (%) were used to describe the qualitative variables. The reliability of the SF-36 was tested using Cronbach's Alpha reliability coefficient. Each scale showed satisfactory reliability (index values > 0.7). To investigate the correlation between two quantitative variables, Pearson's correlation coefficient was used parametrically, and Spearman's correlation coefficient was used non-parametrically. The comparison between a quantitative variable and a qualitative variable with two levels was performed using a parametric Student's t-test and non-parametric Mann-Whitney U test. Finally, to compare two dependent samples, the Paired-Samples T-Test was used parametrically, and Wilcoxon test was used non-parametrically. All tests were performed at a 0.05 level of significance. The statistical package for Social Sciences (SPSS) ver.24 was used for data analysis and processing.

RESULTS

Characteristics of Patients

The study included 43 patients (34 men: 79.1%, and nine women: 20.9%). The mean age was 59.63 ± 13.06 years. The demographic characteristics of the participants are presented in **Table 1**. Regarding the reasons for the admission of patients to the ICU, 74.4% (n=32) had respiratory problems, of which 12 (27.9%) also had COVID-19. Cardiac arrest was suffered by 16.3% (n=7), reintubation was performed in 16.3% (n=7), and tracheostomy was performed in 11.6% (n=5) of the patients. 90.7% (n=39) of patients were transferred to an inpatient department from the ICU, and only 4.7% (n=2) were readmitted within 30 days to the ICU. The total length of hospitalization was 30.16 ± 33.91 days.

Comparison between the first and third month of follow-up

Table 2 shows the differences observed in the SF-36 subscale scores between the 1st and 3rd month of follow-up. The subscales "Role limitation due to Emotional Problems", "Mental Health", and "Pain" did not appear to be statistically significantly different between the 1st and 3rd month of follow-up (p-value>0.05). The other subscales showed a statistically significant difference between the 1st and 3rd month of follow-up (p-value<0.05) with an almost overall increase in scores except for the "General Health" dimension.

Comparison between the demographic characteristics of patients in the 1st and 3rd month of the follow-up

During the 1st month follow-up, the comparison of participants' demographic characteristics and SF-36 subscales showed statistically significant differences between the cause of ICU admission (COVID-19 or otherwise) and the "Social Functioning" subscale (p-value<0.05), between the occurrence or non-occurrence of cardiac arrest and the "Energy/Fatigue" subscale (p-value<0.05), and between the presence or absence of tracheostomy and the "Physical Health" subscale (p-value<0.05). Additionally, patients who underwent tracheostomy exhibited significant self-care limitations, frequently experienced fatigue, and assessed their health as poor compared to patients who did not have a tracheostomy (Table 3).

Regarding the 3rd month of follow-up, a statistically significant difference was noted between the patients' gender and the "Physical Function" subscale (p-value<0.05), between the cause of ICU admission (COVID-19 or other) and both the "Physical Function" and "Physical Health" subscales (p-value<0.05), as well as between the occurrence or non-occurrence of cardiac arrest and the "Energy/Fatigue" subscale (p-value<0.05). Female patients appeared to be more constrained in various physical functions, such as dressing and bathing independently, compared to male patients (Table 3).

During the 1st month follow-up, the length of ICU hospitalization (in days) appeared to have a statistically significant weak negative correlation with the "Physical Function" and "Energy/Fatigue" subscales (p-value<0.05). The duration of mechanical ventilation (in days) seemed to be a statistically significant weakly negatively correlated with the "Physical Function," "Pain," and "Physical Health" scales (p-value<0.05). The duration of high-flow oxygen therapy (in days) displayed a statistically significant weak positive correlation with the "Pain" scale (p-value<0.05). The length of hospitalization with spontaneous breathing (in days) demonstrated statistically significant weak negative correlations with the "Physical Function," "Energy/Fatigue (or Vitality)," and "Mental Health" subscales (p-value<0.05). The total length of hospitalization (in days) ap-

peared to have a statistically significant weak negative correlation with the "Physical Function" and "Energy/Fatigue" subscales (p-value<0.05).

In contrast, during the 3rd month follow-up, the duration of mechanical ventilation (in days) appeared to have a statistically significant weak negative correlation with the "Pain" subscale. The duration of high-flow oxygen therapy (in days) displayed a slight positive correlation with the "Pain" subscale (p-value<0.05). The length of hospitalization with spontaneous breathing (in days) demonstrated a statistically significant weak negative correlation with the "Physical Function" subscale (p-value<0.05). The total length of hospitalization (in days) seemed to have a statistically significant weak negative correlation with both the "Physical Function" and "Physical Health" subscales (p-value<0.05).

Patients' age did not appear to correlate with any SF-36 subscale in either the 1st or 3rd month of follow-up (p-value>0.05).

DISCUSSION

The current study revealed that the quality of life for patients who were hospitalized in the ICU improved in the 3rd month of follow-up compared to the 1st month. Specifically, the subscales "Physical Function," "Role Limitation due to Physical Health," "Energy/Fatigue," "Social Function," "General Health," "Physical Health," and "Mental Health" demonstrated higher scores during the 3rd month of patient follow-up. This suggests a slight improvement in health, highlighting the benefits of the treatment received by patients within the ICU. This finding is consistent with that of a previous study.¹⁴ Specifically, in a study conducted in Greece, which aimed to assess the changes in health-related quality of life (HRQoL) in patients discharged from the ICU using the "Quality of Life-Spanish (QOL-SP)", it was found that the mean quality of life score of the patients increased from 2.9 ± 4.8 (out of a maximum of 25 points) upon ICU admission to 7.0 ± 7.2 points at six months after discharge, and then decreased to 5.6 ± 6.9 points at 18 months (p-value<0.001).¹⁴

Moreover, a systematic review encompassing 48 studies with a total of 11,927 patients reported that quality of life improved in the first year after discharge in four domains: physical function,

physical role, vitality, and social function, with no significant improvement observed thereafter.²² However, these domains were also the least likely to return to population norms, as they were more deeply impacted by critical illness.²² The critical illness appears to affect psychological health less than physical health, and the former may experience less improvement following hospital discharge.²² Interventions aimed at enhancing health after critical illness may be more effective for physical health than psychological health²²

In this study, we found that age is not associated with the quality of life following discharge, which is consistent with the findings of two previous studies.^{13,23} In a study conducted in France,¹³ for patients older than 70, scores were not different from those of younger patients, whatever the underlying condition. Another study conducted by Orwelious et al.,²³ it was found that age did not have any impact on health-related quality of life (p-value=0.084). However, this result contrasts with the findings of two other previous studies.^{14,24} In a Greek study,¹⁴ it was found that age had a positive association with quality of life at 18 months after ICU discharge ($B = 0.129$, p-value<0.001). In another study conducted by Vogel et al.,²⁴ which aimed to describe and analyze factors associated with Health-Related Quality of Life (HRQoL) after discharge from a general surgical ICU using the SF-36, it was found that patients aged 65-74 years estimated their HRQoL lower than both younger and older patients in two domains: Physical Functioning (p-value = 0.00) and Mental Health (p-value = 0.04).

In the 3rd month of follow-up, the female gender exhibited a lower quality of life, which is consistent with three previous studies.^{14,24,25} Vogel et al.²⁴ found that the female gender was associated with lower HRQoL in three domains of SF-36; Bodily Pain (p-value = 0.03), Emotional Role (p-value = 0.04), and Mental Health (p-value= 0.01). In a Portuguese study,²⁵ which aim was to assess HRQOL and independence in activities of daily living (ADL) six months after discharge from an ICU, and to study its determinants, it was found that women had significantly lower scores for bodily pain, general health perception, vitality, and social functioning than men. Fildissis et al.¹⁴ found that the male gender had a positive association with quality of life at 18 months after ICU discharge ($B = 3.934$, p-value=0.002).

Another interesting finding of our study was that during the 1st and 3rd month follow-up, statistically significant differences were observed between the cause of ICU admission (COVID-19 or otherwise) and the "Social Functioning" subscale, as well as between the cause of ICU admission (COVID-19 or other) and both the "Physical Function" and "Physical Health" subscales, respectively. A similar study involving COVID-19 patients has not been conducted. However, other studies suggest that car accident victims who survived serious injuries experienced significant levels of disability with subsequent reduced quality of life.^{26,27}

Another interesting finding of our study was that patients who underwent tracheostomy appeared to have significant limitations in their self-care, often felt fatigued, and rated their quality of life as poor compared to patients who did not undergo tracheostomy. This finding is in contrast with this of a previous study.²⁸ Specifically, in an Italian study that aims to investigate post-discharge survival and QoL after tracheostomy for acute respiratory failure (ARF) in patients with amyotrophic lateral sclerosis (ALS) using Life Satisfaction Index (LSI-11), it was found that the mean (SD) cumulative score on the LSI-11 was 9.3 (3.6; range, 0-22; higher values indicating better QoL), similar to that obtained from a control group consisting of individuals with ALS who had not received tracheostomy (9.3 ± 4.3) and to that reported for persons in the general population. This may be due to the fact that the variation in patient-perceived life satisfaction may not solely be linked to physical function; it could also be associated with sociodemographic factors such as income, social life, and education.²⁹

In the present study, we found that the length of ICU hospitalization is negatively and weakly correlated with the "Physical Function" and "Physical Health" of SF-36 subscales. This finding is in line with this of a previous study.¹⁵ In a study conducted by Vrettou et al.,¹⁵ which aimed to investigate the quality of life using the WHOQOL-Bref Questionnaire and the correlations of clinical and psychological parameters with the quality of life scores in survivors of critical illness one year after discharge from intensive care, it was found that the ICU stay duration correlated negatively with the physical (Pearson's $r = -0.19$, p-value = 0.04) and the social relationship (Pearson's $r = -0.19$, p-value = 0.04)

domains of WHOQOL-Bref Questionnaire.

Finally, one more interesting finding was that the duration of mechanical ventilation in days appears to be negatively and slightly correlated with the "Pain" subscale. In a systematic published in 2010,¹² which aim was to evaluate the quality of life at least 12 months after discharge from the intensive care unit of adult critically ill patients and to give an overview of factors influencing the quality of life, it was found that the worst reductions in quality of life were seen in cases of prolonged mechanical ventilation.

Our study has some limitations that should be acknowledged. First of all, the sample size was small, as patients were recruited from general adult ICUs of only three Greek hospitals. Thus, the study sample may not be fully representative, and accordingly, the generalization of the present study's findings should be interpreted with caution. Another important limitation is that results are exclusively based on self-reported data; participants may provide an answer that is widely accepted rather than reflecting their true beliefs, a phenomenon called socially desirable responding (SDR), leading to response bias.³⁰ One more limitation was the high heterogeneity of the sample. Lastly, the assessment of QoL in this study was restricted to 3 months after discharge, meaning that the patients who participated were still in the recovery phase. A longer study period is recommended to illustrate more explicitly the ICU patients' condition after discharge.

Clinical perspective

QoL assessments after ICU discharge should be conducted more frequently, as they can potentially provide insights into the long-term outcomes of ICU survivors. Additionally, these assessments may help identify the main challenges that patients face after discharge, thereby enabling the design of specific follow-up programs based on their needs.

Although the nursing staff can perform certain aspects of early intervention in ICUs, the high percentage of patients underscores the need for access to specialist services. This preliminary validation study suggests that the SF-36 Health Survey Questionnaire could be reliably used as a screening instrument at six months, one year, and every year post-discharge from ICU to

identify patients needing referral to such services. This is particularly useful as it aligns well with the timing of ICU follow-up clinics being established in the rest of Europe and recommendations for the timing of early intervention.

CONCLUSIONS

In conclusion, the benefits of ICU treatment were demonstrated as there was a slight improvement in the QoL of the patients in the third month after ICU discharge. Factors such as gender, cause of ICU admission, occurrence or non-occurrence of cardiac arrest, the performance of a tracheostomy, and type of ventilation support should always be considered when assessing the quality of life after ICU hospitalization.

Finally, further studies are needed to improve QoL assessment, allowing comparisons between ICUs and enhancing clinicians' skills and knowledge of patients who experience problems after discharge due to ICU hospitalization.

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Conflict of Interest

None

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ANNEX

Table 1. Demographic characteristics of participants

	n	%
Sex		
Male	34	79.1
Female	9	20.9
Educational level		
Primary education	2	4.7
Secondary education	19	44.2
Higher education	22	51.2
Postgraduate studies		
Yes	2	4.7
No	41	95.3
Occupation		
Civil servant	3	7.0
Private employee	15	34.9
Freelancer	8	18.6
Unemployed	1	2.3
Retired	16	37.2
Marital status		
Married	33	76.7
Unmarried	6	14.0
Divorced	1	2.3
Widower	3	7.0
No of children		
0	8	11.6
1	11	51.2
2	17	20.9
3	5	11.6
> 3	2	4.7
How many people stay with the patient?		
0	5	11.6
1	22	51.6
2	9	20.9
3	5	11.6
> 3	2	4.7
Social Security		
Uninsured	3	7.0
Public	36	83.8
Private	4	9.3
Monthly income		
0-1000	11	25.6
1001-2000	28	65.1
2001-3000	3	7.0
>3000	1	2.3
	Mean ± SD	Range
Patient age in years	59,63±13,06	25-81

Table 2. Comparisons of SF-36 subscales at the 1st and 3rd month of the follow-up

SF-36 subscales	1st month	3rd month	p-value
	Mean ± SD	Mean ± SD	
1. Physical functioning	53.47±26.13	63.50±25.10	<0.001
2. Role limitations due to physical health	15.28±29.45	39.38±44.18	0.003
3. Role limitations due to emotional problems	76.8y±38.06	78.33±34.22	0.581
4. Energy / Fatigue	58.89±13.89	65.25±14.80	<0.001
5. Emotional well being	73.00±15.40	73.30±17.24	0.132
6. Social functioning	67.36±24.14	74.38±22.46	0.009
7. Pain	79.03±22.84	79.94±22.92	0.127
8. General health	67.08±17.58	66.88±17.49	<0.001
9. Physical health	53.72±15.92	62.42±20.45	<0.001
10. Mental health	69.03±26.02	72.81±16.47	0.019

Table 3. Comparisons of SF-36 scales for the 1st and 3rd month of follow-up with participants' demographic characteristics (n=43)

SF-36 subscales	1st month of follow-up		2nd month of follow-up		Sex
	Male (n=34)	Female(n=9)	Male (n=34)	Female(n=9)	
Physical functioning	55.38±27.62	46.88±20.17	0.426	68.75±23.79	42.50±25.07
Role limitations due to physical Function	16.07±30.59	12.50±26.73	0.867	42.97±45.01	25.00±40.09
Role limitations due to emotional problems	79.76±36.67	66.67±43.64	0.399	81.25±31.61	66.67±43.64
Energy / Fatigue	59.29±13.72	57.50±15.35	0.995	65.47±13.76	64.38±19.54
Emotional well being	73.14±13.63	72.50±21.64	0.938	73.13±16.95	74.00±19.60
Social functioning	66.52±23.58	70.31±27.50	0.701	76.17±21.85	67.19±24.94
Pain	75.27±24.43	92.19±7.25	0.156	76.95±24.39	91.88±9.52
General health	68.39±16.84	62.50±20.53	0.411	67.97±16.65	62.50±21.21
Physical Health	53.77±16.95	53.52±12.59	0.969	64.16±20.88	55.47±18.15
Mental health	69.68±15.10	66.74±19.88	0.780	74.00±15.14	68.06±21.52
Cause of admission to ICU – COVID-19		Cause of admission to ICU – COVID-19			
	No	Yes	No	Yes	
Physical functioning	53.80±30.56	52.73±12.12	0.881	68.97±26.50	49.09±18.82
Role limitations due to physical Function	14.00±27.08	18.18±35.52	0.946	46.55±45.67	20.45±35.03
Role limitations due to emotional problems	81.33±33.44	66.67±47.14	0.636	83.91±27.63	63.64±45.84
Energy / Fatigue	58.00±15.75	60.91±8.61	0.570	66.21±16.02	62.73±11.26
Emotional well being	74.72±15.26	69.09±15.71	0.331	74.76±17.92	69.45±15.42
Social functioning	62.00±24.86	79.55±17.92	0.049	73.71±23.70	76.14±19.73
Pain	79.50±21.93	77.95±25.90	0.813	79.74±23.81	80.45±21.47
General Health	67.80±20.00	65.45±10.83	0.718	67.76±19.35	64.55±11.72
Physical Health	53.78±18.00	53.58±10.43	0.974	65.75±22.41	53.64±10.42
Mental health	69.01±16.96	16.96±14.40	1.000	74.65±17.13	67.99±14.17
Cardiac arrest		Cardiac arrest			
	No	Yes	No	Yes	
Physical functioning	56.83±24.55	36.67±29.61	0.084	66.32±25.30	47.50±26.22
Role limitations due to physical Function	11.67±22.49	33.33±51.64	0.576	38.23±43.62	45.83±51.03
Role limitations due to emotional problems	77.78±38.49	72.22±38.97	0.576	80.39±33.95	66.67±36.51
Energy/Fatigue	60.67±14.00	50.00±10.00	0.037	68.38±13.58	47.50±6.89
Emotional well being	73.60±15.67	70.00±14.91	0.608	74.24±17.59	68.00±15.39
Social functioning	68.75±22.4	60.42±32.99	0.448	74.63±22.51	72.92±24.26
Pain	81.17±19.48	68.33±35.87	0.788	80.96±22.15	74.17±28.53
General Heath	69.17±16.77	56.67±19.41	0.187	68.38±17.04	58.33±19.15
Physical Health	54.71±12.73	48.75±28.24	0.632	63.47±19.93	56.46±24.28
Mental health	70.20±15.52	63.16±18.73	0.394	74.41±16.56	63.77±13.82
Re-intubation of a patient while in the ICU		Re-intubation of a patient while in the ICU			
	No	Yes	No	Yes	
Physical functioning	54.19±26.18	49.00±28.37	0.686	64.85±25.29	57.14±30.39

Role limitations due to emotional problems	74.19±40.10	93.33±14.91	0.504	76.77±36.78	85.71±17.82	0.972
Energy / Fatigue	60.00±11.83	52.00±23.87	0.238	64.85±14.71	67.14±16.29	0.715
Emotional well being	73.42±15.20	70.40±18.24	0.690	74.67±16.15	66.86±21.10	0.421
Social functioning	68.55±24.34	60.00±24.04	0.396	76.14±22.83	66.07±20.04	0.218
Pain	79.76±23.21	74.50±22.25	0.533	80.16±23.69	78.93±20.51	0.702
General Health	67.58±16.01	64.00±27.70	0.791	67.88±16.10	62.14±24.30	0.569
Physical Health	54.82±15.74	46.88±17.04	0.307	64.02±20.39	54.91±20.53	0.291
Mental health	69.04±16.17	68.93±16.84		73.10±17.24	71.45±13.20	0.577

	The patient was tracheostomized		The patient was not tracheostomized			
	No	Yes	No	Yes	No	Yes
Physical function	56.29±25.33	36.00±26.79	0.108	65.72±26.32	48.00±18.91	0.157
Role limitations due to emotional problems	78.49±38.05	66.67±40.82	0.371	78.10±36.10	80.00±18.26	0.605
Energy / Fatigue	59.19±13.48	57.00±17.89	0.736	66.57±14.08	56.00±18.17	0.137
Emotional well being	72.65±15.15	75.20±18.63	0.736	73.37±17.16	72.80±19.88	0.905
Social functioning	69.76±22.31	52.50±32.36	0.140	75.36±22.17	67.50±25.92	0.498
Pain	83.06±19.29	54.00±29.45	0.059	82.64±21.95	61.00±22.75	0.103
General Health	66.94±16.21	68.00±27.06	0.902	66.43±16.48	70.00±25.74	0.675
Physical Health	56.01±14.50	39.50±18.62	0.029	64.41±20.42	48.50±16.02	0.104
Mental health	70.02±14.99	62.84±22.45	0.657	73.35±16.67	69.08±16.20	0.524

* The values for each of the ten subscales of the SF-36 are presented as the mean ± SD (standard deviation)