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Self-Reported Physical Symptoms in Intensive Care Unit (ICU) Survivors: Pilot Exploration Over Four Months Post-ICU Discharge

JiYeon Choi, PhD, RN[1], **Leslie A. Hoffman, PhD, RN**[1,2], **Richard Schulz, PhD**[3,4], **Judith A. Tate, PhD, RN**[1,4], **Michael P. Donahoe, MD**[6], **Dianxu Ren, MD, PhD**[5,8], **Barbara A. Given, PhD, RN, FAAN**[9], and **Paula R. Sherwood, PhD, RN, CNRN, FAAN**[1,7]

[1] Department of Acute & Tertiary Care, University of Pittsburgh School of Nursing, Pittsburgh, PA

[2] Clinical and Translational Science Institute, University of Pittsburgh, Pittsburgh, PA

[3] University Center for Social and Urban Research, University of Pittsburgh, Pittsburgh, PA

[4] Department of Psychiatry, University of Pittsburgh School of Medicine, Pittsburgh, PA

[5] Department of Health & Community Systems, University of Pittsburgh School of Nursing, Pittsburgh, PA

[6] Division of Pulmonary, Allergy & Critical Care Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA

[7] Department of Neurosurgery, University of Pittsburgh School of Medicine, Pittsburgh, PA

[8] Department of Biostatistics, University of Pittsburgh Graduate School of Public Health, Pittsburgh, PA

[9] College of Nursing, The Michigan State University, East Lansing, MI

Abstract

Context—Survivors of critical illness must overcome persistent physical and psychological challenges. Few studies have longitudinally examined self-reported physical symptoms in ICU survivors.

Objectives—To describe prevalence and severity of self-reported symptoms in 28 adult medical ICU survivors during the first 4 months post-ICU discharge and their associations with family caregiver responses.

Methods—Patients completed the Modified Given Symptom Assessment Scale. Caregivers completed Shortened 10-item Center for Epidemiologic Studies Depression Scale, Brief Zarit Burden Score, Pittsburgh Sleep Quality Index and Caregiver Health Behavior. Data at ICU discharge (≤ 2 weeks), and 2 and 4 months post-ICU discharge were analyzed.

Results—Across the time points, the majority of patients reported one or more symptoms (88.5 – 97%), with sleep disturbance, fatigue, weakness and pain the most prevalent. For these four highest prevalent symptoms, there were: 1) moderate correlations among symptom severity at 2 and 4 months post-ICU discharge; 2) no difference in prevalence or severity by patients'

Corresponding Author: JiYeon Choi, PhD, RN University of Pittsburgh School of Nursing 336 Victoria Building 3500 Victoria street Pittsburgh, PA 15261 Work: (412) 383-7746 Mobile: (412) 951-8732 FAX: (412) 383-7227 jic11@pitt.edu.

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disposition (home vs. institution), except worse fatigue in patients at home ≤ 2 weeks post-ICU discharge. Patients' overall symptom burden showed significant correlation with caregivers' depressive symptoms ≤ 2 weeks post-ICU discharge. There were trends of moderate correlations between patients' overall symptom burden and caregivers' health risk behaviors and sleep quality at 2 and 4 months post-ICU discharge.

Conclusion—In our sample, sleep disturbance, fatigue, weakness, and pain were the four key symptoms during first 4 months post-ICU discharge. Future studies focusing on these four symptoms are necessary to promote quality in post-ICU symptom management.

Keywords

intensive care unit; critical illness; sleep; fatigue; weakness; pain; caregivers

Introduction

Advances in critical care have improved patients survival in intensive care units (ICU)[1]. Although survival from episodes of critical illness in the ICU has improved, many patients encounter physical, psychological and cognitive sequelae following ICU discharge[2]. Growing recognition of the challenges that accompany recovery following critical illness has led clinicians and researchers to expand their focus beyond ICU discharge in an attempt to improve physical and psychological outcomes for ICU survivors and their family caregivers. Support to alleviate or reduce symptom burden in ICU survivors is essential area to improve their outcomes.

The scope of prior research on ICU survivors has primarily focused on factors influencing quality of life, physical and cognitive function, psychological symptoms and use of health care resources following ICU discharge[3]. Few studies have identified the physical symptoms reported by ICU survivors over time, a critical step in identifying the focus of interventions to resolve or reduce symptom burden and prevent further deterioration in ICU survivors during post-ICU discharge period.

In our previous study that followed family caregivers of ICU survivors for six months post-ICU discharge, we reported that caregivers experienced personal distress when caring for ICU survivors with persisting physical symptoms[4]. A large epidemiological study of community spousal caregivers reported that perceptions of patients' suffering may influence caregivers' psychological and physical health[5]. Likely, similar relationships exist for ICU survivors. However, to date, few studies have explored the relationship between ICU survivors' symptoms and caregivers' psychological and behavioral responses, e.g., depressive symptoms and poor sleep quality, in the post-ICU discharge period.

Therefore, we aimed to describe prevalence and severity of self-reported physical symptoms in adult ICU survivors (patients) assessed at three time points post-ICU discharge (≤ 2 weeks post-ICU discharge, 2 and 4 months post-ICU discharge). We then examined correlations between prevalence and severity of the four most prevalent symptoms and patients' discharge disposition. We also explored correlations between patients' overall symptom burden and caregiver responses (depressive symptoms, burden, health risk behaviors and sleep quality).

Methods

We analyzed patient self-reported physical symptom data from a longitudinal descriptive study exploring biobehavioral stress responses in family caregivers of individuals who

underwent prolonged acute mechanical ventilation (for ≥ 4 days)[6]. The study protocol was approved by the Institutional Review Board at the University of Pittsburgh.

Site and Sample

Patient-caregiver dyads were recruited in a medical ICU (32 beds) at a tertiary academic medical center in western Pennsylvania between November 2008 and July 2010. Patient eligibility criteria were: 1) age ≥ 21 years old; 2) residing at home prior to ICU admission; 3) admitted to a medical ICU, on mechanical ventilation for ≥ 4 consecutive days; and 4) not dependent on mechanical ventilation prior to this ICU admission. Mechanical ventilation for ≥ 4 consecutive days was selected due to its: 1) routine application in the current administrative coding system[7]; 2) clinical relevance reflecting average duration of mechanical ventilation in the medical ICU[8]; and 3) likelihood of including patients at risk for long-term physical and psychological morbidities following ICU survival and 5) likelihood of excluding short-term patients with few sequelae from their ICU stay[9]. Caregivers were defined as the individual who provided the majority of emotional, financial, and physical support to the patient prior to ICU admission. No legal relation or cohabitation with the patient was required. Eligibility criteria were: 1) non-professional, non-paid caregiver; 2) age ≥ 21years; 3) reliable telephone access; and 4) able to read and speak English. For this report, we analyzed the data from 39 patient-caregiver dyads who survived to ICU discharge.

Measures

Patients—*Richmond Agitation Sedation Score (RASS)*[10] was used to assess the level of agitation-sedation in patients prior to obtaining consent and conducting symptom measurement. Scores on the 10-point observational scale ranged from −5 (unarousable) to +4 (combative). Reliability and validity were established in ICU patients[10,11]. Patients were judged able to provide symptom measurement data if they had a RASS score of 0 (alert and calm).

The Confusion Assessment Measure for the ICU (CAM-ICU) was used to assess delirium prior to symptom measurement[12]. The CAM-ICU assesses four features of cognitive domain including: acute onset or fluctuating mental status, inattention, disorganized thinking, altered level of consciousness. Reliability and validity has been established in ICU patients[11-15]. Scores on the four domains determined if delirium was present (CAM-ICU positive) or absent (CAM-ICU negative).

Modified Given Symptom Assessment Tool was used to measure patient self-reported physical symptoms. The original *Given Symptom Assessment Tool* was developed to measure symptoms in persons diagnosed with various types of cancer[16]. We modified the tool to include 10 physical symptoms that commonly occur in patients following ICU discharge based upon published literature[17,18] and our previous work with ICU survivors and their family caregivers[4,19]. We limited selection to 10 symptoms to minimize patient burden. Patients were first asked about presence or absence of symptoms (e.g., pain) and, if present, to rate the severity of each symptom using the scale from 0 (not present) to 10 (as severe as it could be). To describe overall symptom burden, a symptom burden index was computed by summing severity scores for the 10 symptoms[16,20]. Potential scores ranged from 0 to 100. The tool was validated in patients undergo chemotherapy and/or radiation after being diagnosed with various types of cancer[21-25]. To the best of our knowledge, our study was one of the first that to use this tool to assess self-reported physical symptoms in a sample of ICU survivors. No information was available on reliability and validity in ICU patients.

Caregivers—Shortened Version of Center for Epidemiologic Studies-Depression 10 items *(Shortened CES-D)*[26] was used to measure depressive symptoms in caregivers. The Shortened CES-D used a 4-point Likert-type summative scale (range 0-30). Higher scores indicated more depressive symptoms. Validity has been established in caregivers and healthy adults[27,28].

Brief Zarit Burden Interview12 items (Zarit-12)[29] was used to measure caregiver burden. Items in the Zarit-12 described feelings due to caregiving (e.g., feeling strained) using a 5-point Likert-type scale (ranges 0-48). Higher scores indicated greater burden. Validity in prediction of depressive symptoms was reported in caregivers of the community dwelling elderly[30].

Caregiver Health Behavior 11 items (CHB) was used to measure self-reported health risk behaviors in caregivers (ranges 0-11)[31]. Caregivers checked the presence or absence of each behavior. Higher scores indicate more health risk behavior. This instrument has been used in several large population based studies[31,32]. Caregivers' poor health behavior has been linked to high levels of care demands, primarily due to patients' functional status[32].

Pittsburgh Sleep Quality Index (PSQI) was be used to measure sleep quality in caregivers[33]. Caregivers reported quality and efficiency of sleep using Likert-type scales and answer open ended questions (ranges 0-21). Higher scores indicate worse sleep quality. PSQI was validated in various populations, including family caregivers of cancer patients[34,35].

Procedures

Dyads were enrolled during patients' ICU admission. Potential dyads who met eligibility criteria were identified by ICU clinicians (primary nurse coordinators, social workers, case manager) and asked if they were willing to give permission to be approached by a research team member. If permission was granted, a research team member verified eligibility and obtained informed consent. Informed patient consent was obtained if the RASS score was 0 (n=2, 4%). If the patient was unable to provide informed consent, proxy consent was obtained from the caregiver (n=47, 96%).

After enrollment, patient sociodemographic and clinical characteristics were obtained from medical records. Caregiver sociodemographic characteristics were obtained by interview. Questionnaires were completed by the dyads at ≤ 2 weeks post-ICU discharge, and 2 and 4 months post-ICU discharge (± two weeks). A research team member visited patients' home or institutions to obtain questionnaires. For caregivers, questionnaires were completed either via face-to face or telephone interview dependent upon caregivers' preference.

Data analysis—Data were hand entered into IBM-SPSS v. 19.0 (SPSS, Inc.; Chicago, IL, USA) by a research team member and verified by the principal investigator (JC). Descriptive statistics were reported for all variables. Chi-square test and Mann-Whitney U test were used to compare prevalence and severity scores of four most prevalent symptoms in patients by patients' disposition (home vs. institution). Spearman's rank correlation was used to explore the relationships between four most prevalent physical symptoms in patients and caregivers' responses. Friedman test was used to explore the changes in the severity score of four most prevalent symptoms over four months in patients who were alive by 4 months post-ICU discharge. If a symptom showed a significant change in Friedman test, follow-up pairwise comparisons were performed using a Wilcoxon test. The Least Significant Difference (LSD) procedure was used for pairwise comparisons. Besides statistical significance (set at α =0.05, two-tailed), we also explored trends in differences.

Results

Sample characteristics—Characteristics of patients and caregivers who were enrolled and remained in each data collection points were summarized in Table 1. A total of 47 dyads completed baseline sociodemographic and clinical data collection during ICU admission. Patients were mostly Caucasian, male with mean age of 55.4 years. Patients were admitted to a medical ICU with diverse conditions as primary diagnosis; a pulmonary condition (e.g. acute respiratory failure) was the most common (55.3 %, n=26). Patients spent 20.1 ± 13.1 days on mechanical ventilation while staying in the ICU. Caregivers were mostly Caucasian and female with mean age of 52.3 years. Most were a spouse/significant other or adult child of a patient.

Enrollment and retention data are described in Figure 1. Death of patients was the main reason for attrition at each time point. No significant differences were found when characteristics were compared between patients who survived and remained in the study and those lost to attrition, with two exceptions. Patients lost to attrition (n=20, 43%) had a higher mean Charlson comorbidity index score (Mean ± SD = 5.4 ± 3.4) than those who remained in the study (n=27, Mean ± SD = 3.1 ± 3.0; independent sample t-test, p=0.02). Of those enrolled, 3 (6.4%) were African American and all either died (n=2) or withdrew (n=1) by four months.

A minority of patients were not able to provide symptom data based upon RASS scores. Those patients (n=5) unable to respond ≤ 2 weeks after ICU discharge were older (Mean ± SD = 51.5 ± 15.8 vs. Mean ± SD = 75.4 ± 9.4, independent sample t-test, p=0.002) and had a greater number of chronic conditions as indicated by scores on the Charlson Comorbidity Index (Mean ± SD = 3.1 ± 2.9 vs. Mean ± SD = 8.6 ± 3.2, independent sample t-test, $p < 0.001$). They also showed trends of spending more days on mechanical ventilation, more days in the ICU, and a higher APACHE II score at ICU admission. At 2 months post-ICU discharge (n=31), one patient was unable to answer the symptom questionnaire based upon RASS score. This patient was the oldest and had higher APACHE II and Charlson Comorbidity Index scores compared to the rest of respondents.

In the remaining patients, we obtained a total of 87 symptom measurements. For 82 measurements, symptom data were obtained after assessment using the CAM-ICU via face-to-face interview, either in the home or a facility after ICU discharge. All CAM-ICU measurements were negative. Five symptom measurements were obtained via telephone without CAM-ICU measurement because dyads relocated to other states (n=1 at 2 months post-ICU discharge; n=4 at 4 months post-ICU discharge).

Symptom prevalence and severity, and overall symptom burden—At all time points, the majority of patients reported experiencing at least one physical symptom (Figure 2). Table 2 summarizes the prevalence and severity of symptoms in patients by the rank of prevalence and overall symptom burden at each time point. Across all time points, the four most prevalent symptoms were fatigue, weakness, sleep disturbance, and pain. Among patients who reported these symptoms, mean severity scores ranged from 5.3 to 7.3 on a scale of 0 to 10 (10 indicates worst symptom). In comparison, the rest of the symptoms (e.g., shortness of breath, decreased appetite) were reported in less than 40% of patients. However, despite their relatively lower prevalence, mean severity scores for each symptom ranged from 4.2 to 7.7.

We explored correlations among severities of the four highest prevalent symptoms in patients at each time point (Table 3). At 2 months post-ICU discharge, severity of pain showed significant positive correlations with severity of disturbed sleep, fatigue and weakness. At this time point, there was also a significant correlation between severities of

fatigue and weakness. At 4 months post-ICU discharge, severity of fatigue showed significant positive correlations with severities of disturbed sleep and weakness.

Prevalence and severity of symptoms by disposition—At all three time points, prevalence of the four symptoms in patients was not significantly different by disposition (home, not home). When we compared scores of severities of these four symptoms by disposition (Table 4), within 2 weeks post-ICU discharge, patients who were home (n=5, 15.2%) reported significantly greater severity of fatigue than those who remained in institutions (e.g., long-term acute care, skilled nursing facilities). At this time point, we also observed a trend of greater severity in sleep disturbance in patients who were home than for patients who remained in institutions. Severity scores for weakness and pain appeared unrelated to disposition. At 2 and 4 months post-ICU discharge, there was no difference in symptom severity by disposition. Of interest, we observed trends of greater severity for the most of symptoms in patients who remained in institutions with two exceptions: patients at home tended to have greater severity in sleep disturbances at 2 months and pain at 4 months compared with patients in institutional settings.

Patient overall symptom burden and caregiver responses—We explored relationships between overall symptom burden (symptom burden index score) in patients and scores of measures indicating depressive symptoms, burden, health risk behaviors and sleep quality in caregivers. Within 2 weeks post-ICU discharge, there was a significant positive correlation between caregivers' depressive symptoms and patients' symptom burden (Spearman's rho= 0.42, p= 0.02). At 2 months post-ICU discharge, there was a significant positive correlation between caregiver health risk behaviors and patients' symptom burden (Spearman's rho = 0.38, p=0.04). At 4 months post-ICU discharge, despite no statistical significance, there were a trend of correlation between patients' symptom burden and caregivers' worse sleep quality (Spearman's rho=0.38, p=0.06). For the remainder, findings tended to support positive relationships between greater' symptom burden and poor caregiver responses. However, the magnitude of correlations was weak with no significance.

To further explore relationships between caregivers' depressive symptoms and patients' overall symptom burden within 2 weeks post-ICU discharge, we performed additional *post-hoc* analysis. In a group of 19 caregivers who had no history of being seen by health care professionals for their emotional problems, there was a significant correlation between patients' overall symptom burden and caregivers' depressive symptoms (Spearman's rho = 0.49, p=0.03). A significant correlation was not found in the 14 caregivers with a history of emotional problems.

Changes in symptom severity scores over 4 months post-ICU discharge—In Figure 3, we illustrated symptom severity scores at each time point reported by 26 patients who survived and remained to the study by 4 months post-ICU discharge. Among these 26 patients, 22 provided data for all three time points. When we explored longitudinal changes in severity scores of the four symptoms, severity scores of sleep disturbance, fatigue, and pain did not show significant change over 4 months. However, severities of weakness decreased over 4 months ($p<0.01$). Analysis revealed the decrease in weakness occurred during the interval between 2 weeks to 2 months post ICU discharge (p=0.001).

Discussion

To our knowledge, this is the first prospective longitudinal study that described repeated measurements of self-reported physical symptoms during first 4 months post-ICU discharge in ICU survivors. In our sample, sleep disturbance, fatigue, weakness and pain were the

most highly prevalent symptoms in patients at all time points. For these four symptoms, we further observed: 1) moderate positive correlations in severity among the four symptoms at 2 and 4 months post-ICU discharge, especially weakness, fatigue and sleep disturbance and 2) no significant difference in prevalence of symptoms by patients' disposition except greater severity of fatigue in patients who returned home within 2 weeks post-ICU discharge. Within 2 weeks post-ICU discharge, patients' overall symptom burden was significantly correlated with caregivers' depressive symptoms. Although this relationship became weaker at 4 months, patients' overall symptom burden showed trends of moderate correlations with more health risk behaviors and worse sleep quality in caregivers at 2 and 4 months post-ICU discharge.

In previous studies, patient self-reported symptoms were measured during ICU hospitalization[36] and weaning from mechanical ventilation in a respiratory care unit[17]. Along with psychological symptoms (e.g., anxious, sad), several physical symptoms were present in a majority of ICU patients, i.e., thirst, hunger, fatigue, pain[17,36] and insomnia[17]. Our results suggest weakness as an additional symptom highly prevalent during the initial 4 months post-ICU discharge. In our sample, patients who survived through 4 months post-ICU discharge showed no significant change in severity of fatigue, pain or sleep disturbance; however there was an improvement in weakness at 2 months post-ICU discharge. Our data suggest that these four symptoms may continue to be present and ranked as severe for several months post-ICU discharge. If confirmed in larger samples, interventions to decrease these symptoms may be important. Notably, our data suggest that difficulty resolving one or more of these symptoms may compound the severity of another symptom. For example, poor sleep may worsen symptoms of weakness and fatigue or decrease tolerance to pain. Inadequate pain management may further disturb sleep. Targeting a cluster (two or more concurrent symptoms) in assessment and management of symptoms has been extensively studied in the field of oncology[37]. In persons living with various types and stages of cancer, pain, fatigue, sleep disturbance have been the most highlighted symptoms[38]. Studies have reported causal relationship between clusters of pain, fatigue, and sleep disturbance and poor functional status in patients with cancer undergoing chemotherapy[39]. As a way of developing symptom management strategies, targeting clusters, instead of targeting a single symptom, was suggested as efficacious approach to reduce severities of these highlighted symptoms[40]. Because of the small sample size, our analysis was limited in exploring direction and magnitude of correlations among symptoms in ICU survivors. Examining mediating and moderating relationships in a large sample of ICU survivors would be important to identify which symptom(s) is the driving symptom(s) that should be the main focus of future interventions. Future studies in a large sample will be also important to determine groups at higher risk for these symptoms using multivariate predictive models.

We hypothesized prevalence and severity of physical symptoms might be greater in patients who needed long-term institutionalization than patients who returned home relatively early. However, our results suggest prevalence and severity of symptoms in patients who returned home were similar to those who required long-term institutionalization. In fact, those patients who were discharged home reported greater severity in sleep disturbance, fatigue and pain than those who were discharged to an institution. This finding may be due to the differences in providing symptom management in the home and in a setting with professional care. It will be important to further uncover specific needs in patients related to symptom management after they return home.

We also observed correlations between patients' overall symptom burden and caregiver responses, including depressive symptoms, burden, health risk behaviors and sleep quality. We speculate that patients' symptoms in the early period of ICU discharge may cause

greater emotional distress in caregivers (e.g., depressive symptoms). For example, patient sleep disturbances may also affect caregiver sleep leading to increased depression.

Because a history of emotional problems was common in our caregiver participants (36-42%), we questioned whether caregivers with a history of emotional problems reported more depressive symptoms and whether responses differed by patients' disposition. Our results showed significant correlations between caregivers' depressive symptoms and patients' symptom burden within 2 weeks post-ICU discharge only in the subgroup of caregivers who reported no history of emotional problems. When examining caregivers' responses to stress, it is important to differentiate potential role of pre-existing psychological conditions[41,42]. Because our sample was small and data were limited to self-reported history from caregivers, our analysis was limited and needs cautious interpretation.

Regarding the other question on potential difference in caregivers' response by patients' disposition, all caregiver response measures showed trends of worse scores for all time points when patients remained in institutions. This finding was consistent with the findings from our previous study that reported greater burden and more lifestyle disruption in caregivers when patients involved prolonged institutional stay[4]. These data should be interpreted with caution because of previous findings that reported persistent psychological distress in caregivers regardless of patients' disposition[2,43]. In order to design post-ICU symptom management interventions that can benefit both ICU survivors and caregivers, it would be helpful to conduct a longitudinal descriptive study enrolling a larger sample to better understand the prevalence and duration of symptoms, identify a vulnerable patients group who develop symptoms, and explore strategies for targeted symptom management.

Limitations

First, the sample size was small and only included ICU survivors who were able to self-report symptoms. Because we analyzed a small subsample, providing results with adequate statistical power were not feasible and cautious interpretation is recommended. During the acute ICU hospitalization, measuring self-reported symptoms is a challenge in some patients because of the inability to communicate verbally as a consequence of the presence of an endotracheal tube and sedative administration[44]. In our study, difficulties in self-reporting symptoms persisted following ICU discharge in a small portion of ICU survivors because their severities of illness resulted in physical and cognitive dysfunction and limited communication ability. Researchers have developed strategies to improve symptom assessment in the ICU[44-47]. Strategies to improve symptom assessment in the ICU could be used during the immediate ICU discharge period when symptom burden is greatest. For future studies, methods to improve symptom identification by ICU survivors with various communication capabilities could enhance generalizability of the data and help refine the target of interventions.

Second, in addition to the limitation of small sample size, unequal sample size by disposition also limited our analysis. Our correlation data may be limited in explaining potential causal relationships between patients' symptoms and negative caregiver outcomes. Therefore, interpreting our findings should be done with caution.

Third, we assessed symptoms at one time point at each sampling interval and therefore were unable to assess daily variability in symptom experience. Given severity scores of the symptoms reported in our sample, examining daily challenges from symptoms may be important to support survivors especially during the initial few months post ICU discharge. Monitoring trends of daily symptom distress or symptom clusters in each individual patient during post-ICU discharge period may provide an important indicator of worsening patients' condition or any impending event that might lead to hospital readmission or death. Given

growing use of personal electronic devices, real time assessment of symptom may be feasible[48] and can provide valuable data that help clinicians achieve better symptom communication and management during post-ICU discharge period.

Fourth, caregivers were enrolled after the patients admitted to the ICU and measuring shortened CES-D prior to the episodes of patients' illness was not feasible. Instead we used caregiver self-reported history. Given this limitation, it is difficult to explain the role of pre-existing depressive symptoms in determining caregivers' responses to patients' physical symptoms during post-ICU discharge period.

Finally, we used a measure that was modified from Given Symptom Assessment Tool, a symptom measurement tool that has been developed and validated mainly in people living with cancer[21-25]. Reliability and validity of its use in ICU survivors need further validation in a large study.

Conclusions

We explored self-reported physical symptoms in ICU survivors for their first 4 months post-ICU discharge. In our study, sleep disturbance, fatigue, weakness and pain were highly prevalent in ICU survivors over the first 4 months. These four symptoms might be considered as a focus of future research involving monitoring and management of physical symptoms in ICU survivors. Our findings also suggest symptom burden in ICU survivors can be associated with caregivers' health risk behaviors and sleep quality when patient' symptom burden persists for months post-ICU discharge. Additional follow-up support may be necessary to decrease symptom burden for ICU survivors and family caregivers during the initial ICU post discharge period, regardless of whether the patient is at home or in an institution. It is important to further strengthen the strategies to assess and manage symptoms in ICU survivors to promote quality post-ICU care that will benefit both ICU survivors and family caregivers.

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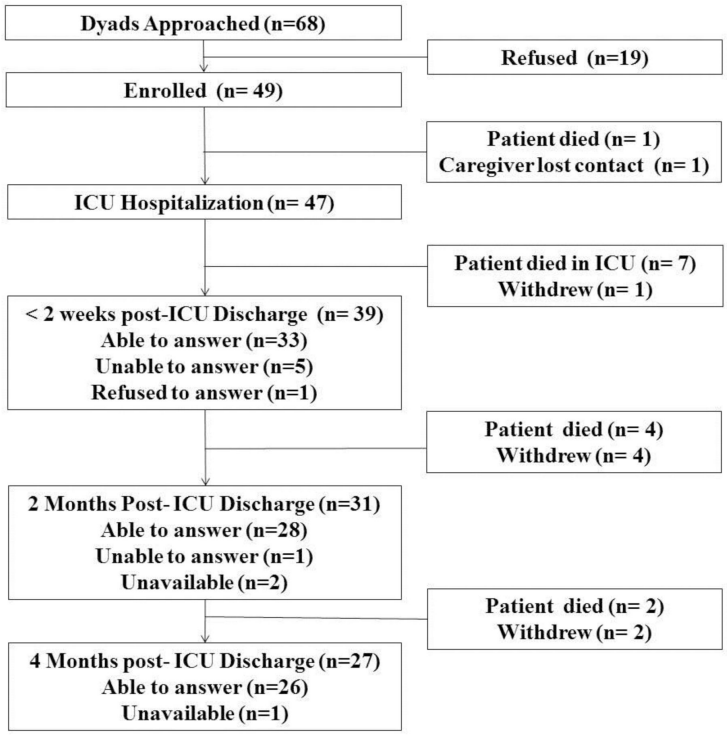

Figure 1.

Participants Enrollment and Follow-Up

Participant enrollment occurred between November 2008 and July 2010 (over 21 months). In 19 dyads who refused, reasons for refusal include: “too busy” (n=10, 53%), “feel stressed” (n=4, 21%), “other family members disagree” (n=2, 10.5%), “not interested” (n=2, 10.5%), and “not feel comfortable” (n=1, 5%).

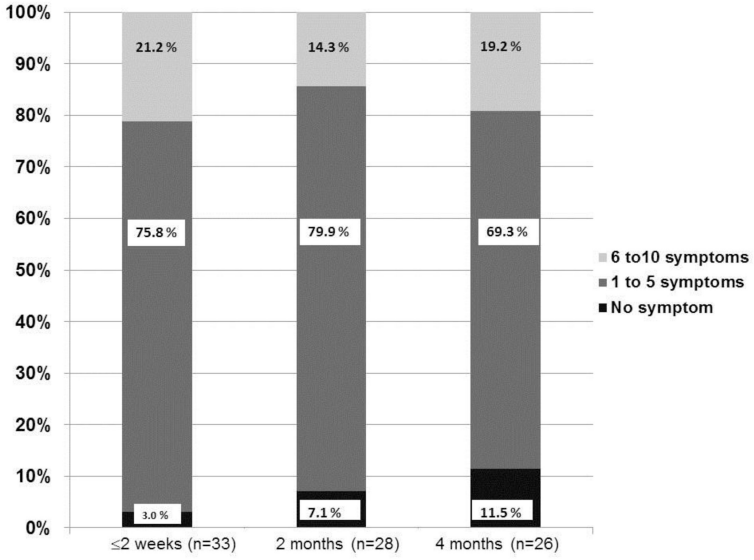

Figure 2.
Proportion of the patients by the number of symptoms present at each time point following ICU discharge.

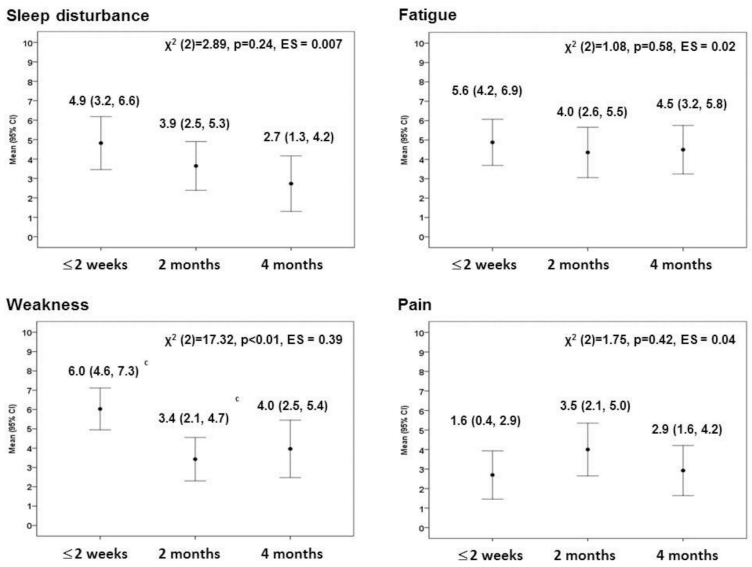

Figure 3.
Severity Scores of Four Symptoms for Four Months Post-ICU Discharge

Table 1

Demographic and Clinical Characteristics of Patient-Caregiver Dyads 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)
Patient 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)
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)	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)
Caregiver Characteristics				
Age (years), Mean (SD)	51.9 (12.1)	51.1 (12.3)	49.5 (12.4)	50.6 (11.1)
Gender (Male)	12 (25.5)	9 (23.1)	7 (22.6)	6 (22.2)
Ethnicity, Caucasian, n (%)	44 (93.6)	36 (92.3)	30 (96.8)	27 (100.0)
Relationship to patient, n (%)				
Spouse or significant other	27 (57.4)	22 (56.4)	17 (54.8)	15 (55.6)
Adult child	12 (25.5)	10 (25.6)	8 (25.8)	6 (22.2)
Parent or sibling	8 (17.0)	7 (18.0)	6 (19.4)	6 (22.2)
History of emotional problem (Yes)a, n (%)	18 (38%)	14 (36%)	13 (42%)	11 (41%)
Shortened CES-D, Mean (SD)	16. 7 (7.2)	10.6 (6.0)b	10.3 (6.1)c	10.0 (7.8)d
Shortened CES-D 10≥8, n (%)	38 (80.9)	21 (55.3)b	15 (51.7)c	12 (46.2)d
Zarit-12, Mean (SD)	14.1 (7.0)	15.1 (7.4)b	12.6 (8.8)c	13.1 (8.9)d
PSQI, Mean (SD)	6.7 (3.7)	7.5 (4.4)b	6.2 (3.5)c	6.3 (4.3)d
PSQI> 5, n (%)	31 (66.0)	24 (63.20)b	16 (55.20)c	14 (53.8)d
CHB, Mean (SD)	3.9 (2.5)	3.4 (2.5)b	2.5 (2.0)c	2.6 (2.2)d

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; PSQI = Pittsburgh sleep quality index; CHB = caregiver health behavior.

[a] Caregivers were asked whether they had been seen by health care professionals for emotional problems.

[b] n=38 because of missing data; caregiver skipped measurement (n=1).

[c] n=29 because of missing data; caregiver skipped measurement (n=2).

[d] n=26 because of missing data; caregiver was unavailable (n=1).

Table 2

Prevalence and Severity of Physical Symptoms and Overall Symptom Burden in ICU Survivors at Three Time Points Following ICU Discharge

Time points								
≥ 2 weeks post-ICU discharge (n=33)a			**2 months post-ICU discharge (n=28)b**			**4 months post-ICU discharge (n=26)c**		
Symptom	Yes, n (%)	Mean (SD)	Symptom	Yes, n (%)	Mean (SD)	Symptom	Yes, n (%)	Mean (SD)
Weakness	28 (84.8)	7.1 (1.8)	Fatigue	21 (75)	5.8 (2.5)	Fatigue	21 (80.8)	5.6 (2.4)
Fatigue	26 (78.8)	6.2 (2.4)	Weakness	18 (64.3)	5.3 (1.6)	Weakness	16 (61.5)	6.4 (2.4)
Disturbed sleep	22 (66.7)	7.3 (2.1)	Disturbed sleep	18 (64.3)	5.7 (2.1)	Pain	14 (53.8)	5.4 (2.2)
Pain	14 (42.4)	6.4 (2.2)	Pain	18 (64.3)	6.2 (2.2)	Disturbed sleep	12 (46.2)	5.9 (2.8)
Shortness of breath	13 (39.4)	6.0 (2.1)	Decreased appetite	8 (28.6)	5.0 (1.9)	Shortness of breath	9 (34.6)	5.6 (2.3)
Diarrhea	10 (30.3)	7.3 (2.7)	Shortness of breath	6 (21.4)	4.3 (3.3)	Decreased appetite	6 (23.1)	6.0 (2.9)
Decreased appetite	9 (27.3)	5.0 (3.2)	Fever	5 (17.9)	5.8 (2.8)	Diarrhea	5 (19.2)	5.6 (2.6)
Nausea/ vomiting	5 (15.2)	5.8 (2.3)	Nausea/ vomiting	5 (17.9)	5.6 (1.5)	Nausea/ vomiting	4 (15.4)	4.5 (1.9)
Fever	5 (15.2)	4.2 (1.3)	Diarrhea	3 (10.7)	7.7 (2.1)	Constipation	4 (15.4)	5.5 (3.0)
Constipation	4 (12.1)	6.5 (3.4)	Constipation	2 (7.1)	4.5 (2.1)	Fever	0	N/A
Symptom Burden Index		26.7 (11.9)	Symptom Burden Index		21.0 (13.6)	Symptom Burden Index		20.0 (15.9)

SD = standard deviation; ICU = intensive care unit; RASS = Richmond Agitation Sedation Score

a n=33 because of missing data; inability to answer (n=5, RASS score −3 to −1); refused to answer (n=1).

b n=28 because of missing data; inability to answer (n=1, RASS score −3); refused to answer (n=2).

c n=26 because of missing data; refused to answer (n=1)

Table 3

Correlation of Severity of Symptoms of Sleep disturbance, Fatigue, Weakness and Pain

	Time point											
Symptom	**<2 weeks post-ICU discharge (n=33)a**				**2 months post-ICU discharge (n=28)b**				**4 months post-ICU discharge (n=26)c**			
	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
Disturbed Sleep (a)		0.25	0.17	0.12		0.30	0.34	0.40d		0.53d	0.12	0.29
Fatigue (b)			0.28	0.31			0.42d	0.45d			0.53d	0.37
Weakness (c)				0.27				0.54d				0.37
Pain (d)												

SD = standard deviation; ICU = intensive care unit; RASS = Richmond Agitation Sedation Score

a n=33 because of missing data; inability to answer (n=5, RASS score −3 to −1); refused to answer (n=1).

b n=28 because of missing data; inability to answer (n=1, RASS score −3); refused to answer (n=2).

c n=26 because of missing data; refused to answer (n=1).

d Spearman's rank correlation, $p<0.05$.

Table 4

Comparison of Severity of Symptoms of Sleep disturbance, Fatigue, Weakness and Pain by Disposition

Time Post ICU Discharge	Symptom	Severity Scores by Disposition, Mean (SD)		P	ESe
<2 weeks, (n=33)a	Disposition	Home, n = 5 (15.2 %)	Not Home, n = 28 (84.8 %)		
	Disturbed sleep	7.2 (4.1)	4.4 (3.7)	0.06	0.32
	Fatigue	7.8 (1.9)	4.4 (3.3)	0.03d	0.37
	Weakness	5.6 (3.2)	6.1 (3.1)	0.67	0.07
	Pain	2.8 (3.9)	2.7 (3.5)	0.98	0.004
2 months, (n=28)b	Disposition	Home, n = 20 (71.4 %)	Not Home, n = 8 (28.6 %)		
	Disturbed sleep	4.3 (3.2)	2.2 (3.0)	0.09	0.32
	Fatigue	4.0 (3.4)	5.4 (3.2)	0.33	0.19
	Weakness	3.0 (3.1)	4.5 (2.2)	0.37	0.17
	Pain	3.6 (3.5)	5.1 (3.5)	0.31	0.19
4 months, (n=26)c	Disposition	Home, n = 21 (80.8 %)	Not Home, n = 5 (19.2 %)		
	Disturbed sleep	2.3 (3.5)	4.4 (3.4)	0.17	0.27
	Fatigue	4.4 (3.3)	5.0 (2.4)	0.67	0.08
	Weakness	3.5 (3.8)	5.8 (2.8)	0.19	0.26
	Pain	3.0 (3.1)	2.4 (3.9)	0.58	0.11

SD = standard deviation; ICU = intensive care unit; ES = effect size.

[a] n=33 because of missing data; inability to answer (n=5, RASS score −3 to −1); refused to answer (n=1).

[b] n=28 because of missing data; inability to answer (n=1, RASS score −3); refused to answer (n=2).

[c] n=26 because of missing data; refused to answer (n=1).

[d] Mann-Whitney U test, $p<0.05$.

[e] Absolute value of *r* was used to report effect sizes.