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Parental Posttraumatic Stress Symptoms in the Context of Pediatric Post Intensive Care Syndrome: Impact on the Family and Opportunities for Intervention

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Abstract

Objective: Pediatric intensive care unit (PICU) survivors and their families experience ongoing impacts on physical, cognitive, and psychosocial functioning, described as Post-Intensive Care Syndrome (PICS). The objective of this study was to determine whether the posttraumatic stress symptoms (PTSS) of parents predict the impact of critical illness on families following PICU admission beyond other factors (e.g., sex, race/ethnicity, age, insurance status, illness severity, family involvement or death).

Method: We conducted a retrospective analysis of data from 88 children aged 1 month to 18 years who were hospitalized with critical illness and acquired brain injury in the PICU and their families. Patients and their families participated in a 1–3 month post-discharge follow-up assessment, during which data on demographics, medical diagnoses, parent self-report of PTSS, and family impact of critical illness (via the Pediatric Quality of Life Family Impact Module) were collected. We used a hierarchical linear regression to determine whether parent PTSS predicted family impact above and beyond demographic and injury/illness factors.

Results: One-third of parents reported elevated PTSS. Among those with complete available data ($n = 56$), PTSS were the only significant predictor of family impact ($\beta = -.52$, $t = -3.58$, $p = .001$), with the overall model accounting for 41% of variance.

Conclusion: In addition to the direct effects on parents of children who survive the PICU, PTSS may negatively impact families and interfere with rehabilitative progress. We provide a

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Declaration of Interest Statement

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rationale and conceptual model for integrating interventions designed to address parent PTSS into post-PICU care.

Keywords

pediatric; critical care; posttraumatic stress; family impact; patient outcome assessment

Admission to the pediatric intensive care unit (PICU) for life-threatening illness or injury is among the most stressful events imaginable for children and families. Each year, thousands face this life-changing stressor due to illness or injury from events like traumatic brain injuries, cardiac arrest, meningitis, sepsis, heart defects, and severe pneumonia (Williams, Eriksson, et al., 2019). Due to advances in critical care medicine, long-term morbidity has supplanted mortality as a key outcome for PICU care (Pinto, et al., 2017). An emerging literature indicates PICU survivors face long-term physical, cognitive, and psychosocial sequelae due to both the conditions leading to admission (e.g., stroke) and side effects of critical care interventions (e.g., mechanical ventilation; Bone et al., 2014; Williams, Eriksson et al.). Approximately 25% of intensive care unit survivors experience cognitive impairment, 25% experience physical impairments, and 62% experience psychiatric illness (Rawal, et al., 2017). This constellation of morbidities is known as Post-Intensive Care Syndrome (PICS; Needham et al., 2012).

In addition to the direct effects of critical illness and care on patients, clinicians and researchers have identified psychological, social, and quality of life impacts on family members. The term “PICS-Family” (PICS-F) was coined to bring attention to these clusters of outcomes (Goldberg, et al. 2020), but is not stringently defined. To date, pediatric PICS-F research has largely focused on parental mental health across child ages, but impacts in other areas, such as financial distress, have also been captured (Williams et al., 2018). A recent review of 19 studies found that 10–42% of parents meet criteria for posttraumatic stress disorder (PTSD) in the 12 months after their child’s discharge from the PICU; 18–62% experienced subclinical symptoms; 23–31% experienced anxiety; and 8–17% experienced depression (Yagiela, et al., 2019). For parents of PICU survivors, posttraumatic stress symptoms (PTSS)¹ appear to be especially prevalent. Some research has found rates of PTSS as high as 84% among parents following their child’s admission to the PICU (Nelson & Gold, 2012). Rates of PTSS and PTSD decline in the first year following an accident or new diagnosis (Landolt, et al., 2012), but symptoms are persistent for many parents (Bronner, et al., 2008; Bronner, et al., 2010).

Consistent with the extant literature, in our experience providing multidisciplinary, outpatient, follow-up care to PICU survivors (Dodd, et al., 2018; Hall, et al., 2020), parents commonly present with PTSS. For example, whereas children are often amnesic of their time in the PICU and the preceding events, parents routinely describe recurrent and invasive memories. We previously conducted focus groups with parents of PICU survivors to understand their experiences of care, identify family-centered outcomes, and determine potential avenues of enhancing care (Williams et al., 2018). Parents emphasized

¹We use “PTSS” to refer to posttraumatic stress symptoms that may or may not constitute psychopathology. By contrast, “PTSD” refers specifically to the diagnosable disorder.

the psychological sequelae of PICU survivorship, somewhat contrary to the historical emphasis on physical health outcomes of most critical care research, parents emphasized the psychological sequelae of PICU survivorship. Three major themes emerged: 1) PICU admission is an intense emotional experience for the whole family, 2) it leads to ongoing psychological and social distress, and 3) survivorship is a form of chronic illness. Parents identified needs for education about outcomes, enhanced communication between families and providers, family support groups, and referrals to mental health services.

Given the apparent importance of parent PTSS within PICS-F, we are interested in understanding and intervening on parent trauma to better serve this population and improve rehabilitative outcomes. While the high prevalence of PTSS in parents following PICU admission is established, the impact of those symptoms on family functioning is not well understood. Nelson et al. (2019) recently found that baseline family functioning did not predict whether parents developed PTSS at 3 months post-discharge in a sample of 69 families; however, no study has quantified whether development of PTSS is associated with greater family impact during the recovery process. To begin to address these gaps in knowledge, we conducted an analysis of novel clinical data testing the hypothesis that parent PTSS predicts the family impact of critical illness when controlling for other demographic and clinical factors in a post-PICU sample. We also propose a rationale for intervening on PTSS in the context of an integrated multidisciplinary follow-up program.

Methods

Clinical Setting

In 2016, we developed the Pediatric Critical Care and Neurotrauma Recovery Program (PCCNRP; see Supplementary Figure 1) at Doernbecher Children's Hospital to systematically identify and address PICS. To our knowledge, the PCCNRP is one of two such programs in the United States. The PCCNRP targets the ~90% of youth (from birth to age 18 years) treated for critical illness and acquired brain injury in the PICU who do not engage in long-term inpatient rehabilitation with physiatry, but are discharged directly home and into the community. Programmatic details of the PCCNRP have been described at length elsewhere (Dodd, et al., 2018; Hall, et al., 2020; Hartman, et al., 2020; Williams, et al., 2017).

Our integrated multidisciplinary team (critical care, neuropsychology, and neurology) identifies issues related to PICS in physical, cognitive, emotional, and psychosocial/family domains through a combination of direct assessment and questionnaires. At their first outpatient follow-up visit, patients receive a physical and neurological evaluation conducted by a pediatric critical care physician and a brief neuropsychological or neurodevelopmental evaluation (based upon age) by a pediatric neuropsychologist.

Participants and Procedures

The study sample consisted of 88 children aged 1 month to 18 years who were acutely hospitalized in the PICU with a critical illness or acquired brain injury between July 2018 and May 2020 and completed an acute (i.e., 1–3 months post-discharge) outpatient

follow-up visit through the PCCNRP. Children who were admitted for complications of complex chronic conditions (e.g., recurrent aspiration in a patient with quadriplegic cerebral palsy) were excluded, as we were focused on acute critical illness impacts. Clinicians collected and entered clinical data into a REDCap database at the time of the follow-up visit. Demographic variables were collected via electronic medical record review by trained study staff members. One caregiver completed questionnaires during the acute follow-up visit. If multiple caregivers were present, a single caregiver completed the questionnaires at the family's discretion. The Institutional Review Board at Oregon Health & Science University approved all procedures.

Measures

We used measures that are utilized clinically by the PCCNRP team to determine whether additional support or treatment is needed for parents and families of patients. We selected variables based upon relevant literature, available clinical data, and our clinical experiences.

Demographics—We recorded child demographic characteristics, including sex, insurance status, race/ethnicity, and age at onset of illness.

Illness Related Characteristics

Mechanism of illness. We recorded the primary mechanism of illness as traumatic brain injury, hypoxic/ischemic event, or infections/inflammatory.

Severity. We used the Glasgow Coma Scale (GCS; Teasdale & Jennett, 1974) score at admission to assess severity of illness. The GCS is a clinician-rated measure of consciousness designed for traumatic brain injury assessments consisting of three separate scales that measure eye, motor, and vocal responsiveness. Scores are classified as mild (13–15), moderate (9–12), or severe (3–8). We chose the GCS as a marker of severity given the clinical population is largely traumatic brain injury patients, and because GCS score is consistently documented at the time of admission. The GCS is a well-established tool recommended as a common data element by the National Institutes of Health (n.d.) for assessing brain injury severity.

Family involvement. We measured family involvement with two dichotomous variables: *Direct involvement*, defined as whether a family member was involved in the activity (e.g., driving during motor vehicle accident) or immediate aftermath (e.g., providing cardiopulmonary resuscitation) that resulted in PICU admission; and *family death*, defined as a family member dying as a result of the event that led to the patient's admission. We included these measures, as we reasoned direct involvement and family death might lead to greater trauma symptoms.

Post-traumatic stress. We used the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5; Prins et al., 2015) to assess PTSS within the past month. The PC-PTSD-5 is 5-item yes/no screener that was originally developed to screen for PTSD in primary care. We used a cut score of 3, which maximizes sensitivity, to indicate elevated PTSS, consistent with the screening function of the PC-PTSD-5 in the PCCNRP clinical model. The PC-PTSD-5

was selected for use in the PCCNRP based on clinical feasibility and strong psychometric properties (Prins et al., 2016). Internal consistency in our sample was good ($\alpha = .82$).

Family Impact.: We used the Pediatric Quality of Life Family Impact Module (PedsQL-FIM) v2.0 (Varni et al., 2004) to assess the impact of critical illness on families. The PedsQL-FIM includes 36 items that assess both caregiver and family function in relation to their child's health within the past month. Caregivers respond to each item (e.g., "Lack of communication between family members") on a five-point Likert scale (0=never a problem, 4=always a problem). Items are reverse scored, resulting in a possible range of 0 – 100 with lower scores indicating greater illness impact and worse quality of life. The PedsQL-FIM Total Score was the primary outcome, whereas subscale scores in the domains of Parent Quality of Life (Physical, Emotional, Social, and Cognitive Functioning), Family Functioning (Family Relationships and Daily Activities), Communication, and Worry were secondary outcomes. The PedsQL-FIM has good internal consistency and construct validity in families of children with multiple chronic health conditions and in community samples (Varni et al., 2004). Internal consistency in our sample was good ($\alpha = .82$). The PedsQL-FIM was added to the clinical battery subsequent to other measures in response to the clinical team's growing appreciation of the need to capture outcomes and impacts beyond immediate health status of patients.

Analytic Methods

We used descriptive statistics to summarize demographic and clinical characteristics of the sample. We report median with interquartile range (IQR) for continuous variables that were not normally distributed. We used chi-square and Mann-Whitney U tests as appropriate to compare participants with and without outcome measures data. Independent samples *t*-tests were used to compare PedsQL-FIM mean scores and standard deviations from our population to published acquired brain injury (de Kloet et al., 2015) and community sample (Medrano et al., 2013) cohorts, as these data were more normally distributed. In order to determine the relative contribution of parent PTSS to overall family impact beyond other factors, we conducted a hierarchical linear regression controlling for potential confounders. The PedsQL-FIM total score was the outcome measure. Demographic characteristics, including sex, insurance status, race/ethnicity, and age at injury, were entered as potential predictors in the first block. Injury-related characteristics such as GCS, direct family involvement, and family death were entered in the second block. Parent PTSS as measured by PC-PTSD-5 total score were entered in the third block. Missing data were excluded pairwise. We conducted a post-hoc power analysis of the final model using G* Power (Faul, et al, 2007), and found $(1-\beta) = .99$ for the obtained R^2 value. Only families with a completed PedsQL-FIM were included in the regression analyses.

Results

Table 1 summarizes participant characteristics. Families completed acute follow-up visits approximately 2 months ($Med = 2.0$; $IQR = 1.3, 2.9$) from hospital discharge. One-third of sampled parents endorsed elevated PTSS, which was more likely when a family member was directly involved ($\chi^2 = 4.03, p = .05$). Of the 88 total participants, 56 (63%) completed

the PedsQL-FIM. Of the 32 missing the PedsQL-FIM, 23 (72%) were seen in clinic prior to implementation of the measure. Participants with a complete PedsQL-FIM had higher GCS scores ($U = 572.00, p < .05$) and were significantly more likely to have had a family member directly involved in the accident ($\chi^2 = 5.00, p < .05$). There were no other significant differences based on completion of the PedsQL-FIM.

Amongst those with a complete PedsQL-FIM, most informants were mothers (61%) and 40% endorsed elevated PTSS. Compared to families of children with acquired brain injury as reported by de Kloet et al. (2015), mean PedsQL-FIM total scores in our sample were significantly lower (indicating higher impact), $t(162) = 2.11, p < .05$, as were caregiver quality of life mean scores, $t(161) = 2.98, p < .01$. (de Kloet et al. did not report physical functioning, emotional functioning, social functioning, daily activities, or family relationships subscales, so no comparisons were made.) Parents in our study reported significantly greater impact on the worry subscale than the Medrano et al. (2013) community sample, $t(930) = 2.65, p < .01$. However, other subscale scores (family functioning and relationships, and daily activities) from our sample indicated significantly lower impact than the community sample. Means and standard deviations for each PedsQL-FIM subscale are available as a digital supplement.

Predictors of Family Impact

Table 2 displays the results of the hierarchical regression. None of the demographic or injury characteristics resulted in a statistically significant model. The addition of parent PTSS in the third block resulted in a significant R^2 change, $F(1, 34) = 12.84, p < .001$. The overall model was significant, $F(8, 34) = 2.92, p = .01$, and accounted for 41% of the variance in family impact. Parent PTSS was the only significant predictor, such that greater PTSS predicted worse family impact (i.e., lower score on the PedsQL-FIM), $\beta = -.52, t = -3.58, p = .001$.

Discussion

This study adds to the growing PICS-F literature and implicates parents' psychological functioning as a critical component of PICS recovery. Consistent with previous research (Yagiela, et al., 2019), we found a considerable portion of parents reported elevated PTSS in the months following PICU care, and that PTSS has a significant association with the overall family impact of acute pediatric critical illness admission. Notably, a majority of parents in our sample did not report elevated PTSS, indicating that many caregivers respond to PICU admission with resilience and may not require direct intervention. Understanding factors that lead to PTSS and identifying those parents who would benefit from trauma-focused intervention services is therefore an important goal for improving post-PICU care targeting PICS-F.

We found that parents in the post-PICU sample reported significantly greater total family impact and worse parent quality of life than parents of children with acquired brain injury (de Kloet et al., 2015). However, this was complicated by finding that parents in our sample reported less family impact in some areas than community controls (Medrano et al., 2013). This could indicate critical illness is less impactful in those domains, or as

Medrano et al. suggested, may point to limitations of the PedsQL-FIM to detect differences between illness and non-illness populations, particularly at the subscale level. This may also indicate differences in our populations beyond acute illness, such as socioeconomic and cultural differences, that were not accounted for in this analysis. Interestingly, Worry was the only subscale on which post-PICU parents reported significantly greater impact than the community sample, mirroring the findings of a study comparing parents of children with sickle-cell disease to community controls (Panepinto et al., 2009). Illness may contribute specifically to increased parental worry about their child's future well-being, but more research is needed on contributing factors to family impact in childhood illness and injury.

This is the first study to find that PTSS predicts family impact following PICU discharge. This finding was expected given established relationships between parent PTSS, family distress, and child functioning in the context of other pediatric illnesses (e.g., Cousino et al., 2017; Kazak et al., 1997) and other forms of trauma (Lambert et al., 2014; Cross et al., 2018). Parent PTSS predicted the total family impact of illness above and beyond demographic and injury characteristics. While the PICS-F literature is in its infancy with regard to overall family impact of pediatric critical illness, this finding is consistent with previous research. Demographic variables and traditional markers of illness and injury severity in pediatric critical care patients do not reliably predict development of PICS morbidities or overall quality of life (Aspesberro, et al., 2015; Hartman, et al., 2020; Williams, Harman, et al., 2019).

More research is needed to identify additional risk factors for PICS and PICS-F, particularly those that are modifiable through intervention. Parent PTSS is a potentially modifiable target for mitigating the overall family impact of pediatric critical illness, and holds implications for child rehabilitative success through impacts on child mental health and engagement with medical services (Arakelyan, et al., 2019). Bradbury et al. (in press) recently found parent PTSS was the only significant predictor of child anxiety and depressive symptoms after pediatric critical care for traumatic brain injury in a model controlling for injury severity and demographic variables. Other studies have similarly noted the impact of family environment on psychosocial outcomes following traumatic brain injury (e.g., Yeates, et al., 2010). Our study strengthens the rationale for screening and intervening upon parent PTSS in families of PICU survivors in the context of PICS and PICS-F.

Existing Interventions

Research on interventions for PICS-F and parent PTSS is limited: A systematic review of interventions targeting psychiatric morbidity in parents and children discharged from the PICU consisted of only six studies, three of which specifically targeted PTSS (Baker & Gledhill, 2017). Common intervention components included screening and psychoeducation, usually in a single session. The most comprehensive and well-studied intervention, Creating Opportunities for Parent Empowerment (COPE; Melnyk, et al., 2004), provides educational-behavioral intervention starting shortly after PICU admission until a few days post-discharge. Studies of the COPE program have yielded small to medium effect sizes for preventing parent psychological symptoms following PICU admission (Melnyk, et al., 2004; Samuel, et al., 2015). This stands in contrast to the broader PTSD prevention literature,

which has generally yielded little evidence that preventative interventions offered to all persons who experience a traumatic event are effective (Kearns, et al., 2012; Roberts, et al., 2019). There are no well-established therapies for those parents with post-PICU care PTSS, but a recent trial that included some parents of PICU patients showed improvement in PTSS after a brief videoconferencing intervention grounded in Acceptance and Commitment Therapy compared to waitlist controls (Muscara, et al., 2020).

Pediatric Post-Intensive Care and Parent Psychological Functioning

Growing recognition of PICS and PICS-F has driven interest in developing clinical models to promote optimal rehabilitation (e.g., Hartmann, et al., 2020; Dodd, et al., 2018; Hall, et al., 2020), and our findings further indicate that parent PTSS may be an important target of such models. To date, PICU follow-up programs have included procedures to screen for parent mental health problems and provided referrals to community resources, but not directly targeted parent mental health. While referring to specialty adult mental health providers remains an important option for care, we believe integrating mental health intervention for parents into pediatric care holds potential for improving child and family outcomes. Several factors inform our thinking: First, available evidence indicates that parents' post-PICU needs are not well met in the current system. Logan and colleagues (2020) recently found that the proportion of parents who access mental health services after their child's PICU hospitalization is much lower than the proportion who report psychological symptoms. More research is needed to further elucidate the nature of this disparity, but it indicates a need for new models of care. Second, there is a significant history of parent-focused interventions improving outcomes for children with chronic health conditions and their parents (Law, et al., 2019). This includes interventions that are delivered directly to parents only. Third, parents' experiences of post-PICU PTSS are intertwined with significant parenting challenges, often in the context of dramatically altered child functioning. Services that can offer guidance regarding child developmental, behavioral, and educational functioning in addition to parent PTSS (e.g., pediatric psychologists) may be more convenient and efficient for parents than accessing multiple independent services. This could be especially important for families with limited resources who may be engaged in multiple rehabilitative therapies. Third, in our previous work with parents of children hospitalized in the PICU (Williams, et al., 2018), parents voiced a desire for PICU providers to address parental wellbeing, specifically, as well as improve integration, coordination, and communication amongst providers. Integrating parent-focused services within the pediatric system allows for continuity of care, improved coordination via shared records, direct communication between providers, and streamlined referral processes. For example, upon identifying a need for psychological intervention, the PICU team, with whom families establish trust and rapport, may execute a warm handoff to an integrated psychotherapist. Such practices increase engagement in behavioral health service in other settings (Pace et al., 2018), and we expect the same would be true of post-PICU care. In our experience, the life-saving nature of critical care often results in parents developing very high levels of trust in the PICU team. By incorporating parent treatment into post-PICU care, we can leverage that trust and parents' natural tendency to prioritize child health over their own to facilitate engagement in care and enhance the therapeutic relationship.

The potential benefits of integrating parent mental health interventions into PICU follow-up programs should be weighed with pragmatic and ethical considerations. A full discussion of these issues is beyond the scope of this paper, but herein we briefly address some major points. In considering the integration of parent-focused interventions in pediatric care, a primary issue is determining the identified patient, as this has implications for documentation and reimbursement of services. In our view, parent-focused interventions to address PTSS can be delivered in service of the child patient's rehabilitation. Many well-established interventions for improving child outcomes (e.g., parent management training) included parent-focused components (e.g., stress management techniques, problem solving), and we do not view intervention for PTSS in post-PICU families as fundamentally different. As such, documentation of such services as part of the child's medical record and billing via Family Psychotherapy (e.g., 90846) or Health and Behavior Intervention Services (e.g., 96170) current procedural terminology codes would be appropriate. Availability and authorization of those codes would likely vary by local policy and payer, as is true of most fee-based services. We recognize there are boundaries of this approach, and services that cross the line from family-based interventions to individual psychotherapy focused on parent-level outcomes would require an alternative strategy. Conceivably, such an alternative could still be integrated with post-PICU care, perhaps via systematic coordination with an adult psychotherapist with expertise in PTSS; a variation of "collaborative care" models that have proven useful in adult medical home settings (e.g., Muntingh, et al., 2016).

Pediatric providers must be mindful of myriad ethical issues when providing direct care to parents (see Andrews, 2020 for a full discussion). Perhaps foremost is competence to provide adult-focused services. Psychologists are aware of the boundaries of their competence and should only provide services within those boundaries (American Psychological Association, 2002). Pediatric psychologists are likely to be familiar with evidence-based therapeutic approaches (e.g., trauma-focused cognitive behavioral therapy) and techniques (e.g., exposure) for treating adult PTSS and PTSD. However, these are not core competencies (Palermo, et al., 2014), and significant variability in relevant expertise is therefore likely. Any pediatric psychologist planning to deliver such services to parents is ethically bound to seek out adequate education, training, supervision, and consultation to ensure adequate competency, the extent of which may vary based on existing competency and the nature of the service provided (e.g., psychoeducation versus intensive psychotherapy).

Ultimately, whether and how parent-focused interventions can be feasibly and effectively integrated into post-PICU care programs is an empirical question requiring further research. In the absence of definitive science, practitioners must weigh available evidence, patient and family characteristics, and clinician/setting level factors to provide evidence-based, ethically-sound care (APA Presidential Task Force on Evidence-Based Practice, 2006).

Limitations

This study's limitations should be considered when interpreting the results. We drew the sample from a single regional medical center, and it is unclear how well the results generalize to other regions and populations. Our data were collected as part of clinical

practice, and are thus limited to those families who attended follow-up clinic and completed the included measures. Approximately 5% of PICU patients are discharged to inpatient rehabilitation do not follow-up with the PCCNRP. This includes children with more severe injuries and illnesses whose parents may be at greater risk for PTSS and other poor outcomes. Additional markers of illness severity beyond GCS, such as need for critical care interventions, may also provide insight into risk for greater family impact and development of PTSS, and should be evaluated in larger populations.

It is also important to note that while the PCCNRP intends to see all families 4–6 weeks after discharge, some families were seen up to three months after discharge. Given normative subsiding of trauma symptoms, similar ratings of PTSS reflect differential responses at different time points. Further, we were also unable to fully account for issues such as preexisting family functioning or parental anxiety.

Participants with missing PedsQL-FIM scores were less likely to have a family member directly involved in the accident and had lower GCS scores. This may have biased our results as we also found that those with direct family involvement were more likely to report elevated PTSS. Among those with complete PedsQL-FIM, there were no total score differences based on direct family involvement or GCS score. We included potential covariates in the regression model in an attempt to mitigate bias, but ultimately cannot account for the 32 families that were excluded from that analysis. Of note, the majority of the missing PedsQL-FIM scores were explained by the timing of its clinical implementation, lessening the likelihood of some illness-or family-related selection bias.

Our sample size was comparable to similar studies of the post-PICU population, but still relatively small, limiting the generalizability of findings and leaving the regression analyses potentially underpowered with respect to the number of predictors. Further, while parent PTSS was a significant statistical predictor, it was assessed at the same time-point as family impact, so the temporal relationship of these variables remains unclear. There was a moderate correlation ($r = -.57$) between parent PTSS and the PedsQL-FIM total score, which could reflect some overlap in constructs (mental health symptoms and mental health impact). Fully-powered, longitudinal studies are needed to disentangle the relationships between parent PTSS, family functioning, and other important factors.

Conclusion

Our findings reinforce the importance of family psychological functioning in the recovery of pediatric critical illness and acquired brain injury, with particular attention to parent PTSS. The family impact of critical illness is broad, and our findings provide preliminary evidence that parent PTSS is a potentially modifiable target to improve family impact in the context of PICS-F.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Impact Statement.

Parents' posttraumatic stress symptoms predict the impact of child critical illness on the family beyond other factors. Accessible, effective interventions to address posttraumatic stress symptoms of the parents of pediatric intensive care survivors are needed.

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Table 1

Sample Characteristics

	Child Characteristics		Parent Characteristics		Injury-related characteristics	
Age at injury, years, <i>Mdn</i> (IQR)	8.9 (5.6, 13.9)	Informant (<i>n</i> , %)			Mechanism of Injury (<i>n</i> , %)	
Months since injury, <i>Mdn</i> (IQR)	2.0 (1.3, 2.9)	Mother	52, 59%	Traumatic Brain Injury	78, 89%	
Sex male (<i>n</i> , %)	48, 55%	Father	12, 14%	Hypoxic/Ischemic	7, 8%	
Insurance (<i>n</i> , %)		Both parents	17 19%	Infectious/Inflammatory	3, 3%	
Private	37, 43%	Grandparent	3, 3%	Glasgow Coma Score, <i>Mdn</i> (IQR)	15 (13,15)	
Public	49, 57%	Foster parent	3, 3%	Family Involvement (<i>n</i> , %)		
Race/Ethnicity (<i>n</i> , %)		Elevated PTSS	21, 33%	No/indirect	60, 69%	
White, non-Hispanic or Latino	53, 62%			Direct	27, 31%	
Minority race/ethnicity	32, 38%			Family Death (<i>n</i> , %)	7, 8%	

Note: *N* = 88; discrepancies are due to missing data; PTSS = posttraumatic stress symptoms.

Table 2

Hierarchical linear regression analysis of predictors of the impact of critical illness on families

Predictor Variables	R ²	β at entry	β at final
Step 1 (demographics)	.09		
Sex ^a		-.02	.06
Race/ethnicity ^b		-.18	-.06
Age at Injury (years)		.09	-.03
Insurance ^c		-.16	-.11
Step 2 (injury characteristics)	.10		
Glasgow Coma Scale		.02	-.06
Family Involvement ^d		-.35	-.26
Family Death ^e		.27	.29
Step 3 (parent characteristics)			
Parent PTSS ^f			-.57 ^{***}
R ² for total model	.41		
F for total model	2.92 [*]		

Note: The PedsQL-Family Impact Module total score was the outcome variable

^a coded as 0=male, 1=female

^b coded as 0=not a racial/ethnic minority, 1=racial/ethnic minority

^c coded as 0=private, 1=public

^d coded as 0=indirect or no family involvement, 1=direct family involvement

^e coded as 0=no, 1=yes

^f Primary Care PTSD Screener for DSM-5 total score.

* p .05

** p .01

*** p .001.