HHS Public Access

Author manuscript

Clin Pediatr (Phila). Author manuscript; available in PMC 2023 September 01.

Published in final edited form as:

Clin Pediatr (Phila). 2022 September ; 61(8): 560–569. doi:10.1177/00099228221097498.

Caregivers' and Young Children's Emotional Health Needs After Pediatric Traumatic Injury

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Abstract

Pediatric traumatic injury (PTI) is associated with emotional health difficulties, but most US trauma centers do not adequately address emotional recovery needs. This study aimed to assess families' emotional health needs following PTI and determine how technology could be used to inform early interventions. Individual semi-structured, qualitative interviews were conducted with caregivers of children admitted to a Level I trauma center in the Southeastern United States to understand families' experiences in-hospital and post-discharge. Participants included 20 caregivers of PTI patients under age 12 (M = 6.4 years; 70% male, 45% motor vehicle collision). Thematic analysis was used to analyze data from interviews that were conducted until saturation. Caregivers reported varying emotional needs in hospital and difficulties adjusting after discharge. Families responded enthusiastically to the potential of a technology-enhanced resource

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Author Contributions

LER: Contributed to design; contributed to acquisition, analysis, and interpretation; drafted the manuscript; critically revised the manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.
TMD: Contributed to conception and design; contributed to analysis and interpretation; drafted the manuscript; agrees to be accountable for all aspects of work ensuring integrity and accuracy.
JW: Contributed to analysis and interpretation; drafted the manuscript; critically revised the manuscript.
JW: Contributed to conception and design; contributed to acquisition; drafted the manuscript; critically revised the manuscript.
MTA: Drafted the manuscript; critically revised the manuscript.
HCE: Drafted the manuscript; critically revised the manuscript.
LSN: Contributed to design; contributed to analysis and interpretation; critically revised the manuscript.
CJS: Contributed to acquisition; critically revised the manuscript.
KJR: Contributed to conception and design; critically revised the manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval/Patient Consent

Consultation with our university's Institutional Review Board (IRB) deemed this project quality improvement and not "research," and therefore exempt from IRB review or approval, as our goal was to assess the mental health needs of families impacted by pediatric traumatic injury who were previously not receiving any screening or treatment. Thus, caregivers only verbally provided consent to participate, and did not sign informed consent forms.

Supplemental Material

Supplemental material for this article is available online.

for families affected by PTI. A cost-effective, scalable intervention is needed to promote recovery and has potential for widespread pediatric hospital uptake.

Keywords

pediatric injury; parent stress; qualitative methods; mental health; mhealth/ehealth

In the United States, roughly 9.2 million children receive emergency care due to pediatric injury annually,[1] with nearly 300,000 experiencing pediatric traumatic injury (PTI) that requires hospitalization.[2] Pediatric traumatic injury (eg, serious injuries from motor vehicle collisions (MVCs), gunshot wounds, falls) is a leading cause of death, disability, and medical costs for youth in the United States,[3,4] and between 25% and 57% of children with a PTI develop significant posttraumatic stress symptoms (PTSS) and/or other emotional health problems, such as anxiety and depression.[5,6] If these psychological needs go unaddressed, long-term impairment in social functioning, academic performance, and quality of life often result.[6]

Few interventions target emotional recovery post PTI,[7-9] and the interventions that exist target older school-aged and adolescent children.[10] Consequently, there is a critical gap in services for young children with a PTI. According to the most recent available data, approximately 71% of children with a nonfatal PTI are under the age of 15 years; 45% are under the age of 10.[1] Young children have a unique set of circumstances that distinctly affect trauma recovery including a high level of dependence on caregivers, limited emotion regulation skills, and a rapid rate of physical, neurological, and emotional development.[11] As such, the developmental nuances of trauma recovery for young children,[12,13] coupled with the gap in care for PTI in this age group, suggest that evidence-based resources and support are needed to promote recovery for these families. However, caregiver and young child experiences and necessary supports following a PTI hospital admission are still largely unknown. As such, the current study aims to identify the needs of families with a PTI for children under 12 years during PTI admission as well as after hospital discharge.

Caregivers are a key source of support for children following PTI, with research linking younger child age to heightened caregiver involvement in PTI recovery.[14] Parental support (eg, emotional support, involvement, warmth) is consistently associated with improved child outcomes.[15] However, parents' ability to provide support is complicated by difficulties managing PTI-related stressors, including financial strain, disrupted routines, and stress.[15,16] Moreover, nearly 20% to 40% of caregivers experience high distress and significant PTSS after PTI, which is associated with decreased parental support, and, in turn, deleterious child outcomes.[17-19] Previous research suggests that caregivers' emotional health is strongly correlated with child outcomes.[20] Thus, it is critically important to understand how trauma centers can best address caregivers' emotional health needs in addition to a child's needs post-injury in order to improve child outcomes.

Trauma centers face challenges implementing new behavioral health interventions, including financial, staffing, and infrastructure constraints.[8,9,21] Of note, epidemiologic data demonstrate that most people with mental health needs never seek treatment or

delay seeking treatment for months or years.[8] This suggests that early intervention, patient engagement, tracking, and follow-up is critical in targeting post-injury posttraumatic stress and depressive symptoms before they lead to potential long-term dysfunction. Telehealth, *mHealth*, and technology-assisted interventions have rapidly been adopted in hospital settings and show promising evidence for increasing access to evidence-based practices,[22-24] improving patient engagement,[25] and facilitating patient tracking and follow-up,[25] all while minimizing burden on hospital systems.[26,27] Furthermore, technology-based interventions are particularly advantageous for increasing access to traditionally underserved populations, including racial and ethnic minorities,[24] low-income families,[28] and rural communities.[29,30] Given the large reach of trauma centers and the disproportionate impact of PTI on minority and low-income families,[31,32] technology-facilitated interventions may be imperative to engage caregivers of young children post-injury. Technology-based services can attenuate burden on trauma centers while also reducing traditional barriers to care (eg, transportation, childcare), which are likely exacerbated during the physical recovery period post-injury. However, research is needed to assess the utility and acceptability of these tools for caregivers of young children with PTI.

Given the prevalence of PTI and its consistent link to mental health outcomes in children and their caregivers, the present study aimed to assess child and caregiver mental health needs following a traumatic injury. To address the gap in services for young children, we conducted a qualitative assessment of caregivers of pre-adolescent (ie, ages 0-11) patients following hospitalization for a traumatic injury. Overall, our goals were to (1) inform early intervention by assessing the emotional and behavioral health needs of young, traumatically injured children and their caregivers and (2) determine how technology could be used to meet caregivers' needs, address staffing shortages, and improve scalability and cost-effectiveness.

Methods

Study Design

This qualitative study was designed to obtain feedback from caregivers regarding their own and their child's emotional recovery post-injury. We used a thematic analysis process described by Bradley, Curry, and Devers[33] to collect and analyze data. Consultation with our university's Institutional Review Board (IRB) deemed this project quality improvement and not "research," and therefore exempt from IRB review or approval, as our goal was to assess the mental health needs of families affected by PTI who were previously not receiving any screening or treatment. Thus, caregivers only verbally provided consent to participate and did not sign informed consent forms. To date, no adverse events have been reported.

Recruitment

Caregivers of patients under age 12 admitted to a Level I trauma center in the Southeastern United States were contacted within 1 year of their child's hospital discharge and asked if they were interested in participating in a brief interview to assess their emotional recovery experiences in-hospital and after discharge. Any caregiver of a child under age 12 hospitalized for traumatic injury was contacted initially. After some themes emerged

from the interviews, demographics of the existing sample were examined and a purposive sampling approach was used to recruit the remaining sample to ensure it was diverse with respect to child age, child sex, child race and ethnicity, and injury mechanism to be more representative of the national pediatric injury population under age 12. Forty-nine caregivers expressed interest in learning more and were contacted to discuss the purpose of this pilot initiative and schedule the interview. Of the 49 who were contacted about participation, 40 agreed and 9 were no longer interested. Of those, 18 were unable to be re-contacted, and 2 were scheduled for an interview but were unable to complete, for a final sample size of 20 caregivers. Consistent with the Consolidated Criteria for Reporting Qualitative Research (COREQ)[34] guidelines, interviewers discussed data saturation throughout the data collection process to determine when new themes were no longer identified, at which point data collection was discontinued.

Participants

Twenty caregivers were interviewed, of whom 9 caregivers had a child admitted following a MVC (45%), 6 after being hit by a car (pedestrian/“ped” vs auto; 30%), 4 following a fall (20%), and 1 due to a burn (5%). Children on average were 6.4 years old (ages 0-11), 70% (n = 14) boys, and 40% (n = 8) Caucasian, 40% (n = 8) African American, 10% (n = 2) biracial, and 10% (n = 2) “other.” No caregivers identified their child as Hispanic/Latino.

Data Collection

Caregivers completed telephone-based, semi-structured interviews that gauged specific topics and subject areas and allowed the interviewer to ask relevant follow-up questions to clarify responses (see Supplemental Appendix for interview questions). Interviews were conducted by 4 clinicians from diverse levels of training (bachelor’s, master’s, and doctoral levels), each of whom was trained in the conduct of qualitative interviewing. Interviews were audio-recorded and later transcribed by a third-party professional transcriptionist. Data were collected from October 2017 to September 2018. Caregivers were informed that the interview aimed to assess child and caregiver emotional health needs in-hospital and post-discharge. Questions were open-ended and designed to gain detailed context about families’ experiences. Data collection concluded once data saturation was achieved. Participants were compensated $35.

Data Analysis

A thematic analysis was conducted by 2 trained independent coders based on the approach of Bradley and colleagues.[33] A codebook was developed based on interview questions prior to coding to analyze the interviews. The codebook was adapted with each interview based on emerging themes. Codes were used to develop taxonomies and organize data based on the following themes: (1) child and caregivers’ emotional needs in hospital/post-discharge, (2) hospital staff addressing emotional needs, (3) education about emotional health, (4) emotional responses that surprised the caregiver, (5) facilitators and barriers to families’ emotional recovery, (6) whether help was sought from third-party professionals, and (7) caregivers’ recommendations for scalable *m*Health resources. Two individuals trained in qualitative analysis coded interviews separately using a spreadsheet-based codebook. Both coders met regularly to compare codes for each interview and refine thematic categories

from the codebook accordingly; thus, each transcript was independently double coded and compared. A third coder, the principal investigator of this project, provided oversight and resolved any coding discrepancies to develop final themes. Coders were reliable, with percent agreement greater than 90%.

Iterative coding was conducted to ensure depth of analysis and prevent coder bias. This approach provided a formal system to organize the data, resolve questions, and identify and refine thematic categories. This method was guided by thematic analysis such that themes from earlier interviews shaped continued data collection until thematic saturation (ie, when no novel information was provided in subsequent interviews) was met.

Results

We gained insight about the experiences of caregivers following PTI. Table 1 presents 6 final themes: (1) Families' emotional needs in hospital are variable, (2) Emotional recovery can be enhanced by hospital staff, (3) Family adjustment to changes in their child's activity or status, (4) Perceived barriers and facilitators to emotional recovery, (5) Recommendations for families, and (6) Use of technology in promoting recovery.

Theme 1: Families' Emotional Needs in the Hospital Are Varied

Overall, caregivers reported a wide range of emotions during their child's hospitalization. Some caregivers focused on their child's emotional needs in the hospital, while others highlighted their own emotional needs during their child's recovery. A significant majority of caregivers reported experiencing anxiety and worry while in hospital. Others reported feeling overwhelmed, frustrated, and stressed regarding their child's care. For example, one caregiver (child: female age 10; MVC) was also involved in her child's accident and, through her own recovery process in-hospital, maintained her focus on her child's recovery:

> I was worried. My anxiety was high … I actually was like "why are you all taking me before her, you need to take her before me …" I was worried about her, I was. I was asking questions when I was in the trauma room with all those people and they were working on me and they just reassured me that she's okay, she's in ICU right now … they kept the communication with me as I kept asking.

Only 2 caregivers reported that their child felt comfortable and safe during their hospital stay. Most other caregivers instead mentioned that their child felt fearful, scared, anxious, sad, angry, or irritable. For example, one caregiver (child: male age 4; pedestrian vs auto) expressed,

> Well, this hospital stay wasn't long but when we was there, I noticed he was very shy, he didn't really want to associate with nobody or talk to nobody. He just kept thinking that the doctors were going to cut his leg off. So, as a mom and as a parent, you're going to keep your stand for your child like no, everything will be okay. They're going to fix your leg. He was only four. So, he don't really understand that. … He was scared.

Theme 2: Emotional Recovery Can Be Enhanced by Hospital Staff

Caregivers commented on emotional health resources provided by the hospital and whether their family's emotional recovery was addressed adequately during their hospital stay. Several caregivers discussed experiences where hospital staff addressed their own emotional needs, while others reflected on emotional health resources provided to their child.

Many caregivers felt that the hospital did all they could to address emotional needs, noting that nurses were helpful, patient, and compassionate. One caregiver (child: female age 6; pedestrian vs auto) recalled,

> They made us feel like family … they made her feel comfortable. They made her feel like she was the only kid in the children's hospital.

Others reported that the hospital offered resources that made their stay more comfortable (eg, a lounge and refreshments). One caregiver (child: female age 9; MVC) expressed,

> We were able to take our minds off of what was going on and have some type of normalcy in a terrible situation.

Caregivers were also asked about any mental health education their families received during their hospital stay. Only a few caregivers recalled anyone in the hospital talking or providing printed materials about emotional health or where and how to get help if needed post-discharge. One caregiver (child: male age 5; pedestrian vs auto) recalled,

> No, didn't really receive anything … I was helpless and couldn't do anything for my son. He was very stressed because he felt like I should be making him feel better but my hands were tied and there was nothing I could do.

Theme 3: Family Adjustment to Changes in Their Child's Activity or Status

Interviews also addressed families' adjustment and emotional health recovery in the days and weeks following hospital discharge, with interview questions targeting both caregiver and child adjustment. Most caregivers expressed that their child experienced anxiety, stress, irritability, depression, and lack of interest in activities they used to enjoy. For example (child: female age 9; MVC),

> She was frustrated she couldn't get around and do what she wanted to do. Someone in the family had to even help her with sleeping and she got annoyed or frustrated. She felt helpless like she couldn't do anything she used to do.

Other caregivers reported that their child had difficulties sleeping, nightmares, and changes in sleep. One caregiver (child: female age 10; MVC) recalled,

> I know in the beginning, she was getting up two times a night I guess because she was trying to readjust herself from the hospital back to home and she slept with me some of the time. It's back to normal, but it did take a little time for her to readjust.

Some caregivers reported that they did not experience any emotional difficulties post-discharge. However, most reported that they were anxious and worried following discharge. Other caregivers reported feelings of sadness and anger. For example, one grandmother

(child: male age 1; MVC) lost her adult daughter (the child's mother) in an accident and recalled,

> It's crazy. I was really angry. I was angry and then didn't really understand why. Yes, I was angry because my daughter was no longer here and not necessarily because she wasn't here for me, she's not here for [child] … Yeah, that first six months was like really it was hell, it really was hell.

Caregivers were surprised by their emotional reactions following their child's injury, noting that they did not know what to expect and felt unprepared to deal with their emotional response. For example, one caregiver (child: male age 1; fall) expressed,

> I'm not a person who cries, who's sad—I've never been. I have a tough exterior, so it all surprised me. And the people around me—they didn't understand how I was holding it together as well as I was. But it was definitely surprising to me that I was reacting that way—to express my emotions, to be crying, to be talking about it—I normally don't show much emotion. You can't hide it if you don't understand what's happening. I wasn't able to contain it like I normally do.

Finally, caregivers also reported burdens following their child's discharge, including follow-up medical care, uncertainty about how to care for their child without the assistance of a medical team, and stress over the consequences of injury (eg, hospital bills and ability to provide). One caregiver (child: female age 11; MVC) stated,

> Not only did I have to watch my two youngest and her, but I was helping her walk with her broken foot, her sore stomach with the seat belt burn, giving her a bath and then giving my other kids a bath. Then whenever her dad finally came home from the hospital, I was just taking care of a lot of people in one little house. It's a lot on one person. Like … I want to give up, but the only thing keeping me here is my children and how they need me.

Theme 4: Perceived Barriers and Facilitators to Emotional Recovery

We were interested to learn about factors that either inhibited or facilitated families' emotional health in the acute period following their child's injury. Caregivers noted several barriers to emotional recovery, including limited medical assistance to care for their child and trying to resume a normal routine with new physical limitations. For example, one caregiver (child: male age 1; fall) recalled,

> I can't bring a nurse home with me. You go from one extreme to the next. If I didn't want to, I didn't have to do anything in the hospital—there were times they let me sleep and gave him his medicine. I was up all the time watching him making sure he was breathing and sleeping. I don't think anything could have made that easier.

However, caregivers also noted several factors that assisted in their emotional recovery, including social support and support from church and community. For example, one caregiver (child: female age 2; MVC) expressed,

> Yeah, my family was really supportive and, you know, having—we come from a very supportive church in the past, like deacons and cousins and uncles bring her

> teddy bears and balloons. Like, if you saw her room you will walk into her room, they're like, oh my god, look at your room.

Theme 5: Recommendations for Families

Interviewers also elicited tips or strategies that were helpful as they navigated emotional health strengths and challenges that they might recommend to other families affected by pediatric injury. Caregivers stressed the importance of addressing their own emotional needs, seeking emotional support, and talking about the injury and accompanying emotional reactions sooner than later. For example, one caregiver (child: female age 10; MVC) stated,

> Try to get someone to get your mind off and encourage you and help you do something that's new even, like a walk outside, and you're walking outside with somebody who you know. Even if it's you call someone and say hey, can you please come over for a little while and come visit me. I had one of my friends come visit me and they sat and talked with me and we talked about fun, they just basically trying to rebuild the confidence but also rebuild the happiness around you. You got to have joy, you can't misery. You cannot have misery.

Caregivers offered recommendations on speaking with children about the traumatic experience and revealing their accompanying emotions. Recommendations varied, with some caregivers reporting that it would be better to hide their emotions from their child or only disclose them on a "need to know" basis. However, others stressed the importance of open communication with their child about the traumatic experience. One caregiver (child: female age 10; MVC) recalled,

> She asked me if I was sad. I said, well, yeah, mommy was sad. That's like mommy was sad when I gave birth to you. Mommy was sad when you had your first birthday. I was sad but at the end of the day, I made sure that when you're happy, I'm happy and that's all that matters. Even you know sometimes I'm sure you don't want to hear that but at the same time, you really got to make them believe that all right, and so if mommy is sad for a minute, I promise you mommy won't be sad for every day, that's not going to happen.

Theme 6: Use of Technology in Promoting Recovery

The final portion of the interview targeted feedback regarding leveraging technology to address the gaps noted to accelerate both caregivers' and children's emotional recovery after pediatric injury. Nearly all caregivers reported that they would use a Web Site or mobile application to support emotional health. For example (child: female age 11; MVC),

> If there were an app, I would let my child download it on her phone and use it for questions she's maybe scared of asking me or is nervous about. Then she could look things up and understand and feel more comfortable talking to me about it.

The majority of caregivers felt that including tips for coping with trauma and managing stress for themselves and their child would be helpful. Most caregivers also recommended the use of testimonial videos from caregivers who have been in similar situations and the use of discussion boards to connect. One caregiver stated (child: female age 11; MVC),

> This app would've helped in knowing there is a lot of support at hand and there are people going through the same thing … Knowing they have had a positive outcome would probably help me with anxiety and knowing that it's okay.

Another caregiver provided examples for helpful tools to include in a technology-based resource (child: female age 10; MVC):

> How to cope with trauma, steps for that. Being told it's okay to be sad, angry, et cetera. Maybe a discussion board or something you can communicate or get in touch with other people in the same situation.

Others felt that education and strategies for fostering positive communication between caregivers and children, caregivers and other family members, and caregivers and the school and workplace would be particularly helpful. Some caregivers indicated that tips to help their child manage physical restrictions would also be useful. A resource linking users to a range of providers (eg, counselors) was also suggested by some caregivers. Finally, caregivers felt that this resource should also include child-focused activities, including videos of favorite cartoon characters and games to provide education about traumatic injury, physical and emotional expectations, and various coping strategies.

Discussion

We conducted qualitative interviews with caregivers of traumatically injured children under 12 years regarding their families' emotional recovery both during and after their child's hospital stay. Most children do not receive routine mental health screening or follow-up services in trauma centers following PTI, despite high rates of both caregiver and child trauma-related symptoms after traumatic events.[20,35-37] Thus, it is crucial to gain a clearer understanding of families' unique needs after PTI to facilitate emotional recovery and improve functioning. Caregivers of young, traumatically injured children experience unique stressors following PTI, and this is the first initiative to qualitatively assess these emotional health experiences.

Overall, results highlight the range of reactions and emotions experienced by most caregivers both in-hospital and post-discharge. Although it is normative for caregivers to feel anxious immediately following their child's traumatic injury, between 20% and 40% of caregivers develop post-traumatic stress disorder (PTSD) following PTI.[17-19] Caregivers' mental health is strongly associated with children's emotional and behavioral recovery.[20,35,38,39] Untreated PTSS can contribute to poorer physical recovery and interference with medical regimen adherence, increased use of health care services, and negatively affect quality of life.[14,40-42] In the current sample, caregivers reported a variety of emotional and behavioral responses for both themselves and their child following injury including anxiety, worry, uncertainty, and sleep and mood disruptions, they navigated the weeks following their child's injury. While most caregivers stated that hospital staff were compassionate and supportive during their child's inpatient stay, few caregivers received targeted mental health education or resources to address their family's emotional health. Together, these findings reinforce the value of incorporating timely education,

assessment, and early interventions targeting caregiver and child acute stress and mood-related symptoms into routine patient care.

Caregivers also identified barriers and facilitators to their families' emotional recovery following discharge. In addition to difficulties adapting to physical restrictions after the injury, other barriers included reduced support and uncertainty around adopting new roles and routines. When asked about factors that facilitated their emotional recovery, caregivers identified multiple sources of support (family, church, friends) as beneficial. This is consistent with previous research and recommendations from the Medical Working Group of the National Child Traumatic Stress Network to assess and reinforce families' support following PTI and other traumatic events.[43-46] Caregivers' feedback in conjunction with these findings and recommendations emphasize the need to consider social support when working with these families. Connections to support and tips for adapting to new routines can be offered to caregivers and their children via pamphlets, handouts, technology-assisted tools, and in conversations with health care team members such as social work, nursing, psychiatry or psychology, and other providers trained in trauma-informed care.

Caregivers were enthusiastic about the availability of individualized resources to promote both caregiver and child emotional and behavioral recovery. Most caregivers recognized the potential and were excited about the possibility of an interactive, technology-enhanced resource available to provide psychoeducation, symptom tracking, coping tools, and other resources to facilitate recovery. Caregivers' acceptability of an *m*Health intervention is consistent with research demonstrating families' interest in and use of technology-based resources following traumatic events.[47,48] Available resources for PTI have demonstrated potential to enhance caregivers' knowledge about mental health following their children's injury.[49-51] Data from the current project can be used to build upon existing resources to provide an *m*Health-facilitated resource (1) for both the caregiver and child that (2) provides coping tools, selfhelp, and mental health referrals (3) targeting a wide age range of pediatric groups, including young children, with content that can be (4) individualized to families' unique needs. With very few pediatric trauma centers offering screening and education to families after PTI, implementation of an *m*Health solution to address emotional and behavioral health symptoms could provide a cost-effective, scalable solution. Additionally, caregivers also suggested incorporating testimonial videos from families affected by PTI and links to discussion boards to connect them to other caregivers who best understand their stressful situation. An *m*Health resource has the potential to incorporate testimonial videos, as well as links to community and/or national support.

An *m*Health resource, such as a mobile application (app), delivered to families during their child's hospital stay has potential to address additional themes elicited from caregivers in the current study. Opinions about talking with children about trauma and injury varied, with some caregivers discussing the importance of open communication with their child about emotional recovery and others preferring to hide emotions or discuss on a "need-to-know" basis. *m*Health solutions can be leveraged to offer modules to improve caregiver-child communication, including tips for identifying "best times" to check-in on their child's emotional health, example talking points and language to use, and how communication changes and can be adapted depending on developmental age. Brief education can be

embedded into these *m*Health modules highlighting the importance of caregiver-child emotional health "check-ins" and ongoing communication to promote caregiver and child recovery and facilitate normal roles and routines. Digital health solutions offer cost-effective solutions that can be feasible and acceptable to both pediatric trauma centers and caregivers after PTI and fit seamlessly into existing infrastructure and workflow.

Limitations

The current study is not without limitations. First, qualitative interviews were conducted with a small number of caregivers ($n = 20$), which may limit the generalizability. However, interviews were conducted until theme saturation was reached across caregivers and with a relatively diverse group of caregivers in regard to child age, trauma type, and race/ethnicity. Second, these interviews were conducted with caregivers via telephone rather than in-person, which some researchers caution against. Yet, others argue that it could be a useful method.[52,53] Additionally, interviews were only conducted with caregivers due to the wide range in developmental age of young children targeted in this project. Future initiatives may also interview children following PTI, as well as providers treating these children, to understand their emotional needs during the acute and intermediate phases of recovery. Finally, the current study did not include complementary quantitative data to examine additional characteristics such as child or caregiver trauma-related symptoms, technology familiarity, or other relevant data. Research is needed to examine whether child age, caregiver distress level, and injury type affect feedback differently.

Conclusions

The current project qualitatively assessed the emotional and behavioral health needs of caregivers of young, traumatically injured children and elicited suggestions to leverage technology meet their families' mental health needs in the immediate aftermath of PTI. Overall, our findings suggest that caregivers and children experience a range of emotional health and adjustment needs both in-hospital and in the weeks following pediatric injury. Caregivers also identified barriers and facilitators to their recovery, including children's physical mobility/medical limitations that complicate new routines and social and community support that accelerated their emotional health. Caregivers noted that tools such as *m*Health applications and Web Sites providing them with education, coping skills, and testimonial videos would be helpful to promote their families' recovery after PTI.

Very few evidence-based, trauma-focused *m*Health apps exist, particularly for traumatic injury populations,[54] despite the fact that up to 90% of traumatically injured individuals prefer technology-based behavioral health interventions.[55] *m*Health interventions are scalable, practical, and cost-effective. Findings from the current study can be used to develop and test a technology-enhanced intervention to prevent symptom development and improve quality of life and emotional health outcomes of caregivers and young children affected by PTI. A cost-effective, scalable technology-enhanced intervention that can be used in conjunction with existing services has the potential to be acceptable to pediatric trauma centers and has widespread uptake by hospitals and greater impact on families who need it most.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors wish to acknowledge the MUSC Department of Pediatrics' support of the Trauma Resilience and Recovery Program (TRRP). The authors also wish to acknowledge Cara Mohr for her contributions to the qualitative coding process, Sarah Chambers for her dedication to the TRRP and assistance with the formatting of this manuscript, as well as the TRRP staff for their tireless efforts toward improving the emotional recovery of our patients.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by funding from the Medical University of South Carolina (MUSC) Center for Telehealth and the South Carolina Telehealth Alliance and Donors Cure. Dr Ridings is supported by the National Institute of Child Health and Human Development (K23HD098325). Dr Davidson is supported by an award from The Duke Endowment (6657-SP). Dr Ruggiero is supported by the SmartState South Carolina Centers of Economic Excellence.

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Table 1.

Caregiver Interview Responses.

Core theme	Subtheme
Families' emotional needs in the hospital are varied	• Child emotional reactions in hospital include fear, irritability, and anxiety • Caregiver emotional reactions in hospital include anxiety, overwhelmed, and worry
Emotional recovery can be enhanced by hospital staff	• Hospital providers demonstrated compassion, patience, and support to address caregiver and child needs in-hospital • Few caregivers received mental health education or support while in-hospital
Family adjustment to changes in their child's activity or status	• Child emotional and behavioral reactions post-discharge include anxiety, stress, decreased mood, and sleep disruptions • Caregiver emotional needs and experiences post-discharge varied and include stress, anxiety, surprise, and uncertainty
Perceived barriers and facilitators to emotional recovery	• Barriers to emotional recovery include physical mobility limitations and medical assistance • Factors that facilitated family emotional recovery include social and community support
Recommendations for families	• Helpful tips for caregivers in similar situations • Caregivers recommend addressing their emotional needs and showing emotions to children • Opinions about talking with children about trauma and injury varied
Use of technology in promoting recovery	• Usefulness of Web Site and mobile application resources • Tools to include for caregivers and children include coping skills, testimonial videos, and connections to support