

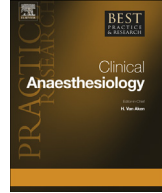


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### Multimodal therapy in perioperative analgesia



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This article reviews the current evidence for multimodal analgesic options for common surgical procedures. As perioperative physicians, we have come a long way from using only opioids for postoperative pain to combinations of acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), selective Cyclooxygenase (COX-2) inhibitors, local anesthetics, *N*-methyl-D-aspartate (NMDA) receptor antagonists, and regional anesthetics.

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chronic postoperative pain  
persistent postoperative pain

As discussed in this article, many of these agents have decreased narcotic requirements, improved patient satisfaction, and decreased postanesthesia care unit (PACU) times, as well as morbidity in the perioperative period.

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## Introduction: multimodal modal analgesia along the neurochemical pathway

Adequate control of acute pain is important for both short-term and long-term patient outcomes, as perioperative pain may lead to neural sensitization potentially resulting in persistent postoperative pain [1]. In the perioperative setting, numerous multimodal techniques have been utilized in order to target pain along various pathways involving transduction, transmission, modulation, and perception by the central nervous system. Combinations of medications or interventional analgesic techniques have allowed for modulation of pain at various points in the neurochemical pathway within the central nervous system; this results in synergistic analgesia which is the cornerstone of multimodal analgesia.

In this article, we have chosen to describe analgesic choices by surgical specialty, mirroring the extensive efforts of the Procedure specific postoperative pain management (PROSPECT) group, in order to provide a rapid review of available evidence for the clinician – with the hope of phasing in multimodal regimens into daily patient care [2]. Refer to Table 1 for a summary of select analgesic options by surgical procedure and Table 2 for the description of analgesic modalities. Appropriate systemic opioid administration is an implied component of multimodal analgesic regimens and will not be separately discussed. Specific adjuvant agents have been included at the end of this article as an addendum.

It should be noted that it is not possible or desirable to synthesize these options into “one-size-fits-all” algorithms. Consequently, a thoughtful approach tailoring available analgesic modalities (Fig. 1) to specific clinical situations is necessary in order to practice the science and art of perioperative pain medicine. This article intends to review recent evidence of perioperative analgesic options for only select surgical procedures – specifically, general surgery, orthopedic surgery, gynecology/urologic, and cardiothoracic surgeries.

### Approach to the general surgery patient

The approach to the general surgical patient requires an understanding of the perioperative course associated with different types of surgery. A hernia repair requires a different technique from a patient receiving a liver resection or a gastric bypass. The following section discusses multimodal analgesic management of common abdominal procedures.

#### *Laparotomy*

##### *Neuraxial analgesia*

Epidural analgesia is known to provide significant pain relief with improved gastrointestinal function after colorectal surgery performed via laparotomy; the results are more significant compared to colorectal resection performed via the laparoscopic approach or when used as a part of a multimodal analgesic regimen, as indicated by a 2007 review of the effect of epidural analgesia on postoperative outcome after colorectal surgery [3].

##### *Multimodal drug analgesia*

In addition to neuraxial techniques, multimodal drug therapies have proven to be useful. In comparison to medication adjuvants, epidural analgesia was found to be non-superior when compared to a six-drug (ketamine, clonidine, morphine, tramadol, paracetamol, and a nonsteroidal anti-inflammatory drug (NSAID)) multimodal analgesic regimen in a retrospective case control study of a patient undergoing colorectal laparotomy [4]. This indicates the additional benefit of multimodal

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