An Overview of Acute Postoperative Pain Management: Past, Present, and Future

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Learning Objectives: After reading this article, pharmacists should be able to discuss:
1) The importance of pain management in the perioperative period.
2) Common methods to assess pain.
3) The past, present, and future of acute pain management.
4) The common reasons for the undertreatment of pain.
5) Pharmacologic techniques and non-pharmacologic methods of pain management.

The Importance of Pain
Adequate and appropriate pain management will be one of the primary challenges of healthcare in the new millennium. In general, pain is considered to be a protective phenomenon. From an epidemiologic standpoint, its presence extracts a significant societal toll by consistently and persistently accounting for increasing healthcare utilization and subsequent expenditures. Also, problematic are the societal implications of pain in terms of lost work productivity and disability. The personal implications are more with nearly 70% of cancer patients dying with unrelieved pain.

The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." This universally accepted definition involves perception of a painful stimulus and a reaction to the sensation implying a level of subjectivity to the pain experience. Acute pain is limited by a time frame of 3 to 6 months and is described by its temporal relationship to the causative event or injury. It typically resolves with analgesics and treatment of the precipitating event.

Acute pain is a dynamic process involving both beneficial physiologic and detrimental autonomic and immunologic changes. Beyond learned avoidance, pain is beneficial in that it maintains blood pressure and cardiac output while promoting substrate mobilization and hemostasis. The presence of pain also invites psychosocial issues: anxiety, fear, and prolonged convalescence. Disadvantages of acute pain include tachycardia, sustained hypercoagulation, hypertension, and myocardial ischemia, as well as decreased pulmonary function and reserve. These detrimental physiologic changes may lead to strokes, arrhythmias, increased risk of thrombosis (deep venous thrombosis), myocardial infarction, atelectasis, and pneumonia. Thus, the benefits of the acute injury response must be weighed against the disadvantages in the postoperative period. This gives credence to the importance of efficacious pain management to prevent these adverse sequelae.

The Assessment and Evaluation of Pain
Common experimental techniques used to quantify pain in the laboratory are not readily transferable to the bedside. Clinicians are dependent upon the patient's report of pain since there are no readily reproducible models to clearly quantify the level of clinical pain any individual patient experiences.

Suffering is often confused with pain, but denotes a physical and psychological response, where pain may be only a small part. In the past, acute postoperative pain management centered on a "one size fits all" approach. It was most commonly treated in a palliative fashion by opioid analgesics via intramuscular (IM) injection with no assessment of its efficacy.

The first component of acute pain management involves anticipation of postoperative pain and ongoing surveillance. This entails assessment of pain and frequent documentation. In assessing an individual's pain, it is critical to assess the baseline intensity, character, quality, and impact of the pain experience. This allows pain to be measured and treatment goals developed. The most common scales utilized in the adult population are a 10-point visual analogue scale (VAS; 0 = no pain, 10 = worst pain imaginable) or a 10-point verbal analogue scale (VAPS) and categorical measures of pain (eg, none, mild, moderate, severe). The McGill Pain Questionnaire is a standardized 20-item tool that provides a description of the character and quality of the patient's pain.

Assessment of pain in the pediatric population is more difficult due to cognitive issues. A variety of pain measures range from physical characteristics to parental input are designed specifically for children and are utilized based on the verbal state of the child. However, the gold standard for the assessment of pain remains patient report.

The Undertreatment of Pain
Multiple factors contribute to the undertreatment of pain: patient and clinician demographics, healthcare professionals' knowledge base, and patient education. Other major reasons for the undertreatment of pain are inadequate assessment of pain, use of pain dosing, lack of documentation of efficacy, and regulatory issues. Furthermore, triphasic prescription policies for strong opioids have deterred the use of strong opioids for patients who may need them.

Current Pain Management
Today, management of acute postoperative pain involves a preemptive approach where pain is one of the daily clinical problems that are actively managed. Combinations of opioids and pain adjuvants are used to control pain. Ideal pain management involves a multi-level approach where: 1) peripheral input is inhibited, 2) spinal cord transmission is blocked, and 3) central processing of pain is prevented.

During the preoperative period, the pain management regimen should be discussed with a thorough review of the risks and benefits of treatment. It is critical to assess the patient's preoperative pain history during this time period in order to optimize the design of an individualized pain regimen.

There are multiple indicators for patients at risk for poor postoperative pain control. Patients with chronic diseases that have pain as a component (eg, sickle cell anemia, fibromyalgia, rheumatoid arthritis) may be tolerant to the typical doses of opioids administered in the postoperative setting. Furthermore, patients with systemic diseases may metabolize opioid (continued on page 12)
analgesics differently. Patients with psychiatric disorders (e.g., anxiety and depression), chronic pain or a prior history of substance abuse, addiction, or psychiatric disorders have substantial analgesic requirements. Patients with language barriers as well as the elderly and pediatric populations are at significant risk for the undertreatment of pain.

Opioid Analgesics
The major goal of postoperative pain management is to provide effective analgesia while minimizing side effects. No matter the patient population (inpatient or outpatient), inadequate pain control has a significant impact upon patient satisfaction. The presence of acute postoperative pain delays discharge and remains a common surgical cause of unanticipated admission of the outpatient. Despite tremendous improvements in knowledge and additions to the armamentarium of currently available analgesic techniques, the mainstay of acute postoperative pain management remains opioids.

At therapeutic doses, opioids provide analgesia. However, opioids may have many undesirable side effects: sedation, nausea, vomiting, respiratory depression, dysphoria, and tolerance. These side effects can be managed by changing the opioid, patient education, or treatment with other medications (e.g., naloxone, diphenhydramine, or antiemetics). It is important to emphasize that the use of opioids for acute postoperative pain rarely leads to addiction.

There are multiple modalities currently utilized to administer opioids intravenous (IV) patient-controlled analgesia (PCA), intramuscular (IM), transdermal, rectal, epidural, intrathecal, sublingual, and buccal routes. PCA can overcome the inherent pharmacokinetic problems of IM opioids. Besides their discomfort, IM injections when compared with IV PCA have been shown to provide inadequate analgesia. PCA also prevents a communication lag between the patient and the caregiver, thus decreasing the need for nursing and interventions.

PCA allows the patient to be the best judge of their pain and use the PCA prophylactically to titrate and improve pain control. PCAs also provide important information regarding a patient's individual requirements such that an adequate oral analgesic regimen can be implemented prior to discharge. However, problems can occur with PCAs including operator, patient, and mechanical errors.

Epidural and intrathecal opioids provide superior analgesia to systemic administration of opioids. The combined use of local anesthetics (e.g., bupivacaine and ropivacaine) and opioid analgesics (e.g., fentanyl, hydromorphone, and morphine) administered epidurally may provide additional benefits. Yeager et al showed that in a high-risk surgical population, patients who received epidural opioids following surgery had a better outcome as determined by decreased morbidity and mortality.

Non-Opioid Analgesics
A variety of agents other than opioids have become available as adjuncts to pain management. The most prominent of these are the non-steroidal anti-inflammatory agents (NSAIDs).

Many studies have suggested that NSAIDs decrease postoperative opioid requirements and provide analgesia with less nausea, vomiting, and sedation. Oral agents (e.g., ibuprofen, indomethacin, etc.) have been administered in the preoperative and postoperative period. Ketorolac tromethamine (Toradol®) is a potent injectable NSAID that is utilized during the peripreropeative period or when a patient cannot tolerate oral medications. However, a great deal of debate exists as to whether or not ketorolac can be used alone as a single agent for the management of moderate to severe pain. NSAIDs have the ability to provide prostaglandin analgesia both centrally and peripherally. The most common side effects associated with NSAIDs are gastrointestinal irritation, nausea, impairment of platelet aggregation, and other non-specific complaints. Despite the clear advantages of utilizing parenteral ketorolac in a fastig patient, there are no differences in efficacy or side effects between oral or parenterally administered NSAIDs. In fact, oral NSAIDs generally provide a cost advantage over parenteral formulations. A number of studies have documented the efficacy of NSAIDs as an alternative, or adjunct to opioids by showing enhanced recovery profile and opioid sparing with a reduction in pain scores.

Acetaminophen has been shown to have significant analgesic effects. It has beneficial effects in providing opioid sparing and does not affect wound healing. It is also not currently available in an injectable form, but is commonly used in the pediatric population as a suppository. Despite an injectable aspirin (lysing acetyl salicylate), it has been shown to have minimal analgesic effects and has no real advantages.

Local Anesthetics and Peripheral Nerve Blocks
Peripheral nerve blocks have been utilized intraoperatively to provide anesthesia for surgical procedures of the extremities. These blocks can be continued into the postoperative period to provide postoperative anesthesia without delaying discharge. Intrarticular bupivacaine and morphine has been shown to decrease postoperative opioid requirements and facilitate earlier ambulation following joint arthroscopy. Local anesthetic filtration of the surgical site (inguinal nerve), or nerve block of a traumatized area (intercostal nerve block for fractured ribs), has been used to supplement intraoperative analgesia and can also be utilized to improve the postoperative course. These blocks can also be utilized to provide excellent analgesia while improving recovery.

Intraoperative infiltration with a local anesthetic solution can obviate the need for any additional analgesics. It is also important to remember that simple techniques such as the application of topical anesthetics can also be used to provide effective analgesia as well.

Alternative Therapies
Non-pharmacologic techniques of managing acute postoperative pain have gained great popularity. Techniques such as relaxation techniques, simple comfort measures (ice, heat, massage, and reassurance) and transcutaneous electrical nerve stimulation (TENS) can enhance traditional analgesics. The techniques of acupuncture and acupressure have been used to decrease pain as well as nausea and vomiting.

Future Directions of Postoperative Pain Management
Acute pain will be recognized as a significant health concern. Multimodal methods and novel delivery systems will be developed. Multidisciplinary teams will be used to prevent, evaluate, and treat pain. Increased clinical knowledge and patient education regarding pain management will lead to designing specific individual pain regimens. Designer analgesics that incorporate the patient’s pharmacogenetic profile will be selected to provide optimal analgesia with minimal side effects. Baseline pain information and psychosocial issues (e.g., anxiety) will be obtained to facilitate appropriate analgesic prescribing. Outcome studies will be done to document the benefits of newer analgesic agents in order to individualize pain management and to hasten postoperative recovery. More cost effective and simple patient controlled methods for relieving acute and postoperative pain will be utilized to allow the patient to titrate their analgesia.

In the new millennium, opioid analgesics will remain the mainstay of postoperative pain management. However, NSAIDs, local anesthetics, opioid and local anesthetic combinations, and other pain adjuvants (antidepressants), will be used to reduce side effects, decrease morbidity, and improve analgesia. Thus acute postoperative pain will be viewed on a continuum with chronic pain leading to aggressive management and enhancements in treatment.

References