

## Pediatric Medical Traumatic Stress

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### ABSTRACT

Pediatric medical traumatic stress is a newly emerging term in the literature that is used to describe the impact of negative health care experiences on children and their families. The aim of this scoping review is to explore the health care conditions in which the pediatric traumatic stress framework has been described and what is known about the experiences of children and families who are facing pediatric medical traumatic stress. Best practices for conducting a scoping review were utilized which included the preferred reporting items for systematic reviews and meta-analyses extension checklist for scoping reviews (PRISMA-ScR). Following the inclusion and exclusion criteria, 16 articles were included in this review. Results demonstrate a lack in the knowledge around variants within health condition, developmental stage, pre-existing factors, the longevity of symptoms, child reports on trauma, and how trauma can impact future health care.

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Pediatric medical traumatic stress (PMTS) is described as trauma resulting from negative medical experiences which can have a devastating effect on both the child and their family, as well as impact future hospital visits (Kazak et al., 2006). PMTS is not viewed as a traumatic stress disorder, but rather as post-traumatic stress symptoms (PTSS), in which a variety of symptoms of post-traumatic stress disorder (PTSD) may be present without meeting the full diagnostic criteria for PTSD (Kazak et al., 2006). Identifying the varying symptoms of PTSD has shown to be more supportive to patients and families than looking at the psychiatric diagnosis alone (Kazak et al., 2006). In order to develop an understanding of the unique aspects of trauma symptoms in children that are caused by a medical

event, the term PMTS was developed to describe these symptoms within a pediatric medical context (Ari et al., 2018). The definition was developed from research and clinical experience of trauma specifically related to health care (Kazak et al., 2006), and is defined as

a set of psychological and physiological responses of children and their families to pain, injury, serious illness, medical procedures, and invasive or frightening treatment experiences. Medical trauma may occur as a response to a single or multiple medical events (The National Child Traumatic Stress Network, 2003, para 1).

These responses may include re-experiencing, arousal, or avoidance symptoms (The National Child Trau-

matic Stress Network, 2003). PMTS is understood as a framework that brings a new understanding of how injury, medical procedures, illness, and treatment can impact children and families (Kassam-Adams, 2006). The PMTS framework provides the opportunity to widen the understanding of the impact of medical events on children and their families (Kassam-Adams, 2006).

### **Post-traumatic Stress Disorder, Post-traumatic Stress Symptoms, Acute Stress Disorder, and Pediatric Medical Traumatic Stress**

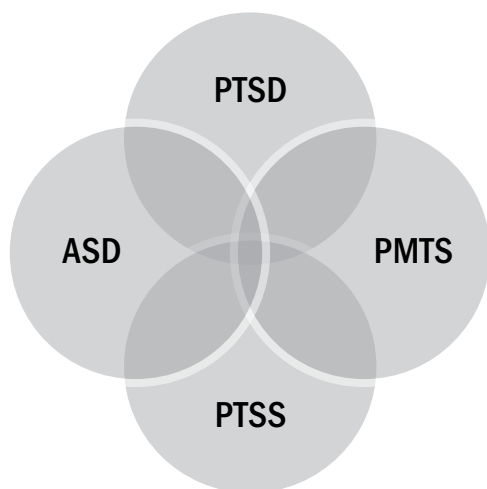
There are similarities in the symptoms that are present between post-traumatic stress disorder (PTSD), post-traumatic stress symptoms (PTSS), acute stress disorder (ASD), and PMTS, but also defined distinctions. PTSD is a psychiatric disorder that involves disturbing or distressing symptoms after exposure to a traumatic experience (Kessler et al., 2012). Symptoms include avoidance of stimuli, changes to mood and condition, as well as notable changes to arousal and reactivity that last for more than a month after trauma exposure and are not attributed to other factors (Barnes et al., 2021). ASD is also a psychological disorder, with diagnosis involving exposure to trauma and experiencing nine or more symptoms from the diagnostic categories (negative mood, intrusion, dissociation, avoidance, and arousal) that last anywhere from three days to one month after the traumatic exposure and are not attributed to another condition (Barnes et al., 2021). ASD diagnosis is utilized before

PTSD can be diagnosed (within one month of symptoms) or as a predictor of the potential development of PTSD (Bryant, 2018). PTSS and PMTS are not viewed as psychological disorders but as the symptoms associated with PTSD. These symptoms include avoidance, arousal, and re-experiencing. While they have overlapping elements, PMTS is understood more specifically with these symptoms which are related only to medical trauma in a pediatric population (Kazak et al., 2009).

The majority of trauma research in pediatric health care focuses on PTSD, ASD, and PTSS, which may be due to the fact that there is currently no standardized measure for PMTS (Ari et al., 2019). There is a dearth of research that examines traumatic stress within the context of the PMTS framework; however, there are currently no reviews in the literature focusing specifically on the PMTS framework alone for understanding children and family's experiences and its presentation across health care conditions. As Certified Child Life Specialists (CCLSs) support children and families through their healthcare experiences, increased understanding of how PMTS has been described in the literature and the specific conditions studied aids in identifying gaps in the knowledge base, allow for further clarification of the presentation of PMTS, as well as expand the knowledge around how to support children and families within a health care setting.

### **Introduction to Scoping Review**

A scoping review was undertaken to explore the existing evidence of the application of the PMTS framework. Colquhoun et al. (2014) define a scoping review or scoping study as “a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting and synthesizing existing knowledge” (p.5). The mapping of research knowledge is an important exercise in health care research, and scoping reviews are becoming an increasingly favorable way to present research (Colquhoun et al., 2014). Scoping reviews have been heavily adapted in health care research and have advantages over other traditional literature reviews as they allow for systematic searches of emerging evidence bases (Minaker



**Figure 1** *Overlapping Elements of Trauma*

et al., 2016). Scoping reviews are often completed to identify the range, nature, and extent of existing literature, as well as to identify gaps where no previous research has been conducted (Arksey & O'Malley, 2005; Levac et al., 2010). Arksey and O'Malley (2005) were among the first to publish a framework for providing methodological guidance to undertaking a scoping study. Levac et al. (2010) furthered the understanding of the framework to guide scoping reviews, and the Joanna Briggs Institute (JBI) subsequently published a document to support existing direction on conducting a scoping review (Peters et al., 2015). In 2018, the preferred reporting items for systematic reviews and meta-analyses developed an extension checklist for scoping reviews (PRISMA-ScR; Tricco et al., 2018, appendix 1). All of the above will provide a methodological guide and format for the current scoping review, focusing on the framework originally proposed by Arksey and O'Malley (2005) which includes these six steps:

1. Identify the research question: mapping out the research question that is sought to be answered; this should be clearly defined and broad in nature;
2. Identify relevant studies: identify relevant studies and make decisions for where to search (e.g., language, sources, and time span);
3. Study selection: select studies based on inclusion and exclusion criteria;
4. Chart the data: extraction of data from relevant literature;
5. Collate, summarize, and report results: a framework that is analytically or thematic to provide an overview of the literature; and
6. Consultation: this stage is optional and provides opportunities for stakeholder involvement to provide insights beyond the literature.

## Methods

### Research Question

The aim of a scoping review is not to strive for answers to very specific questions or to comment on the quality of the studies included (Arksey & O'Malley, 2005). Instead, scoping reviews involve the posing of broad research questions, to support a summation of the ev-

idence base (Levac et al., 2010). This scoping review aimed to address the following questions:

1. In what health care conditions has the pediatric medical traumatic stress framework been described in the literature?
2. What is known about child and family experiences of pediatric medical traumatic stress?

### Study Identification

An extensive search of PUBMED, Embase, and PsycINFO databases was undertaken using a combination of keywords and synonyms as noted in Table 1.

**Table 1** Search Terms and Synonyms

'paediatric medical traumatic stress'	'children'	'hospitalization'
or	or	or
'pediatric medical traumatic stress'	'child'	'hospital'
or	or	or
'PMTS'	'paediatrics'	'healthcare'
	or	or
	'pediatrics'	'illness'

Once the search was completed and appropriate articles were obtained, key journals were searched for relevant primary studies, in addition to systematic and other forms of literature reviews as recommended by Arksey and O'Malley (2005). All studies were identified through a review of the title and abstract and evaluated against the inclusion and exclusion criteria. If they met the criteria, the full text articles were retrieved for further screening.

### Inclusion Criteria

1. Include children's or caregivers' experience of PMTS in a health care context;
2. Include children aged birth-17 years old or their families with PMTS; and
3. Published between 1990 and 2020.

### Exclusion Criteria

1. Articles published in languages other than English;
2. PMTS with children or families outside of a health care context such as natural disasters or abuse;
3. PMTS not involving experiences of children between birth and 17 years old and families;

4. Studies involving practitioners' experiences of PMTS; and
5. Studies not directly referring to PMTS and its framework, including studies looking specifically at PTSS, ASD, and PTSD exclusively.

### Study Selection

Article titles and abstracts were searched to determine eligibility against the identified inclusion and exclusion criteria. A full text article of any study that mentioned PMTS in the title or abstract was obtained for further screening. To limit bias within study selection, several provisions were put in place. These included:

- Agreement on the search string and databases;
- Agreement of inclusion and exclusion criteria;
- Agreement of PRISMA diagram;
- Independent review and extract of three papers to agree articles are appropriate; and
- Review of papers in which the reviewer was uncertain and came to a team consensus.

### Charting Data

Ritchie and Spencer (1994) describes this stage of the review as interpreting, sorting, and charting material according to key themes (Arksey & O'Malley, 2005). The following pieces of data were extracted from each study including: authors, date published, country of author origin, aims, methods, sample size, and results (Table 2). This data was then put into an excel database to allow for analysis (Arksey & O'Malley, 2005).

## Results

In total, 595 potential papers were identified through the initial database search and an additional one was identified in a subsequent search. After excluding 163 duplicates, 433 articles remained for further screening by abstract and title against the inclusion and exclusion criteria. Of these, 406 articles were excluded, leaving 27 full text articles to be screened. Following full-text screening, 16 papers were selected for inclusion (Figure 2).

Based on the country of the lead author, most papers derived from the United States (Figure 3). The papers were published between 2006 and 2019. Eight of the papers were review articles, research studies accounted for five, conference proceedings were two, and a case study was the remaining paper. The results of the

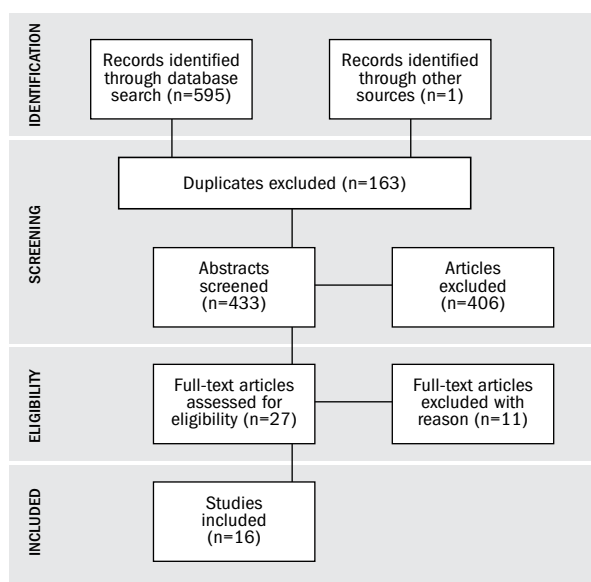


Figure 2 PRISMA Flow Chart

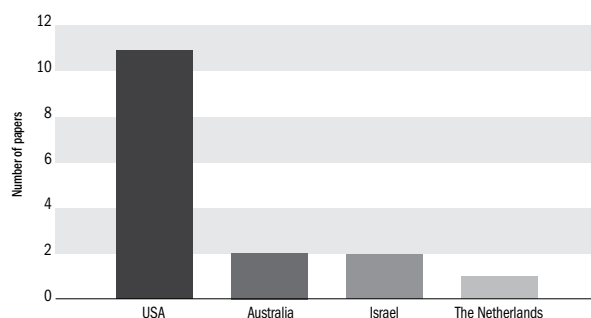


Figure 3 Prevalence of Countries

review are presented in three key categories: identification and assessment of symptoms, pediatric health conditions, and interventions.

### Identification and Assessment of Symptoms

Kazak and colleagues (2006) developed the first model aimed at assisting in the assessment and identification of PMTS. The model was developed out of a lack of understanding how medical trauma may unfold over various points in the course of pediatric illness (Kazak et al., 2006). The *integrative model of pediatric medical traumatic stress* is a therapeutic model which breaks down the expected pathway most families experience during a traumatic medical event into three phases (Kazak et al., 2006). The model aids in explaining the psychological impact that PMTS can have on both children and families (Kazak et al., 2006), and provides a structure for describing how children and families may adapt to medical challenges over time; supports the identification of symptoms; and guides

Table 2 Data Extraction

Author	Date	Title	Country	Aim
Kazak et al.	2006	Integrative model of pediatric medical traumatic stress	USA	To guide assessment and intervention for patients and families, construct a model for assessing and treating pediatric medical traumatic stress by integrating the literature across pediatric conditions
Pai & Kazak,	2006	Pediatric medical traumatic stress in pediatric oncology: family systems interventions	USA	To review family systems interventions in pediatric oncology with a focus of reducing PMTS across the family unit
Vermaes et al.	2008	PMTS and stress response sequences in parents of children with spina bifida	The Netherlands	To test the presence and course of PMTS symptoms in parents of children with spina bifida
Jordan et al.	2013	Maternal report of infant emotional well-being following their infant's hospitalization for neonatal cardiac surgery	Australia	To investigate if infants exhibited emotional and behavioral dysregulation of traumatic responses post cardiac surgery in their first 3 months of life
McGarry et al.	2013	Pediatric medical trauma: The impact on parents of burn survivors	Australia	There were three aims: i) Investigate the psychological profiles of parents exposed to PMTS; ii) Identify the impact that pre-existing factors of distress have on parents; and iii) Examine the association between resilience and risk of increased psychological distress
Bergeron	2016	Factors that support the use of child-parent psychotherapy as an intervention for child-parent dyads to pediatric medical traumatic stress	USA	To explore the literature around clinical interventions for young children who have experienced PMTS
Guvenek-Cokol et al.	2016	Medical traumatic stress: A multidisciplinary approach for iatrogenic acute food refusal in the inpatient setting	USA	To examine food refusal in the context of medical traumatic stress of a 5-year-old girl and demonstrate treatment interventions
Price et al.	2016	Systematic review: A reevaluation and update of the integrative (trajectory) model of pediatric medical traumatic stress	USA	To re-evaluate, review, and update the integrative model of pediatric medical traumatic stress
Ari et al.	2018	Surgical procedures and pediatric medical traumatic stress (PMTS) syndrome: Assessment and future direction	Israel	To assess the frequency and characteristics of psychological symptoms persisting 3 months after hospitalization in a pediatric surgery ward
Yagiela et al.	2018	Reframing pediatric cardiac intensive care outcomes: The importance of the family and the role of pediatric medical traumatic stress	USA	To explore the experiences and outcomes of families and children admitted to an intensive care unit for cardiac disease

Method	Sample	Results/Findings
A model of PMTS is developed through review of literature	Not stated	The paper developed a 3-phase model to support the identification of symptoms, assessment, and intervention of children and families suffering with PMTS across conditions. This model was the first to support the development of assessment and intervention for PMTS.
Review	Not stated	The findings show that the integrative model of pediatric medical traumatic stress is useful for understanding psychological consequences of pediatric oncology and beyond treatment. Interventions for PMTS were acknowledged, including: The Surviving Cancer Competently Intervention Program (SCCIP), The Surviving Cancer Competently Intervention Program-Newly Diagnosed (SCCIP-ND), and the Problem-solving Skills Training (PSST). All are promising when working with PMTS within oncology.
Parental report Two part qualitative study Semi-structured clinical interviews	Study 1: 23 parents with a new-born diagnosed with spina bifida within 3 months of age  Study 2: 58 parents of school-aged children with spina bifida	Study 1: While reporting symptoms of intrusion and arousal, their symptoms weren't intense or frequent enough to be described as PMTS.  Study 2: Significant amount reported the highest levels of PMTS were found at spina bifida diagnosis. Symptoms of PMTS were shown to decrease between diagnosis and the first 4 years of the child's life.
Qualitative study Parental highly structured interviews and questionnaire	97 mothers of infants under 3 months who had cardiac surgery.	The responses of the mothers described three types of infants: those who appear happy with no behavior or emotional problems, those that appear mainly happy but have an area of difficulty, and infants who have significant issues in relation to emotion and/or behavioral problems.
Parental report Utilization of 4 screening tools around different facets of PMTS (the Connor Davidson resilience scale, the impact of events scale revised, the depression and anxiety scale, and the screening tool for early predictors of PTSD)	63 parents of children with a burn requiring at least one night stay in hospital	Findings suggest parents of children who have sustained a burn will experience significantly more symptoms of PTSD than the general population in the USA. Significant distress is experienced in the first week of a burn incident. Parents reported lower levels of resilience and more symptoms of depression and anxiety.
Review	Not stated	The findings show that while there is research in the area of trauma-informed cognitive behavior therapy, it may not be appropriate for younger children with PMTS. For PMTS in younger children under the age of 5 years, the use of child-parent psychotherapy (CPP) may be better aligned and allow for a focus on therapy that incorporates play and is flexible.
Case study	1 child aged 5 years	Findings suggest that multidisciplinary team is important to support patients facing trauma. Behavior intervention, family support, and decreasing medical trauma are valuable interventions.
Systematic literature review	216 papers	The findings demonstrate that the new evidence base supports the assumptions of the integrative model of pediatric medical traumatic stress and puts a new assumption based on the literature. In line with new evidence, the model was updated and renamed the integrative (trajectory) model of pediatric medical traumatic stress.
Prognosis study. Parental report via questionnaires (demographic questionnaires, Achenbach's child behavior checklist, assessment of PTSD symptoms, the post-traumatic stress disorder semi structured interview, the preschool children's assessment of stress scale) over the phone 3-5 months post discharge	Parents of 79 children aged 1-6 years from a range of conditions requiring pediatric surgery including; gastroenterology, urology, dermatology, ENT, ophthalmology, orthopedics, cardiology, neurology, nephrology, cardiology, combined conditions and other conditions	Showed that a significant amount of children in the sample were shown to suffer from psychological stress following surgery, per parental response.
Review	Not stated	Findings suggest that parental support is required, specifically interventions that support psychological and emotional health of parent and build on resiliency skills. Following the integrative model of pediatric medical traumatic stress, it supports that parents may be impacted by pre-existing factors prior to admission and appropriate assessment and intervention is required.

Table 2 Data Extraction (continued)

Author	Date	Title	Country	Aim
Ari et al.	2019	Traumatic stress among school-aged pediatric surgery patients and their parents	Israel	To assess prospectively the prevalence and characteristics of PMTS in school-aged children and their parents following hospitalization in a general pediatric surgery ward
Cuneo, Perito, et al.,	2019	Medical traumatic stress in pediatric patients with cystic fibrosis	USA	To show the prevalence and predominant symptoms of PMTS in children and adolescents with cystic fibrosis (CF)
Cuneo, Perito, et al.	2019	Medical traumatic stress in pediatric patients with chronic pancreatitis	USA	Identify the prevalence and predominant symptoms of PMTS in children and adolescents with chronic pancreatitis
Christian-Brandt et al.	2019	When treatment is traumatic: An empirical review of interventions for pediatric medical traumatic stress	USA	To review literature on PMTS using a developmental framework and identify gaps
Lakatos et al.	2019	Child-parent psychotherapy with infants hospitalized in the neonatal intensive care unit	USA	To describe the use of CPP within the neonatal intensive care unit (NICU) to show it can be adapted for use with infants who have experienced PMTS
Yagiela et al.	2019	Parent medical traumatic stress and associated family outcomes after pediatric critical illness: A systematic review	USA	To summarize literature on parental medical traumatic stress from a child's critical illness requiring PICU admission

the development of interventions that are targeted specifically for PMTS (Kazak et al., 2006). The model consists of three phases that aim to support in the identification of PMTS from addressing early experiences of trauma, reducing distress, and identifying longer term trauma that may persist to PTSD (Kazak et al., 2006).

Within phase I (peri-trauma), it is believed that pre-existing factors of the child and family can make them more vulnerable to the development of PMTS symptoms, which interact with the characteristics of a medically traumatic event (i.e., feelings of horror, helplessness, or life threat; Kazak et al., 2006). Phase II (early, ongoing, evolving) involves the continued experiences of trauma related to the trigger medical event. These can include responses and symptoms that are ongoing such as pain, memories of treatment, or worries for the future (Kazak et al., 2006). Phase III (long-term) looks at long-term PMTS involving trauma symptoms that have not subsided over time (Kazak et al., 2006). Due to the lack of PMTS specific research, the model was developed from studies

conducted around PTSS and PTSD within a medical setting and across illness groups. It stresses the need to view PMTS in the context of a family and is centered on five main assumptions:

1. Potentially traumatic medical events have similarities across illness or injury groups;
2. There are a variety of normal reactions to traumatic medical events;
3. Children and families can have pre-existing psychological issues;
4. A developmental outlook is required for thinking about trauma related to children; and
5. A social-ecological or contextual approach is ideal (Kazak et al., 2006).

To review if further developments had emerged since the creation of the *integrative model of pediatric medical traumatic stress*, a systematic review of 216 papers was undertaken to examine if the model needed to be updated (Price et al., 2016). Literature was in-

Method	Sample	Results/Findings
Parental report via questionnaires (demographic questionnaire, Achenbach's child behavior checklist, University of California at Los Angeles-PTSD reaction index: DSM-V version, and posttraumatic stress diagnostic scale)	Parents of 88 children (aged 6-13 years) of mixed medical conditions (orthopedics, urology, dermatology, gastroenterology, neurology, cardiology, ENT, nephrology, combined reasons, and other reasons)	Findings show that both children and their parents are vulnerable to traumatic symptoms following hospitalization and found a correlation between parents and child distress.
Conference abstract Single-center, cross-sectional survey using the validated UCLA PTSD-Reaction Index and the Impact of Events Scale - Revised	21 children and adolescents aged 8-21 years	The responses reported they experienced events that they perceived as traumatic during health care, and one-third of the responses reported arousal symptoms.
Conference abstract Single-center, cross-sectional survey using the validated UCLA PTSD-Reaction Index and the Impact of Events Scale - Revised	21 children and adolescents aged 8-21 years	Over half reported consequential PMTS symptoms, particularly arousal and intrusion symptoms. Within these symptoms categories, patients reported frequent sleep disturbance and concentration problems.
Systematic literature review	16 papers	Findings show that the literature was mixed when thinking about PMTS with a developmental framework, and further studies are needed looking at children's cognitive and development stages. When looking at interventions, cognitive behavior therapy was found to be part of the base of the majority of interventions for PMTS.
Review	Not stated	The findings show that CPP can be adapted to be used in the NICU and may have promise in being able to support PMTS in infants.
Systematic review	23 papers	Findings show that parent and family outcomes of developing PMTS after an admission for critical illness are affected by various factors. These factors include pre-existing factors, their experience being hospitalized, and stressors post-hospitalization.

cluded with studies that examined traumatic stress, ASD, or PTSD related to children or families within health care (Kazak et al., 2006). The review found developments in the research that furthered our understanding of additional pediatric populations such as burn victims, diabetes, cardiology, brain injury and premature infants, as well as the relationship between child and parent PMTS and the impacts of PMTS on future health outcomes. With the new evidence in the way PMTS is experienced, an additional assumption was put forward. The new assumption held that PMTS impacts future health outcomes, and a new model was developed and renamed as the *integrative (trajectory) model of pediatric medical traumatic stress* (Price et al., 2016). This updated model also consists of three phases that were renamed (phase I: peri-trauma, phase II: acute medical care, phase III: ongoing care or discharge from care), emphasizing the varying clinical changes in medical care that can vary across illness groups and potentially traumatic events (Price et al., 2016). As well as introducing four trajectories (resilient, recovery, chronic, and escalating PMTS), these changes were made to show the variability in

the psychological impacts and responses to illness and injury (Price et al., 2016). The new model also highlights important developments in the evidence of experiences of trauma and childhood health. These changes include:

1. PMTS symptoms can move across the phases at different rates, in relation to timing and the course of medical events; procedures and treatment can also vary across various health conditions;
2. Identifies individual assessments aimed at reducing possible risk for PMTS;
3. The addition of trajectories of PMTS in line with recent evidence;
4. Confirms a skills-based approach is required to support children and families with PMTS;
5. Stresses the importance of viewing PMTS within the context of family; and
6. Updated the intervention and identification implications (Price et al., 2016).



The two PMTS models are important foundations for understanding the potential stages that children and their families may experience in order to support the identification of symptoms to aid in the implementation of therapeutic interventions. Missing the initial signs can lead to trauma progression and worsening symptoms, which could result in children and families meeting the full criteria for PTSD (Kazak et al., 2006; Price et al., 2016). There is also an identified need for a validated screening tool to identify patients who are at risk of developing PMTS, to aid in the support of early identification and implementation of appropriate support (Ari et al., 2018; Yagiela et al., 2019). As no such tool exists, a study is being conducted to develop a measurement tool specific to PMTS (Ari et al., 2018).

### **Pediatric Health Conditions**

Nine of the 16 papers focused specifically on the experiences of PMTS within different patient groups. These diagnostic groups included oncology (Pai & Kazak, 2006), cardiac conditions (Jordan et al., 2013; Yagiela et al., 2018), pediatric intensive care unit (Yagiela et al., 2019; Yagiela et al., 2018), chronic pancreatitis (Cuneo, Ly, et al., 2019), spina bifida (Vermaes et al., 2008), cystic fibrosis (Cuneo, Perito, et al., 2019), food refusal (Güvenek-Cokol et al., 2016), and burn victims (McGarry et al., 2013). A further two of the articles included children from a pediatric surgery group from various medical conditions (Ari et al., 2019; Ari et al., 2018).

Ari et al. (2018) examined PMTS symptom experiences in children from a range of conditions requiring pediatric surgery. PMTS symptoms demonstrated in this population include 55.7% of children who suffered from symptoms of re-experiencing. Of those children, 30.4% demonstrated avoidance, and 32.9% displayed symptoms of arousal (Ari et al., 2018). A further 15.6% of parents also reported that they were very concerned about their child's difficulties with separation since the surgery, with 28.9% reporting that their child was more attached to family members (Ari et al., 2018). In addition, 22.1% of parents reported that their child now reacts with panic to any sudden changes, even those outside of the health care context, and a high number of the children suffered from psychological distress following discharge from the hospital (Ari et al., 2018). A second study conducted in pediatric surgery explored the characteristics and prevalence of PMTS across children and their parents

(Ari et al., 2019). It was identified that over 10% of children met the Diagnostic and Statistical Manual of Mental Disorders' (DSM-V) PTSD criteria for diagnosis, and a further 26.4% partially met the criteria (Ari et al., 2019). The findings showed high rates of post-traumatic distress for both children and parents post-surgery, with the majority of parents noting their children's hospital admission as the main traumatic event (Ari et al., 2019). These findings highlight the impact that the medical environment has on both child and parent. Recognition of the impact on parents is important for understanding how their level of stress impacts their child's experiences and their ability to support them (Yagiela et al., 2018).

Yagiela et al. (2018) described the need for parental support to aid in emotional and psychological health and resilience of a child following the admission to a pediatric intensive care unit (PICU). The authors found that negative child outcomes correlated with parents with PTSD symptoms (Yagiela et al., 2018). There appears to be a link between parental anxiety and child PMTS symptoms, and the consideration of parental PMTS symptoms has been identified in various patient groups (Ari et al., 2019; Ari et al., 2018; Christian-Brandt et al., 2019; Güvenek-Cokol et al., 2016). Vermaes et al. (2008) examined PMTS symptoms in parents with children who have spina bifida.

Parents of newly diagnosed infants reported symptoms of intrusion and arousal; however, symptoms were not described as sufficiently intense or recurring to be viewed as PMTS (Vermaes et al., 2008). However, parents with school-age children with spina bifida were asked to describe the stage of the condition that they thought they had the highest levels of trauma; the participants identified the stage following the initial spina bifida diagnosis (Vermaes et al., 2008). This was in contrast to the reports of parents currently in the initial stages of diagnosis, showing the parents might not be aware of symptoms at the time due to the shock or not being able to recognize the symptoms (Vermaes et al., 2008). In a study of children who had experienced burn trauma, McGarry et al. (2013) found that parents reported lower levels of resilience and experienced psychological distress that was significant within a week of their child's burn injury. Vermaes et al. (2008) further identified that symptoms of PMTS were shown to decline between diagnosis and the first four years of the child's life. These findings may indicate that parents may have their highest rates of trauma at initial diagnosis (McGarry et

al., 2013; Vermaes et al., 2008). This could be due to children getting older and having less reliance on their parents, having developed a routine, understanding of the condition, having reduced uncertainty, or parents who have accepted the condition and its impacts over time (Vermaes et al., 2008). However, the longevity of symptoms of PMTS is currently unknown. Pai and Kazak (2006) identified that symptoms can persist after cancer treatment and when patients are in remission. This was the only article that identified that PMTS symptoms in children and families can continue to impact functioning long after discharge from medical care.

Only two papers involved children directly as participants, via a survey, which questioned them about their experiences of trauma. A pilot study conducted by Cuneo et al. (2019a) found 80% of children and young people suffering with chronic pancreatitis reported that they had experienced a frightening hospital experience. The most common PMTS symptoms reported were intrusion and arousal symptoms. A similar finding showed that 76% of patients with cystic fibrosis reported they had a traumatic event during a health care experience, 62% reported they had a painful or scary medical trauma experience, and one-third of the responses reported arousal symptoms (Cuneo, Perito, et al., 2019). Along with health conditions, a child's age may also impact the PMTS symptoms experienced. Jordan et al. (2013) found PMTS symptoms of alarm and avoidance were present in infants after cardiac surgery when presented with reminders of medical trauma, even in those that appear generally happy. This study highlighted that even infants under three months of age are susceptible to PMTS and their perception of the environment shouldn't be underestimated (Jordan et al., 2013).

The developing evidence is indicating that symptoms of PMTS can differ among health conditions and developmental stage. Some studies have found re-experiencing to be the most common symptom (Ari et al., 2018; Vermaes et al., 2008). It is unclear if these differences are due to age or health condition group, highlighting the need for further research to develop an understanding of the variances with symptom presentation.

### **Therapeutic Interventions**

There are currently no accepted standardized interventions specifically aimed at reducing PMTS symp-

toms. However, eight of the 16 papers discussed intervention techniques which may aid in supporting children and parents suffering with PMTS.

Christian-Brandt et al. (2019) identified varying approaches to PMTS interventions, with the most popular being cognitive behavior therapy (CBT), which demonstrated mixed evidence on effectiveness at reducing PMTS. CBT that is trauma focused (TF-CBT) has been shown to have benefits in supporting those who have experienced medical trauma (Ari et al., 2018; Bergeron, 2017). However, some concerns have been raised on its effectiveness when utilized with younger children due to cognitive understanding and lack of evidence for children under five years of age (Bergeron, 2017). When working with children it is imperative to consider their development capabilities, and as TF-CBT uses factors that involve emotional regulation, memory and language, this questions its transferability for younger children (Bergeron, 2017). Bergeron (2017) recommended using child-parent psychotherapy (CPP) as an intervention for PMTS when working with children from birth to five years. This is due to its flexibility and play-focused techniques that start simple and work with the family's needs (Bergeron, 2017; Lakatos et al., 2019). Similarly, Lakatos et al. (2019) discussed the potential benefits of utilizing CPP with infants for the support of PMTS. Further research in this area is required to determine if this is an effective technique for working with children and families experiencing PMTS.

The most promising findings were in studies that utilized interventions which were self-guided, online, or time-limited (Christian-Brandt et al., 2019). Guvenek-Cokol et al. (2016) recommended creating a consistent environment, decreasing medicalization, establishing medical play, implementing behavioral plans with positive reinforcement, and the importance of utilizing the multidisciplinary team. Furthermore, Christian-Brandt et al. (2019) found that interventions should integrate a developmental lens, consider approaches such as trauma-informed care, screening patients using the pediatric psychosocial preventative health model (universal, targeted, and clinical interventions), and consider the child's wider ecosystem.

Interventions aimed at decreasing stress and increasing resilience in parents might have a universal impact on their well-being and that of the child's (McGarry et al., 2013), which can aid in developing appropri-

ate coping skills for both the child and parent. These findings highlight the need for parent-specific interventions for support of both their child and family through trauma (Yagiela et al., 2019). One particular study recognized that fathers might benefit from specific support interventions, particularly fathers with mental health problems which can impact their child's behavioral and psychological development (McGarry et al., 2013). Increased research around parent's specific support is required to aid in developing interventions targeted at their unique and individual needs.

Pai et al. (2006) discussed existing family systems interventions (The Surviving Cancer Competently Intervention Program (SCCIP), The Surviving Cancer Competently Intervention Program-Newly Diagnosed (SCCIP-ND), and the Problem-Solving Skills Training (PSST)) that can be utilized to support the reduction of PMTS symptoms in pediatric oncology patients. SCCIP has shown evidence of addressing symptoms of medical trauma in adolescents who survived childhood cancer along with their families (Pai & Kazak, 2006). Where the SCCIP-ND is utilized in families newly diagnosed with cancer, there is only preliminary data on its effectiveness in reducing trauma symptoms and further evaluation studies have been recommended (Pai & Kazak, 2006). The PSST is an intervention focused on mothers of children who have been newly diagnosed with cancer and aims to teach problem solving to reduce trauma symptoms (Pai & Kazak, 2006). These interventions have only been utilized within oncology patient groups.

## Discussion

There have been variations to the findings of when trauma symptoms develop across conditions and how differing symptoms may manifest across health conditions. In some health conditions such as spina bifida and burn injuries, symptoms of PMTS were reported to be higher at immediate diagnosis (McGarry et al., 2013; Vermaes et al., 2008), and then decrease over time (Vermaes et al., 2008). Whereas, other patient groups such as oncology showed that symptoms continued long after medical care ended (Pai & Kazak, 2006). Arousal was the most common symptom in some health conditions (Cuneo, et al., 2019; Cuneo et al., 2019; McGarry et al., 2013; Vermaes et al., 2008), while for others it was avoidance (Güvenek-Cokol et al., 2016; Jordan et al., 2013; McGarry et al., 2013)

or re-experiencing (Ari et al., 2018; Vermaes et al., 2008). As there is no standard measurement of PMTS (Ari et al., 2019), it is difficult to assess symptoms and the course they can follow throughout medical care experiences.

It would be beneficial for future studies to involve children directly to understand their first-hand experiences of PMTS and if these experiences are different to parental reports, as trauma may be experienced and perceived differently. The age of children varied in this review from birth to 19 years. Further research examining age-specific trauma experiences can help to support the utilization of a developmental lens with identification and intervention, as well as determine if theories on younger children being more vulnerable to trauma symptoms are accurate (Bergeron, 2017).

It is evident that understanding the symptoms and responses to PMTS within pediatric patient groups and their families is imperative for the development of future interventions for PMTS (Pai & Kazak, 2006). Recommendations for interventions for PMTS should integrate a developmental lens, consider approaches such as trauma-informed care, screening patients using the pediatric psychosocial preventative health model (universal, targeted, and clinical interventions), and consider the children's wider ecosystem (Christian-Brandt et al., 2019).

This scoping review identified gaps in the knowledge base on when and how to provide therapeutic support to children and parents who have experienced medical trauma. As PMTS is still an emerging area of study, there is limited awareness on the variants within health condition, developmental stage, pre-existing factors, the longevity of symptoms, child reports on trauma, and how trauma can impact future healthcare. Further research that investigates PMTS specifically in relation to symptoms, health conditions, interventions, and therapeutic support services for children and their families will support CCLSs in working with families exposed to trauma. Through further understanding how PMTS impacts children and their families, how they experience trauma, and what interventions may help will enable CCLSs to provide targeted support. Research thus far has looked at PMTS as a concept to help understand how it might be experienced; future studies aimed at understanding how CCLSs can support children and families experiencing trauma, as well as when and what CCLS input would be helpful, is warrant-

ed. CCLSs work with children in health care settings and their skills in speaking with children about their health care experiences are uniquely placed for furthering research on PMTS that is undertaken directly with children, rather than about children.

### Limitations of Review

This review included papers that specifically examined PMTS within pediatric medical conditions. Papers were excluded that exclusively described PTSS, PTSD, or ASD. Although it is recognized that PMTS is an extension of ASD, PTSS, and PTSD, the aim of this review was to understand how the emergence of the PMTS framework has been utilized to describe experiences of medical traumatic stress in children who have experienced a variety of health conditions. In doing so, it is acknowledged that papers looking at trauma within a health care context that fall outside the PMTS label will have been excluded from this review. Guidelines for scoping review recognize a benefit to having more than one researcher conduct searches and evaluate studies (Levac et al., 2010). However, the budget limitations for this review did not allow for multiple researchers. To limit bias in the selection of studies and extraction of data, the process described in the study selection was put in place with a supervisory team.

### Conclusion

It is anticipated that research in this field will continue to grow and increase our understanding of the experiences of children and their families who are facing hospitalization. Furthering understanding of how PMTS is experienced by different developmental stages and health care conditions will provide the opportunity for CCLSs working with patients and families facing medical trauma to be able to identify symptoms and provide therapeutic support that is aimed at their unique needs.

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