

Acute pain management after trauma: What you need to know

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ABSTRACT: Effective acute pain control is mandatory after injury. Opioids continue to be a pillar acute pain management of strategies despite not being as effective as some nonnarcotic alternatives. An acute pain management strategy after trauma should be thoughtful, effective, and responsible. A thoughtful approach includes managing a patient's expectations for acute pain control and ensuring that interventions purposefully and rationally affect the domain of pain that is uncontrolled. An effective pain management strategy includes a multimodal approach using acetaminophen, nonsteroidal anti-inflammatory drugs, and regional anesthesia. A responsible acute pain management approach includes knowing the relative strengths of the opioids prescribed and standardized approach to opioid prescribing at discharge to minimize diversion. Acute pain management is quite understudied, and future considerations include a reliable objective measurement of pain and the evaluation of nonmedication acute pain interventions. (*J Trauma Acute Care Surg.* 2024;96: 537–541. Copyright © 2023 Wolters Kluwer Health, Inc. All rights reserved.)

KEY WORDS: Acute pain; opioid; pain management; analgesics.

Effective acute pain control is an important patient-centered outcome. Inadequate pain relief contributes to harmful physiologic and psychological sequelae.¹ Undertreated acute pain limits a patient's early mobilization and return to baseline and may also lead to the development of chronic pain syndromes.^{2,3}

Opioids remain a mainstay in acute pain management but are actually not as effective as nonnarcotic alternatives.^{4–6} Preclinical animal data suggest that opioids can increase both the magnitude and duration of pain.^{7–11} A recent human study found no benefit of opioids over placebo for acute back and neck pain.¹² In fact, patients who received placebo had lower acute pain scores even 52 weeks after a short course of opioids. Thus, opioids were not effective and may actually have been harmful.

An acute pain management strategy after trauma should be centered around a multimodal pain regimen using the few effective, evidence-based nonnarcotic medications currently available. Opioids are not going anywhere, and an opioid-free strategy is infeasible. Opioid minimization, however, can be achieved in a thoughtful, effective, and responsible manner.

THOUGHTFUL

Expectation Management

Setting realistic expectations about posttraumatic pain is vital. For some patients, the visit to a trauma center may be their first interaction with the medical system. They may not know that achieving “zero pain” is not possible. Some patients have had

multiple interactions with the medical system and bring with them the expectation that only opioids work to treat acute pain.

Patients should be reassured that pain after surgery or injury is normal and that time is the most effective treatment for the resolution of pain. Until that healing can take place, however, the provider is going to balance the patient's level of pain with their ability to function and rehabilitate.

The American College of Surgeons has patient-centered information available on their website that can assist with expectation management that can be readily available for patients via a Quick-Response (QR) code or premade pamphlets.¹³

Background, Breakthrough, Procedural, and Operative Pain

Pain is not static. Simply relying on an aggregate pain score from the previous day or reacting to the worst experience of the day without consideration for external factors leads to irrational treatment strategies.

There are four domains of acute pain: background, breakthrough, procedural, and operative pain. Background pain is pain present while the patient is at rest. Breakthrough pain occurs randomly when spikes of pain exceed the effect of background analgesics. Procedural pain is expected and occurs in response to external events (e.g., dressing changes, physical/occupational therapy sessions). Operative pain is expected pain that occurs after surgical procedures.

If you were to react without consideration for the domain of pain you intend to address, your treatment strategy may be irrational (Fig. 1). For example, a patient with a necrotizing soft tissue infection of the right lower extremity who is status post full-thickness excision of the leg and thigh down to fascia is receiving daily wet to dry dressing changes. The patient reports severe pain during and for hours after the dressing change event. Ordering a subdissociative ketamine infusion continuously, extended-release oxycodone scheduled throughout the day, or increasing the dose of any already ordered scheduled medication (all interventions really meant to affect background or breakthrough pain) is an irrational response to what is an inadequate procedural pain regimen. A more

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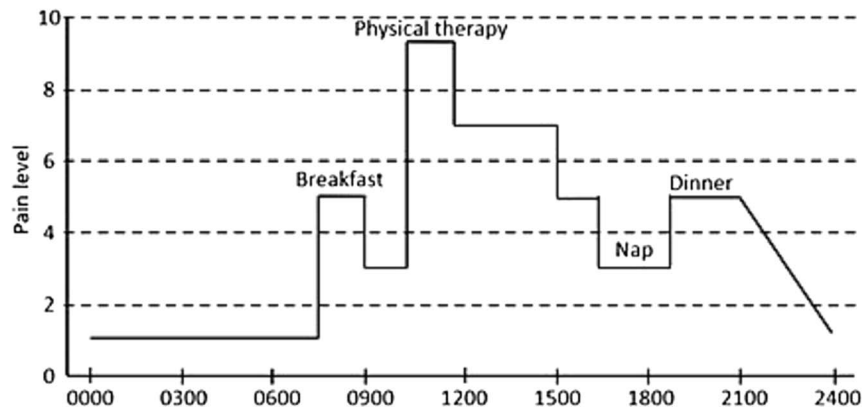


Figure 1. Pain is not static. The longitudinal experience of pain throughout a patient's hospital stay is not static. Consider thinking of acute pain as having multiple domains: background pain that is present at rest, breakthrough pain that occurs when pain exceeds the therapeutic effect of background analgesics, procedural pain that occurs during external events (e.g., physical therapy), and perioperative pain.

rational approach would be medication given before the dressing change, moderate sedation, or a regional block.

Patient Risk Stratification

Patients are heterogenous as is their risk for developing opioid use disorder (OUD) after discharge.^{14,15} A single approach to all patients will not work. There are a number of tools available that can estimate a patient's risk for developing OUD. The Opioid Risk Tool is a simple one that stratifies patients as low or high risk for OUD.¹⁶ By being purposeful and risk stratifying, you can offer high-risk patients additional interventions to minimize the risk of developing OUD. These could be increased office visits postdischarge to ensure weaning of opioids or the referral to an acute pain specialist who can follow the patient long term.

Other Concomitant Factors Affecting Pain

The entire concept of pain is challenging. Certainly, after injury, tissue damage causes somatic pain that is perceived by the patient. Other concomitant emotions, however, can modulate this perception of pain such as anxiety and acute stress. In addition, untreated or undertreated psychiatric conditions may also modulate the perception of pain.^{17,18} Pain medication of any sort, opioid based or nonopioid, is not an effective treatment for acute stress or poorly controlled schizophrenia.

EFFECTIVE

Effective, Evidence-Based Nonopioid Medications

The number of medications that are evidence-based and effective in trauma patients is limited but includes acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), and subdissociative ketamine infusions.^{19–22} Acetaminophen and NSAID alone or in combination have consistently been shown to be as or more effective for acute pain control compared with opioids. Multiple Cochrane reviews estimated the number needed to treat for various acute postoperative pain strategies (Table 1).^{4–6} A combination of ibuprofen and acetaminophen provided the most effective pain relief of the regimens.

While the effectiveness of acetaminophen and NSAIDs is clear, there continues to be hesitancy in some centers to widely

use NSAIDs. Some orthopedic surgeons worry about the effect of NSAIDs on fracture healing. Some neurosurgeons worry about the temporary antiplatelet effect in patients with traumatic brain injuries. Indeed, some trauma surgeons worry about the risk of bleeding in patients with solid organ injuries, the risk of acute kidney injury in patients who may already have one or more risk factor (e.g., hemorrhagic shock), or the risk of gastrointestinal bleeding.

Some of these concerns are based on preclinical studies or pharmacologic principles that do not translate to the care of adult humans.^{23,24} The data to suggest that NSAIDs negatively affect fracture healing in humans is mixed, and an ongoing multicenter randomized trial should answer this concern. Except for ketorolac, the temporary antiplatelet effect of commonly used NSAIDs appears to be clinically insignificant.^{25,26} At current, in absence of an individual level patient factor that precludes the use of acetaminophen (e.g., allergy or advanced liver disease) or NSAIDs (e.g., allergy, history of gastrointestinal bleeding, acute kidney injury, pregnancy), there is no sensible reason that these drugs should not widely be used in trauma patients.

Regional anesthesia is also an important and effective acute pain strategy, although more dependent on the presence and availability of expertise in your trauma center. An example of the significant effect of regional anesthesia is after split-thickness autografting. At our center, the acute pain service will perform cryoablation of the lateral femoral cutaneous nerve before autografting of small wounds (Fig. 2). This effect will last 2 to 3 months. Once completed, they will test the patient and mark the area that is numb. In the operating room, surgeons stay within the marked area, and the patient will never feel donor-site pain because the wounds will have healed before sensation returning.

TABLE 1. Number Needed to Treat for Various Pain Regimens

Medication Regimen	Number Needed to Treat
Oxycodone (15 mg)	4.6
Oxycodone (10 mg) and acetaminophen (650 mg)	2.7
Naproxen (500 mg)	2.7
Ibuprofen (200 mg) and acetaminophen (500 mg)	1.5

RESPONSIBLE

Morphine Milligram Equivalents

Prescribing opioids without understanding the relative doses of the different types of drugs can also lead to irrational ordering. A common example of this is seen in intensive care units across the country. Intubated patients are commonly treated with opioid infusions (e.g., fentanyl) for pain control and sedative infusions (e.g., propofol, dexmedetomidine, midazolam) for agitation. Rates of fentanyl drips vary, but a 100 µg per hour rate is not uncommon. If being prescribed for acute pain, however, this is irrational. If a patient receives 100 µg of fentanyl an hour for 24 hours, then they will receive 2,400 µg of fentanyl in a day. This is equivalent to 480 oral morphine milligram equivalents (MMEs) in that 24-hour period ($2,400\text{ }\mu\text{g} \times 0.2 = 480\text{ MMEs}$) (Table 2). The MME for a single 5-mg oxycodone tablet is 7.5 MMEs. This means that the fentanyl drip was equivalent to sixty-four 5-mg oxycodone tablets over that day (480 MMEs fentanyl divided by 7.5 MMEs oxycodone equals 64). No patient requires 64 oxycodone tablets in a day. In reality, that fentanyl drip is acting as a sedative.

This can occur at discharge or in the outpatient setting as well. Some providers prefer the use of oral codeine or tramadol because they consider them to be “weak” opioids. If one does not consider the relative strengths of the various possible dosages, irrational prescribing can again occur. Consider that the following drugs and dosages are listed in order of “strongest” to “weakest”:

TABLE 2. Oral Morphine Milligram Equivalent Conversion Factors

Drug	Conversion Factor	Common Dosage	MME per Dose
Oral opioids			
Codeine	0.15	30/60 mg	4.5/9
Tramadol	0.1	50/100 mg	5/10
Hydrocodone	1	5/10 mg	5/10
Oxycodone	1.5	5/10 mg	7.5/15
Intravenous opioids			
Morphine	3	4 mg	12
Hydromorphone	15	0.2–2 mg	3–30
Fentanyl	0.2	25–100 µg	5–20

100 mg of tramadol (10 MMEs), 2 tablets of Tylenol 3 (9 MMEs), one 5 mg of oxycodone (7.5 MMEs), and one 5 mg of hydrocodone (5 MMEs). One could easily be prescribing a “weak” opioid but doing so at a dose in which it is actually a higher MME than oxycodone or hydrocodone.

Opioid Prescribing at Discharge

Diversion is a major potential problem for opioids prescribed at discharge. Much impressive work has gone into estimating an average number of pills to be prescribed after elective surgery.²⁷ This work has made a tremendous impact on reducing diversion. Unfortunately, trauma patients and their injuries are heterogenous such that there is no average amount of pills that is sufficient.

A rational way to determine a reasonable amount of opioid pills is to use a multiplier.^{28,29} If you look at the patient's use of opioid pills over the 48 hours before discharge, you can estimate the average daily number of pills a patient might require after discharge. No evidence-based multiplier exists for the trauma population, but at our center, we provide a week's worth of opioid pills, meaning a multiplier of 7. If the patient took zero opioid pills, then they do not require an opioid prescription at discharge. If the patient required 2 opioid pills each day, then it would be reasonable to prescribe them 14 opioid pills (2 pills per day times 7 days equals 14 pills). The multiplier one might choose could be heavily influenced by the risk of diversion in one's local population and state regulations on opioid prescribing.

FUTURE CONSIDERATIONS

Measurement of Acute Pain

Currently, the majority of scales that are used to measure acute pain are subjective in nature. A patient's perception of pain is vital to adequate treatment. However, as mentioned earlier, patients can sometimes have concomitant emotions or psychiatric conditions that modulate the somatic perception of pain.³⁰ This can often lead to the overtreatment of pain and the undertreatment of the concomitant condition. While some pain scales are increasingly incorporating or using more objective information, we currently do not have a criterion standard for the measurement of acute pain.

For some, opioid consumption may be a good indicator for a patient's overall acute pain level for a designated period of time. For example, a patient with an average self-report Numeric Rating



Figure 2. Cryoablation of the lateral femoral cutaneous nerve. A novel example of preoperative regional anesthesia in patients undergoing split-thickness autografting is cryoablation of the lateral femoral cutaneous nerves. After cryoablation, the provider tests the patient's sensation and marks out the area that is numb. The analgesia lasts months. By staying within that area, the patient will have his/her skin harvested, and then the donor site will heal without feeling donor-site pain.

Scale pain score of 9 of 10 the previous day might be considered to have inadequately treated acute pain. However, if that patient worked with physical therapy, was out of bed the majority of the day, and requested zero as needed opioids, the acute pain strategy was likely effective. If another patient reported an average Numeric Rating Scale pain score of 3 of 10 but would not get out of bed because of pain, would not work with the rehabilitation team because of pain, and requested every as-needed opioid dose available, then that patient's acute pain strategy is inadequate and needs to be reassessed.

Determine the Effect of Adjunctive Medications

While acetaminophen, NSAIDs, ketamine, and regional anesthesia have moderate to strong evidence to support their utilization, other drugs either have weak to no supporting evidence. Commonly used drugs, such as gabapentin, methocarbamol, and lidocaine patches, have been extensively studied, but results are mixed. The routine use of gabapentin for acute pain is largely unsupported by most randomized trials.³¹ Evidence supporting the routine use of methocarbamol and lidocaine patches are mixed.^{32–35}

Other types of nonnarcotic medications proposed as part of a multimodal pain regimen include lidocaine infusions, hydroxyzine, dronabinol, tricyclic antidepressants, and serotonin-noradrenaline reuptake inhibitors. These medications all need high-quality clinical trials to determine their effectiveness on acute pain after injury. Of note, our center is currently enrolling in a randomized controlled trial of dronabinol.

Management of Patients at High Risk for OUD After Discharge

Patients at high risk for OUD are discharged with opioid prescriptions every day from trauma centers across the country. Even if accurately identified, the best practices for management of acute pain after discharge in a manner that mitigates the risk for OUD are unknown. Specialists in addiction have an array of potential interventions, from traditional behavior therapy to cognitive behavioral therapy to acceptance and commitment therapy. Best practices for the outpatient management of trauma patients at high risk for OUD are currently unknown.

Nonmedication Acute Pain Interventions

Some simple, noninvasive, nonpharmacologic interventions have been used with success for ages, including ice, heat, elevation, rest, immobilization, and exercise. Newer nonmedication interventions for acute pain, such as virtual reality, mindfulness, and ultrasound, are becoming more common but currently lack high-quality evidence to support widespread use. Rather, the data to date suggest that these interventions are helpful in some patients but not others.³⁶

CONCLUSION

Thoughtful, effective, and responsible opioid-minimizing acute pain management is possible by managing expectations, using evidence-based nonopioid medications, and rationally prescribing opioids as needed. Future investigation include developing a more representative measurement of a patient's somatic pain experience that allows providers to specifically treat pain and any concomitant emotional or psychiatric issues and the evaluation of nonmedication acute pain interventions.

AUTHORSHIP

J.M.K. and J.A.H. contributed to the conceptualization, writing, and critical revision of the submission.

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DISCLOSURE

Conflicts of Interest: Author Disclosure forms have been supplied and are provided as Supplemental Digital Content (<http://links.lww.com/TA/D384>).

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