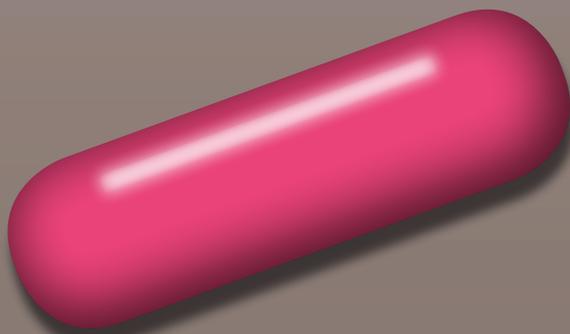


The Society of Hospital Medicine's (SHM's) Multimodal Pain Strategies Guide for Postoperative Pain Management

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OVERVIEW

Pain management can pose multiple challenges in the acute care setting for hospitalists and front-line prescribers. While their first priority is to optimally manage pain in their patients, they also face the challenges of treating diverse patient populations, managing patient expectations, and considering how pain control and perceptions affect HCAHPS scores. Furthermore, due to the ongoing opioid epidemic, there is an added layer of needing to ensure that pain is managed responsibly and ethically. With this in mind, the Society of Hospital Medicine (SHM) assembled three of its members to review the literature, consult best practices, address how to work in an interdisciplinary team, identify impediments to implementation and provide examples of appropriate pain management. In accompaniment with this *Multimodal Pain Strategies Guide for Postoperative Pain Management*, there are three modules presented by the authors which will supplement the electronic booklet.

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OBJECTIVE

This compendium has been developed by hospitalists for front-line providers who manage pain in the acute care setting. In particular, it is focused on postoperative pain management and will benefit providers who help manage perioperative or co-management services. By the end of this directive the reader should be able to:

- Understand the importance and prevalence of pain and its treatment.
- Identify key stakeholders and teams to help drive improvement of pain management.
- Recognize the various etiologies of pain, its physiology and target management appropriately.
- Apply specific pain control modalities and appropriately escalate treatment in the perioperative setting.
- Identify barriers to effective pain management in the care transition period, and appropriately transition patients to the outpatient setting.
- Realize the challenges presented by the ongoing opioid epidemic and become familiar with the Centers for Disease Control and Prevention's latest guideline for the appropriate management of pain.

INTRODUCTION

Pain and its treatment are major public health issues that we face as a society today. Pain is described by the International Association for the Study of Pain as “an unpleasant sensory and emotional experience that is associated with actual or potential tissue damage or described in such terms, and is always subjective.”¹ There are many types of pain that one can experience. Cicely Saunders, well known as the “mother of modern hospice,” introduced the concept of “total pain” in that physical pain has an emotional, social and spiritual interplay. A social loss can lead to the experience of pain in any or all of those domains.²

Estimates based on the 2012 National Health Interview Survey indicate that nearly 50 million Americans have chronic or severe pain.³ The Medical Expenditure Panel Survey estimates pain at more than 100 million people in the United States when joint pain or arthritis is included.⁴ The Hospital Pain Care Survey posted on the Pain News Network collected over 1,200 surveys of hospitalized patients, and found that more than 80 percent felt that the staff was not adequately trained to treat pain.⁵ According to a recent Institute of Medicine Report, *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*, pain is a significant public health problem that costs society at least \$560–\$635 billion annually, an amount equal to about \$2,000 for everyone living in the United States.⁶

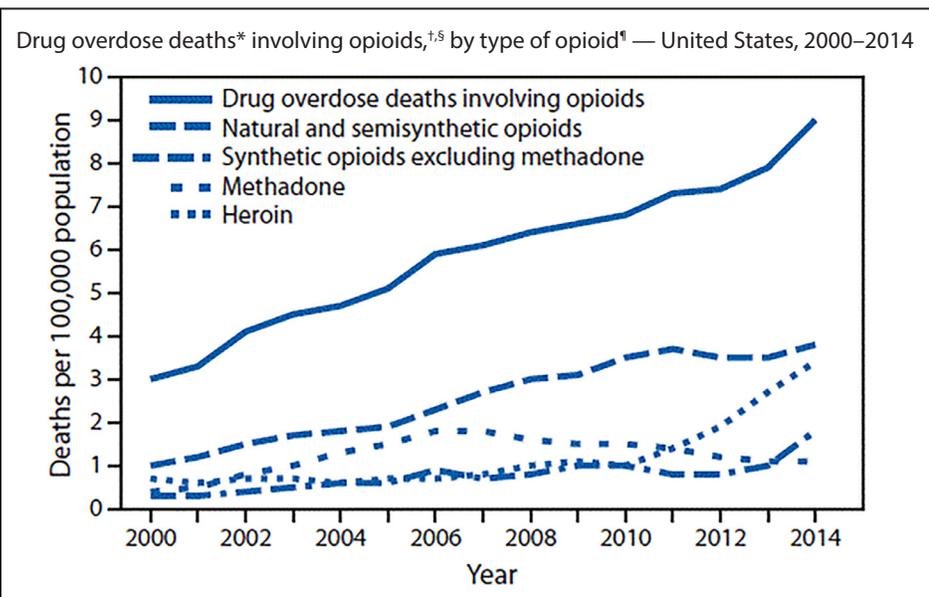
According to the National Health and Nutrition Examination Survey, pain accounts for more than 20 percent of all outpatient visits.⁷ In a landmark study from 1973, it was estimated that 73 percent of hospitalized patients experience pain.⁸ This trend has continued, and it is now estimated that 80 percent of postsurgical patients experience pain, 11–20 percent of which is severe.⁹ It is estimated that 45–80 percent of nursing home patients experience pain, and that only half of patients with severe pain will be likely to get adequate relief. Similar percentages may be seen in patients at end of life. In a study looking at end-of-life experiences, more than 50 percent of patients had moderate to severe pain during their last three days before death.¹⁰

Superimposed on these pain management challenges are the inequities and disparities in access to appropriate pain management among individuals who lack appropriate access for a variety of reasons. These reasons could include socioeconomic factors such as lack of insurance or efficient access to physicians, those who are elderly or disabled and unable to communicate pain easily, or those who are simply unable to navigate the system or advocate for themselves for treatment of pain or other conditions.^{11,12}

Much attention has been paid to the adequate assessment and control of pain. A large national campaign by the Veterans Administration deemed it the “5th vital sign,” and pain has been incorporated into national patient care surveys as well as included in hospitals’ value-based purchasing metrics.^{13,14} Additionally, a focus has been placed on pain as a national quality agenda item for hospital regulatory agencies such as the Joint Commission on Hospital Accreditation, so hospital executives and staff alike view pain management as an important quality initiative. For this reason, executive support and buy-in should be readily available. For any major initiative this is key to success.

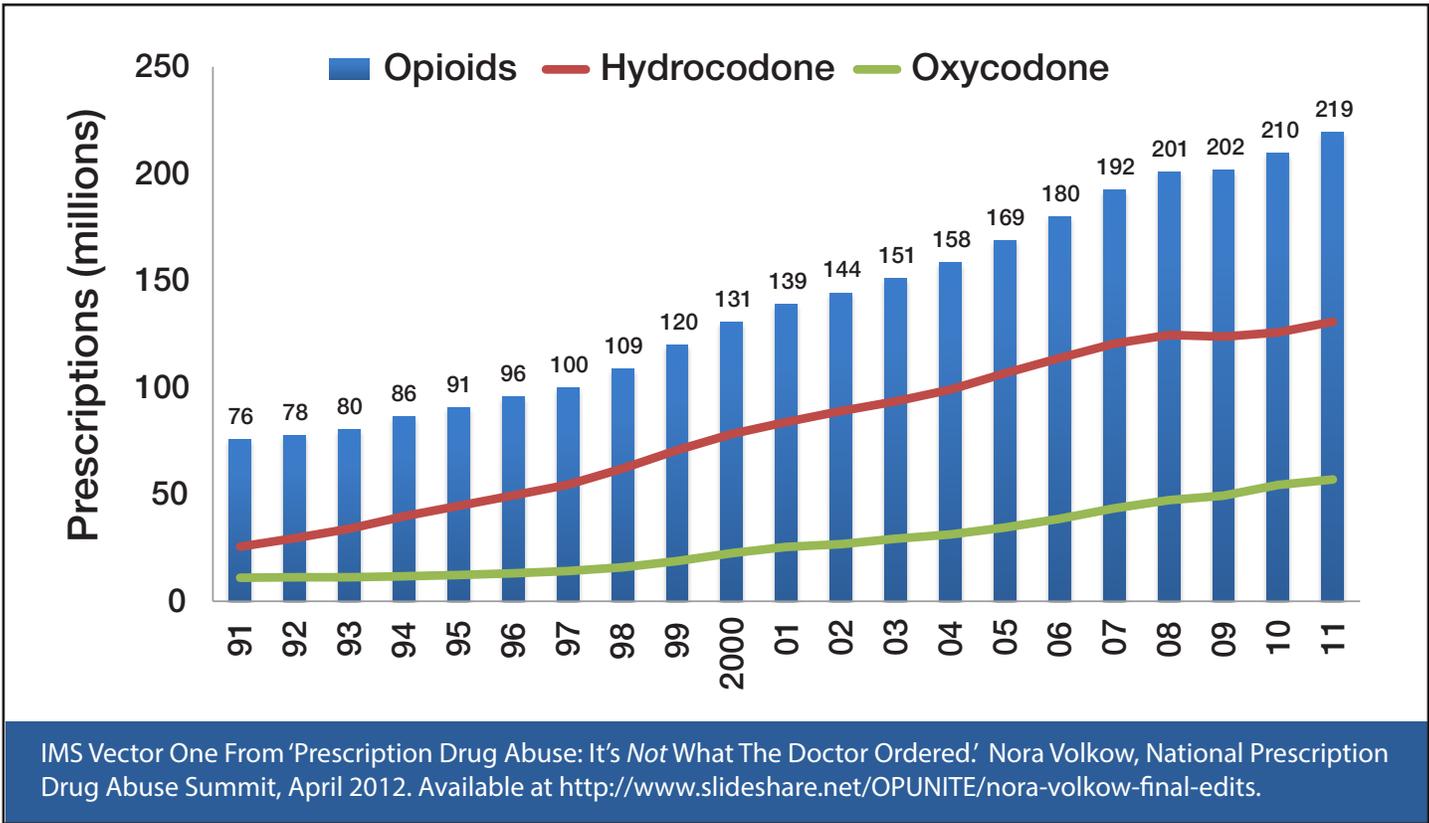
PRESCRIBING IN THE AGE OF THE OPIOID EPIDEMIC

While pain management is of the utmost importance, there is a growing literature base demonstrating that the escalated use of opioid prescriptions has been detrimental to our patients. The indiscriminant escalation of opioids in patients who do not have cancer or other terminal illnesses is potentially more harmful than beneficial due to the number of opioid-related overdoses, deaths and hospitalizations. The use of opioids for pain management for chronic, nonmalignant, nonpalliative conditions has created large controversies due to the accumulating evidence with regard to the complications of such use. According to MMWR data, drug overdose poisoning from opioids has increased 200 percent since 2000.¹⁵



National Vital Statistics System, Mortality file.

In the United States, in 2011, 219 million opioid prescriptions were dispensed by retail pharmacies, a continued rise over the last two decades according to Volkow at the National Prescription Drug Abuse Summit.¹⁶



It is estimated that 26.4–36 million people worldwide are addicted to opioids with 2.1 million people in the United States suffering from substance abuse disorder related to prescription opioid use.¹⁷ In the United States this is particularly problematic, as Americans constitute only 5 percent of the world’s population, yet consume 80 percent of the global opioid supply, and 99 percent of the global hydrocodone supply, as well as two-thirds of the world’s illegal drugs.¹⁸

While the Centers for Disease Control and Prevention (CDC) has come down strongly on modifying prescribing habits and focusing on the lack of evidence for chronic opioid use in terms of improving functional status, clinicians are still faced with trying to learn how to adequately manage and support patients who present with pain. It is not practical for clinicians to stop using all opioids, however, it is important to understand the entire armamentarium of medications, interventions and techniques available to providers. There is no question that opioids are appropriate in certain acute settings such as post-acute surgical pain and in those with palliative diagnoses. While opioids have a key role in managing pain, it is important to understand when opioids are not appropriate. Opioids can have detrimental effects when used in diagnoses such as functional abdominal pain, irritable bowel syndrome, cyclical vomiting syndrome, fibromyalgia or chronic headaches. Oftentimes there are underlying emotional health issues accompanying chronic illnesses, and opioids are often inadvertently used in these situations when more efforts need to be placed on a holistic approach. Clear communication with patients and other providers is critical in these scenarios. Clinicians should express their legitimate concerns about worsening side effects and that opioids are simply not an appropriate standard of care in many clinical situations.

In summary, it is important to understand the specific indications where it is appropriate to use opioids, as well as what other modalities are available in order to mitigate their use. Having knowledge of opioid pharmacology and dose adjustments, and knowing how to manage side effects, are also key. Additionally, it is important to be cognizant of individual risk factors that could potentially cause more harm if opioids are to be used.

CHALLENGES IN PAIN MANAGEMENT IN THE ACUTE CARE SETTING

Pain management presents multiple challenges in the acute care setting. While there is an opportunity to longitudinally observe a patient and escalate treatment in a monitored setting, hospital-based providers encounter patients out of their normal “well” context and without sufficient background information or an ongoing therapeutic relationship, as they may have with their primary care physicians. Additionally, lack of insight into a patient’s home situation or prior experiences may put an acute care provider such as a hospitalist, staff nurse, surgeon or pain specialist at a disadvantage. Staff may feel uncomfortable escalating medications without intimate knowledge regarding the patient and his or her prior history, tolerance or other important historical elements. There may be questions about a patient’s ability to understand and report his or her true pain sensation, or there may be concerns from providers regarding patients becoming addicted or having side effects to the medications. There may also be a poor understanding on the part of the provider of the pharmacology of the pain interventions and other barriers that may exist in treating a patient’s pain properly.

Patients who present to an acute care facility will generally be more complex and have greater levels of pain or complications than would a patient presenting in an ambulatory practice. Presenting symptoms may be more severe than those of patients who have outpatient procedures, so these scenarios may require a more aggressive approach. Additionally, patients who present to an acute care setting may be in distress and more often present with numerous complex comorbidities. Patients may have decompensated heart or lung disease, delirium or dementia, or renal or liver disease, making it a challenge to safely treat and escalate the pain regimens available to the practitioner. Additionally, with the majority of hospitalized patients being elderly, other concerns pertaining to mental status and safety with regards to cognitive impairment may play a role. There are more than 50 million surgeries performed yearly in an acute care setting.¹⁹ It is estimated that more than 75 percent of those patients will experience moderate to severe pain 24 hours after the procedure.²⁰ It has been shown that many of those who are prescribed opioids for low-risk procedures such as cataracts may be more likely to use opioids in the future, which leads to increased reluctance among providers to prescribe opioids for more appropriate indications.

So how do we treat pain and implement strategies in diverse and disparate acute care settings? How do we actually begin to manage pain when we are faced with patients who have various conditions and comorbidities, various ages or varying psychosocial factors that may influence their experience with pain? And finally, how do we navigate treating pain appropriately, balancing it with our concerns for overuse and misuse of opioids in the new era where there is a focus on correcting the evolving opioid epidemic? We must take a systematic approach to ensure a comprehensive evaluation and treatment plan that is right for each individual patient.

PHYSIOLOGY OF PAIN

Pain is universally understood as a signal of disease. Its function is to protect the body and maintain adequate homeostasis by identifying pathologic processes in the damaged tissues. Given our cultural goal to alleviate suffering, pain control is paramount both from an ethical patient care perspective as well as an organizational standpoint considering its role in patient satisfaction, public reporting and value-based purchasing.

Pain is essentially a combination of nociception, the perception of noxious stimuli, and activation of the limbic system leading to emotional arousal from the stimuli, producing the unpleasurable sensation that is pain. Pain perception begins in the primary afferent sensory neuron in peripheral nerves. A-beta fibers are the largest peripheral nerves in diameter and respond to light touch and moving stimuli. Smaller diameter A-delta fibers and unmyelinated C fibers respond to painful stimuli and produce the experience of pain when stimulated. Thus, they are referred to as primary afferent nociceptors. They typically respond to any number of noxious stimuli including heat, cold and mechanical distortion, such as a pinch or pinprick. Chemical irritants, serotonin, bradykinin, histamine, and acidic or basic environments can also produce the sensation of pain. Substance P is a key mediator in pain transmission as well as the excitatory amino acids glutamate and aspartate.²¹

However, it is also well known that substance P-mediated nociception is antagonized by local production of endogenous opioids such as enkephalins and endorphins in the dorsal horn and brainstem. In addition, pain modulation from the brain cortex can lead to endogenous pain relief via noradrenergic and serotonergic transmission.

The phenomenon of sensitization is quite important in the perioperative period.²² Intense or prolonged stimuli applied to damaged, inflamed tissues can lower the threshold of activation for primary afferent nociceptors. This leads to higher frequency of firing for all stimuli and is compounded by additional peripheral inflammatory mediators. Sensitization may also occur centrally at the dorsal horn of the spinal cord. This can lead to the clinical phenomenon of allodynia (innocuous stimuli leading to pain) or hyperalgesia, which refers to increased pain intensity in response to a previous stimulus of lesser intensity. Deep tissues that can be affected during surgery may also be sensitized and lead to substantial pain with any mechanical stimulation. This presents challenges in the postoperative period with regards to appropriate pain management.

The term opioid analgesics refers to a broad class of agents that includes natural compounds extracted from poppy seeds, such as morphine and codeine, or synthetic or semisynthetic derivatives such as oxycodone, hydromorphone, oxymorphone, meperidine, fentanyl and methadone. Opioid receptors are widely distributed throughout the central and peripheral nervous system and in other systems such as the gastrointestinal tract. These agents can be classified as full agonists (morphine, fentanyl) or agonist-antagonists such as buprenorphine.

There are several types of opioid receptors that help to mitigate pain. The most common one is the mu receptor that has typical opioid actions including analgesia, euphoria, cough and appetite suppression, respiratory suppression and diminished gastrointestinal motility. Stimulation of the alpha receptor leads to dysphoria, psychotic symptoms, sedation, diuresis and analgesia. The delta receptor has similar effects. Most opioids have their primary effect through the mu receptor. In fact, some agents such as tramadol are very selective to the mu receptor.²³

Table 1. Actions of Opioid Receptors. From Reference 23: Kosten TR, Haile CN. Opioid-Related Disorders. In: Harrison's Principles of Internal Medicine, 19th ed. 2015.

Harrison's Principles of Internal Medicine, 19e, 2015 > Opioid-Related Disorders	
Dennis Kasper, Anthony Fauci, Stephen Hauser, Dan Longo, J. Larry Jameson, Joseph Loscalzo+	
TABLE 468e-1 Actions of Opioid Receptors	
Receptor Type	Actions
Mu () (e.g., morphine, buprenorphine)	Analgesia, reinforcement euphoria, cough and appetite suppression, decreased respirations, decreased GI motility, sedation, hormone changes, dopamine and acetylcholine release
Kappa () (e.g., butorphanol)	Dysphoria, decreased GI motility, decreased appetite, decreased respiration, psychotic symptoms, sedation, diuresis, analgesia
Delta () (e.g., etorphine)	Analgesia, euphoria, physical dependence, Hormone changes, appetite suppression, dopamine release
Nociceptin/orphanin (e.g., buprenorphine)	Analgesia, appetite, anxiety, tolerance to opioids, hypotension, decreased GI motility, 5-HT and NE release

Abbreviations: GI, gastrointestinal; 5-HT, serotonin; NE, norepinephrine.

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ASSESSMENT OF PAIN AND ITS CHALLENGES

Before prescribing pain medications, it is critical to conduct a thorough assessment of pain in the perioperative period. This should start with knowledge of the past medical history and a detailed description of the pain in terms of location, duration, radiation, intensity and, most importantly, its character. Knowing the medical history and character of symptoms helps one assess which type of pain a patient has, which will help determine what pain treatment modality to choose.

For example, osteoarthritis may lead to more of inflammatory pain, whereas diabetes, herpes zoster, spinal cord injury or shooting pain will point to a neuropathic origin. A history of cancer or bony pain may point to a more somatic origin. Visceral pain may be related to colic, obstruction or internal organ inflammation that may not be well localized, and thus more difficult for the patient to characterize.

Additionally, the pattern of pain as well as aggravating and alleviating factors are important. Movement is a very common aggravating factor in the hospital setting. A common strategy in managing this is to dose pain medications prior to physical therapy to maximize mobility.

Physical examination for pain management in the postoperative period requires evaluation of the surgical site, and any other site where the patient is complaining of pain or discomfort. Tachycardia, hypertension, diaphoresis or tachypnea may or may not be present, and while helpful in making a diagnosis at times, also may be nonspecific. Low-grade fever is a common finding in the immediate postoperative period, and most often does not suggest infection, but more commonly is due to cytokine release from the surgical insult. Thus, it is important to evaluate these findings in the postoperative period clinically, including an evaluation of the wound and for other sources of infection, before pursuing empiric treatment for pain.

Laboratory, radiographic and other tests may or may not be useful in diagnosing the cause of pain. While imaging may show clinical evidence of a mass or lesion causing symptoms, pain is widely understood as a subjective and not always easy to assess, as each patient will experience it differently.

Characterization of pain intensity is a common challenge for all clinicians, especially in the postoperative setting. Single-dimension scales are the most commonly used measures. Two common options of these are the standard numerical rating scale from 0 to 10 with zero representing “no pain at all” and 10 representing “the worst pain of your life”; and the verbal descriptor scale representing “no pain” to “worst pain imaginable.” In children and the elderly, drawings of faces may also be used from a contented smile to a distressed-looking face. These are easy and convenient where repeated measures are required over time, and the American Pain Society 2016 guidelines recommend using one of these validated scales both to assess and gauge response to interventions. Table 2 summarizes various commonly used pain rating scales, however, the challenge is trying to put a simple descriptor to a complex experience that may have many different dimensions.

Table 2.

Pain Rating Scales. From Reference: 27, Management of Postoperative Pain. *J Pain.* 2016;17(2):131-157.

Examples of Validated Pain Intensity Assessment Scales

NAME OF SCALE	RATING SYSTEM
NRSs	Six-point NRS (NRS 0-5) ²⁰⁷
	Eleven-point NRS (NRS 0-10) ^{24,25,53,95}
	Twenty-one point NRS (NRS 0-20) ^{50,131,281}
VRS	Four-point VRS ⁵³
	Seven-point Graphic Rating Scale ^{24,25}
	Six-point Present Pain Inventory (PPI) ^{94,95,157,201,223}
Visual Analogue Scales	Commonly rated 0 to 10 cm or 0 to 100 mm.
Pain Thermometer	Combines a visual thermometer with verbal descriptions of pain ^{130,131}
Faces Rating Scales	Faces Pain Scale-Revised ^{31,53,83,93,131,157,273,281}
	Wong-Baker FACES pain rating scale ^{309,314}
	Oucher scale ^{27,29}

Abbreviations: NRS, Numeric Rating Scale, VRS, Verbal Rating Scale.

While multidimensional scales do exist, they are challenging and time-consuming to conduct in the rapidly changing inpatient setting. Thus, it is important to have more than just a number to characterize pain and response to treatment. Beyond the physiology of pain, there are other factors that may contribute such as psychological processes, lack of social support, coping abilities, adaptation, disability and physical comorbidities. Anxiety, depression, anger and fear may also significantly contribute to the subjective perception of pain in the hospitalized patient.

In addition, our elderly population with severe dementia or non-verbal patients will not be able to easily articulate pain. Thus, providers must be cognizant of non-verbal pain indicators that include facial expression (grimacing), vocalization (calling out, crying, moaning, groaning), agitated behaviors, irritability, decreased appetite, body movement (guarding), and changes in interpersonal interactions or mental status. A change in usual activities as judged by their caregivers may also be a potential sign of pain.¹¹

Patients with psychiatric conditions also must be appropriately assessed and treated. Those with a substance abuse history including alcohol, tobacco or other drugs may undergo withdrawal, which can complicate pain management. Despite these comorbidities, all need to be appropriately treated in the postoperative setting. Understanding the nuances between pain and addiction will be important for providers to ensure adequate treatment without overuse and, in certain instances, the help of psychiatry or addiction medicine may be useful.

Patients with chronic pain present a special challenge. When they have pre-existing pain and undergo an operative procedure, it becomes important to differentiate pre-existing chronic pain from new acute postoperative pain. Additionally, patients already on chronic opioid therapy may require a 200 to 400 percent increase in preoperative opioid requirements.²⁴ Thus, it is important to establish preoperative analgesic requirements to create a postoperative pain management plan, not to mention a keen awareness of comorbidities that may preclude the escalation of regimens due to patient safety concerns.

MANAGEMENT OF EXPECTATIONS AND THE STEPWISE APPROACH

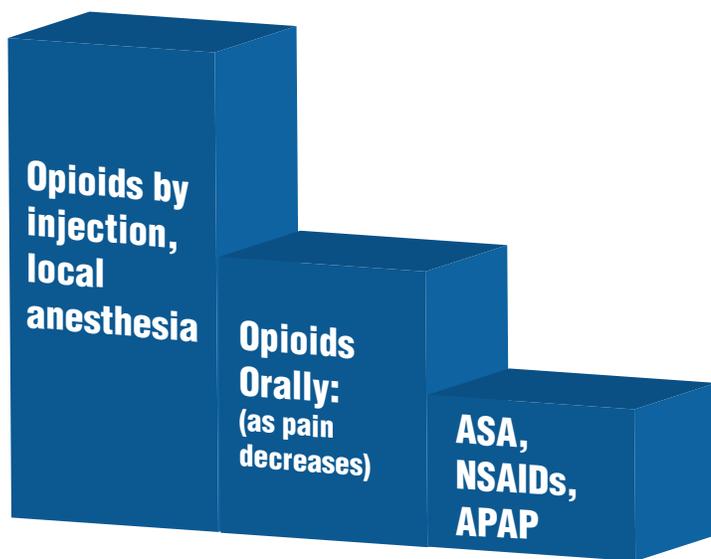
An important aspect of managing postoperative pain will be education of the patient by the team regarding the procedure and what is to be expected afterwards. Educating patients on the duration and potential cause of pain, and how long it is to be expected, will help them manage their symptoms, as well as help them prepare to deal with the various aspects of pain control. Perhaps they will have the ability to elicit support during the postoperative phase so they may limit their activity if needed, or be better prepared psychologically to know what is ahead so that anxiety and fear do not exacerbate symptoms further. Setting expectations may help patients engage in some of the various techniques that can help alleviate pain that do not include medications.

Many providers equate pain management with pharmacologic regimens of pain. However, since pain is a subjective phenomenon involving the affective and cognitive process for each individual, nonpharmacological measures that recognize the importance of cognition and emotion are critical. It is important to leverage a patient's belief in a particular therapy; while limited literature supports this at the present time, it makes sense from both physiologic and psychological perspectives. Nonpharmacological measures may include cold to reduce inflammation and heat to reduce spasms; however, limited benefit has been shown for this in the literature. Transcutaneous electrical nerve stimulation (TENS) studies are conflicting but have some evidence of efficacy, especially in painful diabetic neuropathy. A systematic review of more than 20 randomized trials found 25 percent less postoperative analgesia use compared to patients without TENS. Although this technique is underutilized in the hospital setting, it may be useful in helping to reduce pharmacologic therapy.²⁵

Other techniques include cognitive behavioral therapy, biofeedback, autogenic and relaxation training, progressive muscle relaxation, mindfulness and hypnosis. While these have mixed results, they may be a reasonable part of a treatment plan if specific training and resources are available at a particular institution, especially since most of these are devoid of side effects or complications.²⁶

If pharmacologic management is required for surgical patients, the conceptual model of the World Federation of the Society of Anesthesiologists is helpful here. In the immediate postoperative period, intravenous opioid or non-opioid agents are reasonable, especially if the patient is NPO in the immediate postoperative period. This model is based on the World Health Organization (WHO) stepladder for management of cancer pain, of escalation of the regimen when cancer pain worsens; as postoperative pain is expected to decline over time as the distance from the surgery increases, a de-escalation of the regimen is a prudent approach.

The figure (below) highlights this approach:



Non-opioid analgesics should be prescribed to all postsurgical patients who have pain in the absence of contraindications. They can lead to a reduction in use, and therefore a reduction in side effects from opioids. Acetaminophen is one of the most popular analgesics available on the market. It has its primary effect in the central nervous system, which accounts for its antipyretic action. Since it does not act peripherally at sites of inflammation, it will be of limited benefit in that regard but still should be considered as first line in certain instances. Its analgesic mechanism of action is not well characterized, but may facilitate central down-regulation of pain by serotonin, increasing endogenous cannabinoids, in addition to increasing nitric oxide synthesis. While there are some contraindications to excessive use in patients with liver disease, there is still benefit and acetaminophen should be considered as first-line medical therapy with appropriate dosing adjustments.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are potent anti-inflammatory agents and analgesics, and are valuable to use short term in certain instances. One should be aware of the significant risk for gastrointestinal bleeding and renal insufficiency if used for prolonged periods or in high-risk patients. While many surgeons have concerns about the potential for these agents to lead to bleeding issues, especially in spinal fusion surgeries, associations were not found to be statistically significant, and the expert panel from the American

Pain Society found insufficient evidence to recommend against the use of NSAIDs in these patient populations. Caution, however, is still advised in patients who have coronary artery bypass graft surgery because of the risk of cardiovascular events and the competitive inhibition of aspirin activity.

COX-2 selective nonsteroidal anti-inflammatory agents have a lower risk of peptic ulcer or gastritis compared to nonselective NSAIDs, but equivalent renal toxicity is noted. Celecoxib is the only of the COX-2 selective NSAIDs available in the United States, and it has been shown to increase the risk of major cardiovascular events at high doses. Therefore, it should be used with caution in patients with risk factors for coronary artery disease. While the risk of the COX inhibitors remains an issue particularly with these patients, the panel recommends clinicians “considering giving a preoperative dose of oral celecoxib in adult patients without contraindications.”²⁷

Also recommended is the use of nerve stabilizer agents, especially in neuropathic pain, including gabapentin or pregabalin, which has a strong recommendation with moderate quality evidence. Other agents to consider are the serotonin-norepinephrine reuptake inhibitors (SNRIs), mainly venlafaxine and duloxetine. If sleep is an issue, then the use of tricyclics such as amitriptyline or nortriptyline can be used at night. Caution needs to be taken with these medications with other concurrent medications, particularly with QTc prolongation or concerns for arrhythmia. In general, the use of tricyclics or SNRIs can also help with depression to ensure that a biopsychosocial approach is being taken to manage pain. Table 3 below summarizes this targeted approach to the different types of pain origins.

Table 3.

	Description	Localization	Description	Etiology	Management
Nociceptive	Tactile on skin and external soft tissues; musculoskeletal	Very localized	Variable but typically sharp, stabbing	Trauma, pressure	Anti-inflammatories, centrally acting agents; opioids as last resort
Visceral	Deeper origin, e.g., gut or brain (colic, obstruction)	Poorly localized (headache, abdominal pain, chest pain)	Dull, achy, colicky, intermittent	Injury or trauma to internal organs	Centrally acting; opioids as last resort, need to pursue cause
Neuropathic	Commonly peripheral extremities (spinal cord injury, herpes zoster, DM neuropathy)	Usually well localized	Burning, piercing, tingling; constant	Chronically damaged nerves from DM, ischemia,	Nerve stabilizers, antidepressants > anti-inflammatory; opioids as last resort
Inflammatory	Soft tissues and joints	Usually well localized	Burning, aching, worse with movement	Soft tissue or joint inflammation locally	Anti-inflammatory; ice, compression; opioids as last resort

APPROPRIATE USE OF OPIOID ANALGESICS

After an assessment has been made regarding the pain and the decision has been made to use opioids, it is important to understand how to use them appropriately.

For acute pain, always start off with an immediate release medication. Long-acting opioids are not appropriate to be used to treat acute pain and for initial dose titration. The route of pain medications also makes a difference in frequency of administering pain medications. Short-acting oral opioids peak in 45–60 minutes.

Intravenous dosing will peak in 10–15 minutes. Knowing these parameters makes it easier to dose medications sooner to achieve adequate pain relief in acute pain.

When dosing medications for acute pain, it is appropriate to give an additional dose if the pain is not relieved by the expected peak time. As an example, if a patient in acute pain is given an intravenous dose, then it is appropriate to give the same dose again or double the dose (depending on the clinical situation) if there is no relief in 15 minutes once peak onset of action has been reached.

Short-acting medications can also be scheduled to achieve steady state. Their half-lives are three to four hours, and plasma concentrations hit steady state in four to five half-lives. Thus, if short-acting opioids are scheduled every four hours, steady state can be achieved in less than a day. This would be the same concept if starting a twice-daily long-acting opioid (once it is determined that it is appropriate) as steady state would be achieved in four doses or two days.

When using a patient-controlled analgesic (PCA) in opioid-naïve patients, only patient-controlled dosing should be used initially. Starting a continuous basal dose on an opioid-naïve patient is generally not appropriate. Once steady state is achieved with patient-controlled bolus dosing in 24 hours, then starting a continuous basal rate can be considered if the clinical judgment deems it necessary to use opioids for a longer time period.

Caution also needs to be taken in patients with renal failure. Morphine is not recommended in renal failure because of the accumulation of active metabolites that are cleared by the kidneys. The safest opioid medications in renal failure are methadone and fentanyl, however, it is not practical to use methadone in the acute care setting or in the general population, and intravenous fentanyl is short acting and generally should not be used outside of a controlled ICU setting. Hydromorphone would be a safer alternative in renal failure patients. Dosing also needs to be adjusted, as patients may need a lower dose or increased dosing intervals.

If using long-acting opioid medications, the appropriate breakthrough dosing needs to be considered. Generally, 10 percent of the total 24-hour dose is acceptable. If using a PCA with continuous dosing, then 50 percent of the hourly infusion rate can be used as breakthrough dosing.

DOSE CONVERSIONS

Extra caution needs to be taken with patients who are on existing opioids. It is very easy to miscalculate a dose if appropriate conversions do not take place. Dose conversions can seem very complicated, however, using an equianalgesic table appropriately will assure safe use of opioids. General principles are as follows, keeping in mind that there is variance in equianalgesic dosing²⁸:

1. IV morphine is three times more potent than oral morphine.
2. IV hydromorphone is five times more potent than oral hydromorphone.
3. Oral hydromorphone is four times more potent than oral morphine.
4. IV hydromorphone is 20 times more potent than oral morphine.
5. IV hydromorphone is six to seven times more potent than IV morphine.
6. Hydrocodone is equipotent to morphine.

Fentanyl to morphine can be converted using the Levy's principle, which takes the fentanyl dose in micrograms per hour to a total morphine dose for the day. For example, if a patient is on 50 micrograms per hour of fentanyl at home, then that would equate to 100 mg of morphine in a day. Similarly, if a patient takes 100 mg of morphine a day, this would equate to 50 micrograms of fentanyl per hour.

The interplay between morphine and hydromorphone should not be underestimated. For example, 2 mg of IV hydromorphone, which is frequently used in the hospital setting, is equal to 40 mg of oral morphine (factor of 20) or 13 mg of IV morphine (factor of 6–7). Hence, the use of hydromorphone at these doses needs to be carefully thought through once this is taken into perspective. A more appropriate starting dose of IV hydromorphone would be around 0.5 mg as that would equate to 10 mg oral morphine or hydrocodone.

Frequently, a surgical patient who is in an ICU setting may be on an IV fentanyl PCA. If the appropriate clinical decision is made to transition to transdermal fentanyl for long-term pain control, it is important to understand mechanisms of action and dosing principles. Intravenous fentanyl has a 1:1 ratio to transdermal dosing. Thus, 100 mcg/hr of intravenous fentanyl is equal to 100 mcg/hr transdermal fentanyl. Hence, if a patient is on 50 mcg/hr of intravenous fentanyl and one needs to transition to transdermal dosing, the following would be appropriate:

1. Apply the same dose in transdermal dosing.
2. Six hours after application of the transdermal dose, lower the intravenous dose by 50 percent.
3. Twelve hours after application of the transdermal dose, discontinue the infusion as the onset of action is around 12 hours through the transdermal route.

Ensure that breakthrough medications are ordered during this time period.⁴

When switching between different opioids, it is important to account for incomplete cross-tolerance. Generally, it is appropriate to lower the calculated dose by 25–50 percent based on the severity of pain. It is important to note that this does not apply when switching to fentanyl as the Levy's principle accounts for incomplete cross-tolerance. Also, this does not apply when going from intravenous to oral route of the same opioid.²⁹

CDC GUIDELINES FOR OPIOID PRESCRIBING — 2016

There have been more than 165,000 deaths reported secondary to opioid overdose.³⁰ It is reported by the Drug Abuse Warning Network that the number of ED visits surpassed 420,000 in 2011 as a result of opioid misuse or overdose.³¹ For this reason, the CDC has come out with a new set of guidelines to help clinicians focus on some of the appropriate uses of opioid therapy. Based on the latest CDC guidelines, it is becoming clearer that the benefits may outweigh the risk for the use of long-term pain medications in noncancerous, nonpalliative patients, and much of the recommendations previously have been based on expert opinion and consensus. Many trials are showing negative outcomes with worsening functional status from long-term opioid use.³²

When it comes down to grading the evidence for many of the recommendations within the guidelines, it is apparent that much of the recommendation comes from poor or low-quality evidence with few randomized controlled trials.^{33,34} Controversies are escalating regarding these CDC guidelines and the implications they may have in treating patients, as well as the declaration that the epidemic is caused by physicians. In no uncertain terms, the CDC has focused on adverse consequences of the use of opioids, and understandably so.

The following is a summary of the CDC guidelines described above³⁵:

1. Determining needs for opioids
 - A. Opioids are not first-line therapy for chronic pain and if used should be in conjunction with non-opioid therapy.

- B.** Establish goals for pain and function.
 - C.** Discuss risks and benefits of opioid therapy.
- 2.** Opioid selection, dosage and duration of therapy
- A.** Use immediate release opioids when starting treatment instead of long-acting medications.
 - B.** Start low and go slow.
 - C.** Reassess pain and function when doses reach >50 mg of morphine equivalents a day and avoid increasing doses to >90 mg a day.
 - D.** For acute pain, rarely are greater than seven days needed.
- 3.** Addressing risk and addressing harm
- A.** Evaluate patients for risk factors such as substance use disorder, high doses of opioids, depression and concurrent benzodiazepine use.
 - B.** Check your PDMP database.
 - C.** Annual urine drug testing.
 - D.** Avoid prescribing benzodiazepines concurrently whenever possible.
 - E.** Offer medication-assisted treatment such as buprenorphine or methadone and behavioral therapies for those with opioid use disorder.

MULTIMODAL PAIN MANAGEMENT STRATEGIES

A multimodal pain management strategy is one that employs both non-opioid and opioid pharmacologic regimens, as well as nonpharmacologic measures. This is believed to be superior to using just one modality, allowing for optimal analgesia with the lowest incidence of side effects, and the potential for more rapid recovery and step down of pain regimens. The American Pain Society (APS) recently published a guideline for the management of postoperative pain, and one of its substantive recommendations is that clinicians “offer multimodal analgesia where the use of a variety of analgesic medications and techniques combine with nonpharmacological interventions, for the treatment of postoperative pain.”²⁷ This received a strong recommendation based on high-quality evidence. The APS panel suggested that clinicians routinely incorporate around-the-clock non-opioid analgesics and non-pharmacologic therapies. Randomized trials suggest that simultaneous use of combinations of medications acting at different receptors or administered through different techniques, such as neuraxial in addition to systemic routes, is associated with superior pain relief and decreased opioid consumption. They highlight that pain should be seen from a biopsychosocial model and a multimodal approach should address each of these areas.²⁷ This would also potentially help decrease use of opioids when effectively utilized.

MANAGING SIDE EFFECTS

It is critical that the postsurgical patient is prescribed a standard bowel regimen. Opioid use along with routine postoperative recovery will place a patient at high risk for constipation, ileus or obstruction. Sennosides, two tablets twice daily, is a good starting point. Consider increasing this dose, or adding adjunct medications such as polyethylene glycol on a scheduled basis, predicated on patient response. Early initiation of an aggressive bowel regimen can prevent future complications during the hospital stay.

Other common side effects are nausea, vomiting and sedation. Nausea and vomiting can be managed by anti-emetics. Knowing mechanisms of action of different anti-emetics is important. Ondansetron, which is commonly used in the hospital setting, is not always the most effective for opioid-induced nausea being a 5-HT₃ serotonin antagonist in the chemoreceptor trigger zone. More appropriate choices may be dopamine antagonists such as compazine, prochlorperazine or metoclopramide. Care needs to be taken to monitor for side effects and interactions with concurrent medications.

Sedation is a common side effect even with the most appropriate dosing. The standard medication to administer to reverse effects of opioids is 0.1–0.4 mg of naloxone depending on the clinical severity. However, in patients on chronic opioids, it is also acceptable to use lower than 0.1 mg of naloxone. This can be achieved by taking 0.1 mg and diluting in 10 cc allowing for delivery as low as 0.01 mg when complete reversal of opioid sedation is not appropriate.

Other less common but well-known side effects are the neurotoxicities. Myoclonus, seizures and opioid-induced hyperalgesia can occur with high doses of opioids or if opioids are being used in patients with impaired renal or hepatic clearance. Hyperalgesia is the paradoxical increase in pain sensitivity despite escalation of treatment regimen. Though its mechanism is unknown, it is generally seen in patients with high doses of chronic opioids or when opioids are escalated too rapidly. Treatment of neurotoxicities includes lowering the dose, rotating or weaning off of opioids altogether. Benzodiazepines can be used to treat myoclonus at times but caution must be used to avoid oversedation.

OPIOID DE-ESCALATION

As the postoperative period increases, an earnest attempt should be made to decrease opioid doses to the lowest dose needed. While it is less likely in the acute setting, providers need to be cognizant of opioid withdrawal syndrome. To minimize this, opioid dosing should be decreased 20–50 percent every two to three days.³⁶ Adjunct agents that could be used if withdrawal symptoms arise are alpha-adrenergic agents such as clonidine. In addition, use of various pain modalities as mentioned in previous sections helps successfully decrease opioid dosing.

BARRIERS TO IMPLEMENTATION

Several major challenges exist to implementing a systematic change in postoperative pain management in the acute inpatient setting. There have been important efforts to focus on the needs of patients, their satisfaction and their clinical improvement as it pertains to pain fueled by a variety of reports and studies showing our inability to do this well.^{12,36} Effective pain management really requires a careful process of thinking through all the various elements that may be contributing to a patient's pain including the psychosocial aspects that may be playing a role.

On the front lines, providers who care for patients have personal biases perhaps based on age, sex, race, religion or other factors, or may wonder regarding the subjectivity of patients' reports of pain. While treating hypertension an escalation of a medication regimen may not elicit a practitioner's bias. The same practitioner may believe that a patient whose persistent pain does not respond to standard medications is 'drug-seeking,' a narcotic abuser or has a need to escape reality. Many, however, feel that undertreatment of pain is a violation of the ethical principles of autonomy, especially in reference to self-determination regarding pain management, and beneficence, and that the relief of pain and suffering is a cardinal principle of medical practice.

Lin and colleagues performed semi-structured interviews with 40 general medical patients using the American Pain Society Patient Outcome Questionnaire (APS-POQ-R), a survey instrument for high-quality pain management that has been validated for hospitalized patients.³⁷ They defined three categories of barriers to effective pain relief: patient-related barriers, provider-related barriers and system-related barriers. Each of those broad categories could then be broken down into subsequent barriers within that group, and rounding by interviewing caregivers, patients and providers could ascertain more details about the potential barriers to pain management.

Patient-related barriers include the disabling impact of pain; fear of both pain and of opioids (addiction and/or side effects), and the lack of control related to the hospitalization and disability as well as from pain itself. Forty percent of participants consistently described negative emotional, psychological and functional impacts of the pain, and a sense of helplessness in predicting pain occurrence and effects of opioids. The majority of participants pointed out several provider-related barriers as well, which included physician or nurse concerns for opioid abuse/addiction, lack of communication and education, and lack of non-pharmacologic treatment modalities such as heat, ice, therapy, massage, and counseling and coping skills training. In addition, patients reported that providers showed a lack of trust in their self-description of pain and its impact; they did not invest time in communicating the pain management process and medication side effects. Some patients questioned the validity and consistency of the acute pain management protocol used in the hospital.³⁸

Most patients described a significant time delay, ranging from 30 minutes to several hours, in the delivery of pain medications as a major quality issue. These patients also reported significant dissatisfaction and mistrust because of the time delay, despite adequate and frequent pain assessment. This could be due to the underestimation of the severity of pain by providers, in addition to the mandatory safety requirements required to reduce medication errors, as well as the institutional culture that does not appreciate acute pain crisis as a medical emergency. In addition, there may be general perceptions of opioid misuse, abuse or miscommunication between patients and providers. Concerns exist regarding a lack of education among providers across disciplines and based on various levels of training in general. While both patients and

clinicians have fears concerning opioid use, it is important to appreciate that patients who come into the hospital setting who are chronically on opioids need to be continued on them to some extent. This may create a set of challenges in this population, particularly in the perioperative period. Even if the provider feels that the patient is on opioids inappropriately, during an acute care hospital stay continuing the “home regimen” initially may be important to avoid withdrawal and pseudoaddiction. Pseudoaddiction is where patients manifest impulsive behaviors because they are not being dosed to the same level of opioid relief as in the home setting and thus not achieving pain relief.³⁹ This leads to behavioral issues, which then can create a cycle of anger and resentment.

One of the fundamental challenges that inpatient providers face regarding pain management involves negotiating the relationship between pain control and patient satisfaction. The Hospital Consumer Assessment of Healthcare Providers and Services (HCAHPS) survey revealed that 7 out of 10 hospitalized patients report that their pain is well controlled.⁴⁰ Performance on the survey, which includes questions regarding patients’ perceptions of inpatient management of pain, is currently tied to funding for hospitals from the Centers for Medicare & Medicaid Services (CMS).

Interestingly, one study of more than 50,000 patients revealed that greater patient satisfaction was associated with greater mortality. Patients with chronic pain and/or opioid tolerance typically had higher baseline pain scores and reported lower satisfaction scores overall. Based on efforts to address these questions in the survey, national medical societies are beginning to look at these questions more critically to see if there is some relation to provider prescribing habits. They cite that pain management and opioid prescriptions may be negatively influenced by an effort to enhance patient satisfaction scores.

Souzdalnitcki et al.⁴¹ suggest several strategies in balancing adequate pain control with patient satisfaction. The fundamental aspects of this include: 1) expectation management, 2) clear algorithms of care and 3) early involvement of expert resources. Effective communication is critical to this management. Patient satisfaction is typically more correlated with the perception that caregivers did everything they could to control pain, as opposed to pain being actually controlled. In the preoperative setting, establishing realistic expectations for pain after surgery as well as pain control strategies is key. Teams should promote a multimodal strategy, which would include adjuvant medications, emotional support, spiritual counseling and even bedside complementary therapies. This combination of efforts may be as important as if not more important than escalating doses of opioid regimens. Attention to nurses’ job satisfaction and engagement in these multimodal aspects from a nursing standpoint is also key. Early intervention with expert resources, including pain management services, may help to reduce length of stay and readmission and optimize overall satisfaction. Finally, a key factor is activating and engaging patients in being part of their treatment decisions to the level that they wish, within reasonable safety limits. Empowering patients will improve their perceptions and satisfaction with pain control.

In addition, identifying a front-line interdisciplinary team at your institution including surgeons, hospitalists, pain management teams and nursing should be coordinated as part of the leadership for this effort. Team members will often have various viewpoints critical to successfully operationalizing such initiatives.

Thus, the interdisciplinary team will be important in ensuring that the various aspects of patient assessment and management can be met.

TRANSITIONS OF CARE

Transitioning care from the inpatient to ambulatory setting is the focus of numerous quality improvement initiatives in all medical fields, including medicine and surgery. This is well known to be a vulnerable time for patients, as they are leaving the relatively “secure” environment of the hospital with around-the-clock nursing assessment and pain management assistance, for the less secure environment of home where patients are often responsible for their own pain management. In addition, the challenge of medication reconciliation and medication education are key factors that can lead to either an optimal experience and good postoperative pain control, or a suboptimal experience, increased pain and subsequent ED visits, rehospitalizations or potential side effects from medications also leading to increased healthcare use. In a study of Medicare patients from 2006, 19 percent of these patients discharged from the hospital were readmitted within 30 days.⁴² A 2016 study of postoperative general, vascular and orthopedic patients revealed that 11.1 percent of these patients were readmitted within 30 days.⁴³ Researchers found it difficult to predict which patients would be readmitted, although preoperative factors seemed to play the largest role. Patients with chronic pain on opioids as well as patients with polypharmacy issues are at higher risk for readmission.

Key elements of an effective postoperative pain discharge plan include the following⁴⁴:

- 1.** Ensure that pain is controlled on oral medication, with ideally the lowest dose of opioid therapy necessary, as pain medication requirements should decrease as the patient moves further out from the operative date.
- 2.** Initiate adjuvant non-opioid therapy to help de-escalate opioid needs.
- 3.** Reconcile medications accurately and completely, with clear age- and education-appropriate instructions for the patient and family.
- 4.** Complete patient-friendly discharge instructions in clear age-appropriate language and with follow-up appointments scheduled with primary care, surgeon and pain management when necessary.
- 5.** Complete a discharge summary encompassing the postoperative pain course and plans for ongoing postdischarge pain management.
- 6.** Ensure that postdischarge providers receive a copy of the discharge summary in a timely manner (within 24–48 hours of discharge) so they can continue the plan for postdischarge pain management.
- 7.** If a patient is going to a skilled nursing facility, ensure that the pain management plan is clearly communicated to this team; a completed discharge summary that goes with the patient to the facility may help the downstream caregivers. It is also recommended that you speak directly with the physician or LIP in more complex cases. Also, remember that most skilled facilities do not actually have pharmacies on site, so ensure that your patient gets to the facility in a timely manner so that he or she does not suffer overnight or longer without appropriate pain control.

MEASURING SUCCESS

Assessing the adoption of a successful multimodal strategy for postoperative pain management involves understanding external and internal benchmarks of success as well as what success means to our patients and providers. While at the core of this is the patient's rating of pain, we also must consider structure and process metrics, as well as relevant outcomes of interest, in assessing the success of the implementation.

External benchmarks of success include the HCAHPS Survey described previously, which provides a standardized measure of comparison of hospitals and aims to improve quality of care. Hospital payments from CMS are based on performance on these measures in the Hospital Value-Based Purchasing (VBP) program; however, CMS recently has considered removing the Pain Management dimension from the Hospital VBP program, beginning with the 2018 fiscal year payment and based on discharges from calendar year 2016.⁴⁵ The questions regarding pain management in the survey are:

- During this hospital stay, how often was your pain controlled? (Always, usually, sometimes or never)
- During this hospital stay, how often did the hospital staff do everything they could to help you with your pain? (Always, usually, sometimes or never)

Hospitals are compared based on the percentage of patients reporting “always” to these questions. These questions are validated, however they are limited in the sense that they are influenced by care provided during the whole hospitalization experience, and reflect on perception and consumer satisfaction, but do not address safety and misuse issues. In addition, these are not reported until months after the patient's hospitalization so the impact on changing provider practice in real time is limited.

Other data sources internally that can be helpful in determining success include JCAHO survey results looking at specific local efforts in terms of pain documentation or adherence to policies, as well as medication management standards including PRN opioid order parameters, and avoidance of therapeutic duplication.

Incident event reports and electronic reporting systems, adverse drug reports and the use of naloxone can also highlight individual cases of pain management challenges or safety issues. Individual patient, provider or system issues can be identified via root cause analysis that can help to enhance processes and policies of care around medication safety, care transitions and technology-related issues.

Measures of success for a multidisciplinary postoperative pain management program encompass several domains. System-based measures include provider knowledge and comfort in pain assessment and management; guidelines for opioid prescribing, including short- and long-acting opioids; appropriate equianalgesic dosing; and prioritization of the pain stepladder as described previously. Access to specialist consultations and provider access to state prescription drug monitoring plans for report access to ascertain and address abuse are key.

CASES

Case #1 (Appropriate dosing of acute pain management in patients on chronic opioids)

A 50-year-old male with chronic low back pain, HTN, DM comes in for an episode of acute cholecystitis. He is having nausea and vomiting and can not tolerate any oral medications. At home he is on 10 mg hydrocodone every 6 hours and has used it regularly for years. The hospitalist sees him as a pre-operative consult and is tasked to manage his acute and chronic pain.

What is the minimum amount of intravenous dosing you would prescribe for the acute pain?

- A. Morphine 1 mg IV q 3 hours prn
- B. Morphine 2 mg IV q 3 hours prn
- C. Hydromorphone 2 mg IV q 3 hours prn
- D. Morphine 5 mg IV q 3 hours prn

The best choice in this question is response D.

It is important to note that the patient takes 10 mg oral hydrocodone at a time. This is equivalent to 3 mg of IV morphine or 0.5 mg of IV hydromorphone. The patient has acute on chronic pain and thus would need more pain medication than what he takes at home on an everyday basis. The general principle is that a dose equal or above the home dose should be initiated. At the very minimum, one can prescribe morphine 5 mg IV q 3 hours prn, which would be around 15 mg of hydrocodone. One could also double the home dose and give 1 mg IV hydromorphone, which is equal to 20 mg oral hydrocodone or morphine. It is important to note that 2 mg IV hydromorphone is equivalent to 40 mg oral hydrocodone or morphine, which would be increasing the home dose by a factor of four and, therefore, this would be too high of a dose. At the same time, 1 mg IV morphine would be equal to 3 mg oral hydrocodone and 2 mg IV morphine would equal 6 mg oral hydrocodone, both of which are lower than what the patient takes at home for chronic pain.

Knowing that he cannot take oral medications, what is the best option to manage the *chronic* low back pain?

- A. Morphine 2 mg IV q 3 hours scheduled
- B. Hydromorphone 1 mg IV q 3 hours prn
- C. Fentanyl transdermal patch 25 micrograms/hr
- D. Morphine PCA 1 mg/hr continuous

The best choice in this question is response D.

The first step is to understand that the patient is on chronic long-term opioids. He has a baseline opioid requirement. Though he is not on a long-acting medication, essentially taking 10 mg of hydrocodone every 6 hours is long-acting pain relief. The back pain is still present so one has to replace the maintenance dose. Since the patient is taking 40 mg of hydrocodone a day, that equals 40 mg of oral morphine a day. The best alternative is to start a morphine PCA. Since the patient is opioid tolerant, it would be appropriate to start continuous dosing. 40 mg of hydrocodone a day is equivalent to 13 mg of intravenous morphine a day and, thus, 1 mg/hr of intravenous morphine would also be appropriate.

Though it is not recommended in this clinical situation, it is important to understand how to dose a fentanyl transdermal patch. The patient takes 40 mg hydrocodone a day. Using Levy's principle that would equate to around 20 mcg/hr of fentanyl, which would make starting a fentanyl transdermal patch 25 micrograms/hr appropriate. The half-life of fentanyl, however, is 17 hours with the onset of action 12 hours, therefore this would not be appropriate to initiate in a patient with a short length of stay. More importantly, one will not know how a patient will react to fentanyl keeping in mind upcoming anesthesia induction. This combination of a new opioid, i.e., fentanyl, in addition to administration of anesthesia could bring forth significant untoward side effects.

Case #2 (A multimodal pain approach)

A 70-year-old male with CKD stage IV, HTN, DM, CAD, PVD presents to the emergency room for acute left foot pain. He describes the pain as deep, stabbing and burning. He does have some degree of neuropathic pain but this is significantly worse than usual. At home he takes occasional acetaminophen. His additional medications include aspirin, metoprolol, insulin, simvastatin and lisinopril. On exam he has a purulent ulcer on his left hallux and has diminished pedal pulses. You suspect acute osteomyelitis either from diabetic neuropathy and/or peripheral vascular disease. He needs to be NPO for possible impending surgery.

What would you prescribe for acute pain management in addition to acetaminophen?

- A.** Morphine 3 mg IV q 3 hours prn
- B.** Hydromorphone 0.3 mg IV q 3 hours prn
- C.** Ketorolac 15 mg IV q 6 hours prn
- D.** Hydromorphone 1 mg IV q 3 hours prn

The best choice in this question is response B.

This patient is in acute pain. While important to continue a scheduled dose of acetaminophen, the patient needs opioids for the acute pain. Taking into account his CKD stage IV, one should avoid morphine and, thus, hydromorphone would be a more acceptable option. In addition, the lowest dose of hydromorphone should be used in an opioid-naïve patient. Hence the correct answer is to start with hydromorphone 0.3 mg IV as that is equivalent to 6 mg oral hydrocodone or morphine. Hydromorphone 1 mg IV would be equivalent to 20 mg oral hydrocodone and, thus, would be too high of an initial dose. Ketorolac would also be contraindicated in an elderly patient with CKD stage IV and his other comorbidities.

You start 0.3 mg IV of hydromorphone and eventually reach a dose of 0.5 mg. The patient goes for surgery for an amputation of his toe. You manage him post op and he continues to complain of burning pain. He requests an increase in hydromorphone because of the burning pain.

What is your next step in managing pain?

- A.** Increase the hydromorphone as requested.
- B.** Start a fentanyl transdermal patch.
- C.** No changes and tell the patient you are sorry.
- D.** Start pregabalin and explain to the patient why increasing opioids is not going to treat this pain.

The best choice in this question is response D.

This points out the necessity to understand the type of pain and the communication aspects of managing pain. While it may be time efficient to simply increase the opioid dose, the correct approach is to understand the neuropathic component of pain. This patient needs a multimodal approach and, hence, starting a neuropathic agent for chronic pain relief is appropriate. Starting pregabalin would be appropriate keeping in mind renal dose adjustments. It is also important to sit down with the patient and explain the thought process as neuropathic agents do not provide immediate relief but are important in a comprehensive approach to managing pain. It is also not appropriate to use fentanyl transdermal patches in this situation as you expect his postsurgical pain to dissipate within a few weeks.

You start the pregabalin and the patient is appreciative of the time you spent in explaining the pain management. He begins to realize how advanced his illness is, especially with his amputation, and states that he is depressed. He is not sleeping well and is now asking for IV hydromorphone at night to help him sleep because of the pain. On a recent EKG, his QTc interval is appropriate.

What would you prescribe for the pain and sleep?

- A.** An extra oral dose of hydrocodone every night
- B.** A benzodiazepine
- C.** Melatonin
- D.** Tri-cyclic anti-depressant
- E.** SSRI

The best choice in this question is response D.

Again, while it is easy to increase the opioids or to try benzodiazepines, it is critical to understand the root cause of the complaint. The patient is depressed and has pain. Hence, an approach dealing with his mood and pain would be appropriate. Barring any contraindications, tri-cyclic medications can help with both pain and mood. While an SSRI is not completely contraindicated, it would not theoretically be as helpful in addressing the pain component.

Case #3 (Pain management in patients with comorbidities)

A 74-year-old male with history of DM Type 2, chronic renal insufficiency (creatinine 2) and Hep C cirrhosis secondary to prior intravenous drug use, presents to the emergency room after a fall and is found to have an acute hip fracture. He also has a history of chronic pain from DJD and osteoarthritis for which he takes NSAIDs as needed.

How would you manage pain on admission and in the perioperative period?

- A.** Start IV PCA analgesia with morphine.
- B.** Start acetaminophen 650 mg po q 6 hours and consider cognitive behavioral therapy and TENS.
- C.** Resume NSAIDs and add hydromorphone 2 mg po IV q 6 hours prn pain.
- D.** Start fentanyl patch 25 mcg q 72 hours.

The best choice in this question is response B.

Although this patient has a history of cirrhosis, acetaminophen is not contraindicated in those who do not have acute decompensated cirrhosis or acute hepatitis from alcohol or other causes, so long as liver function is overall preserved. While there are no randomized controlled studies regarding the actual dosing, it is generally recommended by the Food and Drug Administration to limit the maximum dose of acetaminophen to 3–4 grams daily in normal liver function, and roughly 2.6 grams daily in non-decompensated cirrhosis. Diabetics may have other mechanisms of pain such as neuropathic pain, and evaluation and treatment of this, along with other accepted modalities of multimodal therapy, would be appropriate.

It is also important to use caution in avoiding encephalopathy by using excessive opioids in patients with liver disease. This population would be more vulnerable to delirium, and using a strategy of decreasing quantity or frequency of dosing would be beneficial in avoiding unwanted side effects.⁴⁶

In this case, stopping NSAIDs would be appropriate as the patient has been on chronic NSAIDs, which may have affected his renal function. Additionally, worsening renal function in the setting of cirrhosis may be detrimental. Since the patient is still able to take oral medication, following the WHO protocol of starting low and going slow would be appropriate. One should be aware that the highest risk for future opioid addiction is personal or family past history of addiction or abuse, psychiatric history or alcohol dependence.⁴⁷ This patient has a history of substance dependence and while opioids are not strictly prohibited, and the focus would be to appropriately manage pain, it would be wise to pay special attention to limiting doses of opioids and maximizing non-opioid modalities.

Since this patient is able to take oral medications, starting an IV PCA or IV opioids is not necessary at first. Additionally, in the perioperative period, having a patient who is oversedated and unable to participate in physical therapy may limit his ability to transition appropriately to a functional status, which would be needed to help him improve overall outcome. For this reason, a fentanyl patch as a long-acting opioid that is not easily reversible due to its prolonged half-life would also not be appropriate in the perioperative period and would make titration with anesthesia difficult.

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