



Pediatric Pain: New Approaches for Our Most Vulnerable Patients

A Multidisciplinary Approach to the Treatment of Pediatric Chronic Pain

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Many physicians do not understand the complex nature of chronic pain. Whereas patients with acute pain improve fairly predictably and rapidly, chronic pain patients often do not. Physicians may become frustrated because chronic pain appears to lack any identifiable biological purpose, and they see no consistent correlations among physical variables, pain perception, and disability, despite the fact that these patients present with pain behaviors and are often not working, attending school, or leading functional lives.

In the course of their treatment, many pediatric patients with chronic pain go several months with undertreated pain or ineffective treatments. These patients often lose hope and exhibit anxiety and depression that affect their daily life, social functioning, and education. Social, psychological, and environmental factors affect chronic pain (*J Pain* 2010;11:1039-46; *Pain* 2007;131:132-41; *Pain* 2012;153:437-43; *J Pediatr Psychol* 2009;34:882-92; *Pain* 2008;138:11-21). The patient may be unaware of these factors, resulting in treatment failure, drug dependence, depression, and disability.

A multidisciplinary approach encompassing integrated, multimodal, interdisciplinary care is effective and safe (*Clin J Pain* 2015;31:375-83; *Clin J Pain* 2017;33:535-42; *Arch Dis Child* 2003;88:881-5; *Pain* 2014;155:118-28; *Clin J Pain* 2012;28:766-74; *Pain* 2012;153:1863-70; *J Pediatr Psychol* 2010;35:128-37; *Clinical Practice in Pediatric Psychology* 2019;7:116-26; *J Pediatr Psychol* 2013;38:213-23). Its goal is to improve pain assessment and promote coordinated care across the continuum of pain in order to conform to the biopsychosocial model (*Clin J Pain* 2015;31:375-83; *Clin J Pain* 2017;33:535-42; *Pain in Infants, Children, and Adolescents*. 2003; *Arch Dis Child* 2003;88:881-5; *Psychol Bull* 2007;133:581-624; *Pain* 2014;155:118-28; *Clin J Pain* 2012;28:766-74; *Pain* 2012;153:1863-70; *Pain* 2012;153:437-43; *J Pediatr Psychol* 2010;35:128-37; *Clinical Practice in Pediatric Psychology* 2019;7:116-26; *J Pediatr Psychol* 2013;38:213-23; *J Dev Behav Pediatr* 1997;18:413-22). This approach provides value, as defined by predetermined outcomes of care.



All multidisciplinary team members: The pediatric pain physician, physical therapist, behavior psychologist, and child psychiatrist are reviewing the case.

The multidisciplinary approach involves eliminating narcotics, identifying appropriate non-narcotic medications that can calm overactive nerves, and managing anxiety and depression without creating drug dependence. This approach also addresses patients' psychological, social, and emotional difficulties while educating them about chronic pain management. Multidisciplinary models include a pediatric pain physician, pain psychologist, physical therapist, education specialist, and psychiatrist.

Psychiatric disorders are a common comorbidity of chronic pain. The most common psychiatric comorbidities are depression and anxiety, with depression being more prevalent in the pediatric inpatient chronic pain population (*Pediatrics* 2013;132:e422-29) and anxiety being more common in the outpatient community (*Pain Res Manag* 2012;17:93-7; *J Pain* 2015;16:1054-64). Adolescents with chronic pain have higher lifetime rates of anxiety and depressive disorders (*Pain* 2016;157:1333-8). Additionally, among children admitted with chronic pain, 6% have a disorder with related somatic symptoms, and 2.4% have post-traumatic stress disorder (*Pediatrics* 2013;132:e422-29). Boys with conduct disorder show a greater prevalence of headaches, and boys with oppositional defiant disorder and attention deficit hyperactivity dis-

order show a greater prevalence of stomach aches (*J Am Acad Child Adolesc Psychiatry* 1999;38:852-60). Adolescents with chronic pain also have an elevated risk of suicide and should be screened for any suicidal ideation and gestures (*J Pain* 2011;12:1032-9). This association between chronic pain and psychiatric disorders can be explained in part by shared neurobiological pathways (*J Psychiatry Neurosci* 2001;26:21-9) and further emphasized by the negative impact on physical and psychosocial aspects of a child's life. Pain appears to decrease the probability that a patient will experience remission of depressive symptoms when treated with antidepressants (*Pain Med* 2010;11:732-41). Therefore adequate management of a patient's pain affects and improves several aspects of the child's life (*Mayo Clin Proc* 2016;91:955-70). It is also imperative to treat psychiatric symptoms in conjunction with the treatment of chronic pain to achieve positive outcomes (*Can J Pain* 2017;1:37-49). Treatment approaches for youth with chronic pain and psychiatric disorders have been extrapolated from adults; therefore, additional research with randomized controlled trials is required to inform pediatric strategies.

Conceptually, multidisciplinary treatment aims to decrease patients' pain behavior and replace it with "wellness behavior." Importantly, it also educates



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patients and family caregivers that "hurt" is not "harm" and that activity can be beneficial by strengthening them and gradually retraining their brain to decrease pain perception (*Clin J Pain* 2015;31:375-83; *Clin J Pain* 2017;33:535-42; *Pediatrics* 2015;136:115-27; *Pain* 2014;155:118-28; *Clinical Practice in Pediatric Psychology* 2019;7:116-26). The goal is to de-emphasize pain, disability, and negative thinking in every patient interaction and replace these with an emphasis on health, wellness, and positive behaviors affirmations (*J Consult Clin Psychol* 1994;62:306-14; *Chronic Pain: Management Principles*. 1985; *Seminars in Pain Medicine* 2003;1:90-8; *Oxford Textbook of Paediatric Pain*. 2014).

Cognitive-behavioral therapy (CBT) is the cornerstone of psychological treatment for pain management. Children with chronic pain are taught to cope with pain through relaxation and focusing techniques, not dissimilar from the breathing and focusing techniques taught to parturients to help manage the pain of labor. Through CBT, patients living with chronic pain can decrease their focus on and perception of pain, enabling them to regain control of their daily functioning (Cognitive-Behavioral

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Psychiatric Considerations in Pediatric Chronic Pain

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Chronic pain can greatly affect a patient's daily functioning and significantly impact health-related quality of life (*Pain* 2005;119:1-4). Undertreated or untreated chronic pain in children can be especially burdensome to families by disrupting routines, restricting the child's daily activities, and increasing risk of long-term disability (*Paediatr Drugs* 2002;4:737-46). Therefore, it is not unusual for chronic pain to be highly comorbid with psychiatric disorders. This association is mediated by significant overlap in biological pathways.

First, central and peripheral noradrenergic (NA) and serotonergic (5-HT) pathways are affected in both pain and mood disorders (*Prog Neuropsychopharmacol Biol Psychiatry* 2018;87B:290-7; *J Psychiatry Neurosci* 2001;26:21-9). A pathway involving serotonergic neurons in the dorsal raphe nucleus has been implicated in chronic pain as well as depression (*Nat Neurosci* 2019;22:1612-4). Both NA and 5-HT brainstem-spinal descending systems suppress nociceptive signals from afferent neurons, and the activation of spinal NA and 5-HT receptors has antinociceptive effects. Second, glutamate signaling, particularly signaling through

AMPA receptors, plays a key role in regulating pain, depression, and depression in the context of chronic pain (*Neural Plast* 2015;2015:504691). In addition to NA, 5HT, and glutamate, endocannabinoid signaling plays important roles in regulating both depression and pain. Pain-induced depression may also have unique physiologic and molecular mechanisms, possibly related to endocannabinoid signaling via the CB2 receptor (*Pain* 2009;143:206-12). Additionally, neuroplasticity and neuroinflammation are seen in both depression and chronic pain, and the central nervous system undergoes long-term plastic changes associated with chronic pain and depression (*Neural Plast* 2015;2015:504691). Brain-derived neurotrophic factor, a biomarker of depression (*Curr Pharm Des* 2017;23:3154-63), is elevated in patients suffering from chronic pain (*Neurosci Lett* 2019;706:105-9). The same can be said about inflammatory factors like interleukin-6 and C-reactive protein, which are elevated in both depression (*Transl Psychiatry* 2019;9:127) and fibromyalgia (*Cytokine* 2016;84:25-8). Lastly, neuroimaging studies have revealed similar structural changes in the amygdala, hippocampus, and limbic structures of patients with chronic pain, depres-

sion, and anxiety (*Rev Colomb Psiquiatr* 2018;47:46-55).

Psychiatric disorders and chronic pain

Studies suggest that youth with psychiatric disorders have higher rates of chronic pain (*Headache* 2019;59:306-38) and that the prevalence of some psychiatric disorders varies depending on the type of chronic pain. Temporal associations were also found between the onset of mental health disorders and the onset of chronic pain. The greatest association was found when onset of mental disorder preceded onset of pain. However, no significant associations were found when onset of pain preceded onset of mental disorders (*J Pain* 2015;16:1054-64). Generally speaking, 40% of adolescents admitted with chronic pain have a comorbid mental health condition, primarily mood disorders (28%) and anxiety disorders (18%) (*Pediatrics* 2013;132:e422-9). Others have estimated that the most common illnesses in the outpatient population are anxiety disorders (*J Pain* 2015;16:1054-64; *Pain Res Manag* 2012;17:93-7).

Studies have shown a mutual maintenance of depression in conjunction with pediatric chronic pain (*Clin J Pain*

2019;35:633-43). Correspondingly, adolescents with chronic pain have a 24.5% lifetime rate of depression, higher than the 14.1% rate of depression without chronic pain (*Pain* 2016;157:1333-8). Depression is also considered a risk factor for both the development and progression of chronic migraine in youth (*Headache* 2019;59:306-38). Overall, psychiatric issues such as depression, anxiety, and self-harm are the most common comorbid conditions with migraine in pediatric patients (*Pediatr Neurol* 2019;97:26-9).

Anxiety and other disorders

Anxiety also is associated with higher rates of pain (*Pediatr Neurol* 2019;97:26-9), and adolescents with chronic pain have higher lifetime rates of anxiety. This association exhibits a sex bias. Girls with anxiety have a 2.6 times greater prevalence of headaches, a 100 times greater prevalence of stomach aches and headaches together, and a 3.4 times greater prevalence of musculoskeletal pain than girls without an anxiety disorder (*J Am Acad Child Adolesc Psychiatry* 1999;38:852-60). In contrast, boys show no association between anxiety and somatic complaint. However, boys with

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Therapy for Chronic Pain in Children and Adolescents. 2012; *Pain* 2016;157:174-85; *PM R* 2013;5:697-704). Increasing a sense of self-efficacy and gaining skills to manage pain are the ultimate goals. These skills decrease their affective reaction to chronic pain and reduce the catastrophic thoughts that frequently accompany the experience of pain (*Children (Basel)* 2016;3:30; *Pain* 2012;153:1863-70; *J Pediatr Psychol* 2013;38:756-65).

Today, image-guided pediatric chronic interventional pain medicine is a new subspecialty of pain management that uses techniques such as spine injections, joint injections, musculoskeletal injections, and nerve blocks. These treatments are effective for sports injuries, and children require fewer injections than do adult patients who have degenerative changes. However, the outcomes of patients who



The multidisciplinary team concluding the diagnosis and treatment plan with the patient and family.

receive pediatric interventional techniques for chronic pain are dependent on the experience and skill of the operator, especially when these interventions are performed in children who are under sedation or general anesthesia. Therefore, practitioners must be trained in an ac-

credited fellowship program. Moreover, pediatric interventional chronic pain management is a new specialty without sufficient data regarding success rates.

The concept of a multidisciplinary facility for the diagnosis and treatment of complex pain problems has been in-

creasingly embraced by medical professionals (*Pediatrics* 2015;136:115-27). As noted by Vasudevan, "Unlike unimodal, uncoordinated and 'quick fix' pain treatment, multidisciplinary pain programs use a rehabilitation approach in which a 'cure' for the pain or the underlying condition causing the pain is not the goal/aim." (Multidisciplinary Management of Chronic Pain, 2015) In fact, it is counterproductive to imply that patient improvement requires waiting until an explanation and cure can be found. Children living with pain, and their families, can improve their quality of life by replacing pain-related behaviors and negative thinking with behaviors and perspectives that reinforce quality of life. This approach allows individuals with chronic pain to return to a more functional and satisfying life. Thus, chronic pain in the pediatric population is reversible when treated through a multidisciplinary approach. ■