

# Posttraumatic Stress Symptoms and Medical Procedures in Children

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**Objective:** To focus on posttraumatic stress symptoms after childhood diseases such as cancer, organ transplantation, and severe burns.

**Methods:** Differential diagnoses, risk factors, and treatment aspects (psychological and pharmacological) are discussed.

**Results:** The concept of adjustment problems in chronic or severe illnesses is widely used in pediatrics. Many aspects of severe childhood diseases are traumatic, as defined by the DSM-IV: severe illnesses are life-threatening, medical procedures threaten the child's physical integrity, and disorganized behaviour periods are common.

**Conclusion:** This concept, which remains insufficiently investigated, is a promising area of investigation for prospective and prevention studies.

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**Key Words:** posttraumatic stress, cognitive development, tertiary care

Adjustment problems in chronic or severe illnesses are widely applied in pediatrics. These problems are defined as states of subjective distress and emotional disturbance that significantly interfere with occupational and social functioning (1). To date, 2 models have been used to study adjustment problems: the social ecology model and the stress and coping model. In the social ecology model, the child is placed at the centre of a series of concentric circles that represent the increasingly larger environments with which the child interacts. The inner ring constitutes the family. Beyond the family, a midring encompasses the close social context (for example, schools, hospitals) in which the child and his or her family are found. Finally, the outer ring includes social support networks, agencies, and parents' places of employment. All 3 systems are hypothesized to contribute to the child's adjustment, and the focus is thus not on the disease and treatments, but on the contextual factors influencing adjustment. For

example, Hauser (2), in his review of families and chronic illness, noted that disturbed family environments (that is, those which were chaotic and in conflict) were associated with poor patient metabolic control.

Lazarus (3) defined coping as the cognitive and behavioural efforts to manage specific external or internal demands that are appraised as taxing or exceeding the resources of the person. The stress and coping model uses this definition. For example, a transactional stress and coping model was used within a family functioning perspective to study adaptation of children and mothers to cystic fibrosis (4). Illness was viewed as a potential stressor to which the child and the family endeavoured to adapt. Illness parameters reflected the severity of the stressor, modulated by demographic parameters, but the focus was on cognitive mediational processes, such as the appraisal of stress, the expectations of efficacy, and the locus of control—the methods of coping.

In this paper, we advocate the use of a posttraumatic stress model, especially for extreme medical conditions. In this model, the focus shifts from the factors influencing coping to the psychological and physiological dysfunctions evident in the child in relation to the traumatic event. In this respect, the issues of how the child may reexperience some distressing aspects of the illness and treatment and the means by which psychological and physiological processes interfere with a satisfactory adjustment are studied. The posttraumatic stress model does not discard the role of the environment, especially the one played by the parents, but it places this role in the context of a traumatic experience. As posttraumatic stress

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symptoms are manifest on a continuum, they may or may not warrant a clinical diagnosis. The relevance of the posttraumatic stress model, however, is to integrate different adjustment problem symptoms into one coherent picture and to delineate a subgroup of patients who would benefit from a specific therapeutic approach.

## Posttraumatic Stress Symptoms

### Definition

Posttraumatic stress disorder (PTSD) is classified as an anxiety disorder in the *Diagnostic and Statistical Manual (DSM-IV)* (5). It is associated with an unusual, well-identified extreme event, defined by its strong emphasis on the physical threat to the subject. It is worth noting that according to DSM-IV, the criteria of intense experience of fear, helplessness, or horror can be substituted in children by disorganized behaviour or agitation. Disorganized and agitated behaviours are common in hospitalized children but are often considered as normal distress reactions and thus possibly underestimated in their severity.

### PTSD Symptoms in Children

The symptoms and the coping strategies after a traumatic experience depend on the child's developmental stage at the time of the event. Infants and toddlers may show regressive behaviours such as thumb sucking, enuresis, loss of newly acquired developmental skills, or loss of verbal acquisition. They may manifest irritability and sleep problems (for example, difficulty going to sleep or night waking) (6). Preschool children have been observed reenacting traumatic situations in their play activities. Recollections are often confined to a simple image. Terr (7) noticed that repetitive dreams are rare before the age of 5 years. Decreased verbalization, cognitive confusion, and increased anxious attachment behaviour may be present. New fears may occur, like separation anxiety, fear of toileting alone, or fear of the dark. Sleep disturbances and irritability have also been reported.

Elementary school children present nightmares, preoccupation with the traumatic event, complex reenactment of the event, hyperarousal, hypervigilance, exaggerated startle reactions, and numbing of affects. Fears, avoidance behaviours, difficulty concentrating, memory impairment, and psychosomatic complaints are also observed. As reported by Pelcovitz and Kaplan (8), avoidance of reminders of the traumatic event may be the most common manifestation of PTSD seen in children. Traumatized children alternate between withdrawal, overly friendly behaviour, and aggressive outbursts. They obsessively retell the event. Pynoos and others (9) found in school-age children after a sniper attack that the most common symptoms were identification of the event as an extreme stressor, getting upset or being afraid when thinking about the event, and fear of recurrence. In this study, guilt increased posttraumatic distress.

In response to psychological stress, adolescents may manifest very compliant and withdrawn behaviour or, in contrast,

aggressive behaviour. Similarly, they may present premature movement to independence (act out sexually, move from home) or increased dependence. Delinquency, substance abuse, and self-endangering reenactment behaviour may also occur. They may manifest narcissistic rage and be at risk to take revenge (10). Flashbacks and guilt are more common in adolescents than in younger children.

While flashbacks are not common, cognitive-perceptual distortions, such as omens of the trauma, are characteristic among children (11). Sometimes, traumatized children may exhibit a reduced interest in usual activities, develop a sense of foreshortened future, and become unable to make future plans. Children may suffer from a sense of estrangement, as if others really could not understand their experience. From a developmental perspective, some of the PTSD symptoms, such as irritability, withdrawal, or sense of estrangement, may mar these children's interactions and relationships with peers. Reenactment in play and reduced interest in normal activities may also impair their imagination, fantasy, and symbolic expression. Self-esteem and self-image may also be affected, especially in situations involving abuse, illnesses, or life-endangering medical procedures.

Terr (7) distinguished a childhood trauma which results from a sudden blow (type I) from a trauma which follows a long-standing or repeated exposure to extreme external events (type II). In both cases, children meet the criteria of repetition, avoidance, and hyperalertness. The children who suffer from type I trauma (witnessing a murder or road traffic accident, for example), however, present full, detailed memories, omens, and misperceptions, whereas the children who suffer from type II trauma (for example, sexual or physical abuse) demonstrate massive denials, psychic numbing, dissociation, self-hypnosis, self-anesthesia, rage, absence of feeling, or personality problems. Clearly, among medical procedures, some may appear as type I trauma and be associated with traumatic events (for example, emergency interventions following burns, accidental injury), while others could be seen as reactions towards long-standing or repeated exposure to life threats (for example, painful and repeated medical procedures, cancer treatment, bone marrow transplantation) and may be considered as type II trauma. In the following section, we will review the medical procedures in which PTSD symptoms have been documented, according to this distinction.

## Type I Traumatic Situations

### Posttraumatic Stress Symptoms and Burns

Acute and severe burns are painful, frightening, and traumatic experiences. Studies in adults confirmed the presence of PTSD after burn injuries (12). In a study of pediatric burns involving 80% or greater total body surface area, all 25 surviving children appeared to be well adjusted psychologically and socially (13). Kravitz and others (14) found that nightmares and enuresis occur frequently after burn injury. They observed these symptoms in 37% of children who were

admitted one year or more after burn injury and stated that these symptoms did not decrease with time. In these latter 2 publications, however, no assessment of PTSD was reported. Stoddard and colleagues (15) found that 2 out of 30 patients burned at a mean age of 4.3 years presented PTSD 7 to 19 months after the injury. This diagnosis rose to 8 patients if those who had incomplete criteria were included and to 16 if both full or partial criteria over lifetime were included. PTSD was not assessed in the control group, however, and the existence of previous traumatic events was not ascertained. An elevated rate of diagnoses such as phobia, overanxious disorder, and enuresis was also found.

#### *Posttraumatic Stress Symptoms and Accidental Injury*

Craniofacial trauma may result in different kinds of neurological impairment as well as posttraumatic stress symptoms. It is probable that road accidents are the most common cause of PTSD in the general population, with about one-tenth of adult patients having such symptoms during follow-up visits. These symptoms do not manifest themselves in subjects who had been briefly unconscious and were amnesic for the accident (16). The literature says little about PTSD after craniocerebral trauma or after accidents in children. For some children, the trauma is not the accident itself, but the separation from parents, the pain, and the presence of the police or the medical personnel. Children may have difficulty differentiating the fear caused by a traumatic event from that caused by medical treatments. Children who survived a road traffic accident, however, often present posttraumatic reactions like traumatic play, reenactment of the event, traumatic dreams, emotional distress, and avoidance of travelling by car.

#### *Posttraumatic Stress Symptoms and Other Medical Procedures*

To our knowledge, no study evaluating posttraumatic stress symptoms was done on children hospitalized in intensive care units, although some medical interventions and conditions, such as cardiac surgery or severe asthma, may be traumatic.

Pot-Mees (17), in his study of bone marrow transplantation, compared children undergoing this procedure with children undergoing open-heart surgery. There were fewer behavioural problems and less emotional distress observed in the cardiac surgery group, probably due to better outcome expectation. We found a different result (18) in a boy who was born with a cardiac malformation and who was operated on 4 times before the age of 5. At 13 years of age, when a new intervention had to be done, he presented all the manifestations of PTSD: fear of recurrence, reexperience, intrusive image of the last surgical procedure, anxiety, restriction of affect, concentration difficulties, diminution of interest, learning problems, and features of major depression.

Studies concerning children with asthma indicate that they are at increased risk for psychological adjustment problems (19). Wamboldt and others (20) observed that 40% of a

sample of 62 inpatient adolescents with severe asthma met criteria for anxiety disorders as assessed by a semistructured interview. These data were confirmed by Baron and others (21), who found that about 50% of asthmatic adolescents presented anxiety disorders. Some of them demonstrated symptoms of PTSD, especially following intensive care unit hospitalization. Life-threatening asthma episodes can also be experienced as stressful events and may lead to fear of death and therefore to posttraumatic reactions such as traumatic dreams, flashbacks, or emotional distress after subsequent breathing problems.

#### **Type II Traumatic Situations**

##### *Posttraumatic Stress Symptoms and Cancer*

Until the late 1980s, most studies based on standardized measures of adjustment indicated an overall picture of normal adjustment. It is clear that a subset of children do have problems (social withdrawal, irritability, learning difficulties, exaggerated fears of relapse), however, which significantly alter their quality of life. This was first summarized by the concept of the Damocles syndrome (22), referring to the heavy sword that Dionysius, tyrant of Syracuse, made dangle by a horsehair above the head of his courtier. Nevertheless, it seems important to dissociate the legitimate worry caused by numerous well-known short-term consequences (for example, hair loss, nausea, pain) and long-term consequences (for example, growth deficiencies, cardiac diseases, dental and facial abnormalities, infertility) from the pathological stress symptoms related to a psychological trauma. Many aspects of childhood cancer and its treatment are traumatic in the sense of the DSM-IV definition. The diagnosis involves a life-threatening event, clinical evaluation, and treatment procedures, as well as the short-term side effects that constitute threats to the physical integrity of the subject. Procedures may be painful, and anticipatory anxiety may evoke intense fears and a feeling of helplessness. As the definition of a trauma includes both experiencing and witnessing, childhood cancer may be traumatic for both children and parents.

Nir (23) was the first to propose that the symptoms demonstrated by a subgroup of children and adolescents with cancer meet PTSD criteria. PTSD was then assessed in 26 adolescent cancer survivors in the DSM-IV field trials, with 9 of them meeting the diagnostic criteria sometime during their lifetime and 3 reporting severe PTSD symptoms 2 to 12 years after treatment termination (24). In a study of 64 survivors of leukemia by Stuber and others (25), 8 reported symptoms consistent with a severe level of PTSD. The most frequently reported symptoms were as follows: believing that the cancer experience is a severe stressor, being afraid when thinking of what happened, reexperiencing disturbing thoughts (often seen in repetitive plays or frightening dreams), and being distressed by reminders and intrusive thoughts. Previous results (26,27) on a smaller sample of 30 childhood cancer survivors showed that symptom severity was correlated with the subjective appraisal of the treatment

intensity but not with treatment duration in the younger children (6 years old and younger). Conversely, in those aged 11 and older, PTSD symptom severity was correlated with treatment duration but not with subjective appraisal of treatment intensity. PTSD level was not significantly correlated with time of treatment. As both groups had similar overall PTSD levels, these results suggest both a developmental component in the severity of PTSD, with the younger children being more sensitive to subjective aspects of the disease, and a relative stability of the syndrome, once established. The data reported by Stuber and others are based on a small sample, however, and are derived from a relatively low response rate of subjects (40% to 50%) in a self-report questionnaire.

#### *Posttraumatic Stress Symptoms and Organ Transplantation*

While transplantation is a promising intervention for a number of serious illnesses, it can be experienced as a life-threatening event because it often involves fatal diseases and intensive, intrusive medical treatments. The waiting period for a transplantation can also be stressful because parents and children face the anxiety of not knowing when or if the organ will come or whether the child will survive during this waiting time (28). Pot-Mees and Zeitlin (29) found that parents were severely distressed and depressed during the preadmission stage. Moreover, circumstances in which families are informed of an available organ donor but the donation is cancelled may be experienced as extremely traumatic (28). Hospitalization stress depends on the type of transplant and on the number and severity of complications. For a bone marrow transplant, the child may have to stay for more than a month in an isolated environment. In contrast, a kidney transplant requires hospitalization of less than a week. Liver and heart transplants require time in intensive care with isolation precautions but typically have shorter hospitalization stays than bone marrow transplants, depending on the degree of postoperative complications (29). Finally, the first anniversary of the transplantation is a reminder of the traumatic stress.

Pot-Mees (17) suggested that symptoms observed in some bone marrow transplant patients were similar to those developed in PTSD. She underlined the fact that these symptoms may occur 6 to 12 months after the bone marrow transplant. Stuber and others (30), in their pilot study on a small number of children ( $N = 6$ ) with bone marrow transplantation, found that the number of children who met criteria for a DSM-III-R diagnosis of PTSD increased over time (3, 6, and 12 months after transplant). They noted a difference in the symptom distribution between these children and those exposed to violent life threat. Startle responses or generalization of traumatic reminders were less common, whereas denial and avoidance were particularly pronounced. Reexperiencing was the most prominent symptom in the transplant group (30). Slater (28) noted that children often repeated in play what happened to them and identified this response as posttraumatic repetition. Andrykowski (31) noted that many bone marrow transplantation patients exhibited a variety of stress-

induced responses, including anxiety, depression, withdrawal, survivor guilt, sleep difficulties, anger, and hostility.

### **Differential Diagnosis**

#### *Internalizing Symptoms*

Traumatic events have an inherent potential to induce anxiety symptoms. Generalized anxiety disorder may include autonomic hyperactivity, vigilance, and motor tension. A diagnosis of separation anxiety disorder is warranted when anxiety symptoms appear after the child is separated from his or her attachment figures. Overanxious disorder and symptoms of panic disorder may also be manifested by traumatized children (32). Simple phobias have to be distinguished from posttraumatic avoidant behaviour, since avoidance goes beyond the specific trauma-related stimuli. Importantly, clinicians must also be aware of the possibility of patients' developing delayed-onset symptoms (32). These may occur even while treatment designed for anxious disorder is going on. Efforts to eliminate intrusive thoughts or images related to a traumatic experience may be misdiagnosed as an obsessive-compulsive disorder (32). The intensity of intrusive thoughts may sometimes resemble hallucinations but can be differentiated from those in schizophrenia or other forms of childhood psychosis by their traumatic origin and by the child's intact reality testing (32).

#### *Externalizing Symptoms*

Concentration difficulties and memory impairment related to PTSD may contribute to poor school performance and learning (33). Along with these problems, inattention, irritability, or aggressiveness may mimic or be secondarily complicated by disruptive disorders like attention-deficit disorder or attention-deficit hyperactivity disorder, oppositional defiant disorder, or conduct disorder. Otherwise, symptoms of PTSD tend to accentuate problems of disturbance in learning or behaviour in children with a prior onset of these disorders (33). Symptoms of major depressive disorder like depressed or irritable mood, diminished interest in usual activities, sleep disturbances, or difficulty to pay attention are common in patients with PTSD.

### **Risk Factors and Possible Long-Term Effects**

The primary risk factor in PTSD is the level or severity of exposure to the stressor, in particular the severity of the threat to life (34). Girls seem to be more at risk to develop posttraumatic symptoms than boys (35). Specific aspects of the child's recovery environment, particularly parental functioning, are predictive of the severity of later stress responses (35). Others (36) mention the separation from family or friends, the subjective appraisal of life threat, the degree of helplessness, and the active or passive role of the survivor as predictive variables. Earls (37) found that a preexisting psychiatric disorder in children contributes to the development of PTSD.

In the specific setting of pediatric tertiary care, clinicians should be aware of the impact the child's developmental level

has on the assessment of the trauma (26), especially when it has been cumulative in cases of long-term treatment, and of the child's interaction with his or her parents (27). Brown and coworkers (38) suggest that the children with leukemia who were particularly vulnerable to psychiatric difficulties were those whose parents showed psychopathology. Parents who themselves suffer from PTSD are greatly limited in providing adequate emotional support. Risk for PTSD in adolescent cancer survivors was greatest in adolescents whose mothers developed PTSD in response to their children's cancer (8).

In addition, stress may have a detrimental effect on brain development. An excess of glucocorticoids, sometimes a result of sustained stress or specific treatment regimens, can cause hippocampal atrophy in humans (39) and may interfere with memory functions. For example, in long-term leukemia survivors, high doses of prednisone may produce a specific verbal memory and coding deficit (40). Acute memory changes have also been documented in pediatric asthma patients treated with prednisone (41).

## Treatment

Controlled studies are needed in children in order to demonstrate the usefulness of the PTSD model after extreme medical procedures. Prevention approaches aim to decrease the impact of the traumatic experiences, whereas therapeutic approaches try to decrease PTSD symptoms.

### *Preventive Approaches*

Interventions against anxiety and pain, such as massage or self-hypnosis for surgery, or playroom activities (42) can be helpful and may be used in conjunction with anxiolytic drugs in some acute cases. Distraction and breathing exercises may help some children to reduce their anxiety level. In any case, it is essential to take time to explain treatments and prepare the child for the event. The clinician should also remain available to answer questions about procedures, since the child's internal control over a procedure may be an important resilience factor. A family approach is also essential because anxious and helpless parents increase the child's distress during medical procedures, which in turn reinforces helplessness and stress in the parents. It is relevant to note that 34% to 40% of the mothers and 24% to 33% of the fathers of children with cancer reported moderate to severe PTSD symptoms (26,28).

### *Therapeutic Approaches*

According to Pynoos and Nader (42), special interview techniques may be necessary to help children explore their experience and understand the meaning of their responses. Such techniques involve drawing, play, redramatization, or the use of metaphor. Individual psychotherapies should first focus on cognitive enhancement of feelings of security and safety, followed by a modified explorative approach involving an active role for the therapist, who should discuss intervention fantasies (such as retaliation) and later explore the more profound guilt and bereavement issues. Cognitive be-

havioural approaches and relaxation techniques may be used to master intrusive symptoms. As children and parents with the same disease share common experiences, group or family therapy (concomitant with other approaches) may also be useful (43). Pharmacological approaches are aimed at reducing intrusions, avoidance, anxious arousal, and impulsivity and improving sleep and associated disorders such as depression or other anxiety disorders (43). Benzodiazepines, such as clonazepam and alprazolam, diminish the anxiety component. Clonidine decreases startle responses, and propranolol reduces arousal symptoms. The tricyclic antidepressants imipramine and amitriptyline are reported to decrease the intrusion and anxiety symptoms (43). According to van der Kolk (44), a selective serotonin reuptake inhibitor such as fluoxetine can be effective for the entire spectrum of PTSD symptoms in adults. Buspirone, a serotonin agonist, has also been used to target anxiety in PTSD.

## Conclusions

Some life-threatening conditions or intense and painful medical procedures, for example leukemia, transplantation, or burns, may produce posttraumatic stress symptoms in a significant proportion of children. These symptoms differ according to the child's developmental stage and type of trauma. More studies using a prospective design are needed to describe the specific manifestations (especially after long-standing and repeated exposures to extreme events), predisposing factors, and effective treatment approaches to these symptoms. This seems especially important today, given that the number of children surviving medical conditions requiring intensive and sometimes traumatic procedures is steadily increasing.

### Clinical Implications

- Some medical situations may produce posttraumatic stress symptoms in children.
- Posttraumatic stress symptoms vary with age and type of medical situation.
- The PTSD model is useful in clinical follow-up of children with a severe medical condition.

### Limitations

- Clinical PTSD is less frequent.
- Prevention, follow-up, and treatment studies are needed.
- Psychological and biological risk and protective factors have to be studied.

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## Résumé

**Objectif :** Mettre l'accent sur les symptômes de stress post-traumatique après des états pathologiques qui surviennent pendant l'enfance, comme le cancer, les greffes d'organes, et les brûlures graves.

**Méthodes :** Les diagnostics différentiels, les facteurs de risque, et les aspects (psychologique et pharmacologique) du traitement font l'objet d'une discussion.

**Résultats :** En pédiatrie, on utilise beaucoup le concept des problèmes d'adaptation aux états pathologiques chroniques ou graves. Selon la définition du DSM-IV, de nombreux aspects des états pathologiques graves qui surviennent pendant l'enfance sont traumatisants : les maladies graves menacent l'existence, les interventions médicales menacent l'intégrité physique de l'enfant, et les périodes de comportement aberrant sont fréquentes.

**Conclusion :** Ce concept, dont l'étude reste insuffisante, constitue un domaine d'enquête prometteur en vue d'études prospectives et préventives.