

Intervention	Suggested Use	Comments	Contraindications and Cautions
Nonpharmacologic therapies Transcutaneous electrical nerve stimulation	Consider as an adjunct to other postoperative pain management treatments	Typically applied at incision site	Pacemaker or implanted defibrillator, lymphedema, broken skin
Cognitive modalities	Consider as an adjunct to other postoperative pain management treatments	Includes guided imagery and other relaxation methods, hypnosis, intraoperative suggestions, and music Might require preoperative education and patient training for optimal results	None; caution in patients with history of psychosis
Systemic pharmacologic therapies Acetaminophen and NSAID	Use as component of multimodal analgesia	No clear difference between IV and oral administration Reduces use of postoperative opioids Celecoxib usually dosed at 200-400 mg 30 minutes to 1 hour preoperatively and then 200 mg bid postoperatively Acetaminophen usually dosed at 500-1000 mg po or IV every 6 hours Some observational evidence of association between high-dose NSAIDs and nonunion in spinal fusion and surgery for fractures, and between NSAID use and anastomotic leak in intestinal surgery NSAIDs contraindicated in patients who undergo coronary artery bypass surgery	Acetaminophen: hepatotoxicity NSAIDs: gastrointestinal bleeding and ulceration, cardiovascular events, renal dysfunction
Oral opioids	Use as component of multimodal analgesia	Oral is the preferred route for patients who can take oral medications	Respiratory depression, potential for addiction and abuse, sedation, nausea and vomiting, constipation
Patient-controlled IV analgesia with opioids	Use when the parenteral route is needed for postoperative systemic analgesia for more than a few hours	Avoid basal infusion of opioids in opioid-naive adults	See oral opioids
Gabapentin and pregabalin	Consider as a component of multimodal analgesia; primarily studied in patients who underwent major surgery; opioid-sparing	Gabapentin doses vary; in trials, usually dosed at 600-1200 mg 1-2 hours preoperatively, then 600 mg postoperatively (single or multiple doses) Pregabalin doses vary; in trials, usually dosed at 100 mg or 300 mg preoperatively, or 150 mg or 300 mg preoperatively, followed by the same dose 12 hours later Higher doses might be more effective, but might also be associated with increased sedation	Dizziness, sedation; reduced dose with renal dysfunction
Ketamine IV	Consider as a component of multimodal analgesia in patients who undergo major surgery; opioid-sparing	Dosing varies widely; consider preoperative bolus of 0.5 mg/kg followed by an infusion at 10 ng/kg/min intraoperatively, with or without a postoperative infusion at a lower dose Limited evidence for use in children	Patients with history of psychosis Hallucinations, nightmares, dissociative symptoms
Lidocaine IV	Consider as a component of multimodal analgesia in patients who undergo open and laparoscopic abdominal surgery	Dosing varies; consider induction dose of 1.5 mg/kg followed by 2 mg/kg/h intraoperatively	Conduction block Dizziness, seizures, bradycardia
Local, intra-articular, and topical therapies Local anesthetic infiltration	Use local anesthetic infiltration at incision site for surgical procedures for which there is evidence showing benefit (examples: cesarean section, laparotomy, and hemorrhoid surgery)	Clinicians should be knowledgeable regarding specific local anesthetic infiltration techniques	See lidocaine IV above; also local pain, infection, bleeding
Intra-articular local anesthetic and/or opioid	Use intra-articular injections for surgical procedures for which there is evidence of benefit (examples: hip, knee, and shoulder surgery)	Clinicians should be knowledgeable regarding specific intra-articular injection techniques Caution with use of continuous intra-articular bupivacaine in shoulder surgery because of association with chondrolysis	See lidocaine IV and oral opioids; also local pain, infection, bleeding; potential chondrolysis with intra-articular shoulder injections
Topical local anesthetics	Use in combination with penile nerve block in infants undergoing circumcision	4% Liposomal lidocaine or eutectic mixture of local anesthetics, lidocaine, and procaine	See lidocaine IV; also local pain, infection, bleeding, rash
Peripheral regional and neuraxial analgesic therapies Peripheral regional anesthetic techniques	Use as part of multimodal analgesia for surgical procedures for which there is evidence of benefit (examples: thoracotomy, lower or upper extremity surgery, hemorrhoid surgery, circumcision)	Clinicians should be familiar with specific regional anesthetic techniques Use continuous over single-injection techniques when longer duration of analgesia is required	See lidocaine; also potential for falls
Neuraxial analgesia (epidural with local anesthetic [with or without opioids] or intrathecal opioid)	Use for major thoracic, abdominal, cesarean section, and lower extremity surgery	No clear difference between continuous infusion with epidural catheter vs single dose of intrathecal morphine	See lidocaine and oral opioids; also motor weakness and risk of falls

bid, twice per day; IV, intravenous; NSAID, nonsteroidal anti-inflammatory drug; po, orally.

Note: Table data are not listed in order of preference or strength of evidence. The choice of treatments must be made on the basis of comprehensive patient assessment and the available evidence with consideration of multiple factors including individual risk factors for adverse events, comorbidities, cost, patient response; combinations of medications and techniques are often indicated. Doses are for typical adults.