Preventing Posttraumatic Stress Following Pediatric Injury: A Randomized Controlled Trial of a Web-Based Psycho-Educational Intervention for Parents

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Objective The study objective is to evaluate the feasibility and efficacy of a web-based intervention for parents (AfterTheInjury.org [ATI]) in promoting emotional recovery following pediatric injury. Methods 100 children with injuries requiring medical attention and their parents were randomly assigned to the intervention or usual care. Efficacy outcomes included parent knowledge and child and parent posttraumatic stress symptoms (PTSS). Results All parents in the intervention group completed the intervention (directed use of ATI) in the hospital. 56% reported using ATI online post-discharge, and 100% of these parents found it helpful. Parent knowledge increased immediately post-intervention, but there was no significant intervention impact on parent knowledge or PTSS at a 6-week follow-up. Relationships between knowledge and PTSS were identified. Conclusions Brief web-based interventions introduced during child hospitalization are a feasible strategy to reach many parents following pediatric injury. Preventing psychological symptoms may require more than parental education alone.

Key words child injury; emotional recovery; parents; posttraumatic stress; PTSD.

Introduction

Each year, 20 million children in the United States incur a potentially traumatic injury. This results in 8.7 million emergency department visits and 241,000 inpatient admissions. Boys have a higher incidence of accidental injury than girls (Grossman, 2000). In the aftermath of pediatric injury, children and their families must manage both the physical and emotional aspects of medical trauma. Within the first month after pediatric injury (e.g., motor vehicle crash, physical assault, recreational injuries), upwards of 75% of children and their parents report posttraumatic stress symptoms (PTSS) (Aaron, Zaglul, & Emery, 1999; Winston et al., 2002). Six months post-injury, 15–20% of children and their parents continue to exhibit persistent and impairing PTSS. Five to ten percent of children and parents meet diagnostic criteria for posttraumatic stress disorder (PTSD) (Davis et al., 2000b; DeVries et al., 1999; Di Gallo, Barton, & Parry-Jones, 1997; Winston, Kassam-Adams, Garcia-Espana, Ittenbach, & Cnaan, 2003). PTSS include avoidant behaviors, re-experiencing of the trauma, and hyperarousal (American Psychiatric Association, 1994, 2010). For children with injuries, this can include the following symptoms: Avoiding activities associated with the injury (e.g., riding a bike, getting in a...
vehicle), having nightmares or re-enacting the injury event or subsequent medical treatment via play, or becoming agitated or jumpy when reminded of the injury or injury event. PTSS can develop in children and parents, regardless of injury severity and other medical characteristics (e.g., length of hospital stay, injury mechanism or type) (Bryant, Mayou, Wiggs, Ehlers, & Storey, 2004; Daviss et al., 2000a; Kenardy, Spence, & Macleod, 2006; Landolt, Buehlmann, Maag, & Schiestl, 2009; Landolt, Vollrath, Timm, Gnehm, & Sennhauser, 2005; McDermott & Cvitanovich, 2000). Empirical research suggests that PTSS contribute to poor physical recovery and may interfere with optimal adherence to medical regimens (Holbrook et al., 2005; Stoddard & Saxe, 2001; Wesson et al., 1989). Additionally, PTSS are a key predictor of functional outcome and quality of life post-injury (Holbrook et al., 2005; Stoddard & Saxe, 2001; Wesson et al., 1989). The high prevalence and impact of PTSS for injured children necessitates secondary prevention interventions; that is, interceding after the injury has occurred to prevent long-term complications.

Parents are a primary source of support for children following an injury (“Family-centered care and the pediatrician’s role.” 2003), but research indicates that many parents have difficulty assessing their child’s emotional responses to injury (Dyb, Holen, Bænne, Indredavik, & Aarseth, 2003; Kassam-Adams, García-España, Miller, & Winston, 2006; Meiser-Stedman, Smith, Glucksman, Yule, & Dalgleish, 2007; Schreier, Ladakakos, Morabito, Chapman, & Knudson, 2005). Parents also may have difficulty determining the best methods to help their child cope with these reactions (Marsac, Mirman, Kohser, & Kassam-Adams, 2011). Increasing knowledge about reactions to trauma has the potential to prevent PTSS (Litz, 2008; Litz, Gray, Bryant, & Adler, 2001; Norris et al., 2001; Resnick, Acierno, Holmes, Dammeyer, & Kilpatrick, 2000). Thus, interventions that teach parents how to recognize their child’s early reactions and help their child cope may be useful in preventing or reducing PTSS following pediatric injury.

To date, no early intervention has been identified as efficacious in preventing child PTSS following pediatric injury (Kramer & Landolt, 2011). In one study, providing families with psycho-education about children’s reactions and traumatic stress symptoms post-injury resulted in lower child anxiety and parent PTSS compared with usual care (UC) (Kenardy, Thompson, Le Brocque, & Olsson, 2008), though no differences were found for child PTSS. An evaluation of the Child and Family Traumatic Stress Intervention, a four-session in-person psycho-educational and skills-based intervention, shows promise in preventing PTSS in children following acute potentially traumatic events including injury (Berkowitz, Stover, & Marans, 2011). However, this program requires trained mental health providers and multiple face-to-face family sessions.

There is growing empirical support for the efficacy of using the Internet to deliver high-quality interventions to children and parents (D’Alessandro, Kreiter, Kinzer, & Peterson, 2004; Ritterband et al., 2005). Web-based programs have improved symptom management and adherence to medical regimens for asthma, pain, encopresis, and obesity in children (Stinson, Wilson, Gill, Yamada, & Holt, 2009). These interventions have also helped to reduce symptoms of anxiety and depression in adults, children, and adolescents (Kenardy, McCafferty, & Rosa, 2006; O’Kearney, Kang, Christensen, & Griffiths, 2009). Combining printed information for parents with web-based information for children who have experienced injury has also shown promising results for reducing anxiety and a trend for reduced PTSS among higher risk children (Cox & Kenardy, 2009).

AfterTheInjury.org (ATI) is a web-based intervention for parents. ATI is designed to help promote emotional recovery and prevent PTSS in children with injuries. The intervention provides parents with evidence-based information and psycho-education related to pediatric injury. Tools on ATI go beyond the simple provision of information about injury care and reactions: For example, parents can complete a child symptom quiz that generates specific evidence-based tips on ways to assist in their child’s emotional recovery. Objectives of this study were to examine the relationship between parent knowledge and PTSS, determine intervention feasibility, and evaluate the efficacy of the intervention in increasing parent knowledge of injury reactions and preventing child and parent PTSS following pediatric injury. Specifically, we predicted that (1) parent knowledge about injury reactions would be inversely related to child and parent PTSS, (2) parent knowledge about child injury reactions would increase immediately post-intervention as compared with baseline for parents in the intervention group, (3) parents in the intervention group would have greater knowledge about child injury reactions at 6-week follow-up compared with parents in the UC group, and (4) children in the intervention group would report fewer PTSS at 6-week follow-up compared with those in the UC group. We were also interested in exploring the potential impact of the intervention on parent PTSS.

Method

Participants

This study was approved by the hospital’s Institutional Review Board. Study participants included 100 children...
(71 male) who incurred an injury and received medical treatment at a large urban Level I pediatric trauma center, and one parent of each child. Families were eligible to participate in this study if their child was aged 6–17 years ($M = 11.75$, $SD = 3.33$) and had sustained an injury within the past 60 days ($M = 4.19$, $SD = 6.80$, Range = 0–44). Families were excluded from the study if the parent or child was unable to read or understand English, if the child had sustained a traumatic brain injury preventing comprehension of surveys (i.e., Glasgow Coma Score < 13), or if the child’s injury resulted from suspected abuse or family violence. Children sustaining injuries as a result of an organized sport were also excluded from this study based on findings that suggest low levels of PTSS among this group (Kassam-Adams, Marsac, and Winston, unpublished data). Children’s injuries resulted primarily from recreation (31%), falls (31%), and motor vehicle crashes (16%). The majority of injuries were extremity fractures (51%), followed by lacerations (9%), other fractures (8%), multiple traumas (5%), organ injuries (5%), sprains or strains (4%), mild head injuries (4%), and other injuries (14%). Most children in this sample were recruited during an inpatient hospitalization (79%), whereas 21% participated during an emergency department visit. For children admitted to the hospital, length of inpatient stay ranged from 1 to 19 days ($M = 2.90$, $SD = 2.33$) at the time of the baseline assessment (T1).

Of 160 families who were approached by research assistants, 60 elected not to participate in the study. Reasons provided by families for not participating included feeling overwhelmed or fatigued, participation in other research, other family stressors, lack of interest, and insufficient time. There were no differences in child age, race, or sex between families who chose not to participate and those who were enrolled in the study. See Figure 1 for the CONSORT diagram.

Eighty-two of the parents in this sample were mothers (17 fathers, 1 legal guardian). Parents were aged between 23 and 59 years ($M = 41.0$, $SD = 7.50$). The majority of parents identified as White (49%) or Black (46%), with the remaining 5% reporting “Other” or “Prefer not to answer.” Two percent of parents reported that they were of Hispanic origin. Parent education ranged from completion of a high school degree or less (31%) to full or partial completion of a college degree (49%) or graduate degree (17%). A total of 62 families (28 intervention, 34 UC) completed the 6-week follow-up (60 complete parent–child dyads). There were no differences in child age, sex, parent race, parent ethnicity, parent education, baseline child, or parent PTSS, or study condition for those participating at baseline only and those completing the follow-up assessment. See Tables I and II for descriptive statistics for the entire sample and by group.

**Procedure**

After providing consent, parents completed a baseline assessment (T1) including a knowledge questionnaire and ratings of their own and their child’s PTSS. Children reported on their own PTSS. Parents were then randomly assigned to the ATI intervention or UC condition (see later in the text for descriptions of conditions). Parents assigned to the ATI group completed the intervention (20-min directed use of the ATI website) and subsequently repeated the knowledge questionnaire (T2). Participants in both conditions completed a follow-up assessment 6 weeks from baseline (T3). Follow-up assessments were completed via phone and included the knowledge questionnaire and ratings of parent PTSS (self-reported) and child PTSS (by self and parent report). Parents in the intervention condition also reported on their use of ATI following their child’s discharge from the hospital. Those who indicated that they had returned to ATI were asked directed questions to assess the frequency and length of ATI use, the perceived helpfulness of the site, reasons for returning to the site, and ways in which parents used the site.
**Intervention Description**

ATI is an evidence-based website designed to assist parents in helping their child recover after an injury. ATI focuses on preventing PTSS (Kassam-Adams, Marsac, & Winston, 2010). ATI aims to teach parents how to more accurately assess their child’s reactions to injury and provide appropriate coping assistance for their child. The intervention also teaches parents how to address avoidance symptoms.
and seek additional help for their child if needed. To achieve these objectives, ATI provides empirically based information and psycho-education on trauma and trauma reactions, ways to help children after an injury, and when to seek more help. The ATI intervention integrates practical information with features of electronic or web-based interventions that have demonstrated efficacy in improving parental knowledge and confidence regarding participation in their child’s health care (Sockrider et al., 2006). The intervention includes interactive features, engaging videos, and the opportunity for parents to rate their child’s reactions and receive tailored tips and a printable care plan. For this study, parents were guided by trained research assistants through a standard set of ATI activities (~20 min in length) while at the hospital (i.e., during inpatient hospitalization or emergency department visit). Parents read information and viewed selected video clips about traumatic stress reactions, read and listened to tips from other parents about helping children cope after an injury, and created a personalized care plan for their child based on their ratings of their child’s PTSS. Parents were encouraged to re-visit the ATI website as often as they wished after the initial introduction to the website, and over the next month, they received two emails (with a link to ATI) reminding them that the website was available. While parents were not instructed specifically on how to seek more help for their child, the ATI resource provided this information. For more details on the theory- and evidence-based development of the website, see Kassam-Adams, Marsac, & Winston (2010).

UC Description

UC at the study site, a Level I trauma center, involves comprehensive coordinated services provided by multidisciplinary teams (e.g., surgeons, physicians, nurses, trauma social workers, rehabilitation therapists). The usual psychosocial care includes a social worker who provides services to patients with injuries and their families 4 days per week with 24-hr on-call coverage. Social work services generally include an assessment of the child’s psychosocial functioning, options for counseling specific to medical care, and assistance with community resources. In addition, nursing staff and treating physicians routinely complete informal assessments of psychosocial concerns and are able to request consultation from other hospital-based psychosocial services (e.g., psychiatry, psychology, child life, chaplain) as appropriate.

Measures

The Parent Knowledge Questionnaire-Revised (PKQ-R) (Marsac, Kassam-Adams, Hildenbrand, Kohser, & Winston, 2011) assessed parental knowledge about child reactions post-injury. This questionnaire was developed to ascertain parents’ knowledge of specific aspects of child reactions and appropriate parental assistance. The PKQ-R has been piloted in several past studies to improve item wording and format (Marsac, Kassam-Adams, Hildenbrand, Kohser, & Winston, 2011). The PKQ-R includes nine questions covering the following topics: Normative and problematic stress reactions following pediatric injury, how parents can assist in their child’s recovery, and when to seek additional mental health services for their child. Five items (parent knowledge of normative versus problematic reactions 6–8 weeks after a child’s injury) were rated on a four-point Likert scale (1 = “This is 100% normal and expected,” 4 = “My child would probably need extra help”). The remaining four items were formatted as multiple choice questions and assessed understanding of the best actions parents can take to help their child recover following an injury.

The PTSD Checklist for Children–Parent Report (PCL-C/PR) (Weathers & Ford, 1996) is an 17-item parent-report checklist of child PTSS. Summing item ratings yields a PTSD symptom severity score. Though there is not a recommended cutoff score for clinical significance for the PCL-C/PR, prior studies have used a score of 50 (DeVries et al., 1999) as is recommended for the PCL (Weathers & Ford, 1996). The total symptom severity score of the PCL-C/PR has excellent internal consistency (alpha = .91; in this sample = .85 to .89) and has demonstrated convergent and discriminant validity as a measure of child posttraumatic distress (Daviss et al., 2000a).

PCL (Weathers, Litz, Herman, Huska, & Keane, 1993) was used to assess parent self-reported PTSS. It is a well-validated 17-item questionnaire; summing item ratings yields a PTSD symptom severity score. A severity score of ≥50 on the PCL is considered to be clinically significant (Weathers, Litz, Herman, Huska, & Keane, 1996). The PCL has demonstrated high internal consistency (alpha = .94; in this sample = .89 to .92) and test–retest reliability as well as strong convergent and discriminant validity (Weathers, Litz, Herman, Huska, & Keane, 1993).

The Child PTSD Symptom Scale (CPSS) (Foa, Johnson, Feeny, & Treadwell, 2001) is a 24-item self-report instrument (17 PTSD symptom items and seven items regarding impairment). Summing 17 symptom item ratings yields a PTSD symptom severity score. A severity score of 11 or higher on the CPSS is considered to be clinically significant. The CPSS has shown excellent internal consistency (alpha = .89; in this sample = .77 to .79), test–retest reliability, and convergent validity with structured clinical interview measures of PTSD (Foa, Johnson, Feeny, & Treadwell, 2001). The CPSS has been validated.
for children aged 7–17 years (Foa, Johnson, Feeny, & Treadwell, 2001). In our sample, research assistants administered the scale verbally to 6-year-olds and assisted with comprehension as needed.

For each measure of PTSS (PCL, PCL-C/PR, and CPSS), we used the continuous PTSS severity score in analyses because our outcome of interest is a reduction in PTSS severity. As noted earlier, significant PTSS, regardless of PTSD diagnostic status, are associated with negative outcomes post-injury (Holbrook et al., 2005; Stoddard & Saxe, 2001; Wesson et al., 1989).

Analytic Approach

First, we examined descriptive data for the whole sample and the randomized groups. We used independent samples t-tests to compare mean baseline scores and chi-square analyses to compare categorical variables. Associations between parent knowledge and PTSS outcomes were examined using Spearman’s rho correlations (given skewed distributions of the data). Intervention feasibility was assessed by summarizing the frequency of ATI use as described by parents at follow-up. For the intervention group, difference in parent knowledge pre- to post-intervention was assessed using paired samples t-tests. Hypothesized effects of the intervention on parent knowledge and child PTSS were examined via independent samples t-tests. Effect sizes were calculated using Cohen’s d. To ensure we accounted for baseline scores, analysis of covariance (ANCOVA) were also conducted on knowledge and PTSS scores, with scores at T3 as the outcomes and the baseline scores as a covariates. Additionally, to adjust for non-normality in the data, we conducted logarithmic transformations of outcome variables (knowledge, PTSS) and repeated analyses; results were consistent; therefore, original variable values are presented here for ease of interpretation.

We described the extent of missing data in the full sample, and by the two groups separately. The intent-to-treat (ITT) approach was applied as the primary analyses, which used the last observation carried forward when missing data presented at follow-up assessments. In addition, we also conducted analyses only on those who completed T3 assessments as the secondary analyses. Analyses were conducted with SPSS version 20.

Results

See Tables I and II for a summary of descriptive statistics for the full sample, ATI, and UC groups. For the ITT approach, no significant differences were identified between groups at baseline for child age, length of time since injury, nor any of the study measures; however, intervention group included a slightly smaller proportion of boys (Table I). Results were similar for the completers’ approach, with the exception significantly lower parent-reported child PTSS in the intervention group, t(40) = 2.16, p < .05, d = .54. See Table II.

Missing data are summarized as follows: Overall, 61% of parents and children completed the 6-week follow-up assessment (T3), resulting in 39% missing data. In the intervention group, 56% of parents and 54% of children completed the T3 assessment. In the control group, 68% of parents and 66% of children participated in the T3 assessment. Thus, the intervention group had more missing data than the control group. Using an ITT approach, we retained the majority of the sample, dropping those cases only with measures with <70% completion (n = 2–4).

Parent Knowledge of Potential Injury Reactions and PTSS Outcomes (Hypothesis 1)

Results were mixed for parent knowledge and child and parent PTSS, with small to moderate effect sizes for significant findings. In ITT analyses, parent knowledge of injury reactions at T1 was not related to concurrent child PTSS (self-report: r = −.04, p = ns; parent report: r = −.20, p = ns) but was inversely related to parents’ own symptoms (r = −.25, p < .05). At T3, parent knowledge of injury reactions was inversely related to concurrent self-reported child PTSS (r = −.29, p < .01), parent-reported child PTSS (r = −.20, p ≤ .05), and parent PTSS (r = −.32, p < .01). In completer only analysis, the association of measures at T1 were similar to those earlier in the ITT analyses. However at T3, parent knowledge was not significantly correlated with parent-reported child PTSS (r = .01, p = ns), nor parent PTSS (r = −.10, p = ns).

Intervention Feasibility

Under the guidance of a research assistant, 100% of parents in the intervention group completed the 20-min directed use of the ATI intervention during their child’s hospital visit. This group was encouraged to use additional ATI components following their child’s discharge, and 56% of parents who completed the T3 assessment (n = 25) reported returning to the ATI website. Of those, 100% reported that it was helpful and 50% returned to the site more than once. These parents reported that they spent from 1 to > 15 min engaging with intervention materials on the website. Most (94%) reported reading information on the site, 13% watched videos, 6% completed an additional symptom quiz to rate their child’s reactions, and 13% created another personalized care plan for their child.
Table III for reasons parents returned to ATI and how they found it helpful. Though ATI was publically available at the time of the study, no parents in the UC group reported finding or using the resource during the study period. There were no significant differences in any outcomes for those parents who returned to ATI compared with those who completed only the directed intervention in the hospital.

Immediate Outcomes: Parent Knowledge of Potential Injury Reactions (Hypothesis 2)

Within the intervention group, parent knowledge showed a significant yet modest increase from the baseline assessment to the immediate post-intervention assessment (T2, in ITT analysis $n = 46$, $t(45) = 2.44$, $p < .05$, $d = .22$; in completer analysis $n = 44$, $t(42) = 2.44$ $p < .05$, $d = .24$).

Targeted Longer-Term Outcomes: Intervention Effects on Parental Knowledge and PTSS at T3 (Hypothesis 3 and 4)

Across groups, parental knowledge about pediatric injury reactions substantially increased from baseline to the 6-week follow-up assessment: In ITT $t(93) = 4.78$, $p < .001$, $d = .37$; in completer analysis $t(56) = 5.2$, $p < .001$, $d = .71$. No differences were identified between the ATI and UC groups for parent knowledge, child PTSS, or parent PTSS at the 6-week follow-up. The results from t-tests and ANCOVA were similar, both suggesting no differences between the two groups. See Table I for ITT analysis and Table II for completer analyses.

### Discussion

Study findings highlight a potential role for parent knowledge about child injury reactions: Greater parent knowledge about child reactions following pediatric injury was related to less severe parent PTSS in the early aftermath of the child’s injury. Additionally, greater parent knowledge 6 weeks after their child’s injury was related to less severe concurrent child PTSS. Results for the ITT and the completers’ only approach both confirmed results earlier in the text; however, results for the relationship between knowledge and parent-reported child PTSS and parent PTSS were inconsistent. Because of the magnitude of the missing data in this sample, results remain ambiguous, and more research is needed to confirm findings. A recent meta-analysis by Kramer and Landolt (2011) found that psycho-education can be a helpful preventive intervention following a single acute trauma in children; findings from the current study could support this conclusion, but a causal relationship between parent knowledge and PTSS is unclear. Given the current study findings, targeting knowledge alone may not be sufficient to achieve the goal of preventing psychological symptoms.

The ATI intervention was created based in theory and empirical evidence. ATI was carefully examined throughout its development to ensure usability, functionality, and user engagement (N. Kassam-Adams, Marsac, & Winston, 2010; Kassam-Adams, Hildenbrand, Kohser, & Winston, 2011). The current study evaluated the immediate impact (knowledge gains) and longer term outcomes (sustained knowledge gains, child and parent PTSS) of the ATI intervention. By having parents participate in the ATI

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**Table III. Utility of ATI Website Following Child Hospital Discharge**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parent responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons parents returned to ATI</td>
<td>Study participation/Received an e-mail reminder.</td>
</tr>
<tr>
<td></td>
<td>To answer a question.</td>
</tr>
<tr>
<td></td>
<td>Seeking information on child’s emotional reactions (new fears, school problems).</td>
</tr>
<tr>
<td></td>
<td>Identified ATI while searching the Internet.</td>
</tr>
<tr>
<td>What parents were seeking</td>
<td>General injury and injury recovery information.</td>
</tr>
<tr>
<td></td>
<td>Information about child’s emotional reactions.</td>
</tr>
<tr>
<td></td>
<td>Information about somatic symptoms (nightmares, fatigue).</td>
</tr>
<tr>
<td></td>
<td>Tips to facilitate discussion with child.</td>
</tr>
<tr>
<td></td>
<td>Care plan to re-assess child’s reactions.</td>
</tr>
<tr>
<td>How ATI was helpful</td>
<td>Offered information about reactions to monitor post-injury.</td>
</tr>
<tr>
<td></td>
<td>Enabled parent to complete another care plan to re-assess child’s recovery.</td>
</tr>
<tr>
<td></td>
<td>Provided generally useful or interesting information.</td>
</tr>
<tr>
<td></td>
<td>Helped parent learn specific questions to ask to assess child’s posttraumatic stress symptoms.</td>
</tr>
<tr>
<td></td>
<td>Provided information about injury recovery.</td>
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<tr>
<td></td>
<td>Reinforced knowledge about posttraumatic stress.</td>
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</tbody>
</table>
intervention while their child was in the hospital, 100% of the parents completed the intervention. Thus, this may be a good way to reach this population. As demonstrated in a previous evaluation of this web-based intervention (Marsac, Kassam-Adams, Hildenbrand, Kohser, & Winston, 2011), current study results suggested an immediate yet modest increase in knowledge following the use of ATI. However, participation in ATI did not predict outcomes at the 6-week follow-up (in ITT or completer analysis). Although the intervention group maintained knowledge gains and continued to increase in their knowledge in the 6 weeks following the ATI intervention, the control group demonstrated a similar increase in parent knowledge of injury reactions. These findings suggest that parents engage in some natural learning in the weeks after their child sustains an injury. Given that parents regularly confront stressful situations in raising their children, it is likely that many are accustomed to learning new skills to support their child throughout his/her development and the challenges he/she faces. Another possible factor is the high-quality UC at the study hospital (which is family-centered and trauma-informed): The nature of this care may contribute to increasing parent knowledge about children’s reactions post-injury. It is possible that use of the ATI intervention expedites the process of parental learning; however, additional research is needed to explore this possibility. In complete analysis only, the ATI group had significantly lower parent-reported PTSS than the control group at baseline, which could contribute failure to detect intervention effects. However, given other analyses that take into account baseline scores, it is unlikely that this finding is meaningful.

Although many parents reported that the intervention materials were helpful and returned to ATI for guidance following their child’s discharge from the hospital, the intervention was not effective in preventing PTSS in children or their parents. Examining these study results in the context of findings from other studies of psycho-educational interventions, it may be that providing education only to parents and not to children with injuries is not sufficient for affecting PTSS, particularly in children. Past research has identified decreased anxiety in children (Kenardy, Thompson, Le Brocque, & Olsson, 2008) and decreased PTSS in parents (Cox & Kenardy, 2009) when providing both children and parents with information. Neither of these studies (Cox & Kenardy, 2009; Kenardy, Thompson, Le Brocque, & Olsson, 2008) found decreased PTSS in children. Although the ATI intervention included information and personalized tips for parents, it may be that adding information and activities for children or more focused skills training for parents would be helpful in preventing symptoms. Because the current study solely assessed PTSS, it is unclear whether the ATI intervention may affect other psychological symptoms.

Findings from the current study reiterate the importance of conducting careful evaluations throughout the development of psycho-educational resources. Evaluations conducted for ATI to date suggest that parents find the intervention engaging, easy to use, and helpful. Findings demonstrate an increase in parental knowledge immediately following use of ATI. As ATI was developed using accurate evidence-based information and parents find the information helpful and informative, there may be a role for ATI in promoting child recovery from injury. However, results from this study suggest that steps should be taken to continue to improve the ATI intervention toward the overarching goal of reducing child and parent PTSS. Considering recent developments in preventive care, future improvements to ATI may include adding a child component (Cox & Kenardy, 2009; Kenardy, Thompson, Le Brocque, & Olsson, 2008) as well as a section that focuses on parent–child communication about injury reactions (Berkowitz, Stover, & Marans, 2011).

Limitations

All participants from this study received treatment at one hospital, which provides family-focused care and includes psychosocial support for families as indicated. Thus, it is possible that the UC condition represented a high standard with which to compare the ATI intervention. In addition, our data on parent use of ATI following their child’s discharge are limited to self-report about use, as parents were not required to log-in to use the resource. Conducting the follow-up assessment over the phone may have influenced some parents to provide socially desirable responses regarding their use of ATI post-discharge. Although ATI aims to educate parents about when to seek professional help for children’s trauma symptoms, this study did not conduct a systematic evaluation of follow-up services that parents sought for their children.

Consistent with previous findings (Marsac, Kassam-Adams, Hildenbrand, Kohser, & Winston, 2011), parent knowledge of injury reactions was high at baseline, creating a possible ceiling effect. Information is limited on the psychometric properties of the PKQ-R, as this is a relatively new measure. It is also possible that study participation (i.e., the baseline assessment) was educational in and of itself. For example, rating their own and their child’s PTSS may have helped parents become more aware of symptoms or reactions to look for as their child recovered. If this is the case, both intervention and control groups may have been influenced by the assessment process. The self-report
of PTSS in the 6-year-olds should be interpreted with caution, as the questionnaire has not been validated for this age group, and the children had assistance from research assistants in answering these questions. Finally, on a positive note, children and parents participating in the study presented with sub-clinical levels of PTSS, and few had significant symptoms at follow-up. Thus, with low levels of PTSS in this study group creating a floor effect, the ATI intervention did not have much opportunity to prevent symptom persistence. For those few children and parents presenting with high levels of PTSS, ATI may not have been powerful enough to affect these symptoms.

**Recommended Next Steps**

Given the observed relationship between parent knowledge and PTSS in the current study, future research should examine ways to strengthen ATI and other psycho-educational interventions to ensure significant and sustainable gains in parent knowledge. Gaining a better understanding of how parent knowledge naturally evolves and the extent to which interventions should target parent knowledge during the early aftermath of their child’s injury would help to better inform development of interventions that target parent knowledge and skills. Recent meta-analyses suggest that tools to facilitate children’s coping skills may be an important element in prevention of child PTSS (Kramer & Landolt, 2011); therefore, targeting coping skill may be a key ingredient. Finally, with the increasing accessibility of web-delivered interventions, research should examine the best methods for conducting studies online and effectively disseminating these interventions once they have been thoroughly evaluated.

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