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Paediatric Medical Trauma and Resilience: A Scoping Review

Jessica Anne Furtado[1]

1 Factor-Inwentash Faculty of Social Work, University of Toronto

Abstract:

Objectives: The purpose of this scoping review was to explore current literature describing resilience in children who have experienced paediatric medical trauma (PMT), or the physical and psychological effects of accidental injuries, pain, illness, and/or other dysfunction as well as the corresponding experiences of hospitalization, medical treatments, and other procedures. This review is grounded by a social-ecological framework and was designed to inform social work practice, as well as other medical and allied health professions.

Method: A systematic search was conducted utilizing methodical keywords from several databases.

Results: Nine peer-reviewed studies and several chapters within one book were located and reviewed: four articles focused mainly on building theories and models within PMT, three examined interventions, and two examined risk and protective factors, with some overlap.

Conclusion: Resilience in children experiencing medical trauma is high overall. Key findings included the use of child-centered perspectives, given the bias that knowledge and experience can impose on adults' judgements. The field suffers from inconsistencies, and includes some populations that have been determined to be special cases within medical trauma (i.e. acquired brain injuries), thus, further study is required to distinguish this topic. Risk and protective factors remain somewhat elusive, though exhibited importance within the social-ecological model.

Implication: The review justifies a child-centered model to support resilience in children experiencing medical trauma. A trauma-informed approach that seeks to build on a child's strengths while simultaneously scaffolding support from significant sources (i.e. parents and peers) is critical for improving outcomes.

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Introduction

Approximately one-third of children have experienced traumatic injuries and illnesses (Copeland, Keeler, Angold, & Costello, 2007). Medically ill and injured children are exposed to circumstances before, during, and after hospitalization that can be considered traumatic. These events can include shocking accidents, scary rescues, invasive procedures, separation from parents, intensive rehabilitation, or lasting physical scars, impairments, or disabilities. This type of trauma is called paediatric medical trauma (PMT). Behavioural paediatrician Joan Lovett (2009) described PMT as, "any overwhelming experience that is related to illness, injury, or medical treatment" (p. 60). This definition fits as a type of childhood trauma, which is defined as an event (or series of events) in which a minor experiences or perceives a threat to their own or a loved one's "sense of self, safety, or survival" (Schwartz et al., 2011, p. 3). Trauma overwhelms a child's ability to cope, and often produces a 'fight, flight, or freeze' response (van der Kolk and Courtois, 2005). Over time, PMT can cause a range of reactions in affected children, from post-traumatic stress symptoms to post-traumatic stress disorder, depression, anxiety, and other mental health concerns (Webb, 2009). Despite the high risk that PMT presents children at this vulnerable stage of development, meta-analyses have demonstrated that children are remarkably resilient overall, but risk and protective factors remain somewhat elusive (Webb, 2009).

Within this topic, it is important to distinguish between unintentional and intentional injuries, or to differentiate between the perceived causation of injuries. Unintentional injuries are perceived to be accidental and can include motor vehicle accidents, poisoning, falls, fires, burns, or drowning (World Health Organization [WHO], 2008). It is notable that the use of the term 'accident' is discouraged, based on the concept that both intentional and unintentional injuries are not random and can be prevented (WHO, 2008). Intentional injuries are inflicted based on a purposeful motive, and can include exposure to interpersonal abuse, neglect, community violence, or war (WHO, 2008). Intentional injuries can also be self-inflicted, as in self-harm or suicide attempts.

In Canada, approximately 418 out of every 1,000 children were hospitalized in 2008 (Public Health Agency of Canada, 2012). The majority of these hospitalizations are unintentional (i.e. 333 out of 1,000 children), with falls making up nearly half of this figure (Public Health Agency of Canada, 2012). Intentional injuries occurred less often, but remain a significant proportion of Canada's children and youth. Approximately 78 out of 1,000 children sustained intentional injuries; of these 78 injuries, 44 were self-harming, and 34 were assaults from others (Public Health Agency of Canada, 2012). In the same year, the rate of substantiated child maltreatment was approximately 16 children of 1,000 children in Canada (Public Health Agency of Canada, 2010).

Rates of substantiated abuse in other developed countries vary widely (given the conceptualization of maltreatment and injury), and begin to draw connections between the trauma of maltreatment and PMT. A recent study from Australia suggests 3-5% of injuries presented in metropolitan hospitals are related to physical abuse and neglect (Raman, Maiese, Hurley, & Greenfield, 2014). In contrast, estimates of maltreatment injuries in hospitals are around 10% in the United States (Benger & Pearce, 2002). Children who have been maltreated and require medical intervention are at greater risk for adverse outcomes, within and beyond hospitalization, given the accumulation of traumatic exposure (Klinic Community Health Centre, 2013). The complexities of maltreatment necessitate distinction in traumatology literature, and though this is a critically important topic, it remains beyond the scope of the current review. This paper will focus on children who have experienced PMT from unintentional causes. Despite the high prevalence of unintentional injury and illness in Canada, the effects have been documented in traumatology literature to a far lesser degree than maltreatment (Schwartz et al., 2011).

The purpose of the following report is to review the current literature describing resilience in children who have experienced PMT. The theoretical background of both PMT as well as resilience theory will be introduced, followed by a description of the scoping strategy, which is a five-step process developed by Arksey and O'Malley (2005). From a social-ecological framework, the literature review will examine and critically review resilience models in PMT, finding common ground between approaches. The review justifies a child-centered model, and will explore individual and environmental levels of risk and protective factors. Finally, this report will conclude by examining areas for social work interventions within this population, as well as areas for future research.

Paediatric Medical Trauma. According to the National Child Traumatic Stress Network (n.d.), a leading agency disseminating knowledge to both families and the medical community, PMT can include the physical and psychological effects of injuries, pain, and illness, as well as the experience of hospitalization, medical treatments, and other procedures. Within the scope of this paper, the term medical challenge will be used synonymously with paediatric medical trauma. Webb (2009) noted that this terminology acknowledges difficulty, but also suggests that as a challenge, it can be overcome. Though there is distinction in paediatrics between medicine and surgery, both will be used synonymously under the umbrella term of PMT. Further, the term 'injury' will refer to any bodily harm inflicted on a person, as opposed to the term 'trauma', as is common in the medical literature.

Trauma can occur as a single event, series of events, or as a chronic condition, which can produce varied responses as exposure to trauma accumulates. Bronfman, Campis, and Koocher (1998) differentiate between two types of PMT: event-related trauma, referring to the actual event and potential rescue process (i.e. car accidents); and iatrogenic trauma, which is derived from medical procedures following an injury or illness (i.e. emergency surgery). Bronfman and colleagues (1998) further elaborated on event-related trauma and iatrogenic trauma – conceptualizations that can be compared to Terr's (1991) seminal work on childhood trauma, which roughly distinguished two types - Type I and Type II. Type I is defined as occurring suddenly, is acute and unforeseen, while Type II is repetitive in nature,

occurs over time, and is chronic (Terr, 1991). Single events causing physical injury or illness may be reflective of Type I trauma, while permanent physical changes, such as disability or disfigurement, may reflect the lasting symptoms of Type II trauma (Terr, 1991). Terr (1991) also discussed 'complex trauma' in which children demonstrate a combination of the two types, often seen in accidents or sudden-onset illnesses or viruses that cause lasting damage or chronic pain.

Paediatric Medical Trauma and Related Psychopathology. PMT is associated with acute medical traumatic stress, which could last for up to four weeks following the incident (National Child Traumatic Stress Network, n.d.). It is normal for children to experience some symptoms of arousal (i.e. jumpiness or feelings of being 'on edge'), re-experience the traumatic event, and exhibit avoidance of reminders or triggers to the accident (National Child Traumatic Stress Network, n.d; Smyth, 2008). If symptoms persist for over four weeks and become disruptive to functioning, a diagnosis of post-traumatic stress disorder may be appropriate according to the Diagnostic and Statistical Manual, 5th edition (American Psychiatric Association, 2013). Other childhood mental health issues including anxiety, depression (Smyth, 2008), conduct disorder, borderline personality disorder, phobic disorder, panic disorder, and others may be better explained by responses to trauma than by psychopathology (Terr, 1991). Given the vulnerability of children at this stage, and the potential long-term challenges they may face, it is important to carefully examine trauma as it is thought to be the root cause of many mental health issues (Terr, 1991). The following section will explore the concepts related to resilience in further detail and its theoretical foundations.

Theoretical Frameworks of Resilience. Resilience represents a shift in how researchers and practitioners approach issues related to trauma and other adversities, drawing upon influences from positive psychology and prevention science (Greene, 2008). Resilience was first conceptualized by Rutter (1987) as uniquely successful adaptations to adversity that moved beyond mere surviving to thriving. Later, Borden (1992) introduced the personal narrative to resilience, where resilient individuals were those who were able to maintain their personal narrative over their life course. Masten (1994) classically defined resilience as 'ordinary magic', where children and adolescents have an almost supernatural ability to cope with stressors. Traditional theorists viewed resilience as an individual-level trait that manifests in a variety of ways (Greene, 2007).

The more contemporary view of resilience shifts the scope of resilience from a sole micro perspective to also exploring the role of the mezzo and macro systems. Michael Ungar (2011, 2013) has further drawn upon the seminal work of Urie Bronfenbrenner's (1979) Ecological Systems Theory to investigate how systems like families, schools, teams, cultures, and communities can help or hinder adaptive responses. Ungar (2013) stated that "this resistance to the effects of exposure, also termed resilience, is less a reflection of the individual's capacity to overcome life challenges as the child's informal and formal social networks to facilitate positive development under stress" (p. 255). Therefore, supportive and connected environments are more requisite to successful adaptation to challenges than an inborn genetic trait or characteristic (Ungar, 2011). The-social ecological perspective posits

a critical person-in-environment stance, which aligns with the intent of this paper, as health professionals and organizations shift to more client-centred models (Ungar, 2011; 2013). Therefore, social ecology will be used as the guiding framework for critically analyzing the intersection of resilience and PMT.

Methods

Given that the intersection between PMT and resilience is very new, it was anticipated that limited literature would exist in this area. As a result, a scoping review was determined to be more appropriate than a systematic review. The purpose of a scoping review is to create a map of the existing literature (Arksey & O'Malley, 2005; Pham et al., 2014). In undertaking the objectives of this scoping review, a specific method of searching was followed in order to ensure sufficient saturation and unbiased investigation of the topic. This paper follows the iterative scoping review process described by Arksey and O'Malley (2005), which necessitates five stages: (1) creating a research question, (2) identifying appropriate studies, (3) selecting studies, (4) charting data, and (5) organizing and reporting the results. The research question that guided this investigation was: What is known from the existing literature about the resilience of children ages 0-18 who have experienced medical trauma? From this research question, limitations were placed on the search in order to locate and select appropriate studies.

In the second stage of scoping reviews, a methodical approach to inclusion and exclusion criteria for identifying appropriate studies is required (Arksey & O'Malley, 2005; Pham et al., 2014). The limitations placed upon the methods of scoping in this review include the keywords, date range, and databases selected, which will be described in further detail. The keywords used in this literature review were important in capturing the right type of trauma, population, and framework. Three main domains were included in the search strategy. The first refers to the type of trauma – paediatric medical trauma. This term was inconsistent across databases and therefore derivatives of the following terms were used to correctly capture PMT: paediatric trauma, paediatric trauma, physical trauma, medical trauma, medical traumatic stress, accident, injury, and illness. Note alternative spellings were included to ensure comprehensiveness. The second group of keywords focused on the population, which were children aged 0-12 years old. The keyword used was child*, the asterisk allowing multiple endings (i.e. child, children, childhood, etc.). Using this strategy was found to be effective throughout the search and was therefore maintained across databases. Finally, resilien* (i.e. resilience, resiliency, resilient) or emotional adjustment was found to be effective when searching databases. The date range was capped as far back as 2008, unless the work was seminal or critical to the understanding of the topic. Similarly, the search strategy sought to collect only peer-reviewed journal articles, however, book chapters that examined empirical studies and incorporated practice wisdom were also included, if relevant and critical to understanding of topic.

Ultimately, four types of searches were conducted to ensure a comprehensive database search. The first was a catalogue search to obtain an overall picture of the journals, books, and other publications that existed on the topic. This was followed by database searches.

Given the social work intent of this paper, top social work databases were searched (Social Services Abstracts, Social Work Abstracts, ASSIA, Social Sciences Abstracts, The Campbell Collaboration, The Cochrane Library, HealthStar/ OVID HealthStar, PsychINFO, Social Sciences Citation Index, Sociological Abstracts, Encyclopaedia of Social Work). The third strategy involved entering the search terms into the institutional library's articles tab to ensure a thorough search. Finally, Google Scholar was used to cross-reference with the institution's materials and other online sources.

The third stage of scoping reviews requires the author to select appropriate studies (Arksey & O'Malley, 2005; Pham et al., 2014). Many of the articles examined specific types of medical trauma as opposed to PMT as a whole. Therefore, the author methodically selected those that fit within the definition of PMT as including a significant element of trauma as defined by Lovett (2009) as an "overwhelming experience" for a child (e.g. eczema was excluded, but cancer was included). Furthermore, children must have been the focus of the model, study, or intervention, in maintaining consistency with the social-ecological perspective of resilience. Finally, resilience theory must have been used in a way that was determined by the author to be significant. Resilience is an increasingly popular area of study, with varying approaches and applications. Thus, the presence of the keyword resilience within the article or abstract was insufficient to qualify; resilience must have been used as a model from which to frame the study. The following section discusses the final selections that are explored in detail, after all of the scoping limitations were applied.

Results

Together, the search yielded nine studies and several chapters within one book, which collectively informed the remainder of this report. Generally speaking, four of the articles focused on building theories and models within PMT, three examined intervention strategies, and two examined risk and protective factors, though there is overlap between the topics. As part of the fourth stage described by Arksey and O'Malley (2005), the selected studies were then summarized into a chart. The chart, which can be found as Appendix A, includes more detailed information about the purpose, methodology, main findings, and application of each journal article. The final stage of a scoping review requires organizing and reporting the results of the review (Arksey & O'Malley; Pham et al., 2014). The following section seeks to provide an overview of the results and generate some coherence among the wide scope of articles collected.

Discussion

Defining Resilience in Paediatric Medical Trauma. The purpose of this literature review is to examine resilience within the context of paediatric medical trauma. The articles located in the systematic search yielded a limited number of academic publications covering a wide scope of types of trauma, approaches to resilience, methodologies, and findings. Resilience was determined to be relatively high overall in the populations examined in the studies, with rates ranging from 57%-84% (DeYoung, Kenardy, Cobham, & Kimble, 2012; Fee & Hinton, 2011; Kim & Yoo, 2010; Le Brocque, Hendrikz, & Kenardy, 2010; Phipps et al.,

2012). Many authors noted a lack of coherence in the field of resilience in general - especially in the context of the relatively new field of PMT - but support continued use of the model under further investigation (Beer & Bronner, 2010; Boles, 2013; Castellano-Tejedor, Blasco-Blasco, Perez-Campdepadros, & Capdevilla, 2014; DeYoung et al., 2012; Fee & Hinton, 2011; Kim & Yoo, 2010; Le Brocque et al., 2010; Tonks et al., 2011). Similarly, each of the studies noted a significant area of novelty in their research, thus highlighting the gaps that exist within this field (Beer & Bronner, 2010; Boles, 2013; Castellano-Tejedor et al., 2014; DeYoung et al., 2012; Fee & Hinton, 2011; Kim & Yoo, 2010; Le Brocque et al., 2010; Phipps et al., 2012; Tonks et al., 2011). The following section will analyze the ways in which resilience was studied in the articles and examine their fit with the social-ecological lens used in this article.

Castellano-Tejedor and colleagues (2014) discussed the many differences in approaches to resilience in their literature review of children with cancer (and application to PMT in general) and determined that unifying elements exist across approaches. Resilience is not only the absence of negative adaptations but also the presence of positive adaptations, personally and environmentally, with the goal of restoring balance in the lives of children, or returning to a state of homeostasis (Castellano-Tejedor et al., 2014). Across studies included, this restoration of balance or return to baseline appeared to be the general measure of resilience. Thus, using a measure of post-traumatic stress symptoms, authors charted distress over time to determine trajectories of resilience (DeYoung et al., 2012; Le Brocque et al., 2010) and to evaluate resilience-based interventions (Fee & Hinton, 2011; Phipps et al., 2012). Other studies used healthy controls to compare children experiencing PMT to an average or baseline (Tonks et al., 2011). Thus, despite differences in approaches there is a unifying theme of balance or restoration among concepts of resilience and their application to various populations of children experiencing PMT.

In contrast to this attention to balance, Castellano-Tejedor and colleagues (2014) defined two other related, but independent constructs: post-traumatic growth and benefit finding. Though both terms are often used interchangeably with resilience, they move beyond the central concept of restoring balance to suggest that a child ends up better than before the adversity, as in post-traumatic growth (Castellano-Tejedor et al., 2014). An example of post-traumatic growth could be a deeper appreciation for life after cancer. Similarly, benefit finding is an adaptive strategy identifying positive aspects associated with negative events (e.g. a child may point out that they made a new friend in the hospital that they otherwise would not have met) (Castellano-Tejedor et al., 2014). The difference between post-traumatic growth and benefit finding was discovered during the systematic search of articles and intentionally not used as a search term or as synonymous with resilience.

Trajectories of Resilience in Paediatric Medical Trauma. In keeping with a broad definition of resilience, the next section will examine the general trajectories noted in groups of children who have experienced medical trauma. Le Brocque, Hendrikz, and Kenardy (2010) used a model derived from Bonnano, Layne, and their respective colleagues to examine resilience trajectories in children who had unintentional traumatic injuries. It is based on measuring four patterns of posttraumatic stress symptoms (PTSS) over time: resilient, recovery, chronic, and delayed (Le Brocque et al., 2010). The resilient pathway,

which was demonstrated in 57% of children, began with slightly elevated PTSS but returned to low or no distress within four to six weeks and was maintained at six months. 33% of children were in the recovery trajectory, where PTSS began as high but slowly declined to normal within six months. Chronically high levels of PTSS were demonstrated in 10% of children and remained stable over two years post-injury. There was no evidence for delayed symptomology in this group, as proposed by the original theorists to show low starting PTSS with increasing symptoms over time (Le Brocque et al., 2010).

DeYoung et al. (2012) used the same methodology as the previous researchers, applying it instead to resilience pathways for young children who sustained unintentional burns. Similar to previous results, the majority of children were resilient (72%), many recovered (18%) only a small proportion of children's distress levels remained chronic (8%) over six months and none followed the delayed pattern (DeYoung et al., 2012). This not only provided evidence of the efficacy of the resilience model in this population, but also demonstrated that acute stress symptoms are normative and not an accurate predictor of children at risk for PTSD (DeYoung et al., 2012; Le Brocque et al., 2010).

The Importance of Child-Centred Perspectives. A major distinction that was found between articles was the measurement of resilience from either the child or parent's perspective. Kim and Yoo (2010) critique the major limitation of previous studies examining resilience in PMT as the use of parent perspectives, when a resilience framework requires the child to be the focus of intervention. Parent and child self-reports have not demonstrated consistency (Rende & Plomin, 1991, as cited in Kim & Yoo, 2010). Phipps et al. (2012) found differences in reporting between children and parents on measures of posttraumatic stress, where more children than parents rated the child themself as above threshold for PTSD diagnosis at baseline and after treatment (21.0% to 7.1% in patient reports and 14.5% to 6.2% in parent reports). This suggests that children are capable of self-identifying concerns, perhaps better than their parents (Phipps et al., 2012). It is important therefore, to include the child perspective to ensure health care professionals are adequately monitoring the psychological health of children.

In contrast, children also considered themselves more resilient than perceived by parents. Fee and Hinton (2011) found that despite the chronic and pervasive difficulties caused by Douchenne Muscular Dystrophy, the boys in their sample were highly resilient, with individual qualities of disease progression and severity being statistically unrelated to resilience. The authors suggested "the quantifiable nature of the adversity may be less important to the child than the positive adaptation to it" (Fee & Hinton, 2011, p. 649). In other words, though parents, teachers, or researchers may be able to provide estimates of a child's perceived issues and efficacy in overcoming them, they impose their own values and beliefs in this process that may not be similar to the child's. As was the case of the 1-6 year old children sampled in DeYoung and colleagues (2012) study, it is not always possible or developmentally appropriate for children to articulate the issues as they see them, but every effort should be made to keep the child's perspective the focus of the intervention. The following section will use a child-centered focus within the social-ecological model to examine the risk and protective factors of paediatric medical trauma.

Risk and Protective Factors. Resilience literature often refers to risk factors and protective factors (Greene, 2008). Trauma, and more specifically, paediatric medical trauma, would be considered a risk factor, as it increases the likelihood of event-related stress and adverse outcomes (Webb, 2009). Cumulative risk is another key phrase used to quantify the relative number of contributing risks to one case (Greene, 2008). Ungar (2013) asserted that uniquely intersecting marginalities, such as culture, family dynamics, and poverty will affect a child's capacity for resilience and also negates a one-size-fits-all approach to responding to trauma. Protective factors also exist to mitigate the effects of cumulative risk and promote the balanced state that characterizes resilience (Greene, 2008). The following sections will use the social-ecological model to frame risk and protective factors that exist at the individual as well as the social environment level with parents, peers and teachers.

Individual factors. According to Kim & Yoo (2010), resilience models seek to build upon the strengths of children and use their existing resources to solve problems as they see them, which increases the intrapersonal protective factors of self-esteem and self-worth. In contrast, a problem-based model views the sick child as the problem, which then requires external resources and interventions to fix (Castellano-Tejedor et al., 2014; Kim & Yoo, 2010; Webb, 2009). Webb (2009) notes that in a problem-centred model, a child's identity can be in a state of crisis, potentially shifting their self-image from a 'child with a sickness' to a 'sick child'. This negative self-image can become pervasive and children increasingly doubt themselves, their abilities, and begin to pull away from who they once were (Webb, 2009).

Meta-analyses have demonstrated that specific sociodemographic variables are not predictive of PTSS as studies have shown contradictory findings (Camisasca, 2011). Similarly inconclusive findings were described in a literature review of resilience in paediatric oncology patients (Castellano-Tejedor et al., 2014). A child-centered study conducted by Kim and Yoo (2010) found no significant differences associated with age, gender, religion, existence of siblings, mother's age, academic performance, duration of illness or type of cancer and resilience outcomes. Similarly, Phipps et al. (2012) found very high overall resilience in children with cancer undergoing stem cell transplantation regardless of gender, socioeconomic status, resident parent, site, type of transplant, or diagnostic group.

Outside of paediatric oncology, Fee and Hinton's (2011) study of boys with Deuchenne muscular dystrophy found no significant correlation between resilience and the individual factors of intellectual functioning and physical ability. In children with unintentional injuries, severity of injuries had an impact: those with fractures, dislocations, and lacerations in comparison to burns, internal and multiple injuries, were more resilient (Le Brocque et al., 2010). Younger children were more resilient than older children with unintentional injuries (Le Brocque et al., 2010), though De Young and colleagues (2012) dispelled the myth that young children are always resilient (8% of the burn victims studied had chronic PTSD symptoms after six months). Finally, behaviours were shown to have an impact, where children with fewer internalizing and externalizing issues were more resilient overall (Fee & Hinton, 2011; Le Brocque et al., 2010).

Tonks and colleagues (2012) note that children with acquired brain injuries present a special case in PMT where primary and secondary traumas may impact a child's ability

to access intrapersonal as well as interpersonal skills. Executive functioning damage in the brain may impair a child's ability to access the personal resources or protective factors that are characteristic of resilience (Tonks et al., 2012). The authors found that children with ABIs were less resilient, demonstrating lower levels of mastery and resourcefulness, as well as higher levels of emotional reactivity and vulnerability, and consequently were more depressed and anxious than matched peers. Resilience risk factors (i.e. lack of resourcefulness and increased vulnerability) were correlated with depression and anxiety for both ABI and control groups. The authors suggested that children experiencing medical challenges in general may be less resilient because (a) they are less able to mentally access personal resources in the context of greater vulnerability both socially and emotionally, or (b) children experiencing PMT may have greater emotional distress overall which impacts their strategies for resilience. Thus, it appears that children who have suffered from brain injuries present a special case in PMT and should be distinguished when making generalizations about PMT as a whole.

Taken together, there are many individual factors that can influence the experience of PMT and resilience. Given the infinite number of confounding variables, it may not be possible to make generalizations about individuals' capacity for resilience based on their individual characteristics. This fits within the social-ecological model of resilience, which seeks to recognize an individual's experience within their unique social location (Ungar, 2013), which will be discussed in the next section.

Social environment. According to Webb (2009), an ecological perspective is not only an important consideration but is foundational to working with medically challenged children. In the context of this literature review, environmental level risk and protective factors have demonstrated greater impact than individual level factors (Fee & Hinton, 2011; Kim & Yoo, 2012; Tonks et al., 2011). According to Fee and Hinton (2011), a child's perceived quality of support, degree of social embeddedness, and enacted support are aspects of overall social support. The authors define social embeddedness as "the relationships children have with others including family, friends, and the community" (Fee & Hinton, 2011, p. 649). Enacted support is defined as "positive feedback, guidance, and the emotional support received" (Fee & Hinton, 2011, p. 649). Children have less access to their social support network in hospital settings, in comparison to their parents, siblings, or typically developing peers (Boles, 2013). Parents, peers, and teachers form three important aspects of children's social environments and will be considered in the following sections. Though many other aspects of social environments could be included, and should be addressed in future research, the scope of the current literature review only covered these sources of social support as significant contributors to PMT and resilience.

Including parents. Including parents when considering social support is critical because parents are the primary attachment to children and generally form the most important relationship in early development (Webb, 2009). It is important to take the person-in-environment perspective given the impact that neuroscience is beginning to demonstrate in relation to trauma and resilience. Starting with the ontogenic view of the child at the center of their ecology, a child's secure attachment with caregivers has the capacity to mitigate effects of trauma, especially when parents regulate their emotions effectively and can model this

regulatory behaviour appropriately for their children (Schore & Schore, 2008). Given this newly expanding realm of knowledge, it is important for parents (as well as teachers, and other important figures in a child's life), to model resilient behaviours and build supportive environments (Smyth, 2008; Ungar, 2013), especially for younger children who have fewer independent skills and strengths to draw from (De Young et al., 2012). Fee and Hinton (2011) found that social support was the greatest contributor to resilience in boys with a chronic neuromuscular disorder and that parents with less stress were found to have sons with more positive behaviours. These inter-personal factors have a strong bearing on the process of resilience that is as important as the environmental and contextual factors impeding or promoting resilience.

Nancy Boyd Webb (2009), an American clinical social worker and scholar in the field of paediatric medical trauma, notes that in her extensive experience, parents are an impossibly linked component of children's resilience. Though children are the locus of the environmental model, it is often parents who must adjust the other systems around the child to ensure they will accommodate the many ways in which medical illnesses affect children (Webb, 2009). Kim & Yoo (2010) note that children are increasingly receiving care within the home, necessitating a whole-family approach, as there is more demand and stress on caregivers. For this reason, parents are often the focus of PMT resilience interventions (Boles, 2013). Parent attitudes, therefore, have a significant effect on the child and must be a focus for health care professionals, but not to the exclusion of children themselves (Castellano-Tejedor, et al., 2014; Kim & Yoo, 2012).

Including peers. School-age children require development of cognitive skills, co-operative social interactions with peers, and building self-esteem through such interactions and friendships (Ball, Bindler, & Cowan, 2008). Siblings and classmates are two particularly important sources of social support for young children (Webb, 2009). Social support in the form of social embeddedness is a strong protective factor for children with medical challenges (Fee & Hinton, 2011; Kim & Yoo, 2012). Chronic illnesses can present a variety of stress factors for children, including changes in appearance, differential treatment, or disruption to typical development (Kim & Yoo, 2012). Even while away from their friends and in a hospital or other medical setting, providing times for social interaction through age-appropriate play can provide an outlet for connecting to others, making sense of one's diagnosis, relieving stress and anxiety, easing pain, and building on skills to achieve mastery, self-esteem, and provide children with a sense of control over an otherwise overwhelming situation (Boles, 2013; Webb, 2009).

Boles (2013) suggests that children stand to benefit from returning to an environment (i.e. classroom) where peers have been educated and prepared for changes, needs, and desires of the returning student. Children are naturally curious and should be given the opportunity to ask questions in a safe environment, in order to avoid excessive questioning directed to the child upon return, who may already be anxious about the process (Kim & Yoo, 2012). Thus, it is important to educate peers and friends on the illness of the child, as they may be misinformed and could be a source of teasing and bullying, which, would be an accumulating risk factor as opposed to a protective factor.

Including teachers. In studies of resilience factors in children with paediatric cancer, relationship with teachers was statistically significant in bivariate analyses but no longer in multivariate analyses (Kim & Yoo, 2012). The researchers suggested that within the context of their study, this finding could mean that teacher's attitudes toward sick children had an indirect effect on the ways in which peers and friends view the child, which was shown to be more statistically significant at multivariate level (Kim & Yoo, 2012). Given the previously stated importance of peers for children with medical challenges, teachers can be a very effective ally for preparing classmates and creating an inclusive environment. Resilience research that has focused on social and environmental relationships has demonstrated that one attentive adult has the protective capacity to mitigate many cumulative risk factors as a mentor (Ungar, 2011). Thus, though often forgotten in literature, it is important to include teachers and other significant role models in a child's environment to promote resilience.

Interventions. Interventions that directly address the needs of children experiencing medical challenges were included in this literature review, thus three studies will be described, as well as chapters from a handbook on the topic. Firstly, Beer and Bronner (2010) have suggested that Eye Movement Desensitization and Reprocessing (EMDR) has gathered a sufficient evidence-base in adult trauma literature to be applied to children experiencing PMT. EMDR is designed for children (as well as parents) and requires the client to recall and focus on such disturbing events while completing external tasks simultaneously (i.e. following therapist's finger with a pen or listening to specific sounds on headphones) until the stress level decreases to normal (Beer & Bronner, 2010). Further investigation is required to explore the effectiveness of this intervention in child samples.

Phipps and colleagues (2012) found that despite assignment to interventions (weekly massages and humour therapy) given to children, children and parents, or neither, no significant differences were found in resilience outcomes. Overall, researchers in top teaching hospitals across Canada and the United States found very high rates of resilience in patients, which they partly attributed to benefit finding across groups (Phipps et al., 2012). At admission, overall, children's self-reported depression was only one standard deviation below average for matched healthy children, thus it would be difficult to improve on this finding (Phipps et al., 2012). The remarkable outcomes of children across interventions in the Phipps and colleagues (2012) study was further hypothesized to be the result of attention to psychosocial outcomes by professionals such as social workers and child life specialists within the hospital. Further, though post-traumatic stress was significantly higher than in matched healthy children at intake, by the end of the intervention, post-traumatic stress returned to normative levels, suggesting that a resilience model is a better fit than a trauma model for children with cancer undergoing stem cell transplantations (Phipps et al., 2012).

Similarly to the previous study, DeYoung and colleagues (2012) found that young children with unintentional burn injuries had relatively minor injuries, yet surprisingly high rates of psychological disorders (35%). In contrast to literature that had demonstrated children with severe burns as more resilient, the authors suggested the cause of this difference could have been their designation as outpatients and therefore, their more limited access to psychosocial interventions by health care staff, including clinical social workers (De Young et al., 2012).

Boles (2013) as well as Phipps and colleagues (2012) have noted a lack of specific strategies to foster resilience in children experiencing medical trauma to foster resilience. Boles (2013) described the importance of educational opportunities about a child's diagnosis, preparation for medical procedures, play-based therapies, and discharge and transition support (Boles, 2013). As a therapeutic intervention, the benefits of play with paediatric patients can be summarized as a familiar, child-centred method of working through issues; as well as potentially alleviating pain and distress, offering peer-support, and providing children with mastery and control in an overwhelming environment (Boles, 2013). Just as parents wish to be informed of the details of an upcoming procedure, it is important to provide the same education to children, appropriate to their developmental level, to ease anxiety (Boles, 2013). Medical play using multisensorial techniques can educate children on procedures that they will personally experience in a developmentally appropriate way (Boles, 2013).

In recognizing the importance of parents in fostering resilience of children experiencing PMT, clinical social workers can help support parents and families in a variety of ways. Social workers can help parents to navigate the health care system in general, as a variety of factors may prevent parents from fully accessing resources for their children including language barriers, financial strain, or unfamiliarity with systems as a newcomer, immigrant, refugee, or individual with precarious status. Stress and anxiety can prevent parents from retaining and understanding information, thus a social worker could attend meetings with parents to take notes for parents, and review them at a more appropriate time (Webb, 2009). Webb (2009) noted that parents can also feel intimidated by medical professionals, and that social workers can help families determine which questions to ask physicians or other healthcare professionals, or facilitate conversations between families and other staff (Webb, 2009). Social workers can provide resource counselling and make referrals, or offer psychoeducation and support groups (Webb, 2009). Given appropriate consent, social workers can advocate for clients and families in school meetings, mentor teachers on how to support children with PMT in the classroom, and educate a child's peers (Webb, 2009). It is important that interventions are interdisciplinary and social workers are well positioned, especially in health care settings, to fill the role of case management between various professions.

Implications

Taken together, the social-ecological model of resilience fits well within the context of PMT. This child-centered approach also aligns with social work's practice principles of starting where the client is, perceiving problems from the client's perspective, and working at the client's pace. These foundational social work approaches are increasingly borrowed in other medical and allied health professions and organizations. In the medical sciences, problem-focused models are understandable to some degree given the realities of health and disease. However, it is the responsibility of health workers to look at the whole client – to see past them as a patient and see instead a child seeking well-being and possessing skills, talents, and positivity. As health workers empowering change, there is real value in drawing out strengths and empowering clients to make changes within their own lives, no matter how young or old (Botta, 2009). In a society that often silences the voice of children, especially those who are at risk, this critically-informed perspective is of even greater importance.

Biopsychosocial assessments are common in health care professions including doctors, nurses, psychologists, social workers, child life specialists, and so on. Therefore, using the social-ecological lens to view children with medical challenges is not only appropriate, but intuitive. A variety of methods can be employed to provide information to children, support their healthy development, and use therapeutic intervention to build on their current skills and promote resilience. Thus, though the child always maintains focus as the client, social workers should recognize the need to include other elements of a child's system, such as parents, peers, and teachers, intervening as necessary with these stakeholders.

The scope of the current literature review was not intended to address the potential effects of cumulative risk in PMT. However, this approach is warranted for future reviews. Most studies did not adequately account for such risk factors, though those that did suggested that the characteristics explored (i.e. age, gender, religion, previous traumatic experiences) are not as strongly related as perceived social support (Fee & Hinton, 2011; Kim & Yoo, 2012; Le Brocque et al., 2010). Ungar (2013) has demonstrated how intersecting marginalities based on the social location of an individual (such as culture, family dynamics, and poverty) may present cumulative risk factors and may affect a child's capacity for resilience. In accordance with the interventions presented, recognition of cumulative risk factors negates a one-size-fits-all approach to PMT. Social workers can recognize cumulative effects of risk and help clients recruit personal strengths, as well as use external resources (if required) to mitigate such risks and build resilience.

These strategies form the basis of a trauma-informed approach. Trauma-informed approaches suggest a change in the culture of an organization, which recognizes the prevalence, importance, and impact of trauma (Substance Abuse and Mental Health Services

The Core Principles of Trauma-Informed Spaces

The principles of trauma-informed services may vary based on the population being served, but best practices necessitate the following:

- Understanding the effects of trauma (Elliott, Bjelajac, Fallot, Markoff, & Reed, 2005; Harris & Fallot, 2001; Klinic Community Health Centre, 2013)
- Safety: Avoiding re-triggering (Elliott et al., 2005; Klinic Community Health Centre, 2013; SAMHSA, 2014; van der Kolk & Courtois, 2005)
- Collaborative, trusting, and healing relationship with provider (Elliott et al., 2005; Klinic Community Health Centre, 2013; SAMSHA, 2014; van der Kolk & Courtois, 2005)
- Promoting client autonomy and empowerment (Elliott et al., 2005; Klinic Community Health Centre, 2013; SAMSHA, 2014; van der Kolk & Courtois, 2005)
- Recognizing the influence of systems (Elliott et al., 2005; SAMHSA, 2014) strengths-based (Elliott et al., 2005; Klinic Community Health Centre, 2013)

Administration [SAMHSA], 2014). In contrast, trauma-specific strategies are used to address the effects of trauma (SAMHSA, 2014). Current models promote trauma-specific strategies in hospitals, which are important. Some of these supports include social workers, child life specialists, psychologists, and psychiatrists, who understand the effects of trauma, can recognize the ways in which PMT affect clients, and use evidence-based strategies to provide biopsychosocial support (Boles, 2013). The findings of this scoping review demonstrate that these strategies are critical, but that given the pervasiveness and potential effects of PMT, improvements can be made by adopting a trauma-informed culture within hospitals, where all professionals can support children's resilience. For a more detailed description of the core principles of trauma-informed spaces, see the textbox.

Given the consistently resilient nature of children demonstrated in the studies examined within this literature review, further study is required to investigate the factors that contribute to resilience from a child's perspective, using developmentally appropriate measures. Collecting qualitative data could be useful in determining factors that may be lost using limited quantitative methods (Phipps et al., 2012). Greater coherence is required in this young, segmented, and inconsistent field. Thus, scoping reviews of current literature continue to hold value and will continue to be required as the gaps in current PMT and resilience theories are filled and the scope of this multidisciplinary field widens.

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Appendix A: Summary Table of Selected Articles

Source	Purpose of Study	Participants	*Recruitment*	Research Design	Findings	Strengths and Limitations
Beer, R., & Bronner, M. B. (2010). EMDR in paediatrics and rehabilitation: An effective tool for reduction of stress reactions? Developmental Neurorehabilitation, 13(5), 307-309.	Proposed Eye Movement Desensitization and Reprocessing (EMDR) as an effective intervention for children experiencing PMT stressors	N/A	N/A	Research Summary	Meta-analyses have demonstrated EMDR is effective for groups of adults, can be applied to paediatric medical stress and/or trauma	Research has supported EMDR in different stage of life. Though plausible, is not yet supported empirically for children; requires experimentation and replication
Boles, J. (2013). When everything changes: Supporting resilience in children with acquired brain injuries. Paediatric Nursing, 39(6), 314-316.	Overview of techniques that could be used interprofessionally in a clinical setting to support resilience in children with acquired brain injuries (ABIs)	N/A	N/A	Review	Outlining main areas of resilience in children with ABIs, specific strategies at each level	Using play strategies as a method of coping and developing mastery age-appropriately; involving peers and families to support resilience. Lacked empirical evidence but supported theoretically and in practice. Question of generalizability from ABIs to PMT
Castellano-Tejedor, C., Blasco-Blasco, T., Pérez-Campdepadrós, M., & Capdevila, L. (2014). Making sense of resilience: A review from the field of paediatric psycho-oncology and a proposal of a model for its study. Anales De Psicología, 30(3), 865-877.	Applied the concept of resilience from the scope of paediatric psycho-oncology	N/A	N/A	Theoretical Model	Overview of definitions of resilience, differences from other terms (i.e. posttraumatic growth, benefit finding); A model of resilience can be applied to experiences of paediatric cancer	Lacks empirical and theoretical evidence; further study required to strengthen model. Question of generalizability from childhood oncology to PMT
De Young, A. C., Kenarfy, J. A., Cobham, V. E., & Kimble, R. (2012). Prevalence, comorbidity and course of trauma reactions in young burn-injured children. Journal of Child Psychology and Psychiatry, 53(1), 56–63.	The prevalence, comorbidity, and course of trauma reactions in young burn-injured children were investigated. Trauma reactions were based off the trajectories used by Le Brocque et al. (2010) (see below)	Parents of 130 children aged 1-6 (mean=2.4)	Convenience sampling from a specialist burn centre in Australia. Approximately 39.5% of those eligible participated. Attrition rate = 23%	Parents were interviewed over the telephone using the Diagnostic Infant Preschool Assessment (capable of diagnosing children using DSM-IV-TR criteria) at 1 and 6 months post injury.	The majority of children were resilient (72%). Many recovered (18%) and a small proportion of children's distress levels remained chronic (8%) over six months. No significant differences were found for child gender, parent age, parent employment status or burn size. 35% were diagnosed with at least one psychological disorder within the six month post injury period (most commonly PTSD, ODD, or SAD) despite relatively minor injuries overall.	Age group is significantly younger than others included in this literature review. Lack of control group, thus distress may be more age-related than trauma-related. Researchers were not blind to initial PTSD status, which may have impacted interview and subsequent classification. Lost a substantial number of participants, though mostly because families were (understandably) too busy

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Fee, R. J., & Hinton, V. (2011). Resilience in children diagnosed with a chronic neuromuscular disorder. Journal of Developmental Behaviour Paediatrics, 32, 644-650.	Examined factors associated with resilience of boys with a chronic neuromuscular disorder (Deuchenne muscular dystrophy, DMD)	146 boys with DMD from 6-14 (mean=9.0) years old	Subjects were participants in an ongoing study examining cognitive skills in boys with muscular dystrophy; Convenience sampling through Dystrophy Association clinics in NYC.	Parent reported questionnaire of son's behaviours (Child Behaviour Checklist), social support (CBCL), and familial support (Parenting Stress Index). Also, child's intellectual functioning (Peabody Vocabulary Test) measured	84% were considered resilient and not at risk for psychosocial issues. Individual factors (i.e. intellectual functioning and physical ability) were not significantly associated with adjustment or behaviour, suggesting a child's perception may be more relevant than measures of proposed risk and protective factors of resilience. Social support was most important to adjustment and demonstrated an inverse relationship with problem behaviours. Similarly, parents with less stress were found to have sons with more positive behaviours.	Use of only parent reported measure affect the quality of data, as the authors conceded that child and parent perceptions can differ. Measures were questionably sensitive to the constructs, but were justified by the authors. This article examines a specific type of chronic disease unique to boys and therefore, determining generalizability to PMT is difficult but contributes some understandings.
Kim, D. H., & Yoo, I. Y. (2010). Factors associated with resilience of school age children with cancer. Journal of Paediatrics and Child Health, 46(7-8), 431-436.	Identified factors associated with resilience of children with cancer	74 children, aged 10-15 (mean= 13.1) from a paediatric oncology unit in a university-affiliated hospital	Convenience sampling: All children who fit criteria and visited the hospital from July-September 2004 asked to complete the survey while waiting for their doctor. Approximately 27% of visiting children qualified and completed	Self-report questionnaires (resilience, Family Adaptability and Cohesion Evaluation Scale III, relationship with friends and teachers); some information verified by caregivers	Resilience overall average = 98.5 (possible range= 32-128); Greater family functioning and support from friends demonstrated higher incidence of resilience; No significant differences associated with age, gender, religion, existence of siblings, mother's age, academic performance, duration of illness or type of cancer	From perspective of child, as opposed to parent report; Some of these children are older than the cut off of 12 (average age of 13.1); Study took place in Korea; Convenience sampling; Lack of normative data for measures; Range of scores on measures wide, suggesting some children are much more vulnerable than others and necessitates individualized strategies; generalized can be lost in averages – All limit generalizability.
Le Brocque, R. M., Hendrikz, J., & Kenardy, J. A. (2009). The course of posttraumatic stress in children: Examination of recovery trajectories following traumatic injury. Journal of Paediatric Psychology, 35(6), 637–645.	Using a previously studied model, examined 4 types of recovery trajectories following traumatic injury: resilient (low symptoms of sub-threshold PTSD throughout), recovery (high acute symptoms and decreasing over time), delayed (low acute symptoms but increasing over time), and chronic (high acute and lasting symptoms)	190 Children aged 6-16 (mean=10.7) admitted to paediatric units following accidental injury (no violence or head injuries) who stayed for at least one night, and one primary caregiver	All children admitted to a general or intensive care unit in three tertiary hospitals in Brisbane, Australia	Self-report measures of the effects of trauma (Child Impact of Event Scale), parent reported child mental health (Child Behaviour Checklist) over 3 time points: within one week, 2-6 months, and 2 years post injury. Home interviews were conducted at follow-ups	Overall, PTSS showed a decline over time. 57% of children were resilient, with slightly elevated to low distress within 4-6 weeks. 33% of children were in the recovery trajectory, where distress declined to average within 6 months. 10% of children were chronic in that they had high levels of distress that remained stable over 2 years post-injury. There was no evidence for delayed symptoms in this group. Younger children, those with fractures, dislocations, lacerations, etc. (compared to burns, internal and multiple injuries), and those with less internalizing and externalizing issues were more resilient overall. Acute stress disorder was determined to not be an accurate predictor of PTSD.	Information could not be garnered about participation rates, therefore difficult to generalize to other traumatic injuries and PMT as a whole. Average age fit within childhood, therefore this study was included, but may not be generalizable to 6-12 year olds. Measures and interviewers were not qualified to diagnose but should have adequately screened for PTSS.

Phipps, S., Peasant, C., Barrera, M., Alderfer, M. A., Huang, M. S., & Vannatta, K. (2012). Resilience in children undergoing stem cell transplantation: Results of a complementary intervention trial. Paediatrics, 129(3), e762-770.	Efficacy of resilience interventions with children undergoing Stem Cell Transplantation (STC)	171 patients (age 6-18) undergoing STC, staying at the hospital for over 3 weeks, along with at least one on-site caregiver	4 sites offering STC: 3 in U.S. and Hospital for Sick Children (Toronto); All qualifying families (242) were asked to participate during child's treatment	Randomized control trial over 24 weeks of treatment. Intervention (weekly massage and humour therapy) given to child only, child and parent, or neither.	No significant differences were found between groups, even when considering gender, socioeconomic status, resident parent, site, type of transplant, or diagnostic group. Depression, post-traumatic stress decreased over time for all groups. Could be due to the high overall resilience that children demonstrated, high standard of interprofessional care existing in hospitals. Benefit finding was important for this population.	Strong research design; Confusion of terms (i.e. benefit finding); Age range 6-18 but divided 6-12 and >12 and found no significant difference across treatments. Attrition rates yielded power to detect only medium to large between-group differences, perhaps explaining lack of significant differences. However, similarities in participants may negate some of the effects of high attrition.
Tonks, J., Yates, P., Frampton, I., Williams, W. H., Harris, D., & Slater, A. (2011). Peer-relationship difficulties in children with brain injuries: comparisons with children in mental health services and healthy controls. Brain Injury, 25(9), 870-881.	Examined the role of executive functioning (EF) in the brain and accessing 'resilient' resources following an acquired brain injury (ABI)	21 children ages 9-15 (mean = 12.6) with ABI and 70 matched healthy children based on parent education (deemed more appropriate than SES)	Children with ABI were recruited from a variety of community agencies in the UK, healthy children were recruited from nearby two schools	Self-report measures of resilience (Resilience scales for children and adolescents), depression (Beck Depression Inventory for Youth), anxiety (Beck Anxiety Inventory for Youth); Parent-reported measures of psychological adjustment (Strengths and Difficulties Questionnaire), and problems with emotion, personality, motivation, behaviour and cognition (The Dysexecutive Questionnaire for Children)	Children with ABI were less resilient (lower levels of mastery and resourcefulness, higher emotional reactivity and vulnerability, no difference in emotional relatedness); more depressed and anxious than matched peers. Resilience risk factors were correlated with depression (i.e. lack of resourcefulness and increased vulnerability) and anxiety (i.e. increased vulnerability) across both groups. EF in the brain was found to mediate the relationship between resilience and social-emotional behaviour, as children with ABIs could no longer access and use such skills as effectively	Relatively small sample size; heterogeneous features across population may limit generalizability across ABI studies and especially PMT more generally. Results were parent reported which may not be highly reliable. The authors suggested that children with ABIs may be less resilient because they are less able to find and use personal resources, which is combined with greater vulnerability both socially and emotionally, or children with ABIs may have greater emotional distress overall which impacts their strategies for resilience