



Acute Pain Management in the Year 2018—A Review

James Ducharme^{1,2,*}

¹Division of Emergency Medicine, Department of Medicine, McMaster University, Hamilton, Canada

²Humber River Hospital, Toronto, Canada

This review article provides an overview of acute pain management. It highlights the need to provide balanced pain care while limiting harm from opioids as per the World Health Organization (WHO) recommendations for balanced pain care. Opiophobia and its impact on the use of opioids for acute severe pain are discussed. Interventions that can improve global pain care and the role of pain scales in the management of acute pain are discussed. Newer trends in acute pain management in the emergency department (ED) are also reviewed and include: low dose ketamine, intravenous lidocaine, ultra-sound guided regional anesthesia, intravenous paracetamol, and patient controlled analgesia.

Key words: *acute pain, emergency department, opiophobia, ketamine, regional anesthesia*

Ever since the term “oligoanalgesia” was coined in 1989,¹ there has been considerable attention paid to how we do or don’t manage acute pain. Despite a large number of publications and many educational initiatives, including the National Institutes of Health (NIH)’s funding for research in its “decade of pain” from 2000–2009, physicians seem unable to adequately treat a patient in pain.² Reluctance to believe patient self-reporting, opiophobia, insufficient education around neurobiology of pain and medications, cultural barriers for health care workers and patients, low prioritization in the management of unstable patients: there are many reasons that prevent proper pain management. Carter et al. suggest that oligoanalgesia is due in part to “an epistemic preference for signs over symptoms” and because some ED practices worsen pain by increasing anxiety and fear.³ For this review, the focus will be primarily on acute pain seen in the emergency department (ED), although many points will be relevant to other areas of practice. It will become evident from this review that to achieve widespread excellent pain management, a shift in mindset is required.

Opioids and Opiophobia

The role of opioids has been misunderstood throughout the era of modern medicine. In Taiwan, which holds the dubious distinction of being the country with the lowest amount of opioids per capita prescribed each year,⁴ the reluctance to prescribe opioids can be traced back to the Opioid Wars of the 1800’s. In the United States, despite having the highest amount of opioids per capita prescribed each year, opiophobia is even greater. Opiophobia in the United States arose after the Great Depression, when the use of heroin was seen as a sign of poverty and addiction. This aversion to opioids prevented or minimized their medical use for decades as a result. As oligoanalgesia was decried in the 1990’s, a large rise in the prescribing of opioids occurred, encouraged by the pharmaceutical industry which was bringing novel opioids to the market. The pendulum swing from too little opioids over to too much opioids was almost inevitable—by 2015, the United States was prescribing more than double (per capita) each year the amount recommended by the World Health Orga-

Received: January 10, 2018; Revised: February 6, 2018; Accepted: February 21, 2018.

*Corresponding author: James Ducharme, Emergency Physician, Humber River Hospital, No. 1235, Wilson Avenue, Toronto, ON M3M 0B2, Canada. E-mail: paindoc22000@yahoo.com

nization (WHO).⁵ Despite this apparently excessive use of opioids, pain management was not rated better than in other countries, for pain is not managed solely by prescribing a medication. As prescription opioids became more available, street use also increased—users could obtain a standard dose of an illicit substance without contaminants. They were initially seen as safer for they were prescription drugs. Most adolescents started using opioids recreationally by taking pills from their parents' prescriptions, with misuse escalating to other drugs. The current opioid epidemic⁶ seen in both Canada and the USA has turned increasingly to heroine, street-produced fentanyl and carfentanyl, with thousands of deaths every year. This epidemic has understandably created a backlash within EDs, where avoidance of opioids has become a priority—worsening the already existing oligoanalgesia. This wildly varying use of a single class of drugs related to pain relief demonstrates quite remarkably how inadequate knowledge of medications combined with cultural beliefs create an almost insurmountable barrier to proper pain management. Despite different nations' reasons for opiophobia, there is a clear and necessary role for opioids in the management of acute, severe, pain. It is our duty to find the proper balance, and not “throw the baby out with the bath water.”⁷

How does a country like Taiwan, which uses almost no opioids, move to a greater use of opioids without falling to the epidemic of opioid misuse in North America? The initial approach should be use of opioids parenterally in the ED for patients with severe pain arising from acute trauma, renal colic or acute abdomens; patient controlled analgesia (PCA) pumps can minimize risk by providing on average less total dose, with greater safety, and essentially no risk of abuse. Standardized medical directives with dosing input from Pharmacy can help overcome barriers to opioid use without allowing for risk of excessive dosing. Combination of an opioid with an adjunct, such as ketamine or parenteral acetaminophen, ensures that less total opioid is required. Until nurses and physicians alike are at ease with dosing and indications in these situations, other uses of opioids—such as prescriptions for outpatient use—should be limited or minimal. In North America, it has been the excessive availability of opioids in the outpatient setting that led to the current opioid crisis, not the use of opioids in hospital.

Improving Pain Care in the ED

Given the multiple barriers to optimal pain care, it is unrealistic to expect improvement simply because it is the right thing to do. No health care worker wishes to be a patient suffering severe pain without intervention, yet we consistently fail to control the pain of our patients. This is not true in only one country, but around the world.⁸ It has been demonstrated that educational interventions with staff consistently improves pain care.⁹ As in other aspects of care, standardization of pain care with guidelines or directives—taking the choice of options out of the hands of the physician—also improves pain management.

Regardless of the cultural reasons for opiophobia, a balanced and standardized approach is essential if we hope to minimize the emotional turmoil around their use while ensuring the safety of our patients. We can readily decrease the use of opioids in our departments through the use of local guidelines¹⁰ but we have to ensure that we are not simultaneously worsening pain management. The WHO has established that the standard for opioid use in a country should be approximately 215 mg of morphine-equivalents per capita per year.⁴ In a country such as Taiwan, where the current annual dosing hovers around 0.05 mg/capita, a national strategy is required if this is to be changed—local initiatives alone cannot overcome such a strong resistance to opioid use. Similar global initiatives are required to decrease usage in the USA in order to establish proper prescribing patterns.

Educational interventions, and the use of pain “champions”—both nurse and physician—are required to remove barriers to pain care while minimizing risk to patients.¹¹ Pain management as a priority must not be placed last in the management of acutely injured patients, but addressed in parallel with the other management priorities. Directives ensuring intravenous analgesia for intubated patients, for example, is required or else pain care will be forgotten in the flurry of activity surrounding the patient.

Pain Assessment—What Is Its Role?

The validity and reproducibility of pain scales have been well demonstrated.¹² Self reporting of pain is accepted as the gold standard for documentation of a patient's severity of pain, with physiological markers considered unreliable.¹³ Their use has been integrated into national triage tools, such as the Canadian

Triage and Acuity Scale.¹⁴ Despite this overwhelming evidence, most healthcare providers do not believe the self-reporting of patients, and believe the emergency patient in pain tends to exaggerate the severity of their pain.

Patient self-reporting is based on both a patient's past pain experience and the culture within which they have been raised. A person relatively naïve to painful experiences is more likely to score higher the amount of pain of a broken wrist, for example, than someone who has previously suffered several fractures. Loss of emotional control—such as anxiety—will also influence a pain score, for pain is a multi-dimensional experience. Pain catastrophizing has recently been shown to have a direct association with pain intensity.¹⁵ It is therefore important to recognize that a pain score indicates not what type or amount of medication a patient requires, but the degree of pain that they are currently suffering—in all its dimensions. Severe pain from a corneal abrasion may require but a topical anesthetic, a hip fracture, a femoral nerve block, and a sprained ankle in someone who is certain they will miss their marriage may simply require a caregiver talking to them and reassuring them. That none of these patients requires an opioid does not mean they are not suffering from severe pain. It has been this linking of pain scores to the use of opioids (and thereby the concern of drug seeking) by the healthcare worker that has aided in the latter disbelieving the patient's self-reporting. Roughly 70% of ED patients report moderate or severe pain.¹⁶ This overwhelming percent has nurses at triage believing not that we need to do a better job of managing pain, but instead that patients must be exaggerating. It has to be remembered that patients with minor pain rarely come to the hospital.

In assessing pain, the limitations of a pain scale in the ED must be recognized. Use of a pain scale helps identify sentinel diagnoses and should facilitate rapid care for those with severe pain. It is also of high value for clinical research. It has much less value when titrating medication for pain. Use of a pain scale when titrating analgesics switches the person in control of the painful situation from the patient to the caregiver—the caregiver will give medication until a certain “number” on a pain scale is attained or until they believe enough has been given, rather than titrating to when the patient says they are comfortable. Since self-reporting is the gold standard, the patient

should have control as to when (and how much) they require medication. Asking patients “do you want more pain medication?” not only allows the patient to maintain control but also provides excellent pain relief and satisfaction.¹⁷ Another way of maintaining control in the hands of the patient is through patient-controlled analgesia (PCA).

Newer Approaches to Pain Management

It has not only been concern over opioid abuse that has driven efforts to find valid alternatives. Increasing understanding of the neurobiology of pain has introduced a mechanistic approach to pain management, superseding the previous symptom management based approach. With the latter, pain was “covered” or muted. With a mechanistic approach, specific pathways and neurotransmitters are targeted. Research from the past 20 years has resulted in dopamine antagonists and serotonin agonists for acute migraine headaches as well as sodium and calcium channel agents for neuropathic pain. The alternatives most recently studied in the acute pain setting include low-dose ketamine, intravenous lidocaine and ultrasound-guided nerve blocks. Intravenous acetaminophen has been available for 20 years in Europe, while only available in the United States since 2010, and still not available in Canada. PCA pumps, despite widespread use throughout hospital wards and ICUs, have still not become commonplace in the ED. In many instances the use of one of these newer approaches can decrease the dose of opioids required or even eliminate their use entirely in specific settings. We will review each of these more recent topics.

Low-Dose Ketamine

There has been recognition that lower doses of ketamine can be effective as an analgesic for more than 2 decades. Despite regular use of dissociative-dose ketamine for procedural sedation in EDs for years, use of the lower doses for pain relief is just now being integrated into daily practice. Monitoring that is routine for procedural sedation is not required for these lower analgesic doses. Multiple studies have demonstrated that 0.1–0.3 mg/kg of ketamine can be an excellent adjunct to opioid use, decreasing the total amount of opioid required.¹⁸ A recent systematic review showed this dosing to be safe, with minimal adverse effects; it also suggested that at times ket-

amine can be effective alone in the management of severe pain.¹⁹ It has specifically been studied in the management of migraine headaches. Although anecdotal experience has shown effectiveness for chronic migraine situations, a recent clinical trial found it to be less effective than prochlorperazine for acute migraines.²⁰ How you give ketamine is equally important, for a 10-minute infusion produces less psychotropic adverse effects than does an IV push approach.²¹ Ongoing analgesia can be provided with a ketamine infusion, infusing the same amount as the initial dose each hour. Ketamine use is not without concern, for it is also a drug of abuse and popular in North America; fortunately, its use is restricted to parenteral or intranasal routes, so cannot be prescribed for the outpatient setting. Finally, limited studies have found it to be ineffective in managing the pain of sickle cell vaso-occlusive crises.

Intravenous Lidocaine

Regular infusions of intravenous lidocaine (5 mg/kg over an hour) has been successful in the management of fibromyalgia pain.²² When infused over an hour, in a dose higher than that required for acute pain in the ED) there has been almost no cardiac or seizure risk; such infusions are routinely given in outpatient clinics. There has been limited or no success in patient with cluster headaches. It has recently been studied for some acute pain situations. A case report demonstrated its effectiveness in a patient with a fracture/dislocation of an ankle.²³ A second case series suggested intravenous lidocaine could be an effective adjunct to opioids in the management of severe pain.²⁴ Finally, a small trial found intravenous lidocaine to be as effective as intravenous morphine in the management of the pain from renal colic.²⁵ Further research is required to properly define the role of parenteral lidocaine in the management of acute pain. The recognized neurotoxicity and cardiotoxicity seen with inadvertent overdosing is more common and more serious with bupivacaine than lidocaine.²⁶ Infusions using pumps providing lidocaine on a weight-based algorithm ensures minimal if any risk to patients. Here again, medical directives to ensure standardized dosing offers maximal protection for the patient. At this point, the role for IV lidocaine in the management of acute pain is still being defined.

Ultrasound-Guided Regional Anesthesia

Point of care ultrasound (POCUS) has been promulgated throughout emergency medicine, with the phrase “ultrasound is the stethoscope of the 21st century” heard everywhere. It is an excellent clinical diagnostic tool. It has also been found of great practical use in the placement of both peripheral and central venous lines. Curiously, its use for regional anesthesia in the ED has lagged behind its other uses with even international curriculum guidelines minimizing its role for this purpose.²⁷

Ever since it was demonstrated that the pain of hip fractures created a nine-fold greater risk of delirium in the elderly than the use of morphine, it has been recognized that rapid pain control in the elderly is critical.²⁸ Femoral nerve blocks have rapid onset, and provide sustained pain relief for longer than systemic opioids without the systemic risks.²⁹ Femoral nerve blocks in the setting of hip fracture can actually improve outcomes.³⁰

Use of opioids provides a systemic effect; in trauma patients or in those with altered mental status it may cloud clinical assessment or force additional, perhaps avoidable, imaging or monitoring. Regional anesthesia provides rapid pain relief without systemic effect. It is the recommended treatment for pain relief in flail chest injuries.³¹ Regional anesthesia allows for painless fracture reduction, of great value when procedural sedation may carry increased risk. Many times the fracture may be identified with POCUS and allow for a nerve block prior to formal imaging.³² The latter is often painful, at times the most painful part of the stay in the ED for a child with an extremity fracture. Ultrasound-guided nerve blocks should become a core skill of emergency physicians for both pain management and to perform painless procedures with minimal risk.

PCA

There is no doubt as to the benefits of PCA, as identified in multiple studies elsewhere in the hospital. It usually results in less total medication required, while causing less adverse effects. The introduction of PCA has almost universally resulted in improved and excellent pain relief as well as high levels of patient satisfaction. Finally, by using locked PCA pumps, it can offer a valid pain management option in patients with addiction disorders.

Acute pain care services, post-operative recovery, obstetrics—all of these services consider PCA use standard of care. Despite this overwhelming background of evidence, PCA use is still not the norm for ongoing pain in EDs. Why the reluctance to transition into the use of PCA? In a New York City study, PCA was found to provide more rapid relief than usual opioid prescribing (once the longer time to initial analgesia was past) and greater patient satisfaction.³³ They had problems with pump programming and delays to pain relief onset so did not recommend PCA over usual pain management. Similarly, Smith et al. found no improvement in pain control with PCA over conventional care in trauma patients.³⁴ Lecky however found the PCA introduction into the ED was straightforward and provided superior pain relief.³⁵ It would appear from recent literature, therefore, that in hospitals well organized in pain management PCA may not offer any additional pain benefit over conventional care in the ED. Its use does improve patient satisfaction, and it does introduce a standard practice for the management of pain while minimizing any potential for misuse. These secondary benefits should encourage clinicians to look into introducing PCA into their EDs. In many countries, where opioid use is minimal or even non-existent, the use of PCA may provide the safety and control of dosing necessary to overcome the opiophobia barriers that exist. It would ensure a standard approach to dosing, minimize total amounts used and eliminate any secondary gain such as euphoria or other psychotropic effects.

Intravenous Acetaminophen/Paracetamol

The WHO ladder of pain encourages the use of more than one medication to control more severe pain, reserving opioids for only severe pain. Oral paracetamol is considered equivalent to ibuprofen for the management of mild to moderate pain; it was felt by many that there was an analgesic ceiling of effect with paracetamol, with doses greater than 1 gm PO providing no additional analgesic benefit. Studies in the past decade seem to refute that notion for 1 gm intravenously—equivalent to 2 gms PO—appears to be an effective analgesic for moderate and even some severe pain.

As an adjunct, IV paracetamol provided additional pain relief for migraine sufferers when combined with prochlorperazine.³⁶ In a narrative review,

Sin et al. felt that the level of evidence supporting intravenous paracetamol as an analgesic was limited, with 2 studies showing superiority to untitrated morphine, and one study superior to intramuscular piroxicam. The nature of these studies suggest that the makers of parenteral paracetamol were often making use of “strawman” comparators to demonstrate superiority.³⁷

Given the lack of strong evidence supporting its role as an effective single analgesic for severe pain, its use should be reserved to being an adjunct to other analgesics with the objective of better controlling pain while decreasing the total dose of opioids required. It should not be considered an agent that can replace opioids for severe pain, nor one that can replace parenteral NSAIDs for the pain of renal or biliary colic.

Summary

Progress in acute pain management has taken place over the past decade, but ED crowding and opiophobia risk eliminating any previous gains in pain management. Improvements in post-graduate curricula along with ongoing educational initiatives will help most in raising the pain management bar, along with the installation of directives and guidelines to standardize care. PCA pumps, along with those standardized protocols can decrease considerably the concerns of drug seeking. Further exploration and development of our knowledge of the neurobiology of pain will allow even more targeted pain management with agents like ketamine and lidocaine, while regional anesthesia can allow us to avoid opioid use in many injured patients. The knowledge for optimal pain management exists; we need to apply it better and break down the existing barriers preventing us from using that knowledge. A change in mindset to properly manage acute pain as a priority in our patient care is required.

References

1. Wilson JE, Pendleton JM. Oligoanalgesia in the emergency department. *Am J Emerg Med* 1989;7:620-623. doi:10.1016/0735-6757(89)90286-6
2. Mura P, Serra E, Marinangeli F, et al. Prospective study on prevalence, intensity, type, and therapy of acute pain in a second-level urban emergency department. *J Pain Res* 2017;10:2781-2788. doi:10.2147/JPR.S137992
3. Carter D, Sendziuk P, Elliott JA, Braunack-Mayer A.

- Why is pain still under-treated in the emergency department? Two new hypotheses. *Bioethics* 2016;30:195-202. doi:10.1111/bioe.12170
4. Scholten W. Improving access to adequate pain management in Taiwan. *Acta Anaesthesiol Taiwan* 2015;53:62-65. doi:10.1016/j.aat.2015.05.004
 5. Centers for Disease Control and Prevention. Opioid overdose. Available at: <https://www.cdc.gov/drugoverdose/data/prescribing.html>. Accessed January 10, 2018.
 6. U.S. Department of Health and Human Services. About the U.S. opioid epidemic. Available at: <https://www.hhs.gov/opioids/about-the-epidemic/index.html>. Accessed January 10, 2018.
 7. Strayer RJ, Motov SM, Nelson LS. Something for pain: responsible opioid use in emergency medicine. *Am J Emerg Med* 2017;35:337-341. doi:10.1016/j.ajem.2016.10.043
 8. Louriz M, Belayachi J, Madani N, et al. Practices and perceived barriers regarding pain management among emergency department physicians: a nationwide multicenter survey in Moroccan hospitals. *Acute Med Surg* 2016;3:360-363. doi:10.1002/ams2.201
 9. Van Woerden G, Van Den Brand CL, Den Hartog CF, Idenburg FJ, Grootendorst DC, Van Der Linden MC. Increased analgesia administration in emergency medicine after implementation of revised guidelines. *Int J Emerg Med* 2016;9:4. doi:10.1186/s12245-016-0102-y
 10. del Portal DA, Healy ME, Satz WA, McNamara RM. Impact of an opioid prescribing guideline in the acute care setting. *J Emerg Med* 2016;50:21-27. doi:10.1016/j.jemermed.2015.06.014
 11. Grudzen CR, Stone SC, Morrison RS. The palliative care model for emergency department patients with advanced illness. *J Palliat Med* 2011;14:945-950. doi:10.1089/jpm.2011.0011
 12. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. *Acad Emerg Med* 2001;8:1153-1157. doi:10.1111/j.1553-2712.2001.tb01132.x
 13. Cowen R, Stasiowska MK, Laycock H, Bantel C. Assessing pain objectively: the use of physiological markers. *Anaesthesia* 2015;70:828-847. doi:10.1111/anae.13018
 14. Bullard MJ, Unger B, Spence J, Grafstein E, CTAS National Working Group. Revisions to the Canadian Emergency Department Triage and Acuity Scale (CTAS) adult guidelines. *CJEM* 2008;10:136-151. doi:10.1017/S1481803500009854
 15. Block PR, Thorn BE, Kapoor S, White J. Pain catastrophizing, rather than vital signs, associated with pain intensity in patients presenting to the emergency department for pain. *Pain Manag Nurs* 2017;18:102-109. doi:10.1016/j.pmn.2016.12.001
 16. Todd KH, Ducharme J, Choiniere M, et al. Pain in the emergency department: results of the pain and emergency medicine initiative (PEMI) multicenter study. *J Pain* 2007;8:460-466. doi:10.1016/j.jpain.2006.12.005
 17. Chang AK, Bijur PE, Holden L, Gallagher EJ. Efficacy of an acute pain titration protocol driven by patient response to a simple query: do you want more pain medication? *Ann Emerg Med* 2016;67:565-572. doi:10.1016/j.annemergmed.2015.04.035
 18. Abbasi S, Bidi N, Mahshidfar B, et al. Can low-dose of ketamine reduce the need for morphine in renal colic? A double-blind randomized clinical trial. *Am J Emerg Med* 2018;36:376-379. doi:10.1016/j.ajem.2017.08.026
 19. Ghate G, Clark E, Vaillancourt C. Systematic review of the use of low-dose ketamine for analgesia in the emergency department. *CJEM* 2018;20:36-45. doi:10.1017/cem.2017.48.
 20. Zitek T, Gates M, Pitotti C, et al. A comparison of headache treatment in the emergency department: prochlorperazine versus ketamine. *Ann Emerg Med* 2018;71:369-377. doi:10.1016/j.annemergmed.2017.08.063
 21. Motov S, Mai M, Pushkar I, et al. A prospective randomized, double-dummy trial comparing IV push low dose ketamine to short infusion of low dose ketamine for treatment of pain in the ED. *Am J Emerg Med* 2017;35:1095-1100. doi:10.1016/j.ajem.2017.03.004
 22. Sörensen J, Bengtsson A, Bäckman E, Henriksson KG, Bengtsson M. Pain analysis in patients with fibromyalgia: effects of intravenous morphine, lidocaine, and ketamine. *Scand J Rheumatol* 1995;24:360-365. doi:10.3109/03009749509095181
 23. Sin B, Gritsenko D, Tam G, Koop K, Mok E. The use of intravenous lidocaine for the management of acute pain secondary to traumatic ankle injury: a case report. *J Pharm Pract* 2017;31:126-129. doi:10.1177/0897190017696954
 24. Fitzpatrick BM, Mullins ME. Intravenous lidocaine for the treatment of acute pain in the emergency department. *Clin Exp Emerg Med* 2016;3:105-108. doi:10.15441/ceem.15.103
 25. Soleimanpour H, Hassanzadeh K, Vaezi H, Golzari SE, Esfanjani RM, Soleimanpour M. Effectiveness of intravenous lidocaine versus intravenous morphine for patients with renal colic in the emergency department. *BMC Urol* 2012;12:13. doi:10.1186/1471-2490-12-13
 26. Sekimoto K, Tobe M, Saito S. Local anesthetic toxicity: acute and chronic management. *Acute Med Surg* 2017;4:152-160. doi:10.1002/ams2.265
 27. Atkinson P, Bowra J, Lambert M, Lamprecht H, Noble V, Jarman B. International federation for emergency medicine point of care ultrasound curriculum. *CJEM* 2015;17:161-170. doi:10.1017/cem.2015.8
 28. Morrison RS, Magaziner J, Gilbert M, et al. Relationship between pain and opioid analgesics on the development of

- delirium following hip fracture. *J Gerontol A Biol Sci Med Sci* 2003;58:M76-M81. doi:10.1093/gerona/58.1.M76
29. Riddell M, Ospina M, Holroyd-Leduc JM. Use of femoral nerve blocks to manage hip fracture pain among older adults in the emergency department: a systematic review. *CJEM* 2016;18:245-252. doi:10.1017/cem.2015.94
 30. Morrison RS, Dickman E, Hwang U, et al. Regional nerve blocks improve pain and functional outcomes in hip fracture: a randomized controlled trial. *J Am Geriatr Soc* 2016;64:2433-2439. doi:10.1111/jgs.14386
 31. Simon B, Ebert J, Bokhari F, et al. Management of pulmonary contusion and flail chest: an eastern association for the surgery of trauma practice management guideline. *J Trauma Acute Care Surg* 2012;73(Suppl 4):S351-S361. doi:10.1097/TA.0b013e31827019fd
 32. Poonai N, Myslik F, Joubert G, et al. Point-of-care ultrasound for nonangulated distal forearm fractures in children: test performance characteristics and patient-centered outcomes. *Acad Emerg Med* 2017;24:607-616. doi:10.1111/acem.13146
 33. Bijur PE, Mills AM, Chang AK, et al. Comparative effectiveness of patient-controlled analgesia for treating acute pain in the emergency department. *Ann Emerg Med* 2017;70:809-818.e2. doi:10.1016/j.annemergmed.2017.03.064
 34. Smith JE, Rockett M, S SC, et al. PAin SoluTions In the Emergency Setting (PASTIES)—patient controlled analgesia versus routine care in emergency department patients with pain from traumatic injuries: randomised trial. *BMJ* 2015;350:h2988. doi:10.1136/bmj.h2988
 35. Lecky F. Patient controlled analgesia in the emergency department. *BMJ* 2015;350:3240. doi:10.1136/bmj.h3240
 36. Meyering SH, Stringer RW, Hysell MK. Randomized trial of adding parenteral acetaminophen to prochlorperazine and diphenhydramine to treat headache in the emergency department. *West J Emerg Med* 2017;18:373-381. doi:10.5811/westjem.2016.12.29218
 37. Sin B, Wai M, Tatunchak T, Motov SM. The use of intravenous acetaminophen for acute pain in the emergency department. *Acad Emerg Med* 2016;23:543-553. doi:10.1111/acem.12921