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The ripple effect: systems-level interventions to ameliorate pediatric pain

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Abstract

The focus of this brief review is to highlight to the reader some of the 'ripple effects' of broader systems-level healthcare issues and the implications they may have for effective treatment of pediatric chronic pain. Many healthcare providers focus almost exclusively on the patient, but lack the knowledge of how to intervene effectively at systems levels with families, schools and healthcare institutions surrounding the pediatric patient with pain. We provide a case example and consider this issue across three systems that are particularly relevant to pediatric pain management: the outpatient pain clinic, school and inpatient settings. The information presented will improve the healthcare provider's ability to effectively treat pediatric pain through an enhanced understanding of the multiple systems of care that surround children with pain.

The 2011 report from the Institute of Medicine, 'Relieving Pain in America' highlights that interdisciplinary, biopsychosocial approaches to treating persistent pain are the most promising interventions for affecting positive outcomes [1]. However, there are significant institutional, educational, organizational and reimbursement-related barriers to providing this care for both pediatric and adult patients with chronic pain. These challenges are not unique to pain management. For example, emerging concepts within the US healthcare system include the 'Patient-centered Healthcare Home' [101], the 'Pediatric Medical Home' [2,3] and related 'Health Neighborhood' [4], which all emphasize a need to better connect both physical and mental healthcare.

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Central to patient-centered healthcare and ‘medical home’ concepts is a team approach to managing the multiple needs of the patient and family primarily by the medical home team (who may consist of a physician, physician extenders, nurses, care managers, psychologists, rehabilitative therapists and others) working collaboratively with specialists, the patient and family [2,5]. This model works well for children and adolescents and is especially good for those with complex medical issues, such as chronic or complex pain [2]. Moreover, the integrated system of care advocated by a healthcare home and community-based healthcare neighborhood provides an ideal framework to support the needs of pediatric chronic pain patients who consult multidisciplinary pain services.

There are barriers to the implementation of the pediatric healthcare home including: patient/family factors (stigma, parent mental health); provider factors (training, attitude toward managing and treating mental health issues); and systemic factors (administrative/financial barriers, a lack of technological interoperability and confidentiality concerns, lack of adequate training and availability of medical professionals, and a lack of evidence of large-scale feasibility and population-level improvement in health outcomes) [2]. Each of these factors affecting implementation of a healthcare home can have a downstream effect of creating additional barriers to implementing effective pediatric pain management. More specifically, challenges in creating an effective healthcare home are highly consistent with specific challenges that keep multidisciplinary pain clinics from being more widely available, as described by Meldrum [6]. Three core challenges are defined pertaining to tensions related to inter-disciplinary collaboration in academic medical centers and other settings; financial models of support (e.g., collaborative care models vs fee-for-service models); and treatment models (e.g., tensions between models that emphasize rehabilitation and patient behavioral change vs biomedical ‘curative’ treatment models, such as surgery, interventional anesthesiology, such as nerve blocks and/or a primary reliance on analgesic medications) [6]. This final tension relating to treatment models may be further conceptualized as a difference between whether the main effort of treatment is to either avoid, prevent and/or block pain, or rather, to accept the presence of pain and to help patients to re-engage in living in accordance with their own goals and values.

The focus of this brief review is to highlight for the reader in the sections that follow some of the ‘ripple effects’ or the reciprocally impacting outcomes of these broader systems-level issues and the implications they may have for effective treatment of pediatric chronic pain. To this end, we will consider a few of the challenges and opportunities related to treatment of pediatric pain in three systems: the outpatient academic medical center setting, the school setting and the inpatient setting. Each setting typically includes overlapping and interconnected subsystems that require integration of inpatient, outpatient and network sites, as well as management of out-of-network local and far-reaching referrals. Moreover, each of these three settings would need to maintain a connection with the patient’s medical home to assure continuity of care. A case study is presented for reference of an adolescent with chronic pain to exemplify the multiple overlapping systems involved, including family, inpatient, outpatient and school/extracurricular activities (Box 1).

The pediatric multidisciplinary pain clinic setting

Pediatric chronic pain is common and should be recognized as a major health concern [7–9]. This is confirmed in community samples of children and adolescents, with 83% experiencing pain within a 3 month period and 30.8% having pain present for >6 months with headache, abdominal, limb and back pain being the most prevalent [8]. There is considerable evidence to support the important role of psychological therapies in the management of pediatric chronic pain. Readers are referred to the following excellent reviews on this topic [10–12].

While recurrent and chronic pediatric pain is very common, research suggests that the majority of youth in the community who report chronic pain symptoms do not experience significant impairment or seek treatment [13]. We are only beginning to understand pediatric pain service utilization and this knowledge has important implications for optimizing systems of care. Toliver-Sokol and colleagues recently examined health service utilization in community and clinical pain samples of adolescents [14]. They found that the clinical sample had greater health service utilization for all types of medical visits (general, specialty care, complementary medicine, mental health and occupational/physical therapy) and for medication use, and that higher annual income, pain frequency and levels of caregiver-reported activity limitations associated with more visits in both the clinical and community samples. Moreover, within the clinical pain sample, greater pain frequency and activity limitations predicted more specialty care visits. In addition, the research literature focusing on pediatric pain trajectories into adulthood suggests that these problems can and do persist beyond pediatric age [15–18]. Collectively, these studies underscore the importance of effectively treating chronic pediatric pain and suggest that high healthcare utilizing patients with chronic pain do require biopsychosocial treatment that considers psychological, social, behavioral and biomedical factors that relate to pain [19,20].

To this end, the pediatric multidisciplinary pain clinic plays an important role in synthesizing prior evaluations and in coordinating and implementing a biopsychosocial approach to pain management. It does this by providing education, helping to align treatment expectations (e.g., increased function to occur before decrease in pain; that it may not be a fast process), motivating treatment adherence and providing follow-up treatment. Multiple researchers have documented the need for and importance of pediatric multidisciplinary pain clinic settings [21–23]. The multidisciplinary pain clinic provides a family-centered care approach, which is essential to understanding patient, parent(s) and family factors [24] and the important role of interactions between the patient and parent in alleviating chronic pain [25]. Treatment goals are primarily focused on decreasing pain-related disability, in addition to pain relief, which is frequently measured using the Functional Disability Inventory [26], a well-established pediatric measure of difficulty with physical functioning and activities in youth with chronic pain [26–28].

Researchers are still trying to understand which treatment-related factors relate to later functioning. Treatment adherence is emerging as an important piece of this puzzle. For example, patient JR's case provides an example of multiple factors potentially relating to treatment adherence that could limit her successful coping with headache pain. These factors may include considering whether discontinuation of treatment with a psychologist was premature, what support parents continue to need to help develop constructive responses to their daughter's pain that encourage functional behaviors (e.g., school attendance and participation in activities), and determining whether her medication use has been as prescribed. While adherence is becoming more widely studied in pediatric populations, few studies examine pediatric chronic pain clinic samples. This may, in part, be due to the significant challenges related to assessing complex multidisciplinary recommendations that can straddle medical, behavioral, social, cognitive and academic domains. What we do know about adherence and pediatric chronic pain is that there are high levels of nonadherence to pain clinic recommendations [23], better adherence is associated with better functional outcomes [23], and pain coping and treatment expectations were coupled with adherence [29]. In addition, treatment satisfaction probably plays a role in adherence and outcomes. To date, there are limited data available for pediatric chronic pain treatment outside of satisfaction with initial evaluation [23].

Our understanding of the relationships between factors contributing to treatment adherence and positive outcomes remains superficial. Enhancing this knowledge will allow us to help

overcome barriers to providing evidence-based care for pediatric chronic pain. Changes related to healthcare policy will continually challenge us to rethink traditional models of treatment delivery and ways to provide tools to support pain self-management. The reader is directed to an excellent comprehensive review by Rozensky and Janicke that specifically focuses on pediatric psychology's role and function in healthcare reform within the US healthcare system [30].

As previously noted, considerable challenges currently exist to providing multidisciplinary pediatric pain management in the outpatient setting, including tensions related to interdisciplinary collaboration, financial models of support and treatment models. Nevertheless, many opportunities exist to help meet these challenges. For example, there is potential to enhance pediatric pain treatment through augmenting the initial evaluation encounter to more deliberately jumpstart treatment. The initial evaluation encounter may be the only opportunity providers get to directly provide care (e.g., for those patients who live far from the clinic) and/or to motivate patient and parent readiness to engage in a self-management approach to coping with pain [31]. Recent research focusing on adolescent and parent pain-related behaviors shows that adolescent pain catastrophizing mediates the relationship between protective parenting behaviors and disability, both at the time of the initial clinic visit [32] and over time [33]. The clinical implications of these research findings could suggest that efforts to develop specific strategies to effectively intervene around parenting behavior and pain catastrophizing at the time of the clinic evaluation may be an important front line target of intervention. Continued research is essential to understand key factors that play a role in the treatment process and mechanisms that facilitate improved treatment outcomes over time.

Additional opportunities exist to make treatment more accessible to patients and families. Internet or web-based treatments, such as Palermo and colleagues' WebMAP program, hold great promise in this regard [34]. Preliminary findings for the first 26 families enrolled in this randomized controlled trial demonstrate a 92.3% participation rate in online behavioral pain management intervention for families of adolescents with chronic pain [35]. Notably, positive treatment effects were reported for this initial sample and findings also support that a provider/online coach role was still important in predicting positive treatment outcomes. Other strategies for enhancing accessibility that have shown beneficial treatment outcomes include the provision of psychological services through group interventions [36] and 1-day weekend pain treatment workshops [37]. Yet another potential mechanism to help minimize locational barriers to treatment includes pursuing telephone or video-conferencing options to provide care. Successful treatment models have been developed to deliver multidisciplinary pediatric sleep medicine services to families in geographically isolated areas and this model can be adapted to the specific needs of pediatric pain patients [38]. Finally, working more directly with schools to treat pediatric pain patients provides additional opportunities to enhance accessibility and effectiveness, which will be considered in more detail the next section.

Reaching beyond the healthcare setting: challenges & opportunities for collaborating with schools

School is a crucial domain of functioning for youth with chronic pain. It is the primary goal-oriented activity for children, where they acquire both academic and social skills necessary for success in later life. The effects of chronic pain on school functioning can manifest in a myriad of ways. Pain can impair school attendance, academic performance, peer relations and involvement in extracurricular activities, as well as the child's sense of competence and self-esteem [39–41]. Disability in school during adolescence can set the stage for lifelong patterns of pain-related disability, high healthcare utilization and reduced productivity. Yet

addressing school-based issues often represents a challenge to healthcare clinicians, given the difficulties of working effectively across multiple complex systems.

Over the last decade, studies have begun to address this important area of pain-related functioning, with the majority of research to date focused on school absence. Data have emerged to support the longstanding clinical observation that chronic pain has a significant impact on school attendance. Many children with chronic pain miss extensive amounts of school, with a significant subset of them missing half of school days or more [9,40]. For some, a vicious cycle develops wherein pain-related school absence generates anxiety about the return to school and the need to catch up, resulting in protracted school avoidance [39,42]. In such cases, pain-related school impairment often requires treatment approaches similar to those used to address school phobia, for example, cognitive behavioral techniques, such as systematic desensitization, exposure and operant conditioning combined with parent intervention and school support [43,44]. For instance, in the case of JR, a pain psychologist might intervene to set up a gradual, progressive return to full time attendance at school, combined with specific accommodations that could be implemented in school to facilitate re-engagement, such as allowing JR a few extra minutes to navigate between classes in order to manage her exposure to crowded, bright and noisy hallways. Working with JR's parents to help them encourage JR to attend school even when a headache is present would be crucial to the success of such a plan.

In concert with improving school attendance, there are other important targets to assess and treat when addressing school functioning in youth with pain. Relatively little is known about the effects of chronic pain on academic performance. Many children with chronic pain have been historically high achievers whose academic performance may not necessarily fall below normal but may represent a failure to achieve to their own potential. Pain may affect academic performance through its negative impact on attention capacity [42,45]. Some studies have documented specific neurocognitive effects of some types of chronic pain, with the largest body of research demonstrating this effect among children with headaches [46,47]. Because school personnel may not be familiar with the effects of pain on cognitive abilities, there is an opportunity for clinicians to provide information and guidance to help schools respond to the needs of children with pain.

Pain may also impact children's self-perceptions in the school setting, both in terms of academic [48] and social competence [49,50]. Children with pain may begin to perceive themselves as poor fits in their school environment, leading to a reduced sense of school belongingness [51,52]. These constructs have not yet been well explored among children with chronic pain syndromes and can often be challenging to assess. Communication between the healthcare team and school personnel is vital to understanding the multifaceted impact that pain may have on school functioning to developing and implementing feasible interventions.

Another challenge lies in identifying the causes of pain-related school impairment. From an ecological systems perspective, the factors affecting pain-related school functioning span the individual, family and larger social systems levels. At the level of the individual child, depressive symptoms have been found to associate with school impairment in the context of chronic pain [53]. Anxiety can also impact the child's ability to function in school with pain. For some children, school avoidance arises from a fear of encountering painful stimuli in the school setting. Parental responses to pain appear to play an important role in children's school functioning in the face of chronic pain. Recent research shows that parental thoughts about the child's pain (i.e., parental pain catastrophizing) and responses to the child's pain behaviors (i.e., protective responses) influence the school functioning of children with chronic pain [54]. Appropriate methods for assessing the role that parents play in the child's

ability to function in the school context need to be developed to assess and evaluate effective interventions in this realm. A key goal for the pain clinician is to establish parental 'buy in' to the importance of improving school functioning.

In order to help children with chronic pain succeed in school, we must also acknowledge and understand the role that schools themselves play in meeting the needs of this at-risk population. Little work has been done in this area, but a few studies demonstrate the important influence of the school response and highlight directions for future clinical and research efforts. A study by Logan *et al.* illustrated that the majority of school personnel views chronic pain as either an entirely psychological or entirely medical phenomenon, or are unable to provide any opinion of its origins [55]. It is not surprising that school personnel have little understanding of the biopsychosocial model of pain, since this is a complex conceptualization that is not always consistently adopted, even among healthcare professionals. This study further showed that teachers who attributed the pain, at least in part, to medical causes expressed more willingness to provide accommodations for the child with pain. This finding underscores the opportunities that exist for the pediatric pain healthcare team to reach out to school professionals who work with their patients to provide information and recommendations on responding to the pain in the school setting. Fruitful collaborations may also draw upon other resources within the healthcare system, such as hospital-based educators with expertise in meeting the educational needs of children with medical issues, and occupational therapists who may offer useful adaptive strategies for navigating the school setting. In rising to the opportunity to help children with pain restore their school functioning, important goals for the healthcare provider include: fostering open communication between families, schools and the healthcare team; providing education about pediatric pain to those school personnel; and working collaboratively with schools and families to develop clear and appropriate strategies to help the individual child with pain to function adaptively in school and to meet his/her educational and functional goals.

Challenges & opportunities caring for children with chronic pain in the hospital setting

Pain management in hospital-based care can be especially challenging when children have a chronic pain condition. Procedural pain and acute pain are more commonly treated. Barriers to providing evidence-based care for pediatric chronic pain in an acute setting are numerous [56,57]. As previously identified, interdisciplinary collaboration for optimal care is important, but can be affected by the need to coordinate multiple services involved in the care of the child, each with their own treatment plan. This 'silo' situation is especially problematic in academic medical centers because the goals of patient care can, at times, be disparate. For example, a child or adolescent with a chronic illness that includes a chronic pain component, such as sickle cell disease or inflammatory bowel disease, may have an admission for an acute, episodic diagnosis unrelated to their chronic disease. Coordination with the service that usually manages the adolescents' chronic pain can be delayed and potentially affect the patient care goals for that specific admission. Systems can be put into place to maximize communication and shared clinical decision-making, but this requires regular team meetings involving the family and relevant care providers.

In addition to hospital-based care coordination, patients with chronic pain conditions need assistance with planning strategies to transition back to the school setting mindful of how disruptive chronic pain can be. In the case of JR, care coordination with the school nurse and teachers is vital to encourage attendance. Both JR and her parents can be coached through a discussion of modifications to be put into place that are mindful of successful treatment modalities JR has used in the past. For example, negotiating some schedule modification for JR with her teachers that would allow her to visit the school nurses' office and practice

biofeedback would be ideal. Identifying short- and longer-term goals for pain management that build on past treatment successes is key. Ideally, speaking with the family and with JR to strategize about her diet, exercise and medication needs to prevent severe headache pain recurrence should be part of the hospital discharge planning process. Nurse case managers who are hospital based can assist with coordination of care following discharge. With permission of the family, this care coordination could also include the school nurse and the community-based pain psychologist.

Challenges inherent in promoting effective interventions within the inpatient setting include limited time, increased patient acuity and multiple job responsibilities that nurses must juggle. Nurses are ideal professionals to facilitate these coordination efforts because of their constant presence at the bedside and ongoing interaction with other healthcare team members and the family. One successful hospital-based model is the development of a pain resource nurse (PRN) group. There is strong evidence to support the development of a pain nurse expert or PRN model as a way to effectively improve pain management for hospitalized patients [58,59]. Outcomes of the PRN effort include enhancing the knowledge and skills of healthcare providers in pediatric pain management to improve quality of care for patients and families; synthesis and utilization of existing evidence to identify and implement best practice for quality pain management; and identification and implementation of best practice in pediatric pain management to improve consistent performance throughout the hospital system [60]. A PRN nurse model helps identify nurses with proven expertise. With institutional support, a PRN nurse can schedule time away from direct patient care to attend family meetings, provide in-depth consultation and education, and help focus the plan of care for patients like JR [58].

Conclusion & future perspective

This brief review highlights some of the emerging ripple effects of broader systems-level issues as they relate to treating pediatric pain in inpatient, outpatient and school contexts. A case study was provided and discussed to demonstrate the ways in which effective care for pediatric chronic pain patients overlaps multiple systems. Communication and integration among these separate systems is necessary to affect positive outcomes. We offer a review of some current challenges and opportunities for providing effective pediatric pain management in each setting. An acknowledged limitation of the current review is that it was written primarily from the perspective of authors who work within the US healthcare system. Thus, some of the challenges and opportunities noted may not be applicable to other healthcare systems. Nevertheless, it is our hope that many of the themes discussed in this review will transcend international boundaries, and that evolving policy-level changes in healthcare may provide future opportunities to advance the type of biopsychosocially informed, integrated care that will benefit pediatric patients with pain and their families.

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References

Papers of special note have been highlighted as:

- of interest

■ of considerable interest

1. Institute of Medicine. Institute of Medicine. Relieving Pain in America: a Blueprint for Transforming Prevention, Care, Education, and Research. 2011 Washington DC, USA The National Academies Press ■ Provides a comprehensive overview of the status of pain treatment in the USA with respect to challenges in the current healthcare system. Recommendations are made to help achieve a cultural transformation in the way pain is understood, assessed and treated to improve patient care.
2. Trivedi HK, Pattison NA, Neto LB. Pediatric medical home: foundations, challenges, and future directions. *Pediatr. Clin. North Am.* 2011; 58(4):787–801. [PubMed: 21855707] ■ Provides a recent overview of the pediatric medical home historical foundations, its current challenges relating to patient/family, provider and healthcare systemic factors, and considerations for the future.
3. Medical Home Initiatives for Children With Special Needs Project Advisory Committee. American Academy of Pediatrics. The medical home. *Pediatrics.* 2002; 110:184–186. [PubMed: 12093969]
4. Garg A, Sandel M, Dworkin PH, Kahn RS, Zuckerman B. From medical home to health neighborhood: transforming the medical home into a community-based health neighborhood. *J. Pediatr.* 2012; 160(4):535.e1–536.e1. [PubMed: 22424405]
5. Wegner S, Antonelli R, Turchi R. The medical home – improving quality of primary care for children. *Pediatr. Clin. North Am.* 2009; 56:953–964. [PubMed: 19660637]
6. Meldrum, M. Brief history of multidisciplinary management of chronic pain, 1900–2000. In: Schatman, ME.; Campbell, A., editors. *Chronic Pain Management: Guidelines for Multidisciplinary Program Development*. NY, USA: Informa Healthcare USA, Inc.; 2007. p. 1-15.
7. King S, Chambers CT, Hugué A, et al. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. *Pain.* 2011; 152(12):2729–2738. [PubMed: 22078064]
8. Perquin CW, Hazebroek-Kampschreur AA, Hunfeld JA, et al. Pain in children and adolescents: a common experience. *Pain.* 2000; 87:51–58. [PubMed: 10863045]
9. Roth-Isigkeit A, Thyen U, Stoven H, Schwartzenberger J, Schmucker P. Pain among children and adolescents: Restrictions in daily living and triggering factors. *Pediatrics.* 2005; 115(2):e152–e162. [PubMed: 15687423]
10. Palermo T, Eccleston C, Lewandowski A, Williams A, Morley S. Randomized controlled trials of psychological therapies for management of chronic pain in children and adolescents: an updated meta-analytic review. *Pain.* 2010; 148(3):387–397. [PubMed: 19910118]
11. Eccleston C, Palermo TM, Williams A, Lewandowski A, Morley S. Psychological therapies for the management of chronic and recurrent pain in children and adolescents. *Cochrane Database Syst. Rev.* 2009; (2) CD003968.
12. Eccleston C, Clinch J. Adolescent chronic pain and disability: a review of the current evidence in assessment and treatment. *Paediatr. Child Health.* 2007; 12(2):117–120. [PubMed: 19030350]
13. Hugué A, Miro J. The severity of chronic pediatric pain: An epidemiological study. *J. Pain.* 2008; 9(3):226–236. [PubMed: 18088558]
14. Toliver-Sokol M, Murray CB, Wilson AC, Lewandowski A, Palermo TM. Patterns and predictors of health service utilization in adolescents with pain: comparison between a community and a clinical pain sample. *J. Pain.* 2011; 12(7):747–755. [PubMed: 21481647]
15. Mulvaney S, Lambert EW, Garber J, Walker LS. Trajectories of symptoms and impairment for pediatric patients with functional abdominal pain: a 5-year longitudinal study. *J. Am. Acad. Child Adolesc. Psychiatry.* 2006; 45(6):737–744. [PubMed: 16721324]
16. Hotopf M, Carr S, Mayou R, Wadsworth M, Wessely S. Why do children have chronic abdominal pain, and what happens to them when they grow up? Population based cohort study. *Br. Med. J.* 1998; 316(7139):1196–1200. [PubMed: 9552994]
17. Hotopf M, Mayou R, Wadsworth M, Wessely S. Childhood risk factors for adults with medically unexplained symptoms: results from a national birth cohort study. *Am. J. Psychiatry.* 1999; 156(11):1796–1800. [PubMed: 10553745]
18. Hotopf M, Wilson Jones C, Mayou R, Wadsworth M, Wessely S. Childhood predictors of adult medically unexplained hospitalisations. Results from a national birth cohort study. *Br. J. Psychiatry.* 2000; 176:273–280. [PubMed: 10755076]

19. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science*. 1977; 196:129–136. [PubMed: 847460]
20. Engel GL. The clinical application of the biopsychosocial model. *Am. J. Psychiatry*. 1980; 137:535–544. [PubMed: 7369396]
21. Vetter TR. A clinical profile of a cohort of patients referred to an anesthesiology-based pediatric chronic pain medicine program. *Anesth. Analg.* 2008; 106(3):786–794. [PubMed: 18292420] ■ Describes a cohort of pediatric patients seen at a multidisciplinary pain program with identified low health-related quality of life. Vetter addresses the need to provide comprehensive care for these chronic pain patients.
22. Eccleston C, Malleson PN, Clinch J, Connell H, Sourbut C. Chronic pain in adolescents: evaluation of a programme of interdisciplinary cognitive behaviour therapy. *Arch. Dis. Child.* 2003; 88:881–885. [PubMed: 14500306]
23. Simons LE, Logan DE, Chastain L, Cerullo M. Engagement in multidisciplinary interventions for pediatric chronic pain: parental expectations, barriers, and child outcomes. *Clin. J. Pain.* 2010; 26:291–299. [PubMed: 20393263] ■ The first study to report on adherence to a range of pain treatment recommendations among children and adolescents evaluated within a pediatric chronic pain program.
24. Palermo TM, Chambers CT. Topical review: Parent and family factors in pediatric chronic pain and disability: an integrative approach. *Pain.* 2005; 119:1–4. [PubMed: 16298492]
25. Gorodzinsky AY, Tran ST, Medrano GR, et al. Parents initial perceptions of multidisciplinary care for pediatric chronic pain, pain research and treatment. *Pain Res. Treat.* 2012; 2012 791061.
26. Walker LS, Greene JW. The functional disability inventory: measuring a neglected dimension of child health status. *J. Pediatr. Psychol.* 1991; 16(1):39–58. [PubMed: 1826329]
27. Kashikar-Zuck S, Flowers SR, Claar RL, et al. Clinical utility and validity of the Functional Disability Inventory among a multicenter sample of youth with chronic pain. *Pain.* 2011; 152(7): 1600–1607. [PubMed: 21458162]
28. Claar RL, Walker LS. Functional assessment of pediatric pain patients: psychometric properties of the Functional Disability Inventory. *Pain.* 2006; 121(1–2):77–84. [PubMed: 16480823]
29. Claar RL, Simons LE. Adolescents' pain coping profiles: expectations for treatment, functional outcomes and adherence to psychological treatment recommendations. *Pain Res. Man.* 2011; 16(3):192–196.
30. Rozensky RH, Janicke DM. Commentary: healthcare reform and psychology's workforce: preparing for the future of pediatric psychology. *J. Pediatr. Psychol.* 2012; 37(4):359–368. [PubMed: 22262914]
31. Guite JW, Logan DE, Simons LE, Blood EA, Kerns RD. Readiness to change in pediatric chronic pain: initial validation of adolescent and parent versions of the Pain Stages of Change Questionnaire. *Pain.* 2011; 152(10):2301–2311. [PubMed: 21802852]
32. Guite JW, McCue RL, Sherker JL, Sherry DD, Rose JB. Relationships among pain, protective parental responses and disability for adolescents with chronic musculoskeletal pain: the mediating role of pain catastrophizing. *Clin. J. Pain.* 2011; 27(9):775–781. [PubMed: 21593664]
33. Welkom, JS.; Hwang, WT.; Guite, JW. Adolescent pain catastrophizing mediates the relationship between protective parental responses to pain and disability over time. Presented at: The Pediatric Pain Management: State of the Art and Science Conference; 29 September 2012; Boston, MA, USA.
34. Palermo TM, Wilson AC, Peters M, Lewandowski A, Somhegyi H. Randomized controlled trial of an internet-delivered family cognitive-behavioral therapy intervention for children and adolescents with chronic pain. *Pain.* 2009; 146(1–2):205–213. [PubMed: 19695776]
35. Law EF, Murphy LK, Palermo TM. Evaluating treatment participation in an internet-based behavioral intervention for pediatric chronic pain. *J. Pediatr. Psychol.* 2012; 37(8):893–903. [PubMed: 22511033]
36. Logan DE, Simons LE. Development of a group intervention to improve school functioning in adolescents with chronic pain and depressive symptoms: a study of feasibility and preliminary efficacy. *J. Pediatr. Psychol.* 2010; 35(8):823–836. [PubMed: 20167628]

37. Coakley RM, Barber BN. Overcoming common barriers to engagement in psychological services for chronic pain: a one-day intensive pain management workshop for youth and parents. *Pediatric Pain Letter*. 2012; 14:10–15.
38. Witmans MB, Dick B, Good J, et al. Delivery of pediatric sleep services via telehealth: the Alberta experience and lessons learned. *Behav. Sleep Med*. 2008; 6(4):207–219. [PubMed: 18853305]
39. Gorodzinsky AY, Hainsworth KR, Weisman SJ. School functioning and chronic pain: a review of methods and measures. *J. Pediatr. Psychol*. 2011; 36(9):991–1002. [PubMed: 21745810]
40. Sato AF, Hainsworth KR, Khan KA, Ladwig RJ, Weisman SJ, Davies WH. School absenteeism in pediatric chronic pain: identifying lessons learned from the general school absenteeism literature. *Child. Health Care*. 2007; 36:355–372.
41. Logan DE, Simons LE, Stein MJ, Chastain L. School impairment in adolescents with chronic pain. *J. Pain*. 2008; 9(5):407–416. [PubMed: 18255341] ■ Study examines school functioning, broadly conceptualized, in a large treatment-seeking sample of youth with a range of chronic pain complaints, providing a good overview of how chronic pain impacts school functioning.
42. Palermo TM. Impact of recurrent and chronic pain on child and family daily functioning: a critical review of the literature. *J. Dev. Behav. Pediatr*. 2000; 21(1):58–69. [PubMed: 10706352]
43. King N, Tonge B, Heyne D, et al. Cognitive-behavioral treatment of school-refusing children: a controlled evaluation. *J. Am. Acad. Child Adolesc. Psychiatry*. 1998; 37:395–403. [PubMed: 9549960]
44. Last C, Hansen C, Franco N. Cognitive-behavioral treatment of school phobia. *J. Am. Acad. Child Adolesc. Psychiatry*. 1998; 37:404–411. [PubMed: 9549961]
45. Chan ECC, Piira T, Betts G. The school functioning of children with chronic and recurrent pain. *Pediatr. Pain Lett*. 2005; 7(2–3):11–16.
46. Eccleston C, Crombez G. Pain demands attention: a cognitive-affective model of the interruptive function of pain. *Psychol. Bull*. 1999; 125(3):356–366. [PubMed: 10349356]
47. Waldie KE, Welch D. Cognitive function in tension-type headache. *Curr. Pain Headache Rep*. 2007; 11(6):454–460. [PubMed: 18173981]
48. Dick BD, Riddell RP. Cognitive and school functioning in children and adolescents with chronic pain: a critical review. *Pain Res. Manag*. 2010; 15(4):238–244. [PubMed: 20808969]
49. Claar RL, Walker LS, Smith CA. Functional disability in adolescents and young adults with symptoms of irritable bowel syndrome: the role of academic, social, and athletic competence. *J. Pediatr. Psychol*. 1999; 24(3):271–280. [PubMed: 10379142]
50. Simons LE, Logan DE, Chastain L, Stein M. The relation of social functioning to school impairment among adolescents with chronic pain. *Clin. J. Pain*. 2010; 26(1):16–22. [PubMed: 20026948]
51. Greco LA, Freeman KE, Dufton L. Overt and relational victimization among children with frequent abdominal pain: links to social skills, academic functioning, and health service use. *J. Pediatr. Psychol*. 2007; 32(3):319–329. [PubMed: 16840792]
52. Goodenow C. The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychol. Schools*. 1993; 30:79–91.
53. Logan DE, Simons LE, Kaczynski KJ. School functioning in adolescents with chronic pain: The role of depressive symptoms in school impairment. *J. Pediatr. Psychol*. 2009; 34(8):882–892. [PubMed: 19181819]
54. Logan DE, Simons LE, Carpino EA. Too sick for school? Parent influences on school functioning among children with chronic pain. *Pain*. 2012; 153(2):437–443. [PubMed: 22169177]
55. Logan DE, Coakley RM, Scharff L. Teachers' perceptions of and responses to adolescents with chronic pain syndromes. *J. Pediatr. Psychol*. 2007; 32(2):139–149. [PubMed: 16611926] ■ This study employed a vignette-based methodology to elucidate teachers' understanding of chronic pain and how they would respond to a student experiencing chronic pain in the school setting. Offers a helpful perspective to healthcare clinicians seeking to understand how school personnel respond to pain.
56. Palermo TM. Assessment of chronic pain in children: current status and emerging topics. *Pain Res. Manag*. 2009; 14(1):21–26. [PubMed: 19262912]

57. Kavanagh T, Watt-Watson J, Stevens B. An examination of the factors enabling the successful implementation of evidence-based acute pain practices into pediatric nursing. *Child. Health Care.* 2007; 36(3):303–321.
58. Ellis J, McCleary L, Blouin R, et al. Implementing best practice pain management in a pediatric hospital. *J. Special. Pediatr. Nurs.* 2007; 12(4):264–277. ■ Study designed to improve institutional pediatric pain management through introduction of a pain resource nurse program addressing specific pain management improvement goals. Identifies strategies successfully used at the organizational level to improve research utilization and implement significant practice improvements.
59. Paice JA, Barnard C, Creamer J, Omerod K. Creating organizational change through the pain resource nurse program. *Jt Comm. J. Qual. Patient Saf.* 2006; 32(1):24–31. [PubMed: 16514936]
60. Jones, S.; Green, R.; Carroll, E., et al. Pain resource nurse program and monthly chart audits improve pain pediatric pain assessment. In: Duncan, J.; Montalvo, I.; Dunton, N., editors. *NDNQI Case Studies in Nursing Quality Improvement*. Silver Spring, MD, USA: ANA; 2011. p. 85-92.

Website

101. The Patient Protection and Affordable Care Act. USA Public Law Number 111–148, 23 March 2010. www.gpo.gov/fdsys/pkg/PLAW-111publ148/content-detail.html

Practice Points

- Pediatric pain management is complex.
- Managing pediatric chronic pain is especially challenging.
- A biopsychosocial approach that considers psychological, social, behavioral and biomedical factors that relate to the pain problem and its management is essential.
- An effective systems approach for pediatric patients with chronic pain involves family, school and healthcare systems.
- A multidisciplinary pediatric pain clinic model is compatible with a patient-centered healthcare-delivery system that utilizes a team approach to managing the multiple needs of the patient and family.
- Adherence to treatment is important.
- Collaborating with the school system is necessary.
- Inpatient nursing communication and leadership is imperative.
- Coordination of care across a variety of settings is optimal.

Box 1. The case of JR

JR is a 16.5-year old girl who is currently admitted to hospital for management of a migraine headache that began 3 days ago. She complains of pounding, frontal head pain associated with nausea, photophobia and phonophobia. She is in a darkened room, surrounded by her mother and father, who are applying cool compresses to her head. She has a 3-year history of headaches that have evolved from being episodic, occurring initially about once per week, to her now having a chronic daily headache. These baseline headaches are not focal, but described as dull, aching and largely frontal. She wears sunglasses all the time, except when in bed. She does not have nausea or vomiting with these headaches. She was initially seen in an outpatient Pediatric Pain Program 6 months ago and was started on valproic acid, extended release. This therapy seemed to reduce the severity of the headaches from an average level of 8/10 to 3/10 on a numeric pain intensity rating scale. She had worked with an outpatient psychologist near home who taught her biofeedback, but stopped seeing her when her pain levels became more tolerable. This year, however, she has had multiple episodes of severe head pain resulting in many days of school absence. She is a junior in high school but has missed 65 out of 145 days of school this year and is failing all of her classes. She has dropped out of several sports teams and has gone from being an athletic adolescent to one who is inactive and severely deconditioned. During her current inpatient admission, she is receiving a trial of dihydroergotamine infusions to try to break the headaches. She was also seen by the inpatient pediatric pain psychologist, who identified depressive symptoms and anxiety co-occurring with her chronic pain.

Brief biopsychosocial formulation & opportunities for treatment

This case captures an acute exacerbation of a chronic 'migraine' headache condition by an adolescent female currently admitted as an inpatient and receiving additional bedside support from her parents. The patient has recently received some helpful outpatient support through providers in a Pediatric Pain Program and an outpatient psychologist. There has been some recent success with managing biomedical factors contributing to the problem; however, the patient continues to have significant functional disability. Thus, this admission provides an opportunity to: further assess and support potential psychological, social and behavioral factors that can serve to maintain disability; and develop a helpful discharge plan that facilitates intersystem communication and integrates continued outpatient follow-up care with both new and existing resources (e.g., the Pediatric Pain Program, the outpatient psychologist, the school and so on). Additional considerations for creating an effective treatment plan for this patient are discussed in the text of each section, focusing on outpatient, school and inpatient systems.