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PEDIATRIC
Emergency Medicine Practice
Evidence-Based Education • Practical Application

CLINICAL CHALLENGES

- Which medications are recommended as first-line treatment for pain in children?
- What is the best option for opioid administration when an intravenous line has not been established?
- How can risk for future opioid-related harm be assessed and minimized?

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Prior to beginning this activity, see the "CME Information" on page 2.

Responsible and Safe Use of Opioids in Children and Adolescents in the Emergency Department

Abstract

Untreated pain in childhood may have ramifications well into adulthood. Opioid medications have an important role in care for moderate to severe pain that cannot be relieved by first-line interventions, but clinicians must approach opioid use in the emergency department in an evidence-based, socially responsible manner. This issue reviews evidence-based approaches to assessment and management of pain in children and adolescents, with a focus on optimizing nonopioid pain management as a first approach and using opioid medications safely, when appropriate. Recommendations are provided for safer opioid prescribing, including assessment of risk factors for opioid misuse, careful family counseling and education, and suggested prescribing limits. Prescription and use of naloxone in the emergency department and as take-home kits are also discussed.

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Target Audience: This enduring material is designed for emergency medicine physicians, physician assistants, nurse practitioners, and residents.

Goals: Upon completion of this activity, you should be able to: (1) identify areas in practice that require modification to be consistent with current evidence in order to improve competence and performance; (2) develop strategies to accurately diagnose and treat both common and critical ED presentations; and (3) demonstrate informed medical decision-making based on the strongest clinical evidence.

CME Objectives: Upon completion of this activity, you should be able to: (1) provide evidence-based pain care, using a stepwise, multimodal approach; (2) properly assess risk factors for opioid use in children (including allergies, adverse events, misuse risk); and (3) provide families advice regarding at-home pain management and safe use of opioids.

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Case Presentations

CASE 1

A 10-year-old girl is brought in via wheelchair by her mother...

- The girl is developmentally delayed, nonverbal, writhing and moaning, and keeps batting your hands away when you try to examine her. Her temperature is 39.2°C, and her heart rate 150 beats/min. Her mother is tearful, saying that she has never seen her daughter in so much pain.
- You wonder how you can quickly ease the child's pain so you can figure out what is going on…

CASE 2

A 2-year-old boy with known sickle cell disease is carried into the emergency department triage area by his father...

- The boy is curled up, still, and tearful. He is afebrile, has a heart rate of 160 beats/min, and has pain with movement of his right upper extremity—the site of his typical vaso-occlusive pain crises. His parents have been treating him at home for the last 24 hours. They have been giving him ibuprofen and the oral opioid medication his hematologist has prescribed. They say they think the home treatment is not working.
- You begin to think how you will treat this child's pain quickly and effectively...

CASE 3

A 15-year-old girl fell while skateboarding and sustained a both-bone forearm fracture...

- You successfully reduced her fracture in the ED and have arranged follow-up with orthopedics in 7 to 10 days. The girl is now ready to go home.
- The family is asking what to do for pain, now and at home, since the sedation has worn off and her wrist is beginning to throb.
- What medications should you recommend for at-home use, and how should you advise the family to use them?

Introduction

Pain is the most common reason children seek emergency healthcare.[1,2] To date, studies have not provided clear evidence regarding which medications are most effective for pain management in children.[3-9] This has, in part, contributed to children being less likely than adults to have pain treated adequately.[10-13] Patient race and ethnicity have also been shown to be associated with disparate analgesic prescription practices for children.[14]

Studies evaluating emergency department (ED) injury and fracture pain treatment for children report an analgesic administration rate between 34% to 63%.[2,11-13,15] This low treatment rate was once thought to be due to lower pain scores reported by children during ED care. However, this has been refuted, with only 68% of children with documented moderate to severe pain receiving an analgesic during their ED encounter.[13] Furthermore, 74% of children report moderate or severe pain at the time of discharge from the ED.[16]

Opioids have long been recommended and used for the effective management of acute moderate to severe pain not otherwise relieved by first-line interventions.[17] The American Academy of Pediatrics recommends opioids be considered for acute pain if acetaminophen and ibuprofen are inadequate.[18] Opioid prescriptions among pediatric patients are not uncommon, and the lifetime prevalence of medical use of prescription opioids among adolescents ranges from 13% to 20%.[19] Therapeutic use of opioids can help promote adequate pain relief, leading to a more comfortable and less anxious patient, a more reliable examination, and higher satisfaction in care.[20] Contrary to the belief that pain treatment may confuse the diagnostic evaluation and mask important symptoms, studies have shown that diagnostic accuracy for conditions such as appendicitis is not reduced after opioid analgesia.[21,22]

The lack of evidence-based data to guide opioid-prescribing practices for children has resulted in significant variability in the medications used to treat pain.[11,23] Inadequate pain treatment is associated with under- or over-utilization of healthcare resources and overall higher healthcare costs,[24,25] and by optimizing pain care, the quality of care and the efficiency of ED workflows can be improved. Children with undertreated pain have greater decreases in health-related quality of life, less participation in patient and family activities, more missed school and daycare, and more frequent changes in sleep patterns than children with adequately treated pain.[24] Nonetheless, clinicians must consider and weigh concerns for opioid misuse and diversion when making prescribing decisions; these concerns may also contribute to hesitancy and undertreatment of pain.

In 2017, the United States Department of Health and Human Services declared the current opioid crisis a "public health emergency" after unprecedented numbers of opioid deaths and misuse.[26] Two-thirds of adults who are treated for opioid use disorder (OUD) were first exposed to opioids before the age of 25.[27] Between 1999 and 2020, over 564,000 people in the United States, of all ages, died from overdoses involving opioids, including illicit and prescription opioids.[28,29] In 2019 alone, over 70,000 people died from drug overdose, and over 10 million people misused prescription opioids.[26] Overall, clinicians have valid concerns for potential misuse-related morbidity and mortality associated with liberalizing opioid prescriptions.

There is a growing body of literature regarding the negative impact of the opioid epidemic on children and adolescents, including unintentional opioid poisonings and opioid use, misuse, and overdoses.[30,31] Almost 90% of pediatric deaths from prescription and illicit opioid poisoning occur among adolescents aged 15 to 19 years, with 6.7% occurring in children aged <5 years.[32] Drug overdose deaths among adolescents aged 15 to 19 years that involve opioids have tripled since 1999, with the most common opioids involved being heroin and synthetic opioids (eg, fentanyl, tramadol).[31] Among children and adolescents, 80% of these deaths were considered unintentional, and 61.6% occurred outside of any medical setting, with close to 40% occurring in a residential setting.[32]

Understanding, reducing, and preventing opioid-related harms, while safely providing pain care, should be a priority for all clinicians who care for children. In this issue of *Pediatric Emergency Medicine Practice,* the existing evidence is synthesized and contextualized within other evidence-based acute pain management strategies for children. This review provides evidence-based approaches for optimizing nonopioid pain management as a first approach to pain care, offers guidance for how to safely and appropriately initiate opioid therapy, and highlights the risks and benefits associated with opioid use in pediatric patients.

Critical Appraisal of the Literature

Guided by a research librarian, a literature search was performed using the Ovid MEDLINE®, PsychInfo, and EMBASE databases. Published search filters for *pediatrics* and *emergency* were employed, and then these filters were used together and individually, with multiple combinations of search terms including *pain*, *pain management*, *analgesia*, *opioid*, *opiate*, *narcotic*, *addiction*, *substance use*, *adverse events*, and *side effects*. The Cochrane Database of Systematic Reviews was also searched for all reviews related to *pain* and *children*. Articles relevant to opioids were selected and reviewed, as were citations that appeared in review articles, clinical practice guidelines, and policy statements. Articles were chosen for inclusion if they were published after 1990; however, important articles published before this date were included for completeness and historical perspective.

Prehospital Care Considerations

Prehospital pain management should begin with physical strategies (eg, ice, immobilization of injured limbs) and psychological strategies (eg, distraction with conversation, caregiver ride-along when possible), which can be coupled with pharmacotherapy, as needed. Difficulty in establishing vascular access and unfamiliarity with children are commonly cited reasons for suboptimal pain management in the prehospital setting.[33] Numerous studies have now established the safety of multiple opioid and nonopioid analgesic medications for children that can be administered without vascular access. Intranasal fentanyl has the advantages of rapid administration and an efficacy that is comparable to intravenous (IV) morphine.[34] Intranasal ketamine is also now being studied and used for prehospital analgesia, with similar effectiveness as fentanyl, but more (minor) adverse events.[35,36] In Australia, inhaled methoxyflurane, delivered via the so-called "green whistle," is employed in the prehospital setting for rapid pain relief, with mixed reviews, but minimal published evidence supports this practice for children at this time.[37,38]

Emergency Department Evaluation

Developmental Considerations When Evaluating Pain

The expression of pain is highly subjective and is modulated, in part, by emotional state, developmental age, cultural influences, context of disease, and prior pain experience.[39,40] Some children will withdraw, become quiet, and limit their movements in response to severe pain. For example, some children may quietly grimace with pain; however, their expression may be confused for a smile by an observer who is unfamiliar with the child. A child's pain experience is influenced by their developmental abilities to report pain, especially in times of severe pain or stress. For example, a typical teen should be able to describe and rate their pain, but with severe pain, the teen may defer to the parents to answer questions. A school-aged child with a minor cut to their finger should be able to communicate their pain. If, however, their reaction to the sight of blood is extreme, the child may be too upset to respond accurately.

Pain Measurement Tools

Lack of formal pain assessment has been shown to be a barrier to initiating and maintaining adequate pain treatment.[39] Thus, utilizing an appropriate pain measure for the child's age and developmental abilities is necessary to guide effective treatment.[40] Based on current evidence, the verbal Numeric Rating Scale (vNRS), the Faces Pain Scale-Revised (FPS-R), and the Color Analogue Scale (CAS) are recommended.[41] For full-term infants and toddlers with acute pain, current evidence would support use of the Face, Legs, Activity, Cry, Consolability (FLACC); EValuation ENfant DOuLeur (EVENDOL); University of Wisconsin Children's Hospital Pain; and COMFORT scales.[42] **(See Table 1.)** For a review of the approach to pain assessment in children, including example images of pain scales, see the August 2019 issue of *Pediatric Emergency Medicine Practice*, "Pediatric Pain Management in the Emergency Department," available at: www.ebmedicine.net/Peds-Pain

Children should be encouraged to self-report their pain whenever possible. Pain assessment can be performed by any healthcare team member who has training and an understanding of how to administer a pain tool to a child. Pain scales should always be used as directed, as changing even the anchors (ie, words to describe the extremes of the scale) or altering the images (for a face-based scale) can render a scale invalid. Consistent and accurate use of a scale by all clinicians can facilitate comparison of scores across different evaluators and times.

Pain Assessment in Special Populations

Infants and Neonates

Clinicians once believed that infants did not experience pain because of an underdeveloped nervous system.[43,44] In reality, pain exposure can alter pain processing, development, and behavior in infants and neonates.[45,46] While pain assessment can be challenging for these children, there are many behavioral and physiologic measures as well as neonatal pain scales that can be used to assess pain for infants, including the Neonatal Infant Pain Scale and the Premature Infant Pain Profile.[47]

Nonverbal Children

For a nonverbal child, evaluation of different behavioral signs, such as facial expression, cry, irritability, poor feeding, sleeping disturbance, and inactivity, can help evaluate the child's level of discomfort.[48]

Table 1. Summary of Recommended Pain Scales

Name of Scale	Recommended Age Group	Notes
Self-Reported Scales		
Verbal Numeric Rating Scale (vNRS)	4-18 years	• Initially developed and studied for use in adults • Can be administered verbally • Requires an understanding of numerical hierarchy • Best evidence in patients aged ≥6 years
Faces Pain Scale-Revised (FPS-R)	4-12 years	• Quick and simple to use • Minimal instruction required • Translated into >35 languages • Available free of charge • Strongest evidence for use in children aged >6 years
Color Analog Scale (CAS)	5-16 years	• Vertical scale with increasing gradations of color and width to signify increasing pain • Strongest evidence for use in children aged >7 years
Observational Scales		
Faces, Legs, Activity, Cry, Consolability (FLACC)	2 months-7 years	• Initially developed to evaluate postoperative pain • Recommended for acute pain, but can be suboptimal for children who are less expressive with their pain • May not distinguish pain from anxiety • Child positioning, such as being swaddled, can interfere with FLACC assessment
Revised Faces, Legs, Activity, Cry, Consolability (r-FLACC)	4-19 years	• Used for developmentally delayed children
EValuation ENfant DOuLeur (EVENDOL)	0-4 years	• First developed for children aged 0-7 years, in the ED • Particularly useful for less pain-expressive children • Validated in the prehospital setting
University of Wisconsin Children's Hospital Pain	<3 years	• Used for preverbal and nonverbal children
COMFORT	All	• Adapted for children of all ages and for those receiving mechanical ventilation • Lengthy to administer (less suited to the ED)

Children With Cognitive Delays

For children with cognitive delays, self-report should still be attempted.[49] If self-report is truly not possible, then an observational scale should be used, along with the caregivers' proxy assessment. The r-FLACC is a revised version of FLACC that was adapted to include measures for nonverbal children aged 4 to 19 years.[50,51]

Vital Signs and Pain

It is important to note that a lack of vital sign changes does not equate with a lack of pain. Although changes in vital signs can be linked to pain in infants, this does not apply reliably to older children.[52] There is a lack of correlation between change in vital signs and increasing pain intensity; as such, elevated heart rate and blood pressure should not be expected for patients with severe pain.[53] Nonetheless, vital signs should be reviewed to assess hemodynamic status, as some opioids may lead to lower respiratory rate or blood pressure.

Treatment of Pain

Most families and clinicians are accepting of the use of opioids in the treatment of moderate or severe acute pain, when it occurs in the monitored setting of the ED.[54,55] In the ED environment, there is a level of comfort that acute adverse effects such as respiratory depression, nausea, or oversedation can be anticipated and treated. A survey-based study showed that physicians have less comfort prescribing opioid treatment for pain management at home.[55] This is due in part to the lack of medical monitoring for short-term adverse events but, importantly, also the setting in which the long-term harms associated with opioids may accrue.[56] Clinicians must weigh these additional considerations and risks when performing the patient-specific benefit-to-harm assessment.

Children with chronic pain represent an entirely different pathophysiologic pain process that is truly distinct from the treatment of most acute pain in the ED. The assessment of benefits and harms for children with chronic pain proceeds according to a different set of parameters, and opioids are rarely used in the management of chronic non-cancer pain in children.

The goal of pain management is not necessarily the complete resolution of pain, but the maximization of function. Discussing with families that "zero pain" may not be a realistic outcome with a significant acute illness or injury is an important part of the clinician-family discussion, as it can guide expectations of results and help avoid overuse of medications.

Not all pain requires opioids and, in some cases, such as chronic pain, initiating opioids without involving a pain specialist may be detrimental to the child's long-term care. Such considerations highlight the importance of shared decision-making for clinicians and families of patients requiring opioids for analgesia.

Physical and Psychological Management of Pain

When treating children, parental presence should be allowed and encouraged whenever possible and helpful.[57] If available and feeding is permitted, breastfeeding can be soothing for younger children both during examinations and while waiting for results; nonnutritive sucking (eg, pacifier) can be used if breastfeeding is not available or allowed (due to NPO [nothing by mouth] status).[58] Young infants can have facilitated tucking or swaddling with blankets to calm them during wait times.[59] There may be some condition-specific interventions that are of benefit as well. For example, early immobilization, application of ice, and elevation of suspected fractures may decrease pain and the overall need for analgesic medications.[60] Similarly, cool compresses, dimmed lights, and minimizing noise in a patient's room may help with migraine treatment. Simple distraction techniques that can help minimize anxiety and distress include bubbles and I-spy books/cards. Technology-based distraction can utilize devices brought in by the family or kept within the ED, and include tablet devices, smartphone games, and virtual reality. Child life specialists, if available, are highly effective in reducing distress. Minimizing distress can reduce the need for pharmacotherapy for both acute and chronic pain.

Pharmacologic Management of Mild to Moderate Pain

For mild to moderate pain requiring pharmacologic analgesia, nonopioid medications should be used first and in conjunction with physical and psychological measures. Ibuprofen and acetaminophen are the first-line oral systemic analgesia options for the treatment of mild to moderate pain in children. Based on both efficacy and adverse effect profile, ibuprofen is the first-line oral agent in pain treatment, particularly for acute musculoskeletal injuries.[8,9,61] Historical concerns regarding short-term ibuprofen use interfering with fracture healing have been dispelled by recent studies.[62] Adjunctive medications such as inhaled nitrous oxide can also be considered to lessen pain and distress.

A number of adult studies and some emerging pediatric studies have demonstrated that the combination of ibuprofen with acetaminophen provides pain relief similar to acetaminophen plus an oral opioid, and with a significantly better adverse event profile.[63,64] The combination of acetaminophen and ibuprofen has been shown to be superior to either drug alone in adults with various painful conditions, and the effectiveness of this combination therapy is beginning to be demonstrated in children.[64,65] When monotherapy with ibuprofen is inadequate or presenting pain is moderate, combination or alternate therapy with ibuprofen and acetaminophen for short-term use is recommended. If this remains inadequate,

opioids may be introduced to the treatment plan, but they should always be employed as co-therapy, rather than monotherapy, for opioid-sparing and adverse-event–minimizing benefits.[8]

Pharmacologic Management of Severe Pain

For children presenting with severe pain, treatment may need to begin with a more potent analgesic. If vascular access is already established, IV morphine or fentanyl should be considered.[66] If vascular access is not yet established, intranasal fentanyl is an effective drug that can be rapidly employed while establishing vascular access.[67-69] Historically, intramuscular morphine was employed when vascular access was unavailable; this is more recently being replaced with intranasal fentanyl, in order to avoid the pain and trauma of intramuscular injection, as well as the less predictable absorption.[70-72] As with oral opioids, combination therapy should be used, with ibuprofen, another oral nonsteroidal anti-inflammatory drug (NSAID), or IV ketorolac added to the regimen.[73,74]

Opioids for Pain Management

Opioids That Should Be Avoided in Children

Codeine was once used commonly in children but is now highly discouraged due to safety and efficacy concerns. Recent research confirms that codeine alone, or in combination with acetaminophen, is no more effective than ibuprofen alone, and codeine has a worse adverse effect profile than both ibuprofen and acetaminophen.[3,5] Furthermore, recent United States Food and Drug Administration (FDA) and Health Canada warnings have advised against the use of codeine in children, due to deaths in children, some of whom were ultra-rapid metabolizers of codeine to the more potent morphine.[75,76]

Tramadol, a low-potency synthetic opioid, has also been used for children.[77] However, it is known to be equipotent to codeine, an opioid that has been firmly established as a suboptimal choice for the management of acute pain.[78] Importantly, the FDA has also contraindicated the use of tramadol in children aged <12 years, as well as children who have had recent tonsillectomy/adenoidectomy, those who are obese, or those with sleep apnea or severe respiratory disease.[75]

Given their questionable effectiveness, coupled with many federal warnings, the use of codeine or tramadol should be avoided in children.

Indications for Opioids for Children

Oral Opioids

Oral opioids should be considered for combination therapy when ibuprofen and/or acetaminophen are inadequate. These opioids should not be used in isolation, but rather, as additive therapy to an NSAID or acetaminophen.

- Oral morphine does not appear to have analgesic properties greater than ibuprofen and does not confer any advantage when added to ibuprofen when used for musculoskeletal injuries; its utility for other conditions is unclear at this time.[6,9,79]
- Hydrocodone has very limited evidence for its utility and requires large volumes in liquid form; furthermore, Health Canada has recommended that hydrocodone be avoided in children aged <6 years, due to concerns with respiratory depression and death.[80]
- Oxycodone provides superior analgesia when compared with codeine, buts its efficacy does not appear to be greater than ibuprofen alone.[81,82]
- The effectiveness of oral hydromorphone for children is not well-studied at this time, and merits future consideration if it is shown to have additive value to ibuprofen.

If a child's pain is not responding adequately to oral medications, consider lower-dose intranasal or IV opioid medications.

Intranasal Fentanyl

Intranasal fentanyl is an excellent option when rapid acute pain management is desired (eg, grossly displaced forearm fracture) or when IV line placement is not otherwise necessary (eg, minimally displaced clavicular fracture).[68] Intranasal fentanyl at doses of 1.5 to 2 mcg/kg (maximum 100 mcg) provides rapid analgesia, comparable to that of IV morphine.[34] Furthermore, the time to administration of analgesia is reduced when intranasal fentanyl is used compared with IV morphine.[83] Intranasal fentanyl, administered via mucosal atomizer device, allows for the rapid treatment of moderate to severe pain while awaiting topical anesthetic cream to take effect, prior to IV cannulation. It is also useful in the prehospital setting.[34,84]

Intravenous Opioids

For children with moderate to severe pain and established vascular access, IV opioids offer a rapid and effective pain management strategy. The specific choice of parenteral opioids is determined by the individual characteristics of the drug, the clinical indication, and the patient's prior experience with opioids. Morphine should be administered in IV doses of 0.05 to 0.1 mg/kg (maximum 4-8 mg/dose). Once an adequate dosage of morphine is established, it can be re-dosed every 2 to 4 hours, or more frequently if needed. Fentanyl is shorter-acting, with a duration of 30 to 60 minutes; it can be dosed at 0.5 to 1 (sometimes up to 2) mcg/kg (maximum 50 mcg/dose) for IV use. In rare instances, fentanyl administered as a rapid IV bolus or in high doses to infants, can cause "rigid-chest phenomenon," which may require emergency reversal with naloxone or neuromuscular blockade.[85] Hydromorphone has a much higher potency than morphine and may be useful for

ongoing pain in children (eg, sickle cell pain crisis).[86] Hydromorphone dosing is 0.01 to 0.015 mg/kg IV (maximum 2 mg/dose). See **Table 2** for a summary of dosing and considerations.[66]

Considerations for Using Intravenous Opioids Before Sedation

Children undergoing procedural sedation in the ED setting often have experienced a painful injury (eg, fracture, burn) that may require pain treatment with IV opioid medication. A strong positive association has been found between preprocedural opioids and the occurrence of oxygen desaturation (8.7%), vomiting (6.6%), and the need for positive-pressure ventilation (2.4%).[87,88] Notably, children who receive opioids within 30 minutes of sedation experience the highest incidence of adverse events for all outcomes, but this risk declines gradually with time from opioid administration, regardless of opioid type and choice of sedation medication.[88] Compared to morphine, fentanyl is associated with decreased odds of oxygen desaturation and vomiting. This suggests that instead of withholding opioid pain treatment from a child with severe pain, careful consideration of the timing of

Table 2. TREKK/EIIC Recommendations for Analgesic Medication Dosing for Children Aged ≥1 Year

Drug	Dose	Comments/Cautions
Mild Pain (e.g., 1-3 out of 10)		
ibuprofen PO	10 mg/kg/dose q6h PRN (MAX 600 mg/dose)	For children ≥6 months, first-line option for musculoskeletal injuries and most other painful inflammatory conditions.
acetaminophen PO	15 mg/kg/dose q4h PRN (MAX 1000 mg/dose)	Do not exceed 75 mg/kg/day or 4 g/day (whichever is less).
Moderate Pain (e.g., 4-6 out of 10) Always start with non-opioid medications above, layer on opioid medications below as needed.		
morphine PO	0.2-0.5 mg/kg/dose q3-4h PRN (MAX 15 mg/dose)	Most common pediatric opioid. Lack of demonstrated efficacy for musculoskeletal pain. For initial pain management, second dose may be given sooner than 3 hrs.
HYDROmorphone PO	0.03-0.06 mg/kg/dose q3-4h PRN (MAX 1-2 mg/dose)	Higher risk of dosing errors. Do not use if <6 months or <10 kg.
oxyCODONE PO	0.1-0.2 mg/kg/dose q4-6h PRN (MAX 5-10 mg/dose)	Risk of QT interval prolongation. Tablets must be swallowed whole.
If not responding to PO opioid, consider lower dose IV/Intranasal opioid (see Severe Pain below).		
Severe Pain (e.g., 7-10 out of 10)		
fentaNYL Intranasal	1.5 mcg/kg/dose (MAX 100 mcg/dose). May repeat 0.5-1 mcg/kg/dose (MAX 50 mcg/dose) 10 min after 1st dose if needed. Divide dose between nostrils (MAX 1 mL/nostril)	Provides rapid pain reduction. Provides early pain relief if IV access is not yet established. Give via mucosal atomization device for enhanced absorption. Monitor level of consciousness, vital signs, and pain score prior to therapy and at 10 min post administration.
fentaNYL IV	1 mcg/kg/dose q1-2h PRN (MAX 50 mcg/dose)	Monitoring as per Morphine IV below. For initial pain management, second dose may be given sooner than 1 hr. Monitor level of consciousness, vital signs, and pain score prior to therapy and q10 min post administration (for MIN 30 min). Some institutions recommend continuous O_2 sat monitoring for 30 min post administration.
morphine IV	0.05-0.1 mg/kg/dose q2-4h PRN (MAX 4-8 mg/dose)	For initial pain management, second dose may be given sooner than 2 hrs. DO NOT push medication to avoid rigid chest. Monitoring as per fentaNYL IV above.
ALWAYS ADD PO OR IV NSAID FOR OPIOID-SPARING EFFECT if the pain is expected to require multiple opioid doses.		
ibuprofen PO	Dosing as for Mild Pain section above	
ketorolac IV	0.5 mg/kg/dose q6h PRN (MAX 30 mg/dose, 15 mg/dose for subsequent)	Avoid IV ketorlac if ibuprofen or NSAIDs were given less than 6 hours before.

To see the full resource please visit https://emscimprovement.center/education-and-resources/peak/peak-pediatric-pain/bottom-line-recommendation-pediatric-pain-treatment/ Reprinted with permission from EIIC and TREKK. Please visit our websites at trekk.ca or emscimprovement.center for more information.

Abbreviations: ED, emergency department; IV intravenous; NSAID, nonsteroidal anti-inflammatory drug; PO, oral; PRN, as needed; q, every.

opioid administration, with an adjustment to decrease the amount of procedural sedation medications used, reduces the risk of adverse events. Adequate and early pain management is always recommended while preparations are made for procedural sedation. A well-coordinated pain care plan positively contributes to patient comfort, safety, and clinician workflow.

Monitoring and Re-evaluation After Opioid Administration

A child receiving opioid analgesia in the ED should have regular pain measurements recorded to support assessment of their response to treatment. While most EDs record an initial pain score at triage, repeated assessments after each pain intervention are less frequently documented. The absolute pain score is less important than the change in pain score over time and relative to interventions. Studies have shown that there is a significant association between pain score documentation and the use of analgesia, particularly opioids.[89] Some research has even suggested that increased pain assessment has resulted in an increased use of opioids due to the unidimensional tie of moderate and severe pain scores to algorithmic treatment guidelines.[90,91] Medication administration should always be tied to clinical response, which is not exclusively related to pain scores but also includes a global assessment of the child's level of distress and state. If a child remains in significant pain after seemingly adequate opioid therapy, a thorough reassessment may be required to determine if the etiology of their pain is other than what was initially suspected (eg, development of compartment syndrome post fracture).

Adverse Events Associated With Opioids

Common short-term adverse effects of opioids include nausea, vomiting, constipation, pruritus, dizziness, dry mouth, and sedation; these adverse effects can occur in over half of children receiving opioid medications.[5,6,92] There is limited information about the degree to which these less-serious adverse events (eg, vomiting, dizziness, sleepiness) impact continued use of opioids and a child's functioning. When prescribing opioids for at-home use, families should be counseled regarding adverse effects and their avoidance or management (eg, concomitant use of PEG3350 for constipation prevention). Fear of serious adverse events associated with opioids are cited by both clinicians and families as reasons that influence their use of pain medication for children.[93,94] Specifically, clinicians have reported concerns for opioid-induced respiratory depression as the reason for not prescribing an opioid to pediatric patients.[55]

Variations in a child's metabolic enzyme activity affect opioid metabolism (ie, poor metabolizer, ultra-rapid metabolizer) and can lead to clinically unexpected higher or lower levels of available drug; both of these situations may lead to increased risk for respiratory depression and poor clinical response. Codeine and hydrocodone are particularly associated with issues related to such drug metabolism issues. Children with renal failure should have their opioid doses and frequency adjusted and be closely monitored for increased likelihood of adverse events, due to decreased renal clearance of the drug.[95,96] Children with obstructive sleep apnea who experience recurrent hypoxic episodes may have enhanced opioid respiratory sensitivity and be at increased risk, based on animal studies.[97,98]

The United States Centers for Disease Control and Prevention (CDC) has highlighted the urgent need to comprehensively address the issue of analgesic safety.[99] Without evidence from pediatric studies, clinicians are unable to properly weigh pain treatment benefit against risks for children in an evidence-informed manner.

Treatment of Chronic Pain With Opioids

With chronic pain affecting 15% to 25% of teens, emergency clinicians will undoubtedly be in the position of treating acute pain for such children.[100] Children with chronic pain require a thoughtful approach to their care, and clinicians must additionally consider the following factors when making opioid use decisions: pre-existing analgesic medication use, pre-existing comorbid mental health conditions, and involvement of a pain care team. Children with chronic pain also may present with a new painful condition and should be treated accordingly. In cases in which the patient presents with chronic pain, involvement of their primary/pain care team would be essential, as opioid use is generally avoided for chronic, non-cancer pain. It is important to note that children with chronic pain are thought to be at higher risk for misuse of opioids in adulthood than those without a history of chronic pain, even after controlling for other known risk factors.[101]

Risk for Future Opioid-Related Harms

The risk for future nonmedical opioid use or the development of OUD in children after therapeutic prescription of opioids is of particular concern to emergency clinicians, who regularly treat highly painful conditions. Arguably, the question of greatest relevance in the ED setting is "Will my short-term prescribing of opioids increase this child's likelihood of developing OUD in the future?" A 2021 systematic review of this topic, which included data from 21 studies and almost 50 million participants, has concluded that some studies suggest an association between lifetime therapeutic opioid use and nonmedical opioid use.[56] However, no firm conclusions could be drawn regarding short-term therapeutic use (eg, in the ED), and lifetime risk for opioid misuse. Only 1 study has demonstrated that short-term therapeutic

exposure may be associated with OUD, while 4 studies showed an association between medical and nonmedical opioid use without specifying the duration of exposure. Demographic risk factors are contradictory and unclear. This highlights that opioid prescription requires thoughtful consideration of the medication benefits against the risks for harm. Given the lack of clear evidence regarding short-term therapeutic exposure, when prescribing opioids, clinicians must carefully evaluate pain management options, perform an opioid risk assessment, and educate patients and caregivers about safe and appropriate use of opioids.

Risk Factors for Opioid Misuse

Clinicians who intend to prescribe an opioid analgesic for acute pain management must carefully consider the risk factors associated with the use of that medication for that patient. Current or previous substance use disorder, adolescent age, and a preexisting mental health diagnosis are the currently known risk factors for OUD; however, each child has a different risk profile based on their individual biology and environment.[102]

Close to 15% of families report living with a family member who has a substance use disorder, and this has impacts on—and implications for—the management of children's pain.[54,102] When dispensing opioids for a child who has a personal OUD or a caregiver with an OUD, risk-mitigating options may include pharmacy dispensing of partial prescriptions, involvement of another caregiver for dispensing of medications, and closer follow-up for signs of misuse.

Currently, high-quality prospective studies investigating risk factors related to short-term therapeutic opioid exposure remain limited. Older children, specifically adolescents, are at higher risk for nonmedical opioid use compared to younger children and young adults.[56] No gender has consistently been associated with increased risk for OUD in children.[56] Females have a higher lifetime use of opioids, but males are typically more like to engage in misuse.[19] Females are at elevated risk for depression, anxiety, and trauma, which are established risk factors for substance use, because opioids may be used as a coping mechanism.[103] A 2020 retrospective cohort study found the incidence of nonfatal opioid overdose was higher among females until age 17 years, after which, male gender predominated.[104] A genetic component to opioid use disorders has been suggested, but currently remains unclear.[105,106]

Previously known mental health diagnoses have been associated with increased risk for OUD in opioid-naïve children and adults.[107] This high prevalence of co-occurring psychiatric illness with OUD highlights the importance of screening for these illnesses to identify potential opioid misuse risk.[104] Specifically, mood or anxiety disorders and trauma- or stress-related disorders have been linked to increased risk for OUD for youth.[108]

Current or previous substance use disorder including misuse of alcohol, cigarettes, marijuana, cocaine, or other controlled medications has been variably associated with an increased risk for nonmedical opioid use. While this association would seemingly be clear and has face validity, further prospective investigation is needed.[56,107,108]

Opioid Risk Assessment

A brief, easy-to-use, reliable, and valid screening instrument for children could support point-of-care identification of patients at increased risk for opioid misuse or OUD. Some specific steps can help inform the opioid risk assessment, including use of validated screening tools to screen for substance use and checking the prescription drug monitoring program (PDMP). There are currently no pediatric screening tools to detect risk for opioid misuse or OUD that have been validated specifically for use in the ED.

Validated Tools to Screen for Substance Use in Adolescents

Substance use and substance use disorders are major risk factors for opioid misuse among adolescents. There are 2 validated screening tools to assess for substance use in adolescents aged 12 to 17 years.[109] The Screening to Brief Intervention (S2BI) includes 7 questions to quantify substance use (tobacco, alcohol, marijuana, prescription drugs, illegal drugs, inhalants, herbs, or synthetic drugs) by adolescents in order to categorize risk (ie, no use, lower risk, higher risk). The Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD) asks a single frequency question for past-year use of the 3 substances most commonly used by adolescents.[110] Of note, these screening tools are validated for use in universal screening in pediatric primary care but have not been tested in the ED setting.[109] Another commonly utilized, validated, brief self-report screening tool to detect alcohol and drug use in adolescents aged 12 to 21 years is the CRAFFT tool, which includes 6 yes/no questions.[111] In the ED setting, a positive response to any of the 6 questions can identify children with current problematic substance use or heightened risk of substance use disorders.[112] Of note, current American Academy of Pediatrics guidelines recommend that any teen seeking medical care should be screened for substance use, receive brief intervention, and be referred for treatment, as required.[113] See **Table 3, page 11** for a summary of screening tools for substance use in adolescents.

Safe Opioid Prescribing

Prescription Drug Monitoring Programs

PDMPs are central databases of patient-specific prescription information that are available online for a prescriber to query and review a patient's history of

prior opioid prescriptions. The PDMP profile for an individual patient can be reviewed prior to prescribing opioids, to better understand their opioid medication use history. The PDMP is an example of a state-level opioid reduction policy that can aid in the identification of a patient who has been frequently prescribed opioids and may be at risk for misusing them.[114] A study evaluating the impact of the PDMP on the rate of opioid poisoning in children and adolescents found a long-term decrease in the rate of monthly opioid poisonings for most age groups of children when a PDMP was used.[115-119] However, a 2019 systematic review found limited evidence that PDMP use reduced opioid-related consequences.[115] Overall, while a PDMP may be a useful tool for individual patient-level decision-making, it has been shown to have variable impact on the overall reduction of opioids prescribed to children directly, which is different from what had been shown for adults.[116-118]

Measures to Support Safer Opioid Prescribing

Discharge counseling and education regarding pain assessment and management at home should be a standard part of emergency care for children and their families. Without this clear guidance from clinicians, families risk inadequate pain management for their child, slower return to typical activities, and return visits for inadequately treated pain. Educating patients and families about opioid safety precautions, including not sharing prescribed opioids, keeping medication securely stored, and disposing of unused medications, can reduce the risk of opioid misuse.

Ideally, instructions should be explained in person and reinforced with written or digital information given or sent to the patient and/or their caregiver, immediately afterward. Important concepts to reinforce to families include: (1) taking opioids for a medical reason is different from "doing drugs;" (2) there are often more benefits than risks to using opioid medicines when used as prescribed, for a short period, and for proper medical reasons; and (3) there is no clear evidence that using an opioid medicine for a short time causes misuse later in life.

Patients should be educated on local resources to dispose of opioids. Some pharmacies offer on-site drop-off boxes and mail-back programs to safely dispose of unused medications. To reduce circulating opioids within the community setting, the United States Drug Enforcement Administration has sponsored national prescription drug take-back days.[120] Both national and local take-back drives have been successful in the collection of medications, but the overall impact on overdose rates is not known.[121,122] Opioids are on the "flush list," meaning unused medication can be flushed down the toilet because these medications are felt to be high risk if retained in the home but present minimal risk to the environment. Alternatively, the medication can be mixed with an unappealing substance, such as dirt, cat litter, or coffee grounds; sealed in a plastic bag; and thrown away with home trash. Providing a drug disposal bag to caregivers at the time of prescription has been shown to increase the rate of proper opioid disposal.[123]

Prescribing Limits

Opioid prescribing guidelines for emergency care have been developed in many states. A number of mechanisms have been used, including medical board/state department guidelines, regulations, and statutes. The guidelines for acute pain management are variable between states, but many recommend or require a prescribing limit for opioids (often for 3

Table 3. Screening Tools for Substance Use in Adolescents

Screening Tool	Link	QR Code	Comments
Screening to Brief Intervention* (S2BI)	https://nida.nih.gov/s2bi/#/		• For adolescents aged 12-17 years • 7 brief questions • Can be self-administered by a patient or administered by a clinician, but the clinician must interpret the score and provide clinical guidance
Brief Screener for Tobacco, Alcohol, and other Drugs* (BSTAD)	https://nida.nih.gov/bstad/#/		• For adolescents aged 12-17 years • Focused on specific substances used in the past year to assess risk for substance use disorder • First screens for tobacco, alcohol, and marijuana use; if using any of these, further questions are then added
CRAFFT	https://crafft.org/get-the-crafft/		• For adolescents aged 12-21 years • 6 yes/no questions • 1 "yes" response in the emergency department suggests current problematic substance use or risk of substance use disorder • 2 "yes" responses suggests a serious problem and need for more urgent further assessment

*These screening tools are validated for use in universal screening in pediatric primary care but have not been tested in the emergency department setting.

days duration), and a few have penalties for failure to comply. A 2022 review of leftover opioids after ambulatory and ED prescribing supports this practice, as 70% of children's prescribed opioids remained unused on follow-up.[124] The largest evaluation of a consensus-based education and prescribing guideline impact was performed in an adult surgery quality improvement collaborative that found a significant reduction in opioid prescription size and consumption with no clinically important changes in satisfaction or pain scores.[125] More large-scale pediatric research studies are needed to evaluate the impact of opioid prescribing guidelines on acute pediatric care.

At-home analgesic options and the step-wise approach mirror the approach to oral pain medications in the ED, with ibuprofen often being the first-line agent in this setting, as well.[6] For moderate pain, oral opioids could be prescribed in small numbers of doses (ie, 5-10 doses total) and should be accompanied by a risk assessment prior to dispensing. If pain cannot be managed adequately with oral pain medications, some conditions may warrant admission for pain management alone.

Naloxone

Naloxone Use in the Emergency Department

Naloxone is an opioid antagonist that counteracts potentially lethal respiratory depression by displacing the opioid from the receptor. The currently recommended dose of naloxone for total reversal required for overdose in the healthcare setting is 0.1 mg/kg (delivered IV, intraosseous, intramuscularly, or intranasally) every 2 minutes, with a maximum single dose of 2 mg.[126] If total reversal is not required, as for respiratory depression associated with therapeutic opioid use, 1 to 5 mcg/kg can be titrated to the desired effect.[126]

The optimal dose to reverse opioid-induced respiratory depression in the ED can be challenging if there is risk for precipitating opioid withdrawal in opioid-dependent patients. The American Heart Association recommendations are for naloxone administration at a low dose (0.04 to 0.4 mg) with repeat dosing or dose escalation to 2 mg if the initial response is inadequate, in order to decrease the risk for opioid withdrawal in the opioid-tolerant patient.[127] Pediatric dosing strategies typically include higher naloxone doses because chronic opioid use and the risk for opioid withdrawal is far less common.[128]

The duration of action of naloxone is 30 to 120 minutes, depending on route of administration, but the clinical effects of naloxone may not last as long as those of the opioid, and repeat doses or continuous infusion may be needed in cases involving significant opioid overdose.[129] In order to maintain reversal, naloxone continuous IV infusion may be dosed at 2.5 to 160 mcg/kg/hr, depending on the circumstances and the effect; typical doses are between 24 and 40 mcg/kg/hr.[130]

Take-Home Naloxone Kits/Prescription of Naloxone Upon Discharge

The United States Department of Health and Human Services has called for expanding the availability and access to naloxone. In the ED, access to naloxone could be expanded through either take-home naloxone kits or prescriptions of naloxone.[131,132] There is currently little published literature supporting the effectiveness of ED-based education and distribution of take-home nasal naloxone for overdose prevention, due to low rates of patient follow-up in the community setting.[132]

The World Health Organization recommends take-home naloxone to reduce the burden of opioid-related deaths in OUD patients.[133] Both clinicians and higher-risk patients as young as 16 years of age have been shown to be accepting of take-home naloxone with training.[134] The prescription of naloxone can be considered for any child with an opioid prescription and risk factors for overdose, and it should be prescribed or offered to anyone with OUD. Naloxone can also be prescribed to individuals who may be in a position to help a person who has overdosed. Providing families with naloxone kits, whether or not their child is at increased risk for OUD allows them to treat their child (if needed) or other friends/family who may be in need of emergent opioid reversal. The ED setting provides an opportunity to engage with patients who have a pre-existing OUD who may not present

5 Things That Will Change Your Practice

1. Integrating physical and psychological pain management strategies into ED pain care will improve family experience and satisfaction and decrease the need for pharmacotherapy.
2. Combining acetaminophen and ibuprofen for moderate pain may alleviate the need to use opioids.
3. Screening children and their families for OUD prior to prescribing opioids for at-home use can help identify at-risk families for treatment referral and improve safety counseling regarding medication use.
4. Intranasal fentanyl administration can provide early, effective, and easy-to-deliver pain relief for children requiring urgent severe pain management.
5. Prescribing or providing a take-home naloxone kit in the ED provides an opportunity to discuss harm reduction with families and children who may be at risk for adverse outcomes such as overdose.

Case Conclusions

CASE 1

For the 10-year-old girl who was brought in via wheelchair by her mother…

You determined that this nonverbal 10-year-old child was in severe pain, based on your nursing colleague's r-FLACC assessment, along with the mother's assertion that she had never seen her child so uncomfortable. After an initial dose of 1.5 mcg/kg of intranasal fentanyl and a 15 mg/kg dose of oral acetaminophen through her gastrostomy tube, her writhing settled. You could now examine her, and you determined that the right lower quadrant of her abdomen was quite tender. After applying topical anesthetic cream to her hand, your team established IV access, administered morphine and ketorolac, and then confirmed, with imaging, the diagnosis of appendicitis. The girl headed safely to the operating room.

CASE 2

For the 2-year-old boy with known sickle cell disease who was carried into the triage area by his father…

You headed out to the triage assessment space and quickly examined the boy. While hemodynamically stable, he was lying very still, with silent tears rolling down his cheeks. The triage nurse used the EVENDOL scale to calculate his pain score, which was quite high. The boy's father mentioned that they had been using recommended doses of ibuprofen, acetaminophen, and home opioid, with little effect. You asked for intranasal fentanyl to be administered and called for the child-life specialist to engage with the family. A needle-free injection device was used to numb the surface of the skin so that an IV line could be inserted, and the boy was given IV hydromorphone. When you reassessed the boy a few hours later, his pain had improved, and he was playing with toys the child-life specialist brought him. The boy was ultimately discharged home with a new oral opioid prescription and close follow-up with his hematologist.

CASE 3

For the 15-year-old girl who fell while skateboarding and sustained a both-bone forearm fracture…

You recalled that it was a particularly tough reduction, requiring quite a bit of manipulation. You advised that she use ibuprofen and acetaminophen as first-line agents. You suggested that if the pain was mild, to use ibuprofen first, but if it was moderate, to combine it with acetaminophen. Knowing that there would likely be more swelling and pain over the next few days, you performed an opioid risk assessment, and then prescribed 3 days worth of oral oxycodone. You advised the family of safe storage, use, and disposal.

to other healthcare venues. The ED patient who has been recently treated for opioid-related harms may also be more receptive to an intervention, since there is a clear rationale for provision of preventive treatment in response to either ED treatment of an opioid overdose or ED opioid prescription.

Nonopioid Pharmacologic Alternatives: Emerging Treatments

Methoxyflurane

Methoxyflurane is an inhaled medication that is classified as a halogenated volatile anesthetic. It is a nonopioid alternative to morphine that is used for acute pain relief associated with trauma or procedures. The onset of relief is rapid, after 6 to 8 breaths, and continues for several minutes after inhalation has stopped.[135] There is potential risk for nephrotoxicity with supratherapeutic doses or consecutive-day use, and it is contraindicated in patients with pre-existing kidney disease.[135] A portable, disposable single-use inhaler device, known as the "green whistle," has been used in children aged >5 years. FDA approval for new drug applications for methoxyflurane was withdrawn in the United States in 2005, due to concerns for nephrotoxicity. It is currently being used in Australia and New Zealand, and recent trials are ongoing in the United Kingdom, with promising findings.[4,135]

Subdissociative Ketamine

Ketamine is a noncompetitive N-methyl-D-aspartate (NMDA) receptor antagonist that blocks glutamate and provides analgesia by decreasing central sensitization, "wind-up" phenomenon, and pain memory.[136] Subdissociative ketamine has gained recent popularity for pain management as another opioid-sparing alternative. Its use is associated with higher rates of minor but well-tolerated adverse effects. In studies of limb injury-related pain in the ED, subdissociative ketamine appeared to have the same analgesic efficacy as intranasal fentanyl or IV morphine.[67,68,137,138] IV dosing of subdissociative ketamine is 0.1 to 0.4 mg/kg, while intranasal dosing for subdissociative ketamine is higher, at 0.5 to 1 mg/kg.[139] Similar to intranasal fentanyl, intranasal ketamine shares the advantages of early and rapid pain management for children for whom vascular access has not been es-

tablished, but it confers the added benefit of longer-lasting analgesia (60 minutes for intranasal ketamine vs 30 minutes for intranasal fentanyl).[67,139] One challenge it presents is that it may alter the mental status of some children, which may complicate decision-making in the trauma setting (ie, neuroimaging).

Intravenous Acetaminophen

While not currently widely available in North America, IV acetaminophen is emerging as a promising parenteral analgesic agent for both children and adults. It has been shown to significantly reduce pain scores and need for opioid medication in the operative setting. While acknowledging that there is limited research in the area, the 2022 evidence-based guidelines for prehospital pain management currently recommend IV acetaminophen, if available, in lieu of IV opioids as a first-line therapy for moderate to severe pain in adults.[71] A systematic review comparing the effects of IV acetaminophen to oral acetaminophen in children yielded only 3 studies, and noted that, while IV acetaminophen brought fever down more quickly, its analgesic effects were similar to the oral formulation.[140] Further research is required to confirm its utility in children.

Risk Management Pitfalls to Avoid in Administering Opioids to Pediatric Patients

1. **"He said that his belly pain was 9/10, but he was texting a friend while I was in the room, so I thought he was exaggerating."** Children, especially teens, can downplay the expression of pain in front of peers and strangers. Never assume that they are lying or misrepresenting their pain. Also, pain scales are relative: your 9/10 is not the same as this child's 9/10 because you have had different life experiences, which will influence what is interpreted as 10/10 pain.

2. **"I told the parents that their 8-year-old would be completely safe using the small dose of prescribed oral opioids at home."** Opioids, even when used in appropriate doses and for appropriate reasons, can have some risks, which include both serious (eg, respiratory arrest, anaphylaxis) and non-serious (eg, nausea, constipation) adverse events. Families should be counseled regarding these risks and how to avoid and/or identify and manage them. For example, laxatives or stool softeners (eg, PEG 3350) should be prescribed alongside opioid medications to avoid constipation.

3. **"I didn't want to offend the family, so I skipped the opioid risk assessment screening. Besides, they looked like good people."** Historically, emergency clinicians have not been consistent in integrating opioid risk screening into their opioid-prescribing practices. With close to 15% of families living with a family member who has a substance use disorder, information gathered from opioid risk assessment can and should influence the discussion with the family regarding safe and appropriate use of opioids for their child's pain.

4. **"It was a really bad fracture. I didn't think over-the-counter medications would work, so I prescribed oral hydromorphone."** While clinical experience might help identify patients who would likely need more than over-the-counter medications to treat their pain, therapy should not be switched to opioids. Rather, opioids should be added to nonopioid medications, and physical and psychological therapies should be integrated into the care plan, to minimize opioid use and model appropriate medication use for the family to continue at home.

5. **"I gave my patient with a sprained wrist some ibuprofen, and told him it should take care of the pain."** While it is true that ibuprofen is the first analgesic of choice for mild to moderate pain due to musculoskeletal injury, it works best when it is combined with physical and psychological therapies. Early immobilization and icing at triage are great examples of effective and inexpensive interventions that can be employed. Families can also be counseled to use distraction, and if available, a child life specialist can help guide them.

6. **"I wanted to avoid opioids for that homeless teen. I was worried that she was misusing opioids on the streets and that if I prescribed them to her in the ED for her pain, it would just make things worse."** This young woman should receive an opioid risk assessment, just as any other patient would prior to being prescribed outpatient opioids. She could then be prescribed the appropriate analgesic medication(s), as needed for her condition.

Summary

Untreated pain in children is known to cause harm, and the effects extend into adulthood. Pain care should be personalized to each child and family, taking into account their goals and integrating an opioid risk assessment into planning. When opioids are required, they should be used responsibly, and as co-therapy with nonopioid medications, to minimize adverse events and for their opioid-sparing effects. When dispensing oral opioids for at-home use, care must be taken to dispense the fewest number of pills that are appropriate for the patient's condition (typically 5-10 doses for most ED presentations), and family education should be provided regarding safe storage, use, and disposal.

Time- and Cost-Effective Strategies

- The purpose of nurse or triage-initiated pain treatment is to quickly identify pain that may be improved with the administration of medication. This approach to pain treatment has been shown to improve the timeliness of pain relief.[141-143] It also likely improves the child's cooperation with physical examination and other evaluations, including imaging; both may be more efficiently completed with effective and early pain treatment.
- Achievement of adequate pain relief typically results in more timely disposition and thoughtful prescription of at-home paint treatment, since the experience in the ED can inform the optimal

7. **"The parents expressed concern about the opioid prescription for their daughter. I told them it was not a concern, we all know opioids are safe for medical use."** There are often more benefits than risks to using opioid medicines when they are used as prescribed, for a short period, and for proper medical reasons. Furthermore, there is no clear evidence that a child's use of an opioid medication for a short time causes misuse later. Still, families are often aware of and concerned about the opioid crisis and the risk of OUD after therapeutic use of opioids. Families' concerns and fear regarding opioids should be addressed, and a good pain management plan always includes the family's active involvement. The right balance must be found between reassuring the family that adequate pain management is key and honestly presenting the risk/benefit considerations.

8. **"I was super busy on that shift, so I asked the unit clerk to pass on the opioid prescription to the family and tell them to use it as directed by the pharmacist."** Appropriate discharge counseling regarding pain management is essential to good care. Although a child's pain is treated for a few hours in the ED, their family must manage it at home for days to weeks, and most often without the benefit of healthcare training. Always take the time to explain multimodal pain therapy, co-therapy with nonopioids, management of adverse events at home, safe storage and disposal of medications, and when to return to the ED.

9. **"I told the patient to try acetaminophen for that bad sprain, and if it did not work, to switch to the oxycodone that I prescribed her."** Ibuprofen has been shown in multiple clinical trials and systematic reviews to be the first-line choice for musculoskeletal injuries, including sprains and simple fractures. If it is inadequate, consider co-therapy with acetaminophen, as this combination works for many other conditions including dental pain and some postoperative painful conditions. If opioids are required, they should always be used as co-therapy—never as monotherapy.

10. **"I wanted to avoid the family having to return to the ED for more pain medicine, so I wrote a prescription for 30 oxycodone pills for the boy's leg fracture."** While it is appropriate to prescribe oral opioids when discharging a child who is expected to experience moderate to severe pain at home, emergency clinicians must be mindful of how much is prescribed. Prescribing too many pills can contribute to diversion of opioids for misuse and should be avoided. For most acute self-limited conditions, 3 days, or a maximum of 5 to 10 doses, of oral opioid medication are recommended as a prescription from the ED. Remember to always advise co-therapy with an NSAID.

approach at home. For example, if ibuprofen and the application of an ice pack adequately treated the child's acute pain in the ED, the family will likely comfortably and effectively use the same regimen at home.

- Thoughtful consideration of the number of doses of pain medication needed for home treatment will result in less medication being prescribed, lower costs to patients, and less money spent within the healthcare system to treat and monitor the medications prescribed. If less opioid is prescribed, there will likely be less leftover medication, resulting in less potential for diversion and misuse.
- Decreasing opioid misuse can ultimately decrease the related emergency and rehabilitation costs to the community at large.

References

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study is included in bold type following the references, where available. The most informative references cited in this paper, as determined by the authors, are noted by an asterisk (*) next to the number of the reference.

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CME Questions

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1. **The most reliable and desirable individual to measure a child's pain is:**
   a. The child (self-report)
   b. The nurse
   c. The doctor
   d. The parent or caregiver

2. **A 8-year-old girl presents with abdominal pain, and you wish to assess her pain via self-report. The girl does not have a clear understanding of numerical ordering. Which pain scale should you use to assess her pain?**
   a. Faces, Legs, Activity, Cry, Consolability (FLACC) scale
   b. EValuation ENfant DOuLeur (EVENDOL)
   c. Faces Pain Scale-Revised (FPS-R)
   d. Verbal Numerical Rating Scale (vNRS)

3. **Which of the following statements is evidence-based practice?**
   a. Review of the vital signs to assess hemodynamic status will inform the safety of administering an opioid analgesic.
   b. Increased heart rate and blood pressure are changes in vital signs that are reliably linked to increased pain severity and should guide analgesic decision-making.
   c. Both A and B
   d. Neither A nor B

4. **Which medication is considered the best initial choice for first-line therapy for mild to moderate pain due to musculoskeletal injury?**
   a. Ibuprofen
   b. Acetaminophen
   c. Codeine
   d. Naproxen

5. **A 12-year-old girl presents with a grossly deformed wrist after falling from her bike. She has a closed injury, was wearing a helmet, and has a Glasgow Coma Scale score of 15. She is visibly distraught, crying out in pain, and rates her pain as 9/10. She already received ibuprofen at home. Alongside immobilization and ice packs at triage, what would be the most appropriate medication choice for pain relief?**
   a. Intravenous morphine
   b. Oral morphine
   c. Oral acetaminophen
   d. Intranasal fentanyl

6. **What percentage of children experience adverse effects with oral analgesia?**
   a. 5%
   b. 10%
   c. 25%
   d. >50%

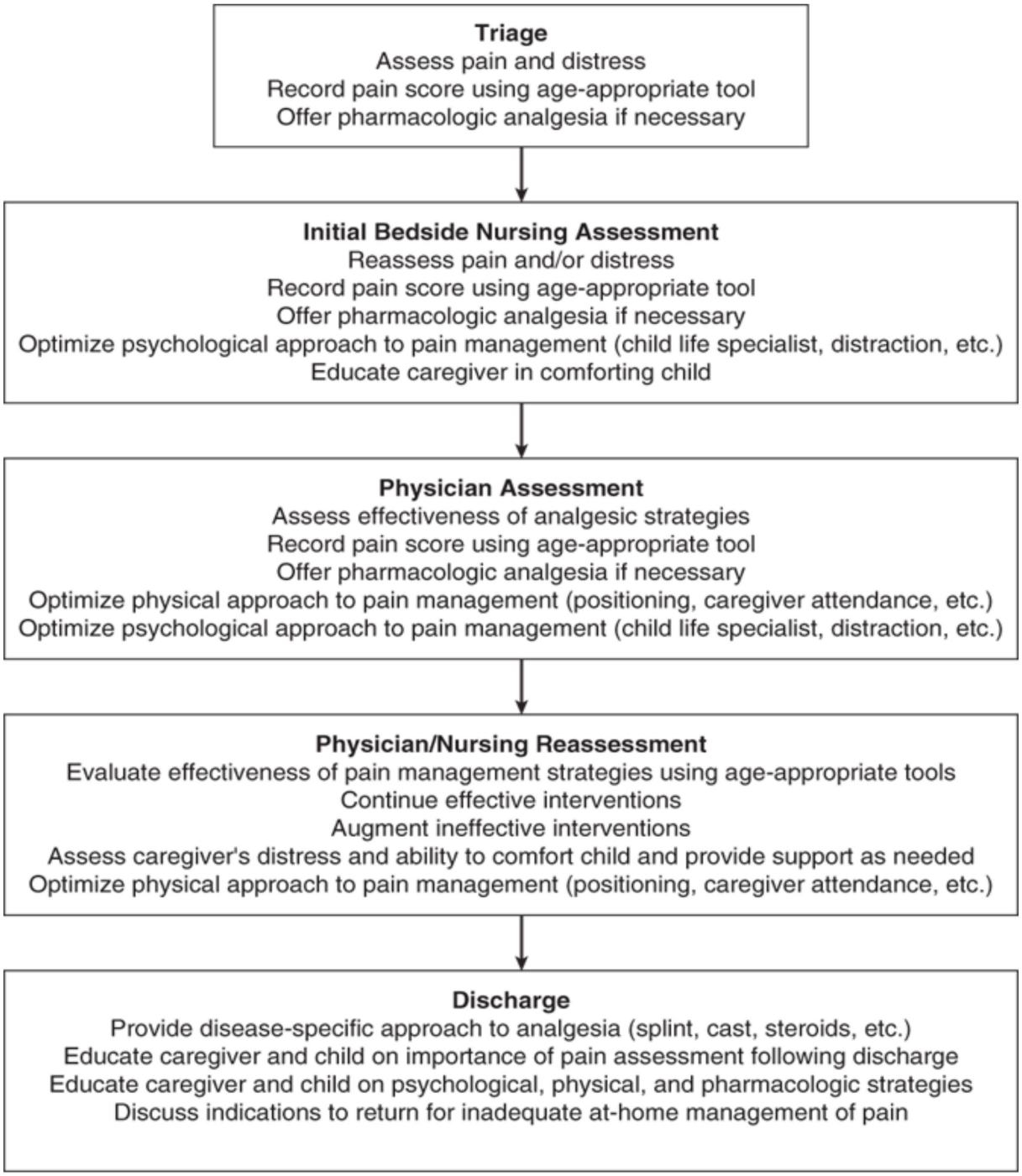
7. **Prior to prescribing outpatient opioids to a pediatric patient, the following steps should be taken by all emergency clinicians EXCEPT:**
   a. An opioid risk assessment for the family
   b. Advising co-therapy with nonopioid medication
   c. Counseling regarding adverse events and their management
   d. Inquiring where the family lives

8. **A teenager with a dislocation of their elbow presents to your ED. Opioids were required as part of their care plan. As a part of your ED care, you perform a substance use disorder screening with the CRAFFT tool. The teen screens positive, answering "yes" to 5 of 6 questions. What should you do as a part of their care plan?**
   a. Consider referral to a substance use program.
   b. Systematically avoid opioids in their care plan.
   c. Inform their parents that they have a substance use disorder, without the patient's consent.
   d. Automatically refer the patient to a psychiatrist.

9. **You are caring for a teen who broke his wrist and required a reduction in the ED. It required quite a bit of manipulation, and you expect that it will be quite painful for the next few days. In addition to advising ice, elevation, and nonopioid medications, you plan to provide an opioid prescription. In most cases, a prescription for how many doses will be adequate and recommended?**
   a. 5-10 doses
   b. 20-30 doses
   c. 50-60 doses
   d. Oral opioids are never appropriate for fractures

10. **A previously healthy 2-year-old boy arrives by EMS with concerns for altered mental state after being found with his father's oxycodone pills. The boy is being bagged by the paramedics because, on the way to the hospital, the child started to have poor respiratory effort. On examination, the child is apneic, does not respond to painful stimuli, and has poor tone. You notice pinpoint pupils. Which of the following is the best first intervention?**
    a. Prepare to intubate.
    b. Administer 0.1 mg/kg naloxone intranasally or intramuscularly.
    c. Administer 1 mcg/kg naloxone intranasally or intramuscularly to reverse opioid-induced respiratory depression.
    d. Administer 0.1 mg/kg naloxone IV and then start a naloxone infusion.

The Continuum of Pediatric Pain Assessment and Treatment in the Emergency Department



It is important to note that there is a continuous cycle of assessment, intervention, and reassessment of pain in the emergency department. This pathway outlines a summary of the continuum of pain care that begins at triage (or occasionally with the prehospital care professionals) and continues to discharge counseling regarding at-home pain care.

The *Pediatric Emergency Medicine Practice* Editorial Board

QUICK READ

Points & Pearls

JANUARY 2023 | VOLUME 20 | ISSUE 1

Responsible and Safe Use of Opioids in Children and Adolescents in the Emergency Department

Points

- Assess pain globally, using a developmentally appropriate pain scale. Ask the family about the impact of the injury on the child's functioning. **(See Table 1, page 5.)** This allows for a better picture of the extent of the pain and can inform the pain management plan.
- Treat pain in a multimodal fashion. Combine physical, psychological, and pharmacological interventions to create the best pain-relief plan. Parents/caregivers and child life specialist involvement form an important part of this planning.
- Based on efficacy and adverse effect profile, ibuprofen is the first-line oral agent in treatment, particularly for acute musculoskeletal injuries.[8,9,61]
- Opioids should always be combined with nonopioid pharmacotherapy (eg, an NSAID). This allows for both opioid-sparing and minimizing of adverse effects.
- Refer to **Table 2, page 8** for a summary of pain medication dosing and considerations.
- While awaiting vascular access to be established, when urgent pain relief is required for moderate to severe pain, intranasal fentanyl should be used.[67-69] This route is safe, allows for relief within 5 to 10 minutes, and results in similar pain relief as IV morphine.[34]
- Opioid risk assessment should be performed for all families for whom a discharge prescription for opioids is being provided. **(See Table 3, page 11.)** A positive risk screening does not preclude the use of opioids, but can guide safer dispensing and storage advice.
- Three days (or 5-10 doses) of an oral opioid is almost always enough to manage acute injuries. By limiting the amount dispensed, diversion and misuse is minimized.[124]

Pearls

- Ibuprofen and acetaminophen can be combined for relief of moderate pain. This combination provides relief similar to many oral opioid medications, without opioid side effects, and may alleviate the need to use opioids, both in the ED and at home.
- Intranasal fentanyl delivers pain relief similar to IV morphine and can be used in situations in which an IV line is not required or has been difficult to achieve.
- Oral and parenteral opioids should be combined with a nonopioid medication (eg, oral ibuprofen, IV ketorolac), to reduce the total amount of opioid needed and lessen the occurrence of adverse events.
- Children who receive opioids within 30 minutes before procedural sedation are at higher risk for adverse events during sedation. Compared to morphine, fentanyl is the safer choice in this situation.

- When treating a child who reveals a personal or family history of opioid misuse or an opioid use disorder, consider providing or prescribing a naloxone take-home kit.[131-133]
- Take time to provide careful discharge instructions and education when sending a family home with a prescription for opioids.
- Explain multimodal pain therapy, co-therapy with nonopioids, management of adverse events at home, safe storage and disposal of medications, and when to return to the ED.

