Challenges in the Management of Postsurgical Pain

Why Are We Not Doing a Better Job?

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Introduction

Surgical caregivers and hospital administrators have expressed both surprise and dismay that despite the introduction of new analgesics and novel analgesic delivery systems, postoperative pain remains suboptimally controlled. Many ask why are we not doing a better job? A number of factors appear to be responsible for inadequate pain management, including:

- Lack of sufficient physician training
- Misconceptions and inappropriate patient expectations
- Intolerable analgesic adverse effects that contribute to noncompliance with prescribed therapy
- Analgesic gaps.

Other factors, including under prescription as well as overprescription of opioid analgesics, not planning or allowing time for wound site infiltration or regional blockade, misconceptions regarding use of NSAIDs, and overreliance on anesthesiologists and other caregivers to provide analgesic therapy, have been implicated as reasons why surgeon-directed management of postoperative pain often remains suboptimal (Table 2.1).

Educational Deficits and Their Impact on Optimal Pain Management

Physician misconceptions regarding analgesic therapy are often the result of educational deficits and misinformation gained during medical training. Medical school and postgraduate training programs have historically placed a low educational emphasis on pain management. Deficiencies in appreciating pain physiology and pathophysiology, and a lack of didactic and bedside training in assessment, therapeutic options, and analgesic dosing have contributed to the mindset where postsurgical pain is often considered a low priority clinical management issue. While surgeons do not want their patients to unduly suffer, they may express indifference to aggressive interventional pain management, rationalizing that pain is a normal response to surgical injury and its intensity will progressively diminish during the healing process.

Common educational deficits include:

- Nonrecognition of pain-related pathophysiologic responses and their impact on perioperative morbidity, particularly in elderly, obese, and high-risk populations
- Negative attitudes towards opioids and exaggerated addiction concerns, resulting in a reluctance to prescribe them
- Negative attitudes regarding NSAIDs, neural blockade with local anesthetic, duration of action of infiltrated local anesthetics and other multimodal analgesic options, resulting in the overprescription of opioids.

A classic example of misinformation and confusion regarding pain management involves the surgeon who requests that a highly effective epidural or continuous peripheral nerve block be discontinued because “after all, the patient has no pain.” Other examples include surgeons who refuse to order pre-incisional neural blockade or perform wound site infiltration because “it is not necessary” when in reality, they are concerned that it will delay the start time or duration of a case. Another common example involves highly risk-adverse caregivers who refuse to prescribe even a single dose of an IV NSAID or COX-2 inhibitor because of fears that they could negatively affect wound healing or bone remodeling.

Surgeons can educate and positively influence patient expectations, thereby preparing them to better cope with postsurgical pain. Patients receiving realistic, unbiased pain management education prior to total hip arthroplasty were found to be significantly less anxious just before surgery than uninformed patients. They experienced less pain following surgery and were able to stand sooner. Unfortunately, many surgeons, in an effort to allay presurgical anxiety, provide no information or deliberate misinformation. Those who inform patients that they will be using a pain pump or will be getting a nerve block and will not have any pain are actually doing a disservice, as patients will still have considerable pain and may become very dissatisfied with the effectiveness and quality of therapy. Studies have shown that in most settings, patients will report pain intensity scores of 3-5 with optimal IV PCA opioid administration, and no nerve block can be guaranteed to be 100% effective.

Underprescription of Opioid Analgesics

Although opioids are generally considered the foundation of analgesic therapy and treatment of choice for moderate to severe postsurgical pain, a relatively low proportion of patients actually receive prescriptions adequate to control their discomfort. There is evidence to suggest that some surgeons withhold opioids because of:

- Confusion regarding addiction
• Regulation of controlled substances
• An exaggerated fear of legal liability and regulatory scrutiny.

A high proportion of physicians expressed fear of addiction as a reason against the use of opioid analgesics—approximately 28% believed that patients receiving opioids for pain relief were at significant risk for addiction, and an even greater proportion of physicians (39%) were concerned about addiction if a family member were to be prescribed morphine. The fact that nurses commonly underadminister physician-prescribed doses may further compound the problem of analgesic undermedication.

A study by Orgill and associates\textsuperscript{12} showed that surgeons underadministered opioids to inpatients with moderate to severe pain following total laryngectomy. To make matters worse, patients actually received significantly lower doses than that prescribed by their surgeons, and remarkably, no patient received the recommended minimum daily dose of morphine for adequate management of moderate-severe pain. Additionally, relatively large number of patients (35%) continued to experience pain due to inadequate analgesic therapy, however, only 22% had their opioid dose increased.

Patient concerns about the abuse and addiction potential of opioid analgesics are another barrier to appropriate use of these agents. A survey of 250 postoperative patients revealed that of those who would choose a nonopioid agent for pain management (72%), almost half made their choice based on fear of addiction.\textsuperscript{13} In contrast to the negative attitudes expressed by physicians and patients towards opioid therapy, studies have shown that when opioid analgesics are administered under proper physician supervision, treatment is associated with very low rates of opioid misuse. The apparent discrepancy between perceptions about the abuse potential of opioids and the actual risk of abuse supports the urgent need for improved physician and patient education with respect to the appropriate use of opioid analgesics for pain management.

**Overreliance on Opioid Monotherapy**

In contrast to those who under prescribe opioids, a growing number of surgeons rely almost exclusively on this analgesic class for acute pain management, and many prescribe relatively large doses despite fears of respiratory depression and other adverse events, and the potential for diversion and abuse. In a recent study looking at common inpatient surgical procedures in a large hospital database, over 95% of patients received opioids either on or after their procedure (Oderda 2011, AHSP Poster). Many of these caregivers prescribe opioids as monotherapy and feel comfortable with dosing regimens that employ small doses for mild to moderate pain, administration of more opioids for moderate to severe pain, and even more opioids for severe to very severe pain (Figure 2.1).

While opioid up-titration appear to be rational, these monotherapeutic dosing protocols generally fail as patients suffer increasing adverse events and intolerability in relation to increasing exposure and elevations in CNS levels of drug. The overall effectiveness of any form of analgesic therapy consists of a balance between efficacy and overall tolerability. Opioids by themselves may not provide a useful balance in acute pain settings. High opioid dose exposure or opioid “burden” is the key factor responsible for annoying side effects and occur in a large proportion of patients prescribed IV or oral opioids.\textsuperscript{13,14} Symptoms may become so intolerable that they negatively influence the success of analgesic therapy. Many patients refrain from prescribed dosing and choose to suffer moderate to severe discomfort rather than experience dose-associated adverse events. These patients suffer in silence rather than alerting the surgical office or risk “offending” their surgeons with complaints related to analgesic choice and dosing regimen.

In recent years, opioid dose intolerance has become one of the most significant and widespread causes of poorly controlled acute pain.\textsuperscript{14,15} In a systematic review that analyzed postoperative opioid-associated adverse from multiple controlled observational trials, 31% of patients reported an adverse gastrointestinal event, most commonly nausea, vomiting, ileus, or constipation.\textsuperscript{15} Sedation and somnolence were the most commonly reported CNS effects (30.3%) (Figure 2.2). Other common adverse events included pruritus (18.3%), urinary retention (17.5%), and respiratory events (2.8%).

Oderda and coworkers\textsuperscript{16} evaluated opioid-related adverse drug events (ADE) in 60,722 postsurgical patients. 2.7% of patients experienced an ADE and the most common side effects were nausea and vomiting (67%) and pruritus (33.5%). Patients experiencing an opioid ADE had statistically significant increases in length of hospital stay (0.53 days) and increased hospital cost (16%), which averaged $840. Retrospective matched cohort trials have found that elderly patients and those treated with higher doses of opioids were more likely to experience an ADE than those receiving lower doses (Figure 2.3).\textsuperscript{17,18} In a similar study presented in 2011, Oderda and colleagues showed this difference to be nearly twice as their original study (increase in length of stay of 1.1 days and increased hospital costs of $1,614. Advanced age increased the risk factor for opioid related ADEs and their impact on increase length of stay and hospital costs. Importantly, the incidence of opioid related ADEs in this National data set was 19.4% and if an opioid ADE occurred the chances of becoming a LOS outlier increases by 214% and the chance of becoming a Total Cost outlier increases by 36% compared to patients who did not experience an opioid ADE. (Oderda 2011 Figure 1)

One factor that increases risks for opioid intolerance and potential toxicity is the fact that surgeons often prescribe opioids according to standardized protocols despite marked patient variability in age, weight, and drug tolerance/dependency. This “one dose size fits all” dosing philosophy can lead to overdose and intolerance in frail elderly patients or subtherapeutic dosing in vigorous adults. Therapy should always be individualized for age-related differences in drug clearance and elimination, as well as effects on the CNS.

A common example of over standardization is seen with IV PCA morphine or hydromorphone order sets. Surgical orders often specify the same loading dose, bolus dose, lockout interval, and 4-hour limits for 30-year-old and 70-year-old patients and for less invasive vs highly invasive procedures. In recent years, an increasing number surgical procedures are being performed in patients with chronic opioid dependencies. Postsurgical IV PCA orders for these patients are rarely adjusted or increased to compensate for opioid tolerance and, again, the same bolus dose given to a naïve individual is prescribed to a patient taking oxycodone 100 mg daily for chronic pain.\textsuperscript{19}
As mentioned above, dose-dependent opioid adverse effects often prevent dosing to maximal efficacy and can be a contributing factor to patients’ discontinuation of therapy. Many patients may choose to cope with pain rather than continuing to experience intolerable opioid side effects.\textsuperscript{13,14} This attitude was observed in preoperative and postoperative interviews of 50 patients undergoing abdominal surgery, in which patients were asked to choose from among several hypothetical treatments with different characteristics reflecting the balance between analgesia and side effects. Overall, the severity of side effects was considered a more important consideration for therapy than the degree of pain relief, suggesting that many patients were willing to “trade” analgesic efficacy for a reduction in side effect severity (Figure 2.4).\textsuperscript{14}

Thus many surgeons and patients alike share a difficult dilemma in that prescription of subtherapeutic opioid doses are often well tolerated yet provides inadequate pain relief, while prescription of higher, more effective doses often elicits an increased incidence of adverse events and suboptimal pain relief if dosing is discontinued. The answer may reside in the use of analgesic regimens to reduce the opioid burden and improve tolerability while still maintaining analgesic efficacy.

**Analgesic Gaps**

Analgesic gaps are specific time periods during postsurgical recovery when pain is unresolved. These gaps may explain in part why the overall effectiveness of postoperative pain management has not improved over the last 15 years.\textsuperscript{3,4,20} For example, a patient may be extremely comfortable for many hours following major surgery, however, a sudden change in analgesic delivery or change in patient activity may lead to dramatic increases in pain intensity. When patients are surveyed prior to hospital discharge, they remember these short, yet highly uncomfortable intervals, and rank overall pain relief and satisfaction lower than it could have been if the “gap” had not occurred. Common causes of analgesic gaps include (Table 2.2):

- Technology failures
- Pain following transition from an interventional technique to oral analgesics
- Pain following hospital discharge.

Patients experiencing severe pain in the PACU are the result of “anesthetic gaps” in which opioids or neural blockade is either withheld or administered in subtherapeutic doses. It may take many minutes to hours of opioid loading by PACU nurses to overcome this analgesic deficiency, which patients recall all to vividly.

Analgesic delivery systems that are complex, invasive, or involve multiple steps for analgesic administration have more frequent system-related events (SREs) or problems that must be addressed by health care providers. For IV PCA opioids, infiltration of the IV line is a frequently reported SRE that results in an ineffective subcutaneous deposition of drug, and increasing pain and discomfort. In this regard, the average patient may need to have their IV restarted 2.3 times just to maintain a site for PCA. A survey showed that there can be as many as 125 steps and six to eight different healthcare personnel involved in setting up and maintaining PCA therapy. This represents significant potential for error including incorrect programming and device malfunctions and overdosing or underdosing errors.\textsuperscript{21,23,24} The use of opioids and potential misprogramming of opioid pumps carry a considerable risk to the patient. From January 1995 to 2003, the Joint Commission found that 21% of medication error-related sentinel events involved opioids, and of those, 98% resulted in a fatal occurrence.\textsuperscript{24} Two percent of opioid medication errors result in patient harm, however, if a PCA pump is involved, the chance for patient harm increases 3.5-fold.\textsuperscript{24}

Another contributing factor for analgesic gaps is the disparity or inequity in the quality of health care based on age, gender, ethnicity, or race. It is well documented that although the overall health of Americans has improved over the past few decades, those improvements are not shared equally among all racial groups, particularly in the management of both pain in both emergency room and postsurgical settings.\textsuperscript{24,25,26} Elderly or disorientated patients may do poorly with PCA and should probably be offered alternative forms of analgesic delivery. It is not uncommon to find these patients attached to the PCA device yet complaining of severe pain as they have no idea how to locate or when to activate the button, or mistake it for a call button.\textsuperscript{21}

Technology failures with epidural and peripheral nerve catheters are also responsible for analgesic gaps. The success rate of epidural catheters is about 70%, which means that the inherent potential failure of epidural technology is about 30%.\textsuperscript{27} A common situation is pain related to catheter dislodgement following turning, physical therapy, or ambulation. Epidural solutions are very dilute in terms of local anesthetic and/or opioid dose and rapidly become subtherapeutic if the catheter is no longer in the epidural space. Epidural and peripheral nerve infusion–related medication errors can also occur, particularly if there is a kink in the catheter, insufficient solution left in the medication bag, or the device becomes unplugged and the batteries lose their charge. Finally, since any infusion pump requires caregiver input, there is the potential that someone is going to use the wrong solution and infusion settings.\textsuperscript{20,21}

The surgeon and nursing staff should contact anesthesiology caregivers immediately to evaluate any interventional technique that is withheld or administered in subtherapeutic doses. Continuous epidural or peripheral infusions with local anesthetics, the use of single dose longer acting local anesthetics and IV PCA can provide excellent pain control but often such therapy is discontinued and replaced by a surgical order for as-needed opioids, which provide suboptimal analgesia.\textsuperscript{28} While many surgeons have moved away from short-acting opioids as primary postsurgical analgesics and employ NSAIDs or acetaminophen, many continue to prescribe hydrocodone or oxycodone preparations that provide only 3 or 4 hours of pain relief. This creates a cycle in which the patient has to request or take pain medication frequently and experiences periods of inadequate analgesia over and over again. Since acute surgical pain has a constant component with periods of exacerbation, caregivers are increasingly prescribing sustained-release morphine or oxycodone as a continuous approach to pain management.\textsuperscript{29}

**REFERENCES**


TABLE 2.1 — Factors Responsible for Lack of Improvements in Postsurgical Pain Management

- Educational deficits (uninformed, misinformed caregivers)
- Patient misinformation (unrealistic expectations, overconcern regarding addiction risks)
- Lack of “pain service” supervision (dedicated anesthesiology, surgical-, or nurse-directed protocol development and 24-hour coverage)
- Analgesic gaps (pain developing in a PACU, following transition in therapy and following hospital discharge)
- Technology failures (IV infiltration, pump misprogramming, epidural, or nerve block catheter dislodgement)
- Opioid “monotherapy” (overreliance on IV and oral opioids)
- Opioid dependency (not recognizing or adjusting therapy for opioid-tolerant and hyperalgesic patients)

TABLE 2.2 — Analgesic Gaps: Specific Time Periods When Pain Is Unrelieved

- Pain in PACU (intraop analgesic deficiency or lack of local anesthetic wound infiltration)
- Pain during transport to and from procedures
- Technology failures (IV infiltration, pump misprogramming, catheter dislodgement)
- Transition from regional, neuraxial, or IV-patient controlled analgesia
- Inadequate analgesic prescriptions for home discharge

FIGURE 2.1 — Postsurgical Opioid Analgesic Monotherapy

Opioid monotherapy suggests that postsurgical pain can be controlled by increasing opioid dose in proportion to the patient’s pain-intensity complaint. The flaw in this dosing strategy is that increasing opioid dose results in increasing intolerability. This limits opioid dose and the effectiveness of pain management.

FIGURE 2.2 — Opioid-Related Adverse Events Commonly Observed in Postsurgical Patients

Data from a review of 45 randomized controlled trials

FIGURE 2.3 — Postsurgical Opioid-Related Nausea and Vomiting Appear to Be Dose Dependent


FIGURE 2.4 — Avoidance of GI Side Effects Is the Foremost Concern of Surgical Patients

In a relative ranking of patient concerns, avoiding postoperative nausea and vomiting was the most important in this study.

Figure 2.5 National Premier Postsurgical Opioid Outlier Study

This recent study identified relationships between opioid related adverse events (ORAEs) and increased length of Hospital stay /total cost in patients at least 18 years of age between September 2008 and August 2010. 45,342 individuals with an opioid related ADE were matched to 135,941 without an opioid related ADE

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Incidence of opioid related ADE’s was 19%. Opioid ADEs increased mean LOS of 5.2 days (SD 3.5) versus 4.1 days (2.8) (p<0.0001). Opioid ADE’s increased mean Total Cost of hospitalization $18,309 (SD 11,267) verses $17,281 (SD 10,209) (p<.0001) Adjusted cost variation from baseline cost was $1,614

Gary Oderda G, Gan TJ, MD. Abstract 46th ASHP Midyear Clinical Meeting & Exhibition, Poster session December 5, 2011, New Orleans, LA