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## Associations between baseline total PTSD symptom severity, specific PTSD symptoms, and 3-month quality of life in neurologically intact neurocritical care patients and informal caregivers

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### Abstract

**Objective:** To pilot test the feasibility of assessing severity of posttraumatic stress disorder (PTSD) symptoms, as well as specific lower-order PTSD symptoms, experienced during neuro-ICU admission and their relationship with 3-month QoL scores in multiple domains (i.e. physical, psychological, social and environmental) in both patients and caregivers.

**Methods:** Between 2015–16 we enrolled neurologically intact patients and informal caregivers of patients who reported demographics and PTSD symptoms (PTSD-Checklist Specific; PCL-S) during neuro-ICU admission and completed a QoL assessment (World Health Organization Quality of Life – BREF) 3 months later. Clinical data was extracted from medical records. We ran two bivariate correlation matrices amongst PTSD symptom dimensions in patients and caregivers. Then, we used multiple linear regression to examine the prospective association of total PCL-S scores with each QoL domain in both patients and caregivers after adjusting for clinically important variables. Next, we explored differential associations between the 4 PTSD symptom dimensions and each QoL domain in both patients and caregivers, adjusting for sex and age.

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2) All authors contributed substantially to this work and approved the final version of this manuscript.

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1) This manuscript complies with all *Neurocritical Care* instructions to authors.

3) This manuscript has not been published in any other journal and is not under consideration by any other journal.

4) Data collection associated with this work adhered to ethical guidelines. This study's protocol was approved by the Institutional Review Board. Informed consent was obtained from all individual participants included in the study.

**Results:** A total of 70 patients (45.7% women, 84.3% white, mean age 52.08 years) and 64 caregivers (64.1% women, 90.6% white, mean age 53.12 years) were included. PTSD symptom dimensions were moderately-strongly correlated amongst patients ( $r = .65\text{--}.79$ ,  $p < .001$ ) and caregivers ( $r = .55\text{--}.78$ ,  $p < .001$ ). For both patients and caregivers, greater PTSD symptom severity was prospectively associated with lower QoL in all domains ( $\beta = -.289$  to  $-.622$ ;  $p < .05$ ). Our exploratory analysis revealed that greater numbing symptoms were associated with lower psychological QoL in patients ( $\beta: -.397$ ,  $p = .038$ ), and lower physical ( $\beta: -.409$ ,  $p = .014$ ), psychological ( $\beta: -.519$ ,  $p = .001$ ), and social QoL ( $\beta: -.704$ ,  $p < .001$ ) in caregivers. Greater re-experiencing symptoms was associated with lower physical QoL in both patients ( $\beta: -.422$ ,  $p = .047$ ) and caregivers ( $\beta: -.4$ ,  $p = .041$ ).

**Conclusions:** Our preliminary results indicated that greater severity of PTSD symptoms, and specifically numbing and re-experiencing symptoms, experienced by patients and caregivers during neuro-ICU admission were predictive of worse 3-month QoL. Continued study is needed to identify treatment targets for PTSD and QoL in this population.

## Keywords

Stress disorders; post-traumatic; caregivers; quality of life; hospitalization; intensive care units; linear models

## Introduction

Admission to the neurological intensive care unit (neuro-ICU) is often an unexpected and traumatic event for both patients and their informal caregivers (i.e. family and/or friends who provide instrumental and emotional support (1) and many develop clinically significant posttraumatic stress disorder (PTSD) symptoms during the hospitalization (patients: 21% informal caregivers: 17%) (2,3). These rates are particularly alarming, as elevated PTSD symptoms have been linked to increased risk of mortality in other critically ill populations (4).

Quality of life (QoL) is an individual's perceived position in life relative to their values, goals, standards, and expectations (5). QoL is an important outcome for both neurocritical care patients, who have to adjust to potential cognitive, emotional, and physical health consequences of their acute brain injury, and caregivers who must juggle their own life responsibilities with the sudden challenges that accompany their loved one's condition (e.g. role changing, uncertainty of loved one's prognosis, alteration of future plans, etc.) (6).

Previous research has shown that the cognitive and physical effects of the acute neurological injury are not enough to explain the poor QoL experienced by patients and caregivers (7,8).

PTSD symptoms experienced during hospitalization may be implicated in poor quality of life in both neurocritical care patients and caregivers, though these relationships have yet to be adequately explored. In survivors of various acute cerebrovascular accidents, recent research has uncovered that PTSD symptoms are cross-sectionally and prospectively associated with lower QoL and greater physical disability (9–12). In caregivers, a prior cross-sectional study by Zale et al (13) found that greater caregiver anxiety and depression scores were associated with worse physical, psychological, and social QoL during the

patient's neuro-ICU admission. Although this study did not examine PTSD symptoms specifically, it does highlight the importance of psychological symptoms when considering QoL in caregivers of neuro-ICU patients. Further study is needed to understand the role of early PTSD in future QoL of both patients and caregivers.

Prior work has shown that PTSD symptom presentations are quite heterogenous (14). As such, recent efforts have started to examine correlates of PTSD symptom clusters or dimensions (4,15–18) in order to inform the development of targeted interventions. The 4-factor numbing model of PTSD symptom dimensions for intrusive re-experiencing, effortful avoidance, emotional numbing, and hyperarousal, and has an established evidence base for its characterization of PTSD symptoms (19,20), including PTSD in a neurologically compromised cohort of cardiac arrest survivors (17). Importantly, however, potential correlates of these PTSD symptoms, such as QoL, have yet to be examined. Thus, identifying the specific lower-order PTSD dimensions associated with future impairments in QoL is an important first step in developing targeted interventions to improve QoL for neurocritical care patients and caregivers.

Illness in the neuro-ICU can be quite heterogeneous, and the limitations that neurological disease impose complicate psychological research methods in neuro-ICU populations. As such, the present study pilot tested the feasibility of assessing PTSD symptoms experienced in the neuro-ICU and their relationship with QoL in both patients and caregivers. We first examined the prospective association of total PTSD symptoms with domains of QoL among both neurocritical care patients and caregivers. Our primary hypothesis was that higher PTSD symptom scores at hospitalization would predict lower QoL scores 3 months later, for both patients and caregivers. Secondary analysis explored differential associations between specific PTSD symptom dimensions (as characterized by 4-factor numbing model) and QoL domains, for both patients and caregivers.

## Methods

### Sample and Design

The present study is a subgroup analysis within a larger prospective, longitudinal, cohort study of dyads of patients and caregivers of patients admitted to the neuro-ICU at a large, tertiary, academic medical center in Boston, MA. Data collection took place between 2015–2016 and was approved by the local institutional review board.

The full recruitment and enrollment protocol has been described previously (2). Briefly, inclusion criteria for patients were as follows: 1) aged 18 years or older, 2) exhibited English fluency and literacy, and 3) hospitalized to the Neuro-ICU within the previous 2-weeks. Patients were excluded if they were deemed unable to provide consent due to cognitive impairment, had severe aphasia or cognitive impairment that prohibited full participation, had permanent cognitive impairment, anticipated death, or did not have an informal caregiver. Patients with transient aphasia or mild cognitive symptoms who were oriented and communicative at the time of consent were considered medically able to participate. All eligible patients were cleared for participation by the medical team. Informal caregivers were eligible to participate if they met the following criteria: 1) aged 18 years or older, 2)

exhibited English fluency and literacy, and 3) were identified as a primary informal caregiver for an eligible patient. As per criterion #3, only the caregiver who identified as the “primary caregiver” was eligible for inclusion, and only caregivers of patients who achieved neurological normalization were included.

Patients and caregivers who consented to participation completed self-report measures of demographic information and psychiatric symptoms at the time of enrollment (i.e. within the first 2-weeks of neuro-ICU admission). At 3-months post-discharge, patients and caregivers were contacted via email to complete follow-up QoL measures using REDCap, a secure online data capture software (21). The analytic sample for the current study included data from 70 patients and 64 caregivers (see Figure 1 for flow chart); the data were not paired and thus two different datasets were used for analysis.

## Measures

### **Posttraumatic Stress Disorder Symptoms in Response to Neuro-ICU**

**Admission**—PTSD symptoms was measured via the PTSD Checklist-Specific (PCL-S) (22) to assess symptom severity for all 17 *Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV)* symptoms for PTSD (23) during neuro-ICU admission. Patients and caregivers rated the degree to which they experienced each symptom in the past month, with reference to “being admitted to the ICU” or “being a loved one of a patient admitted to the ICU” on a scale from 1 (“Not at all”) to 5 (“Extremely”). The PCL-S has demonstrated acceptable test-retest reliability (24) and has shown to be excellently sensitive and specific for identifying PTSD clinical diagnosis (25). For our primary analysis, we calculated total scaled scores from the PCL-S, which was then treated a continuous predictor. For our secondary analysis, we created four continuous variables from total scaled scores for each PTSD symptom dimension in the 4-factor numbing model of PTSD (i.e. re-experiencing, avoidance, numbing, hyperarousal). Because the four dimensions did not have the same scaled score ranges, we converted the total scaled scores to z-scores. Table 1 presents the allocation of each PCL-S item on respective symptom dimensions.

**Quality of Life**—Four domains of QoL were measured via the World Health Organization Quality of Life-BREF (WHOQOL-BREF) (5). The WHOQOL-BREF is widely used as a patient reported outcome measure for perceived quality of life across four domains (physical, psychological, social, and environmental QoL). The physical QoL subscale assesses perceived independence in activities of daily living, use of medical treatments, pain, mobility, sleep, fatigue, and work capacity. The psychological QoL subscale assesses experience of both positive and negative emotions, cognitive function, self-esteem, meaning making, and body image. The social QoL subscale examines satisfaction with and availability of social support, and satisfaction with sex life. The environmental QoL subscale examines perceptions of one’s physical environment and availability of resources (e.g. safety and security, opportunities for recreation, transportation). Individual items are rated on a 5-point scale, with higher scores indicating greater QoL. Domain scores were calculated from respective subscales according to published scoring recommendations (range 4–20) (26).

**Patient Clinical Variables**—Patient medical and treatment variables were obtained from their electronic medical record, including diagnosis and whether the patient was intubated during their hospitalization. Because a large portion of our patients were diagnosed with a stroke or hemorrhage, we dichotomized patient diagnosis into either having a stroke/hemorrhage or having another diagnosis. Patient intubation was used as a proxy for disease severity. It should be noted, however, that intubation on its own is an inexact marker of disease severity; further intubation details such as reasons for intubation and length of intubation are presented in Table 2.

**Statistical Analysis Plan**—We ran Fisher's Exact and Wilcoxon Rank Sum tests as appropriate to examine differences between patients and caregivers' demographic variables, patients' medical variables, total scaled PTSD symptom scores, total scaled PTSD symptom dimension scores, and QoL domain calculated scores. Next, we ran two bivariate correlation matrices between PTSD symptom dimension scores amongst patients and caregivers.

We then conducted separate, identical statistical analyses for patients and caregivers, as these data were not paired. For our primary analysis, we ran a multiple linear regression model for each QoL domain, with total PTSD symptom severity entered as the predictor, adjusted for sex, age, race (white), patient diagnosis (stroke/hemorrhage), and intubation status. Covariate selection was based on potential confounders of QoL in neuro-ICU populations as identified in the literature (9,27).

For our secondary, exploratory, analysis, to examine the unique effect of PTSD symptom dimensions on QoL, we ran a linear regression model for each QoL domain, with all four z-scored PTSD symptom dimensions entered as predictors, adjusted for age and sex. Given our sample size (patients n = 70; caregivers n = 64), only two demographic variables (age and sex) were chosen as covariates so as to not overfit the models. All analyses were completed using SPSS Version 25 (28).

## Results

### Participant Characteristics

Patient and caregiver characteristics can be found in Table 2. There were no significant differences between patients and caregivers in terms of demographics, total PTSD symptom severity, PTSD symptom dimension scaled scores, or QoL domain scores.

### Correlations between PTSD Symptom Dimensions

Bivariate correlation matrices are presented in Table 3. All PTSD symptom dimensions were moderately-strongly correlated amongst patients ( $r = .65\text{--}.79$ ,  $p < .001$ ) and caregivers ( $r = .55\text{--}.78$ ,  $p < .001$ ).

### Associations of Total PTSD Symptom Severity on Quality of Life Domains

Full details on the association between total PTSD symptom severity with QoL in patients and caregivers are presented in Table 4.

**Patients**—In adjusted models with total PTSD symptom severity, patient's sex, patient's age, patient's race (white), diagnosis (stroke/hemorrhage), and intubation, greater total PTSD symptoms was associated with lower QoL in all four domains (physical QoL  $\beta$ :  $-.306$ ,  $p = .017$ ; psychological QoL  $\beta$ :  $-.502$ ,  $p < .001$ ; social QoL  $\beta$ :  $-.315$ ,  $p = .015$ ; environmental QoL  $\beta$ :  $-.289$ ,  $p = .025$ ).

**Caregivers**—In adjusted models with total PTSD symptom severity, caregiver's sex, caregiver's age, caregiver's race (white), patient's diagnosis (stroke/hemorrhage), and intubation, greater total PTSD symptoms was associated with lower QoL in all four domains (physical QoL  $\beta$ :  $-.471$ ,  $p < .001$ ; psychological QoL  $\beta$ :  $-.622$ ,  $p < .001$ ; social QoL  $\beta$ :  $-.373$ ,  $p = .005$ ; environmental QoL  $\beta$ :  $-.378$ ,  $p = .003$ ).

### **Exploratory Analysis of Associations of Posttraumatic Stress Disorder Symptom Dimensions on Quality of Life**

Full details on the exploratory analysis of associations of PTSD symptom dimensions on QoL in patients and caregivers are presented in Table 5.

**Patients**—In adjusted models with all four symptom dimensions, age, and sex, greater numbing symptoms was independently associated with lower psychological QoL ( $\beta$ :  $-.397$ ,  $p = .038$ ) and greater re-experiencing symptoms was independently associated with lower physical QoL ( $\beta$ :  $-.422$ ,  $p = .047$ ). No other symptom dimensions were associated with QoL domains.

**Caregivers**—In adjusted models with all four symptom dimensions, age, and sex, greater numbing ( $\beta$ :  $-.409$ ,  $p = .014$ ) and re-experiencing ( $\beta$ :  $-.4$ ,  $p = .041$ ) symptoms were associated with lower physical QoL, and greater numbing symptoms was independently associated with lower psychological ( $\beta$ :  $-.519$ ,  $p = .001$ ) and social QoL ( $\beta$ :  $-.704$ ,  $p < .001$ ). No other symptom dimensions were associated with QoL domains.

## **Discussion**

To our knowledge, this was the first study to pilot test the feasibility of assessing PTSD symptoms experienced in the neuro-ICU and their relationship with 3-month QoL in both neurologically intact patients and caregivers. Our preliminary findings demonstrated that for both patients and caregivers, higher total PTSD symptom scores significantly predicted lower physical, psychological, social and environmental QoL at 3 months. In these models, PTSD symptoms explained a *small to moderate* amount of variance in QoL domains. Our secondary, exploratory, analysis found that greater numbing symptoms predicted lower 3-month physical, psychological, and social QoL in caregivers, and lower 3-month psychological QoL in patients. Finally, greater re-experiencing was also predictive of lower 3-month physical QoL in both patients and caregivers. In each of these differential associations, a *moderate to large* amount of variance in QoL was explained by PTSD symptom dimensions.

Our finding that higher total PTSD symptom scores was prospectively associated with lower QoL is consistent with prior research in neurocritical care patients (9) but extends this work

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by including caregivers and by demonstrating the relationships with specific QoL domains (physical psychological, social and environmental). Thus, our results provide support for the need for early PTSD screening in both neurocritical care patients and caregivers, and the need for developing targeted PTSD interventions in order to improve QoL and recovery trajectories.

Our exploratory analysis, which demonstrated moderate to strong relationships between greater numbing symptoms and poor physical, psychological and social QoL in caregivers, and poor psychological QoL in patients, suggests that interventions directly addressing numbing symptoms may be especially important in improving QoL, particularly in caregivers. Numbing has previously been conceptualized as a manifestation of maladaptive coping with the experience of intolerable re-experiencing, active avoidance, and hyperarousal symptoms (29). Because emotional numbing involves decreasing awareness to trauma cues, it is conceptualized as the antithesis of mindfulness, which conversely involves non-judgmental, non-reactive awareness of the present moment (29). Importantly, in neurocritical care patients and caregivers, higher mindfulness has been positively correlated with QoL (13). Further, a recent systematic review concluded that mindfulness-based interventions appear to be effective in treating PTSD (30). Taken together, these findings suggest that interventions that teach mindfulness skills have the potential to decrease emotional numbing and subsequent risk for poor QoL in both neurocritical care patients and caregivers.

Notably, the associations between numbing with physical and social QoL in caregivers were not observed in patients. One explanation for this may be that while physical and social QoL are expected to be impacted in patients who recently experienced a brain injury, caregivers instead must juggle their newfound caregiving responsibilities with their previous responsibilities. It is possible that the rigorous physical and temporal demands of caregiving for a neurologically compromised patient may lead to exacerbated numbing symptoms and subsequently reduced self-care, physical activity, and social interactions. Thus, reduced QoL may be an even greater concern for caregivers than for patients.

Regarding re-experiencing, greater symptoms in both patients and caregivers were associated with worse physical quality of life at 3-months. Even years after exposure to trauma, intrusive re-experiencing has been linked to an elevated physiological stress response (31) and significantly greater risk of major adverse cardiovascular events in survivors of acute coronary syndrome (4). When considering these previous studies, there may be a mechanistic link between re-experiencing with worsened physical QoL via heightened cardiovascular reactivity to trauma cues. Continued study with relevant biomarkers is needed to confirm these mechanistic hypotheses in neurocritical care patients and caregivers.

Importantly, no relationships between PTSD symptom dimensions and environmental QoL were observed, suggesting that no specific symptom dimension drives the total association between PTSD symptoms and environmental QoL. Further study is needed to parse out the relationship between overall PTSD symptoms and environmental QoL in neuro-ICU populations.

## Limitations

Our study is not without limitations. First, given our small cohort with heterogeneous neuro-ICU presentations, our findings must be considered preliminary and relevant only to neurologically intact patients and caregivers. Second, in order to meet criteria for full PTSD diagnosis a minimum of 1 month must pass since the index trauma. In the present study, PTSD symptoms were assessed within 2 weeks of neuro-ICU admission, thus participants only may have met PTSD criteria at the 3-month time point, but not at hospitalization. Nevertheless, we have found that PTSD symptoms present during the acute stage of neuro-ICU admission are predictive of subsequent PTSD symptoms at 3- and 6-months post-neuro-ICU admission (3). Importantly, given the highly dynamic and unpredictable nature of ICU stay, assessment of PTSD symptoms during ICU admission but prior to 1 month has been utilized in previous studies (2,3,12,17,18,32)). Next, given our moderate sample size, we were unable to conduct factor analyses on our cohort's PTSD symptoms. As such, we compared our cohort's PTSD symptoms to QoL using an established 4-factor model of PTSD (19), which has previously been used to characterize neurologically compromised survivors of cardiac arrest (17). Further, the present sample was predominantly white, and thus our findings may not be generalizable to other racial groups. Additionally, intubation is an inexact marker of illness severity and there is the possibility that re-experiencing and numbing may be more sensitive proxies of illness severity in this cohort. Thus, our findings should be considered with caution as elevations in these symptoms could be representative of sicker patients. Next, it should be noted that depression and anxiety were not included in our analyses, despite being important factors in QoL and being collected in the parent study (via the Hospital Depression and Anxiety Scale; HADS). We found a strong correlation between the PCL-C and HADS scores for both patients and caregivers (both  $r = .7$ ,  $p <.001$ ) and thus we did not include the HADS in our final regression models. Importantly, when including the HADS and PCL-S scores in the same models, the HADS consistently explained moderate variance across QoL subscales, while the PCL-S no longer demonstrated statistical significance. Because of the dramatic change in the PTSD coefficient when including depression in the same model, previous papers have examined these two predictors in separate models - one with the primary predictor variable being PTSD and one with the primary predictor variable being depression (33–35). Our models do not fully explain the variance in QoL post-NICU stay, though they do demonstrate the problematic association between PTSD and QoL. Finally, dyads enrolled into the parent study only met inclusion if the patient was neurologically intact. There is potential that caregivers of severely neurologically compromised patients may experience even worse PTSD symptoms and lower QoL, and thus dedicated research efforts are needed for these caregivers.

## Conclusions

PTSD assessment during neuro-ICU admission and future QoL follow-up is feasible in both neurologically intact patients and caregivers. Our preliminary findings indicated that greater severity of PTSD symptoms experienced by patients and caregivers during neuro-ICU admission were predictive of worse QoL 3 months later. Early psychological intervention may be warranted in neurocritical care patients and caregivers.

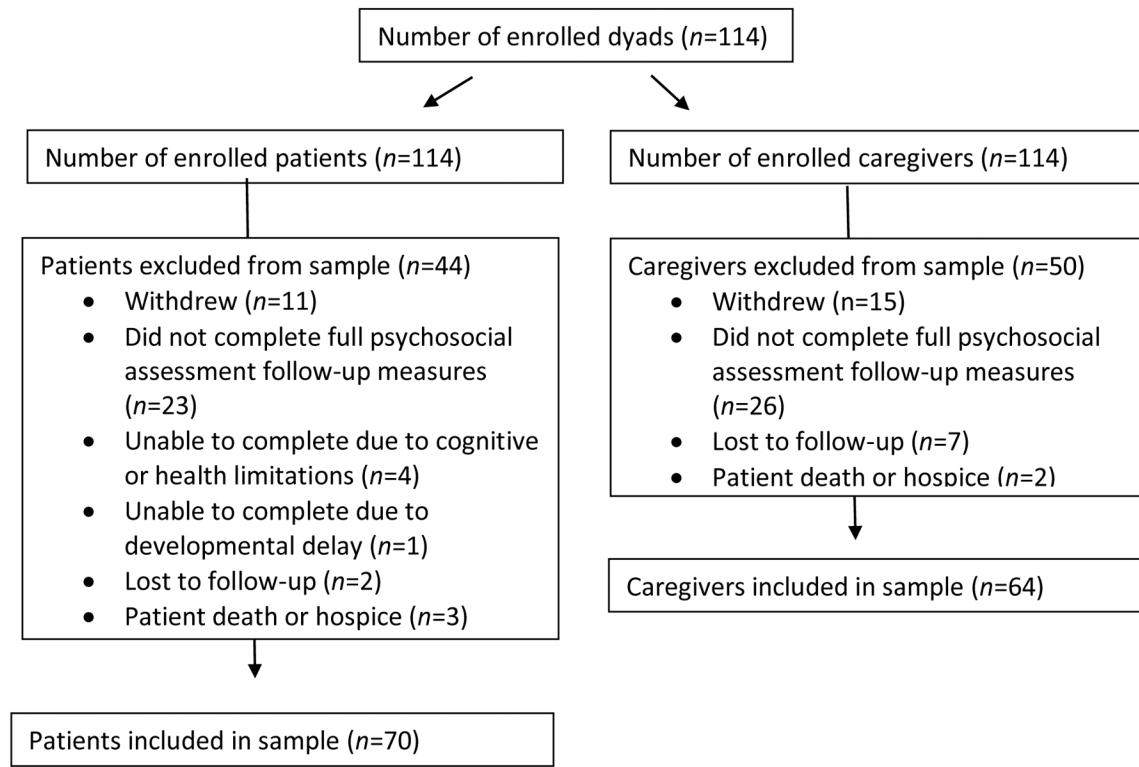
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**Figure 1.**  
Flow chart of analytic sample.

**Table 1.**

PCL-S items and corresponding 4-factor numbing model symptom dimensions.

PTSD Symptom	Symptom Dimension
1. Intrusive thoughts of trauma	Re-experiencing
2. Recurrent dreams of trauma	Re-experiencing
3. Flashbacks	Re-experiencing
4. Emotional reactivity to trauma cues	Re-experiencing
5. Physiological reactivity to trauma cues	Re-experiencing
6. Avoidance of thoughts of trauma	Avoidance
7. Avoidance of reminders of trauma	Avoidance
8. Inability to recall aspects of trauma	Numbing
9. Loss of interest	Numbing
10. Detachment	Numbing
11. Restricted affect	Numbing
12. Sense of foreshortened future	Numbing
13. Insomnia	Hyperarousal
14. Irritability	Hyperarousal
15. Impaired concentration	Hyperarousal
16. Hypervigilance	Hyperarousal
17. Exaggerated startle response	Hyperarousal

**Table 2.**

Subject characteristics.

Subject Characteristic	Raw Scale Range	Patients Mean or n (%)	Caregivers Mean or n (%)
<b>Demographics</b>			
Sex (Female)		32 (45.7)	41 (64.1)
Age (M ± sd)	18–84	52.08 ± 14.9	53.12 ± 13.49
Race (White)		59 (84.3)	58 (90.6)
Diagnosis, n (%)			
Cerebrovascular			
Stroke/Hemorrhage	27 (38)		
Brain aneurysm (unruptured)	3 (4.2)		
Other vascular	2 (2.8)		
Structural			
Tumor	20 (28.2)		
Lesion/brain mass	7 (9.9)		
Other			
Traumatic brain injury	2 (2.8)		
Seizure	2 (2.8)		
Other/>1 diagnosis	6 (8.5)		
Not reported	1 (1.4)		
Intubated, anytime n (%)	55 (78.6)		
Intubated, other than post- op n (%)	9 (16.4)		
Days intubated			
mean (range)	2 (1–3)		
Relationship to patient, n (%)			
Spouse/partner			42 (65.6)
Parent			11 (17.2)
Child			8 (12.5)
Sibling			3 (4.6)
<b>PTSD Symptoms (Scaled Scores)</b>			
Total Score	17–85	30.3	29.0
Re-experiencing	5–25	9.2	8.1
Avoidance	2–8	3.8	3.4
Numbing	5–25	8.6	7.8
Hyperarousal	5–25	10.3	9.3
<b>Quality of Life Subscales (Calculated Domain Scores)</b>			
Physical	4–20	15.5	16.4
Psychological	4–20	15.2	14.9
Social	4–20	15.9	15.7
Environmental	4–20	16.6	16.6

**Table 3.**

Bivariate correlations between individual PTSD symptom dimensions

<b>Patients' PTSD symptoms</b>				
	<b>Re-experiencing</b>	<b>Avoidance</b>	<b>Numbing</b>	<b>Hyperarousal</b>
Re-experiencing	-	.78	.73	.73
Avoidance	.78	-	.67	.65
Numbing	.73	.67	-	.79
Hyperarousal	.73	.65	.79	-
<b>Caregivers' PTSD symptoms</b>				
	<b>Re-experiencing</b>	<b>Avoidance</b>	<b>Numbing</b>	<b>Hyperarousal</b>
Re-experiencing	-	.77	.55	.65
Avoidance	.77	-	.58	.63
Numbing	.55	.58	-	.78
Hyperarousal	.65	.63	.78	-

\* Note: all correlations significant at the 0.01 level (2-tailed).

**Table 4.**

Associations between total PTSD symptom severity with 3-month QoL.

	Physical QoL	Psychological QoL	Social QoL	Environmental QoL				
Variable	Patients	Caregivers	Patients	Caregivers	Patients	Caregivers	Patients	Caregivers
	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)
Total PTSD Symptom Severity	-.306 (.017)*	-.471 (<.001) <sup>#</sup>	-.502 (<.001) <sup>#</sup>	-.622 (<.001) <sup>#</sup>	-.315 (.015)*	-.373 (.005) <sup>#</sup>	-.289 (.025)*	-.378 (.003) <sup>#</sup>
Sex (Male)	.108 (.381)	.015 (.902)	.063 (.584)	-.045 (.693)	-.166 (.183)	.003 (.983)	-.022 (.858)	.064 (.617)
Age	-.037 (.772)	.110 (.391)	-.037 (.756)	.051 (.663)	.043 (.740)	-.075 (.579)	.010 (.938)	.198 (.131)
Race (White)	-.047 (.714)	.051 (.694)	-.090 (.449)	-.127 (.282)	-.094 (.463)	-.219 (.112)	.038 (.766)	.026 (.842)
Diagnosis (Stroke/Hemorrhage)	.092 (.530)	-.140 (.293)	-.013 (.925)	-.081 (.503)	.057 (.701)	.070 (.618)	.095 (.522)	-.117 (.387)
Intubated	.203 (.175)	-.060 (.652)	.036 (.795)	-.126 (.295)	.133 (375)	-.022 (.874)	.225 (.135)	-.120 (.372)

Note:

\* = p < .05,

# = p < .01

**Table 5.**

Associations between subjects' PTSD symptom dimensions with 3-month QoL

	Physical QoL		Psychological QoL		Social QoL		Environmental QoL	
Variable	Patient	Caregiver	Patient	Caregiver	Patient	Caregiver	Patient	Caregiver
	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)	$\beta$ (p-value)
Re-experiencing	<b>-.422</b> (.047)*	<b>-.400</b> (.041)*	-.014 (.941)	.039 (.823)	.153 (.482)	-.042 (.833)	-.296 (.172)	-.102 (.610)
Avoidance	.177 (.340)	-.095 (.619)	-.070 (.690)	-.329 (.063)	-.178 (.356)	.083 (.672)	.019 (.920)	-.339 (.091)
Numbing	-.353 (.081)	<b>-.409</b> (.014)*	<b>-.397 (.038)*</b>	<b>-.519</b> (.001)†	-.298 (.154)	<b>-.704</b> (<.001)†	-.304 (.144)	-.224 (.186)
Hyperarousal	.234 (.241)	.309 (.077)	-.094 (.614)	.081 (.609)	-.046 (.823)	.214 (.231)	.190 (.352)	.194 (.283)
Age	-.051 (.664)	-.006 (.960)	-.046 (.677)	-.066 (.950)	.027 (.825)	.028 (.806)	.012 (.917)	.062 (.591)
Sex	.075 (.526)	.067 (.553)	.056 (.612)	.057 (.584)	-.133 (.278)	-.110 (.348)	-.045 (.713)	.195 (.103)

Note:

\* = p &lt; .05

# = p &lt; .01.