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Depressive Symptoms and Anxiety in Intensive Care Unit (ICU) Survivors after ICU Discharge

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Abstract

Background—Intensive care unit (ICU) survivors face complex physical, cognitive, and psychological sequelae that can negatively impact their health-related quality of life. To date, the association between ICU survivors' psychological sequelae, individual care needs, and discharge disposition has not been evaluated.

Objective—To describe depressive symptoms and anxiety in ICU survivors and explore these symptoms based on individual care needs and home discharge status for 4 months post-ICU discharge.

Methods—We analyzed data from 39 ICU survivors who self-reported measures of depressive symptoms (*Center for Epidemiologic Studies-Depression 10 items* [CESD-10]) and anxiety (*Shortened Profile of Mood States-Anxiety subscale* [POMS-A]) at one or more of the following time points post-ICU discharge: within 2 weeks, 2 months and 4 months.

Results—A majority of patients reported CESD-10 scores above the cut off (8) indicating risk for clinical depression: 83.9% within 2 weeks (26 of 31), 64.3% at 2 months (18 of 28) and 72.0% at 4 months (18 of 25). POMS-A scores were highest within 2 weeks of ICU discharge (8.9 ± 3.5 ; $n=33$) and decreased over time (7.0 ± 3.0 at 2 months, $n=28$; 6.6 ± 2.7 at 4 months, $n=25$). Data trends suggest worse depressive symptoms and anxiety when patients had moderate to high care needs and/or were unable to return home.

Conclusion—In our sample, ICU survivors who need caregiver assistance and extended institutional care reported trends of worse depressive symptoms and anxiety. Early screening and treatment of psychological symptoms may be an important means to promote rehabilitation and recovery.

Introduction

Advances in critical care have increased the likelihood of patient survival beyond the intensive care unit (ICU).¹ Despite reaching this milestone, many ICU survivors face physical, cognitive, and psychological sequelae that result in delay or inability to return to pre-illness function.^{2–4} For this reason, the scope of patient-centered critical care has expanded to support the needs of ICU survivors and their family caregivers during the post-ICU discharge period.^{5,6}

Although interventions to date have primarily targeted health-related quality of life and physical function after critical illness^{7–9}, evidence supports that ICU survivors frequently experience psychological sequelae. From a study that analyzed data from more than 20,000 individuals who experienced critical illness, Wunsch and colleagues reported that ICU survivors are at increased risk for new psychiatric diagnoses in the first months after hospital discharge.¹⁰ Davydow and colleagues reported similar findings from a systematic review of 10 observational studies that enrolled ICU survivors.³ In these studies, the prevalence of clinically significant depressive symptoms ranged from 17% to 43%.³ In 150 patients followed for one year after ICU admission for at least 24 hours, unresolved depressive symptoms were associated with an increase in hospital readmissions and emergency department visits.¹¹ In addition, ICU survivors have reported significant anxiety, with a reported prevalence of 23–41% that can persist for years after ICU discharge.^{12–17}

The Pittsburgh Mind-Body Center Model was proposed by a multidisciplinary team of investigators to examine interactions between psychological, biological and behavioral responses to a stressor.¹⁸ The Adapted Pittsburgh Mind-Body Center Model poses that patient characteristics, e.g., physical function and physical and psychological symptoms, can lead to negative responses in family caregivers, which in turn affect caregiver's overall physical health.¹⁸ Guided by this model, we examined interactions of psychological, behavioral and biological responses to acute and chronic stress in family caregivers of the critically ill from patients' ICU admission to 4 months post-ICU discharge and potential relationships with characteristics of ICU survivors.¹⁹ Findings from this parent study highlighted problems of negative psychological and physical health issues in family caregivers of ICU patients and their relationship with patients' symptoms and discharge disposition.^{20–22} These findings also suggested the need for further exploration of changes in psychological sequelae in patients and their potential relationship with patient care needs (extent of functional recovery) and discharge disposition.

Therefore, the aims of the present study are to: 1) describe trends in depressive symptoms and anxiety in ICU survivors for 4 months post-ICU discharge; 2) explore the relationship between ICU survivors' individual care needs and depressive symptoms and anxiety; 3) explore depressive symptoms and anxiety in ICU survivors based on home discharge status. Our report extends findings of prior studies by exploring longitudinal trends of psychological sequelae in ICU survivors for the initial 4 months post-ICU discharge and relationships to care needs and home discharge status.

Methods

In this secondary analysis, we used the data from a study that explored biobehavioral stress responses in family caregivers of ICU survivors who underwent mechanical ventilation for 4 days or more.¹⁹ The study protocol was reviewed and approved by the Institutional Review Board. All participants provided informed consent.

Site, Sample and Procedure

Information on the parent study site, sample, and study procedures were detailed in a prior publication.²⁰ Among 47 patients enrolled during their ICU admission, 39 survived and were discharged from the ICU. For this report, we analyzed data from ICU survivors who were able to self-report measures of depressive symptoms and anxiety at one or more of the following time points: (1) within 2 weeks post-ICU discharge (to assess acute response following critical illness); (2) 2 months (to assess response when discharge destination tends to become diversified and include home, long-term acute care, skilled nursing facilities); and (3) 4 months (to assess new or persistent psychological symptoms). The flow of available participants throughout the study is summarized in Figure 1.

Measures

Shortened Version of Center for Epidemiologic Studies-Depression 10 items (CESD-10) was used to measure depressive symptoms.²³ Scores were reported using a 4-point Likert-type summative scale (range 0–30), with higher scores indicating more depressive symptoms. On the CESD-10, a score of 8 has been used as an indicator of individual risk for clinical depression.²⁴ The CES-D has been validated in studies involved ICU survivors.^{25–27} The Cronbach's alphas in this study were .73 – .78. Validity has been established in ICU survivors.^{25–28}

Shortened Profile of Mood States-Anxiety scale (POMS-A) was used to measure anxiety. The POMS was developed to assess transient distinct mood states.²⁹ We used the 3-item tension-anxiety subscale to measure anxiety in ICU survivors. Each item was rated using a 5-point scale (1= never, 5 = always). The total subscale score ranged from 3 to 15; higher scores indicated higher anxiety. The Cronbach's alphas in this study were .85 – .90. Validity with other anxiety measures has been established.³⁰

*Activities of Daily Living (ADL; 6 items)*³¹ and *Instrumental Activities of Daily Living (IADL; 8 items)*³² were used to determine patients' care needs at each time point. Patients were asked to answer deficiencies in 6 ADLs (e.g. bathing, eating)³¹ and 8 IADLs (e.g., shopping)³². The score was the sum of activities needing assistance; higher scores indicated worse functional status. Reliability and validity have been well established^{33–39}. Depending on response, the level of care needs was categorized as: no need (no impairment in ADL or IADL), moderate need (1 impairment in IADL but no impairment in ADL), and high need (1 impairment in ADL)⁴⁰. The use of ADL and IADL to determine level of caregiving has been validated in a prior study with a large population of spousal caregivers⁴¹.

Data Analysis

A research team member hand entered data into IBM-SPSS v. 19.0 (SPSS, Inc.; Chicago, IL, USA) which was verified by the principal investigator (JC). Descriptive statistics were reported for all variables. Non-parametric statistics were used to provide a conservative interpretation because of the small sample size. The Kruskal-Wallis test was used to compare ICU survivors' depressive symptoms and anxiety by individual care needs at each follow-up point based upon the sum of the ADL and IADL score, i.e., 1 = no care needs (no impairment in ADL or IADL); 2 = moderate care needs (no impairment in ADL and one or more impairments in IADL); and 3 = high care needs (at least one impairment in ADL). The Mann-Whitney-U test was used to compare ICU survivors' depressive symptoms and anxiety by presence/absence of previous history of psychiatric conditions with data obtained from patients' medical records. Friedman test was used to explore depressive symptoms and anxiety by ICU survivors' home discharge status at 4 months post-ICU discharge. Besides statistical significance (set at $\alpha = 0.05$, two-tailed), trends in differences were also explored.

Results

Participant demographic and clinical characteristics are shown in Table 1. Participants were mostly male, Caucasian, with a mean age of 55.5 years. Respiratory conditions (e.g., acute respiratory failure) were the most common primary diagnosis ($n=26$; 55.3%). Average days on mechanical ventilation and ICU hospitalization were approximately 3 weeks. During the 4-month study period, the main reason for attrition was death ($n=14$). ICU survivors lost to attrition had higher scores of pre-existing comorbidity.²⁰ There was no significant difference in any other examined characteristic between ICU survivors who remained in the study or were lost to attrition.

Depressive symptoms and anxiety for 4 months post-ICU discharge

At each time point, CESD-10 scores were 13.5 ± 6.4 ($n=31$), 10.0 ± 5.9 ($n=28$) and 11.5 ± 6.2 ($n=25$), respectively. Mean CESD-10 scores decreased over time, but remained above the cut-off (≥ 8) indicating risk for clinical depression across the entire follow-up period. POMS-A scores were 8.7 ± 3.6 ($n=33$), 7.0 ± 3.0 ($n=28$) and 6.6 ± 2.7 ($n=25$), respectively at each time point. POMS-A scores were highest within 2 weeks post-ICU discharge and showed a decreasing trend over 4 months post-ICU discharge.

We compared CESD-10 and POMS-A scores at each time point by patients' demographic and clinical characteristics. Female patients reported significantly higher POMS-A scores within 2 weeks (Mann Whitney U test, $U=63.0$, $p=0.01$) and 4 months (Mann Whitney U test, $U=30.50$, $p=0.03$) post-ICU discharge. Younger age was significantly correlated with higher POMS-A scores within 2 weeks post-ICU discharge (Spearman's $\rho = 0.36$, $p=0.04$). Shorter ICU length of stay was correlated with higher POMS-A score within 2 weeks post-ICU discharge (Spearman's $\rho = 0.42$, $p=0.01$) and 4 months post-ICU discharge (Spearman's $\rho = 0.44$, $p=0.03$). Patients with a past history of psychiatric condition had higher mean CESD-10 and POMS-A scores, but differences were statistically significant. No other demographic (e.g., age) or clinical (e.g., APACHE II score, Charlson

Comorbidity Score) characteristics were associated with differences in CESD-10 or POMS-A scores.

Comparison of trends in depressive symptoms and anxiety by individual care needs

We also compared CESD-10 and POMS-A scores at each time point grouped by individual care needs based upon ADL and IADL scores (Figure 2). We observed trends of higher mean CESD-10 scores in ICU survivors with moderate and high care needs, compared with those with no care needs. ICU survivors reported highest scores of POMS-A within 2 weeks post-ICU discharge regardless of their individual care needs. Later (2 and 4 months post-ICU discharge), POMS-A scores were higher in survivors with higher care needs. Neither of these trends was statistically significant.

Trends in depressive symptoms and anxiety by discharge destination

To explore changes CESD-10 and POMS-A scores dependent on the discharge destination, we explored longitudinal trends in median scores of CESD-10 and POMS-A in a subgroup of 28 ICU survivors who were able to provide data for at least two time points (Figure 3). ICU survivors who never returned home during the study period reported the highest CESD-10 scores within one week after hospital discharge and persistently high CESD-10 scores for the 4 month follow-up period. In ICU survivors who were home within 2 weeks post-ICU discharge, median CESD-10 scores showed a worsening trend from 2 months to 4 months. In these patients, median CESD-10 scores at 4 months were worse than the initial period following ICU discharge.

Regarding trends in anxiety, ICU survivors reported highest median POMS-A scores within 2 weeks post ICU discharge, regardless of discharge destination. Over 4 months, median POMS-A scores decreased in patients who returned home by 2 or 4 months post-ICU discharge (Friedman test, $\chi^2 = 11.57$, $p = 0.03$). In ICU survivors who never returned home by 4 months, POMS-A scores had trend of increasing from 2 to 4 months, but this trend was not statistically significant.

Discussion

This present analysis compared trends of depressive symptoms and anxiety in ICU survivors based on their care needs and home discharge status across the 4 months after ICU discharge. In our sample, younger age, being female, and experiencing a shorter ICU stay resulted in higher anxiety scores at 2 weeks that, for some, persisted for 4 months post ICU discharge. Depressive symptoms were common throughout the 4-month follow-up period, reflected by mean CESD-10 scores which were above the cut-off indicating clinically significant depressive symptoms. In addition, we identified trends that suggested worsening of depressive symptoms when ICU survivors failed to return home during the 4-month post-discharge period and worsening of depressive symptoms and anxiety when care needs were moderate or high. Although psychological symptoms are known to be prevalent in ICU survivors,¹¹ few studies have described the relationship between psychological symptoms and recovery following critical illness. Because of the descriptive nature of our study, it is

not possible to determine if the presence of depressive symptoms and anxiety were factors delaying recovery or a response to this delay.

An extensive literature describes the challenges ICU survivors experience regaining functional independence^{42,43} and need for long-term support from family caregivers.⁴⁴ Additionally, the need for long-term institutional care^{45,46} and frequent transitions between different care settings⁴⁷ are other issues that add burden to patients, family caregivers and the health system. Our results support prior studies that suggest ICU survivors who undergo long-term care in various post-ICU settings may be at higher risk for psychological symptoms. From a study of 336 ICU survivors transferred to a long-term acute care setting for weaning from prolonged mechanical ventilation, Jubran and colleagues reported that 42% were diagnosed with depressive disorders.⁴⁸ In their study, weaning failure occurred more often in patients with depressive disorders and the presence of depressive disorders was independently associated with mortality.⁴⁸

Our findings provide several suggestions for clinical practice and research. Using brief screening tools, nurses can monitor for psychological symptoms prior to ICU discharge and advocate to include this recommendation in discharge planning as patients transition to other care settings. Periodic monitoring using a brief screening tool may be a simple and inexpensive way to detect psychological sequelae.^{49–52} Strategies can then be initiated to assist patients to minimize psychological symptoms and monitor response to treatment. This seems particularly important because unresolved psychological distress may affect patients' motivation to engage in an intervention to promote recovery after critical illness. Future research studies should include a measure of depressive symptoms and anxiety at baseline and monitor changes in these symptoms over time as this may influence patients' response to the intervention and family member's experience while providing support.

Our study had a number of limitations. The sample size was small and recruited from a single medical ICU in an academic medical center. Similar to other longitudinal studies that involved ICU survivors,^{20,25,53} attrition due to mortality was high, which further reduced sample size. Therefore, our analysis does not have sufficient power to detect longitudinal changes or differences between variables. Instead, our report was limited to reporting trends. Rather than using more comprehensive diagnostic measures (e.g., DSM-5), we selected the CESD-10 and POMS-A to minimize burden. Study findings may have differed if more comprehensive measures were selected. Nevertheless, despite efforts to minimize burden, some participants were unable to complete measures due to fatigue or illness.

Conclusion

Our findings provide important insights into the occurrence of psychological sequelae and suggestions regarding influencing factors. Results of our analysis suggest that ICU survivors experience symptoms of depression and anxiety that persist for an extended period and may impact functional recovery and ability to return to home. Findings of the present study suggest the need to include screening for psychological symptoms in clinical practice. Periodic screening using a simple, well-validated instrument could detect the presence of depression and anxiety and prompt treatment across the recovery trajectory. Future research

studies need to be designed that test interventions to minimize psychological distress, as this may promote greater engagement in interventions targeting ICU survivors.

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Figure 1.
Flow of study participants at enrollment during their ICU admission and three follow up time points.

Figure 2.

Self-reported depressive symptoms and anxiety of ICU survivors' dependent on care needs. White blocks indicate participants without care needs (no impairment in ADL and IADL). Gray blocks indicate with moderate care needs (no impairment in ADL and one or more impairment in IADL). Black blocks indicate with high care needs (at least one impairment in ADL). The solid horizontal line represents a cut-off score of CESD-10 (8) indicating individual risk for clinical depression.

*Kruskal-Wallis test

Figure 3.

Description of trends in median scores of CESD-10 and POMS-Anxiety by home discharge status at each time point in a subgroup of ICU survivors who participated in at least two time points. The solid horizontal line represents a cut-off score of CESD-10 (8) indicating individual risk for clinical depression.

Table 1

Sample Characteristics from ICU Admission to Four Months Post-ICU Discharge

	ICU admission (Enrollment) (n=47)	2 weeks Post-ICU discharge (n=39)	2 months Post-ICU discharge (n=31)	4 months Post-ICU discharge (n=27)
Demographic and clinical characteristics				
Age (years), Mean (SD)	55.5 (16.7)	54.9 (16.9)	53.0 (16.9)	52.2 (15.6)
Gender (Male), n (%)	31 (66.0)	26 (66.7)	21 (67.7)	19 (70.4)
Ethnicity, Caucasian, n (%)	44 (93.6)	36 (92.3)	30 (96.8)	27 (100.0)
Past history of psychiatric conditions, n (%)	13 (27.7)	13 (33.3)	12 (38.7)	12 (44.4)
Care needs prior to ICU admission, n (%)				
None	28 (59.6)	25 (64.1)	22 (71.0)	19 (70.4)
Moderate	7 (14.9)	6 (15.4)	6 (19.4)	6 (22.2)
High	12 (25.5)	8 (20.5)	3 (9.7)	2 (7.4)
Primary diagnosis, n (%)				
Respiratory	26 (55.3)	23 (59.0)	19 (61.3)	17 (63.0)
Sepsis, Multisystem failure	9 (19.2)	6 (15.4)	3 (9.7)	1 (3.7)
Gastrointestinal, Hepatic	8 (17.0)	6 (15.4)	5 (16.1)	5 (18.5)
Others	4 (8.5)	4 (10.2)	4 (12.9)	4 (14.8)
Charlson Comorbidity Score, Mean (SD) ^a	4.1 (3.3)	3.8 (3.4)	3.5 (3.5)	3.1 (3.0)
APACHE II score, Mean (SD)	21.6 (8.0)	21.6 (7.8)	21.7 (8.4)	20.4 (7.5)
ICU length of stay, days, Mean (SD)	22.9 (13.7)	24.3 (13.5)	23.7 (12.5)	22.0 (10.2)
Days on mechanical ventilation, Mean (SD)	20.1 (13.1)	21.4 (13.4)	20.8 (12.2)	18.9 (9.7)
Post-ICU discharge characteristics				

	ICU admission (Enrollment) (n=47)	2 weeks Post-ICU discharge (n=39)	2 months Post-ICU discharge (n=31)	4 months Post-ICU discharge (n=27)
Home discharge, n (%)		6 (15.4)	21 (67.7)	22 (81.5)
Care needs, n (%) ^b				
None		3 (7.9)	10 (34.5)	7 (26.9)
Moderate		3 (7.9)	7 (24.1)	12 (46.2)
High		32 (84.2)	12 (41.4)	7 (26.9)
Shortened CES-D, Mean (SD)		13.5 (6.4) ^c	10.0 (5.9) ^d	11.5 (6.2) ^e
Shortened CES-D 10-8, n (%)		26 (83.9) ^c	18 (64.3) ^d	18 (72.0) ^e
POMS-Anxiety, Mean (SD)		8.9 (3.5) ^f	7.0 (3.0) ^d	6.6 (2.7) ^e

SD = standard deviation; APACHE = acute physiology and chronic health evaluation; ICU = intensive care unit; Shortened CES-D = shortened version of center for epidemiologic studies-depression 10 items

^aCharlson Comorbidity Score identifies the presence of nine disease/conditions: cardiac, pulmonary, neurologic, renal, gastrointestinal, hematologic/oncologic, rheumatologic, diabetes and peripheral vascular disease. Total score ranges 0–37 and a higher score indicates a greater number and seriousness of comorbid conditions.

^bCare needs were determined based upon ADL and IADL score: (1) none (no impairment in ADL and IADL), (2) moderate (no impairment in ADL and one or more impairment in IADL), and (3) high (at least one impairment in ADL). Missing data exist at each time point because caregivers skipped follow-up interviews: n=38 at 2 weeks (n=2 missing); n=29 at 2 months (n=2 missing); n=27 at 4 months (n=1 missing)

^cn= 31 because of missing data; patient unable to self-report (n=7)

^dn= 28 because of missing data; patient unable to self-report (n=1)

^en= 25 because of missing data; patient unable to self-report (n=2)

^fn= 33 because of missing data; patient unable to self-report (n=5)