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Perioperative Care for Adolescents Undergoing Major Surgery: A Biopsychosocial Conceptual Framework

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Recent research has identified that a significant proportion of adolescents undergoing major surgery go on to develop chronic postsurgical pain and prolonged opioid use at home.^{1,2} At the same time, management of adolescents undergoing major surgery continues to follow a biomedical model, with attention on short-term outcomes such as inpatient pain scores and analgesic consumption and variables that focus on purely physiological and medical risk factors. Currently, there is a paucity of data regarding biopsychosocial factors that may have a significant role in the development of persistent postoperative pain and opioid use.

The aim of this *The Open Mind* article is therefore to present an innovative perioperative biopsychosocial model for delivering care to adolescents undergoing major surgery. This article will focus on a model that is aimed at improving long-term recovery after surgery, reducing opioid use at home, and preventing chronic postsurgical pain. We hope to challenge our field to evolve the current approach to perioperative care to address these important issues facing adolescent patients.

Background and Rationale

Despite biomedical advances in perioperative care, rates of severe pain after pediatric surgery have remained similar over the past 2 decades.^{3,4} Further, the United States currently faces pain and opioid crises, with rising rates of disabling chronic pain and an epidemic of opioid addiction and

overdose.⁵ Neurobiological, psychological, behavioral, and social changes occurring during adolescence make adolescents particularly vulnerable to chronic pain⁶ and drug addiction,⁷ and recent data indicate that opioids are now the most frequently overdosed drug in this age group.⁸ Chronic pain and the evolving opioid crisis have significant implications for the perioperative care we provide for adolescents. Emerging perioperative research has identified that adolescents experience high prevalence of chronic postsurgical pain and persistent opioid use after surgery.^{1,2} After extensive adolescent surgeries such as spinal fusion, up to 80% of the patients report severe pain at home during the initial weeks after surgery,⁹ and 20% go on to report chronic postsurgical pain, defined as postsurgical pain lasting >3 months.² These youth experience significant distress,¹⁰ and impairment in physical and psychosocial health-related quality of life,¹¹ which may persist months to years after surgery. A recent study in a large national cohort of adolescents and young adults¹ found that 4.8% of opioid-naïve youth undergoing surgery (2.7%–15.2% across procedures) developed new persistent opioid use after surgery as compared to 0.1% of nonsurgical counterparts. In susceptible adolescents, long-term opioid use after an opioid prescription may be associated with risk for opioid addiction and overdose.⁵ Based on recent research indicating that psychosocial and behavioral factors play an important role in the high rates of both persistent pain² and opioid use¹² after surgery, we propose a biopsychosocial framework of perioperative care for this vulnerable patient population.

BIOPSYCHOSOCIAL MODEL OF PERIOPERATIVE CARE FOR ADOLESCENTS

In 2010, Chorney and Kain¹³ proposed a framework for family-centered pediatric perioperative care. The framework spans the preoperative period (preparation for surgery), the intraoperative period (management strategies), and the postoperative period (pain management and recovery at home), and incorporates family and system variables that influence family-centered care delivery. Building on this conceptual framework, we present a biopsychosocial model of perioperative care, adapted to the population of adolescents undergoing major surgery (Figure). In the model described in the Figure, we identify adolescent and parent risk factors for chronic postsurgical pain and persistent opioid use and highlight perioperative interventions that can be implemented to improve short- and long-term outcomes after surgery.

Preoperative Period

During the preoperative period, both adolescent factors such as high anxiety, poor sleep patterns, and poor pain

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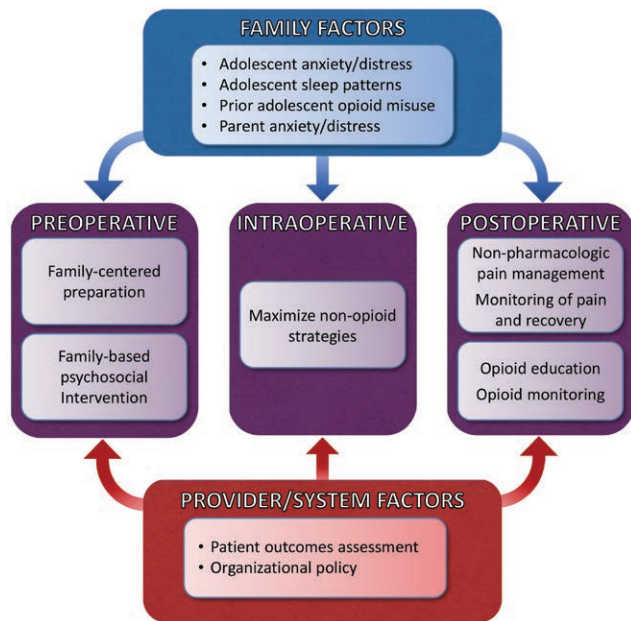


Figure. Psychosocial perioperative care model for adolescents undergoing major surgery.

coping efficacy, and parent/family factors such as high parental anxiety and distress have been identified as risk factors for acute pain and chronic postsurgical pain.^{9,11,14-17} Further, high depressive symptoms and adolescent anxiety about pain before surgery have also been identified as risk factors for increased opioid consumption after hospital discharge.¹² Based on these findings, we submit that an opportunity exists during preoperative preparation to deliver family-based psychosocial interventions targeting these adolescent and parent risk factors and teaching adaptive coping strategies to adolescents and their parents to promote recovery and prevent pain persistence.

The perioperative home model of care can serve as an entry point to identify and intervene for at-risk adolescents in advance of surgery.¹⁸ Major musculoskeletal surgeries are commonly planned for the mid to late adolescent period; for example, surgery for pectus deformities and spinal fusion for idiopathic scoliosis are often anticipated for several years. Patients are referred to the perioperative home for preoperative planning, and families are typically followed at multiple appointments before surgery. This period offers ample opportunity to prepare adolescents and their families for surgery and subsequent recovery. At a minimum, we need to start providing adolescents and their families with realistic expectations of pain and recovery. In the setting of a pediatric center, pediatric psychologists may be available to provide behavioral preparation for surgery.¹⁹ Detection of clinical levels of depression or anxiety should trigger referral for psychological treatment of these conditions.

Postoperative Period

While advances have been made in maximizing nonopioid treatments such as multimodal analgesia and regional anesthesia, nonpharmacologic approaches need to be developed and integrated into postoperative care for adolescents undergoing major surgery. Psychological strategies such

as deep breathing and self-regulation techniques to cope with pain, and cognitive strategies to reduce anxiety and modify thoughts and beliefs about pain, may reduce pain and enhance recovery from surgery. Evidence supports efficacy of interventions teaching distraction, imagery, and relaxation in reducing children’s acute postsurgical pain; however, data on the effects of psychological interventions targeting long-term pain outcomes are still needed.¹⁹ Although adolescents are more involved in their own health care and require their own skills to effectively manage pain, involving parents is important to increase their willingness to support behavioral skill use by their child.

That said, it is essential that a biopsychosocial perioperative care model extend well beyond early recovery from surgery. Pain and recovery need to be assessed during the days, weeks, and months after surgery, to identify youth who are struggling with recovery and who need additional intervention to prevent chronic pain. Multidimensional assessment of pain and recovery ideally includes characteristics and extent of pain as well as measures of functional impact.²⁰ Brief functional measures that are appropriate for use in adolescents recovering from major surgery should be administered alongside pain intensity assessments. For example, the Youth Acute Pain-Functional Ability Questionnaire assesses function relevant in the acute setting, in a 24-hour time frame, to monitor daily change in function during recovery, with a short form developed for use in adolescents admitted to the hospital after major surgery.²¹ Patients experiencing delayed pain recovery may need surgical evaluation to rule out other etiology (eg, infection) before a diagnosis of chronic postsurgical pain.²² Important long-term outcomes include pain outcomes such as chronic pain status, opioid use including opioid misuse (ie, use of prescription opioids without prescription or in a manner other than prescribed) and opioid use disorders (ie, addiction, abuse, or dependence), as well as broader patient-reported health outcomes such as health-related quality of life.

Spurred by the opioid epidemic, efforts are being undertaken at state and national levels to reduce opioid overprescribing and curtail potential for opioid diversion. This includes guidelines limiting opioid prescription, and the prescription drug–monitoring program that tracks controlled substance prescriptions in a state. Restrictions on opioid prescriptions make it imperative that we maximize nonopioid pain treatment and incorporate nonpharmacologic pain management strategies into perioperative care. As experts in perioperative pain management, it is critical that we provide adolescent patients and their parents with education on the danger of opioid misuse, and detailed instructions on appropriate use, tapering, discontinuation, and safe disposal of opioid medications.²³ In addition, adolescents who have a history of opioid misuse before presenting for surgery may need careful consideration of risk/benefit, closer monitoring, and intervention to reduce risks related to opioid use.

System Factors

On a systems level, organizational commitment to a biopsychosocial approach as a standard of practice for perioperative

care is critical to success of such endeavors. Infrastructure needs to be expanded to support access to psychologists for delivery of pre- and postoperative biopsychosocial interventions to improve patient outcomes. Electronic medical record systems and patient portals should be leveraged to facilitate evaluation of postoperative pain and health outcomes, both in the hospital and once patients go home. This will serve not only to monitor individual patients' recovery, but also to evaluate changes in perioperative management pathways for quality improvement.

FUTURE RESEARCH DIRECTIONS

The federal pain research strategy, released in 2017, highlighted the current need for research to improve pain management and reduce reliance on opioids, to prevent transition from acute to chronic pain, and to reduce the burden of high-impact chronic pain.²⁴ Top research priorities identified include studies examining susceptibility and resilience factors underlying acute to chronic pain transition, and research developing optimal approaches for self-management strategies to prevent, cope with, and reduce pain. The perioperative period provides a unique opportunity to study these important questions in youth. Longitudinal research is needed: (1) identifying high-risk adolescents before surgery to enable implementation of primary prevention; (2) developing behavioral interventions and non-pharmacologic strategies to manage pain and reduce opioid use; and (3) monitoring youth during early recovery to identify adolescents experiencing problems with recovery to enable secondary prevention. Research currently being conducted in this area will inform interventions to reduce opioid exposure and decrease overall incidence of chronic postsurgical pain in adolescents. A further gap in research that urgently needs to be addressed is regarding long-term opioid use after surgery. Specifically, research is lacking examining risk factors and preventive strategies for long-term opioid use. It is also currently unknown whether maximizing opioid-sparing treatments that are recommended for acute postoperative pain management (ie, multimodal analgesia, regional anesthesia)²⁵ could reduce the risk for long-term opioid use after surgery.

Finally, while the concepts of family-centered pediatric perioperative care are also applicable to youth undergoing nonmajor surgery, work is needed to understand which of these youth are at risk for persistent pain and opioid use. This will inform the adaptation of this biopsychosocial framework developed to address persistent pain and opioid use after major surgery to the context of nonmajor surgeries and the outpatient setting.

CONCLUSIONS

The current pain crisis and opioid epidemic threaten the health of the adolescents we provide care for. In our role as leaders of perioperative care, anesthesiologists not only have the opportunity but also the responsibility to address these important issues facing our community. A biopsychosocial approach to perioperative care including interventions targeting risk factors for chronic postsurgical pain, nonpharmacologic strategies to manage pain at home, and assessment of broader outcomes of perioperative care

is critically needed for adolescents undergoing major surgery. Developing partnerships with psychologists in the perioperative home model of care will be essential to this approach. This is an opportunity for pediatric perioperative medicine to innovate our practice, evolving our model of care, to improve outcomes for our vulnerable patients. ■■

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