PRACTICE Guidelines are systematically developed recom-
mendations that assist the practitioner and patient
in making decisions about health care. These recommendations
can be adopted, modified, or rejected according to
clinical needs and constraints and are not intended to replace
local institutional policies. In addition, Practice Guidelines
developed by the American Society of Anesthesiologists (ASA) are
not intended as standards or absolute requirements, and their
use cannot guarantee any specific outcome. Practice Guidelines
are subject to revision as warranted by the evolution of medical
knowledge, technology, and practice. They provide basic rec-
mendations that are supported by a synthesis and analysis of
the current literature, expert and practitioner opinion, open fo-
rum commentary, and clinical feasibility data.

This document updates the “Practice Guidelines for Acute Pain Management in the Perioperative Setting,” adopted by the ASA in 2003 and published in 2004.*

Methodology

A. Definition of Acute Pain Management in the
Perioperative Setting

For these Guidelines, acute pain is defined as pain that is
present in a surgical patient after a procedure. Such pain may
be the result of trauma from the procedure or procedure-
related complications. Pain management in the perioperative
setting refers to actions before, during, and after a procedure

American Society of Anesthesiologists Task Force on Acute Pain Management: Practice guidelines for acute pain management in the perioperative setting. An updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. ANESTHESIOLOGY 2004; 100:1573–81.

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that are intended to reduce or eliminate postoperative pain before discharge.

**B. Purpose of the Guidelines**
The purpose of these Guidelines is to (1) facilitate the safety and effectiveness of acute pain management in the perioperative setting; (2) reduce the risk of adverse outcomes; (3) maintain the patient’s functional abilities, as well as physical and psychologic well-being; and (4) enhance the quality of life for patients with acute pain during the perioperative period. Adverse outcomes that may result from the undertreatment of perioperative pain include (but are not limited to) thromboembolic and pulmonary complications, additional time spent in an intensive care unit or hospital, hospital readmission for further pain management, needless suffering, impairment of health-related quality of life, and development of chronic pain. Adverse outcomes associated with the management of perioperative pain include (but are not limited to) respiratory depression, brain or other neurologic injury, sedation, circulatory depression, nausea, vomiting, pruritus, urinary retention, impairment of bowel function, and sleep disruption. Health-related quality of life includes (but is not limited to) physical, emotional, social, and spiritual well-being.

**C. Focus**
These Guidelines focus on acute pain management in the perioperative setting for adult (including geriatric) and pediatric patients undergoing either inpatient or outpatient surgery. Modalities for perioperative pain management addressed in these Guidelines require a higher level of professional expertise and organizational structure than “as needed” intramuscular or intravenous injections of opioid analgesics. These Guidelines are not intended as an exhaustive compendium of specific techniques.

Patients with severe or concurrent medical illness such as sickle cell crisis, pancreatitis, or acute pain related to cancer or cancer treatment may also benefit from aggressive pain control. Labor pain is another condition of interest to anesthesiologists. However, the complex interactions of concurrent medical therapies and physiologic alterations make it impractical to address pain management for these populations within the context of this document.

Although patients undergoing painful procedures may benefit from the appropriate use of anxiolytics and sedatives in combination with analgesics and local anesthetics when indicated, these Guidelines do not specifically address the use of anxiolysis or sedation during such procedures.

**D. Application**
These Guidelines are intended for use by anesthesiologists and individuals who deliver care under the supervision of anesthesiologists. The Guidelines may also serve as a resource for other physicians and healthcare professionals who manage perioperative pain. In addition, these Guidelines may be used by policymakers to promote effective and patient-centered care.

Anesthesiologists bring an exceptional level of interest and expertise to the area of perioperative pain management. Anesthesiologists are uniquely qualified and positioned to provide leadership in integrating pain management within perioperative care. In this leadership role, anesthesiologists improve quality of care by developing and directing institution-wide, interdisciplinary perioperative analgesia programs.

**E. Task Force Members and Consultants**
The original Guidelines were developed by an ASA appointed task force of 11 members, consisting of anesthesiologists in private and academic practices from various geographic areas of the United States, and two consulting methodologists from the ASA Committee on Standards and Practice Parameters.

The Task Force updated the Guidelines by means of a seven-step process. First, they reached consensus on the criteria for evidence. Second, original published research studies from peer-reviewed journals relevant to acute pain management were reviewed and evaluated. Third, expert consultants were asked to: (1) participate in opinion surveys on the effectiveness of various acute pain management recommendations and (2) review and comment on a draft of the updated Guidelines. Fourth, opinions about the updated Guideline recommendations were solicited from a sample of active members of the ASA. Fifth, opinion-based information obtained during an open forum for the original Guidelines, held at a major national meeting, was reexamined. Sixth, the consultants were surveyed to assess their opinions on the feasibility of implementing the updated Guidelines. Seventh, all available information was used to build consensus to finalize the updated Guidelines. A summary of recommendations may be found in appendix 1.

**F. Availability and Strength of Evidence**
Preparation of these Guidelines followed a rigorous methodological process. Evidence was obtained from two principal sources: scientific evidence and opinion-based evidence.

**Scientific Evidence**
Study findings from published scientific literature were aggregated and reported in summary form by evidence category, as described below. All literature (e.g., randomized controlled trials [RCTs], observational studies, case reports) relevant to each topic was considered when evaluating the findings. However, for reporting purposes in this document, only the highest level of evidence (i.e., level 1, 2, or 3 within...
category A, B, or C, as identified below) is included in the summary.

**Category A: Supportive Literature**
Randomized controlled trials report statistically significant (\(P < 0.01\)) differences between clinical interventions for a specified clinical outcome.

- **Level 1:** The literature contains multiple RCTs, and aggregated findings are supported by meta-analysis.‡
- **Level 2:** The literature contains multiple RCTs, but the number of studies is insufficient to conduct a viable meta-analysis for the purpose of these Guidelines.
- **Level 3:** The literature contains a single randomized controlled trial.

**Category B: Suggestive Literature**
Information from observational studies permits inference of beneficial or harmful relationships among clinical interventions and clinical outcomes.

- **Level 1:** The literature contains observational comparisons (e.g., cohort, case-control research designs) of clinical interventions or conditions and indicates statistically significant differences between clinical interventions for a specified clinical outcome.
- **Level 2:** The literature contains noncomparative observational studies with associative (e.g., relative risk, correlation) or descriptive statistics.
- **Level 3:** The literature contains case reports.

**Category C: Equivocal Literature**
The literature cannot determine whether there are beneficial or harmful relationships among clinical interventions and clinical outcomes.

- **Level 1:** Meta-analysis did not find significant differences (\(P > 0.01\)) among groups or conditions.
- **Level 2:** The number of studies is insufficient to conduct meta-analysis, and (1) RCTs have not found significant differences among groups or conditions or (2) RCTs report inconsistent findings.
- **Level 3:** Observational studies report inconsistent findings or do not permit inference of beneficial or harmful relationships.

**Category D: Insufficient Evidence from Literature**
The lack of scientific evidence in the literature is described by the following terms.

- **Inadequate:** The available literature cannot be used to assess relationships among clinical interventions and clinical outcomes. The literature either does not meet the criteria for content as defined in the “Focus” of the Guidelines or does not permit a clear interpretation of findings due to methodological concerns (e.g., confounding in study design or implementation).

- **Silent:** No identified studies address the specified relationships among interventions and outcomes.

**Opinion-based Evidence**
All opinion-based evidence (e.g., survey data, open-forum testimony, Internet-based comments, letters, editorials) relevant to each topic was considered in the development of these updated Guidelines. However, only the findings obtained from formal surveys are reported.

Opinion surveys were developed for this update by the Task Force to address each clinical intervention identified in the document. Identical surveys were distributed to expert consultants and ASA members.

**Category A: Expert Opinion**
Survey responses from Task Force-appointed expert consultants are reported in summary form in the text, with a complete listing of consultant survey responses reported in appendix 2.

**Category B: Membership Opinion**
Survey responses from active ASA members are reported in summary form in the text, with a complete listing of ASA member survey responses reported in appendix 2.

Opinion survey responses are recorded using a 5-point scale and summarized based on median values.§

- **Strongly Agree:** Median score of 5 (At least 50% of the responses are 5)
- **Agree:** Median score of 4 (At least 50% of the responses are 4 or 4 and 5)
- **Equivocal:** Median score of 3 (At least 50% of the responses are 3, or no other response category or combination of similar categories contain at least 50% of the responses)
- **Disagree:** Median score of 2 (At least 50% of responses are 2 or 1 and 2)
- **Strongly Disagree:** Median score of 1 (At least 50% of responses are 1)

**Category C: Informal Opinion**
Open-forum testimony from the previous update, Internet-based comments, letters, and editorials are all informally evaluated and discussed during the development of Guideline recommendations. When warranted, the Task Force may add educational information or cautionary notes based on this information.

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‡ All meta-analyses are conducted by the American Society of Anesthesiologists methodology group. Meta-analyses from other sources are reviewed but not included as evidence in this document.

§ When an equal number of categorically distinct responses are obtained, the median value is determined by calculating the arithmetic mean of the two middle values. Ties are calculated by a predetermined formula.
Guidelines

I. Institutional Policies and Procedures for Providing Perioperative Pain Management

Institutional policies and procedures include (but are not limited to) (1) education and training for healthcare providers, (2) monitoring of patient outcomes, (3) documentation of monitoring activities, (4) monitoring of outcomes at an institutional level, (5) 24-h availability of anesthesiologists providing perioperative pain management, and (6) use of a dedicated acute pain service.

Observational studies report that education and training programs for healthcare providers are associated with decreased pain levels,1–4 decreased nausea and vomiting,2 and improved patient satisfaction1 (Category B2 evidence), although the type of education and training provided varied across the studies. Published evidence is insufficient to evaluate the impact of monitoring patient outcomes at either the individual patient or institutional level, and the 24-h availability of anesthesiologists (Category D evidence). Observational studies assessing documentation activities suggest that pain outcomes are not fully documented in patient records (Category B2 evidence).5–11 Observational studies indicate that acute pain services are associated with reductions in perioperative pain (Category B2 evidence),12–20 although treatment components of the acute pain services varied across the studies.

The consultants and ASA members strongly agree that anesthesiologists offering perioperative analgesia services should provide, in collaboration with other healthcare professionals as appropriate, ongoing education and training of hospital personnel regarding the effective and safe use of the available treatment options within the institution. The consultants and ASA members also strongly agree that anesthesiologists and other healthcare providers should use standardized, validated instruments to facilitate the regular evaluation and documentation of pain intensity, the effects of pain therapy, and side effects caused by the therapy. The ASA members agree and the consultants strongly agree that: (1) anesthesiologists responsible for perioperative analgesia should be available at all times to consult with ward nurses, surgeons, or other involved physicians, and should assist in evaluating patients who are experiencing problems with any aspect of perioperative pain relief; (2) anesthesiologists should provide analgesia services within the framework of an Acute Pain Service and participate in developing institutional policies and procedures. An integrated approach to perioperative pain management that minimizes analgesic gaps includes ordering, administering, and transitioning therapies, and transferring responsibility for perioperative pain therapy, as well as outcomes assessment and continuous quality improvement.

II. Preoperative Evaluation of the Patient

Preoperative patient evaluation and planning is integral to perioperative pain management. Proactive individualized planning is an anticipatory strategy for postoperative analgesia that integrates pain management into the perioperative care of patients. Patient factors to consider in formulating a plan include type of surgery, expected severity of postoperative pain, underlying medical conditions (e.g., presence of respiratory or cardiac disease, allergies), the risk–benefit ratio for the available techniques, and a patient’s preferences or previous experience with pain.

Although the literature is insufficient regarding the efficacy of a preoperative directed pain history, a directed physical examination, or consultations with other healthcare providers (Category D evidence), the Task Force points out the obvious value of these activities. One observational study in a neonatal intensive care unit suggests that the implementation of a pain management protocol may be associated with reduced analgesic use, shorter time to extubation, and shorter times to discharge (Category B2 evidence).21

The ASA members agree and the consultants strongly agree that a directed history, a directed physical examination,
and a pain control plan should be included in the anesthetic preoperative evaluation.

**Recommendations for Preoperative Evaluation of the Patient.** A directed pain history, a directed physical examination, and a pain control plan should be included in the anesthetic preoperative evaluation.

### III. Preoperative Preparation of the Patient

Preoperative patient preparation includes (1) adjustment or continuation of medications whose sudden cessation may provoke a withdrawal syndrome, (2) treatments to reduce preexisting pain and anxiety, (3) premedications before surgery as part of a multimodal analgesic pain management program, and (4) patient and family education, including behavioral pain control techniques.

There is insufficient literature to evaluate the impact of preoperative adjustment or continuation of medications whose sudden cessation may provoke an abstinence syndrome (Category D evidence). Similarly, there is insufficient literature to evaluate the efficacy of the preoperative initiation of treatment either to reduce preexisting pain or as part of a multimodal analgesic pain management program (Category D evidence). RCTs are equivocal regarding the impact of patient and family education on patient pain, analgesic use, anxiety, and time to discharge, although features of patient and family education varied across the studies (Category C2 evidence).22–35

The consultants and ASA members strongly agree that patient preparation for perioperative pain management should include appropriate adjustments or continuation of medications to avert an abstinence syndrome, treatment of preexistent pain, or preoperative initiation of therapy for postoperative pain management. The ASA members agree and the consultants strongly agree that anesthesiologists offering perioperative analgesia services should provide, in collaboration with others as appropriate, patient and family education. The consultants and ASA members agree that perioperative patient education should include instruction in behavioral modalities for control of pain and anxiety.

**Recommendations for Preoperative Preparation of the Patient.** Patient preparation for perioperative pain management should include appropriate adjustments or continuation of medications to avert an abstinence syndrome, treatment of preexistent pain, or preoperative initiation of therapy for postoperative pain management.

Anesthesiologists offering perioperative analgesia services should provide, in collaboration with others as appropriate, patient and family education regarding their important roles in achieving comfort, reporting pain, and in proper use of the recommended analgesic methods. Common misconceptions that overestimate the risk of adverse effects and addiction should be dispelled. Patient education for optimal use of patient-controlled analgesia (PCA) and other sophisticated methods, such as patient-controlled epidural analgesia, might include discussion of these analgesic methods at the time of the preanesthetic evaluation, brochures and videotapes to educate patients about therapeutic options, and discussion at the bedside during postoperative visits. Such education may also include instruction in behavioral modalities for control of pain and anxiety.

### IV. Perioperative Techniques for Pain Management

Perioperative techniques for postoperative pain management include but are not limited to the following single modalities: (1) central regional (i.e., neuraxial) opioid analgesia; (2) PCA with systemic opioids; and (3) peripheral regional analgesic techniques, including but not limited to intercostal blocks, plexus blocks, and local anesthetic infiltration of incisions.

Central regional opioid analgesia: Randomized controlled trials report improved pain relief when use of preincisional epidural or intrathecal morphine is compared with preincisional oral, intravenous, or intramuscular morphine (Category A2 evidence).36–39 RCTs comparing preoperative or preincisional intrathecal morphine or epidural sufentanil with saline placebo report inconsistent findings regarding pain relief (Category C2 evidence).40–43 RCTs comparing preoperative or preincisional epidural morphine or fentanyl with postoperative epidural morphine or fentanyl are equivocal regarding postoperative pain scores (Category C2 evidence).44,45

Meta-analyses of RCTs report improved pain relief and increased frequency of pruritus in comparisons of postincisional epidural morphine and saline placebo (Category A1 evidence); findings for the frequency of nausea or vomiting were equivocal (Category C1 evidence). Meta-analyses of RCTs comparing postincisional epidural morphine with intramuscular morphine report improved pain relief and an increased frequency of pruritus (Category A1 evidence).49,55–59 One RCT reports improved pain scores and less analgesic use when postincisional intrathecal fentanyl is compared with no postincisional spinal treatment (Category A3 evidence).60

One RCT reports improved pain scores when postoperative epidural morphine is compared with postoperative epidural saline (Category A3 evidence).61 Meta-analyses of RCTs report improved pain scores and a higher frequency of pruritus and urinary retention when postoperative epidural morphine is compared with intramuscular morphine (Category A3 evidence); findings for nausea and vomiting are equivocal (Category C2 evidence). Findings from RCTs are equivocal regarding the analgesic efficacy of postoperative epidural fentanyl compared with postoperative IV fentanyl (Category C2 evidence)71–74; meta-analytic findings are equivocal for nausea and vomiting and pruritus (Category C1 evidence).72–76

PCA with systemic opioids: Randomized controlled trials report equivocal findings regarding the analgesic efficacy of IV PCA techniques compared with nurse or staff-administered intravenous analgesia (Category C2 evidence).77–80

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Meta-analysis of RCTs reports improved pain scores when IV PCA morphine is compared with intramuscular morphine (Category A1 evidence). Findings from meta-analysis of RCTs comparing epidural PCA and IV PCA opioids are equivocal regarding analgesic efficacy (Category C1 evidence). Findings from meta-analyses of RCTs indicate more analgesic use when IV PCA with a background infusion of morphine is compared with IV PCA without a background infusion (Category A1 evidence); findings were equivocal regarding pain relief, nausea and vomiting, pruritus, and sedation (Category C1 evidence).

Peripheral regional techniques: For these Guidelines, peripheral regional techniques include peripheral nerve blocks (e.g., intercostal, ilioinguinal, interpleural, or plexus blocks), intraarticular blocks, and infiltration of incisions. RCTs indicate that preincisional intercostal or interpleural bupivacaine compared with saline is associated with improved pain scores and analgesic use when postincisional plexus and other blocks are compared with saline (Category A2 evidence). Meta-analyses of RCTs report equivocal findings for pain relief and analgesic used when postoperative intercostal or interpleural blocks are compared with saline (Category A1 evidence).

Meta-analyses of RCTs report equivocal findings for pain relief and analgesic used when preincisional plexus blocks with bupivacaine are compared with saline (Category C2 evidence). Meta-analyses of RCTs report less analgesic use when preincisional plexus blocks with bupivacaine are compared with saline (Category A1 evidence); findings are equivocal for nausea and vomiting (Category C1 evidence). Meta-analyses of RCTs report lower pain scores when preincisional plexus and other blocks are compared with no block (Category A1 evidence). RCTs report equivocal findings for pain scores and analgesic use when postincisional intercostal or other blocks are compared with saline or no block (Category C2 evidence). RCTs report equivocal findings for pain scores and analgesic use when postincisional intercostal opioids or local anesthetics are compared with saline (Category C2 evidence).

V. Multimodal Techniques for Pain Management

Multimodal techniques for pain management include the administration of two or more drugs that act by different mechanisms for providing analgesia. These drugs may be administered via the same route or by different routes.

Multimodal techniques with central regional analgesics: Meta-analyses of RCTs report improved pain scores (Category A1 evidence) and equivocal findings for nausea and vomiting and pruritus (Category C1 evidence) when epidural morphine combined with local anesthetics is compared with epidural morphine alone. Meta-analyses of RCTs report improved pain scores and more motor weakness when epidural fentanyl combined with local anesthetics is compared with epidural morphine alone. Meta-analyses of RCTs report improved pain scores, greater pain relief, and a higher frequency of pruritus (Category A1 evidence) when epidural morphine combined with bupivacaine is compared with epidural bupivacaine alone; equivocal findings are reported for nausea and vomiting (Category C1 evidence). RCTs report equivocal findings when epidural fentanyl combined with bupivacaine is compared with epidural bupivacaine alone (Category C2 evidence).

The consultants and ASA members strongly agree that anesthesiologists who manage perioperative pain should use therapeutic options such as epidural or intrathecal opioids, systemic opioid PCA, and regional techniques after thoughtfully considering the risks and benefits for the individual patient; they also strongly agree that these modalities should be used in preference to intramuscular opioids ordered “as needed.” The consultants and ASA members also strongly agree that the therapy selected should reflect the individual anesthesiologist’s expertise, as well as the capacity for safe application of the modality in each practice setting. Moreover, the consultants and ASA members strongly agree that special caution should be taken when continuous infusion modalities are used, as drug accumulation may contribute to adverse events.

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pruritus (Category A1 evidence)180,181,188,195,196 with equivocal findings for nausea and vomiting (Category C1 evidence).179–181,188,195–197 RCTs report equivocal findings for pain scores, nausea and vomiting, pruritus, and motor weakness when epidural fentanyl with ropivacaine is compared with epidural ropivacaine (Category C2 evidence).198–201 Meta-analyses of RCTs200,202–206 are equivocal for pain scores (Category C2 evidence) and a higher frequency of pruritus when epidural sufentanil combined with ropivacaine is compared with epidural ropivacaine (Category A1 evidence). Meta-analysis of RCTs is equivocal for pain scores when epidural opioids combined with clonidine is compared with epidural opioids (Category C1 evidence).207–212

Multimodal techniques with systemic analgesics: Meta-analyses of RCTs213–220 report improved pain scores and reduced analgesic use (Category A1 evidence) when intravenous morphine combined with ketorolac is compared with intravenous morphine; equivocal findings are reported for nausea and vomiting (Category C1 evidence). Meta-analyses of RCTs221–226 report equivocal findings for pain scores, analgesic use, or nausea scores when intravenous morphine combined with ketamine is compared with intravenous morphine (Category C1 evidence). RCTs report inconsistent findings for pain scores and morphine use when intravenous patient-controlled opioid analgesia (IV PCA) combined with oral cyclooxygenase-2 (COX-2) selective nonsteroidal antiinflammatory drugs (NSAIDs)227 or nonselective NSAIDs228,229 are compared with IV PCA opioids alone; findings for acetaminophen are equivocal (Category C2 evidence).230 Meta-analyses of RCTs report lower pain scores and reduced opioid use when IV opioids combined with calcium channel blockers (i.e., gabapentin, pregabalin) is compared with IV opioids alone (Category A1 evidence).231–240,241 no differences in nausea or vomiting are reported (Category C1 evidence).233–236,238,241

The consultants and ASA members strongly agree that whenever possible, anesthesiologists should use multimodal pain management therapy. The ASA members agree and the consultants strongly agree that acetaminophen should be considered as part of a postoperative multimodal pain management regimen; both the consultants and ASA members agree that COX-2 selective NSAIDs (COXIBs), nonselective NSAIDs, and calcium channel α-2-δ antagonists (gabapentin and pregabalin) should be considered as part of a postoperative multimodal pain management regimen. Moreover, the ASA members agree and the consultants strongly agree that, unless contraindicated, patients should receive an around-the-clock regimen of NSAIDs, COXIBs, or acetaminophen. Both the consultants and ASA members strongly agree that (1) regional blockade with local anesthetics should be considered as part of a multimodal approach for pain management; (2) dosing regimens should be administered to optimize efficacy while minimizing the risk of adverse events; and (3) the choice of medication, dose, route, and duration of therapy should be individualized.

**Recommendations for Multimodal Techniques.** Whenever possible, anesthesiologists should use multimodal pain management therapy. Central regional blockade with local anesthetics should be considered. Unless contraindicated, patients should receive an around-the-clock regimen of COXIBs, NSAIDs, or acetaminophen. Dosing regimens should be administered to optimize efficacy while minimizing the risk of adverse events. The choice of medication, dose, route, and duration of therapy should be individualized.

**VI. Patient Subpopulations**

Some patient groups are at special risk for inadequate pain control and require additional analgesic considerations. Patient populations at risk include (1) pediatric patients, (2) geriatric patients, and (3) critically ill or cognitively impaired patients, or other patients who may have difficulty communicating. The Task Force believes that genetics and gender modify the pain experience and response to analgesic therapies. In addition, the Task Force believes that patient race, ethnicity, culture, gender, and socioeconomic status influence access to treatment as well as pain assessment by healthcare providers.

**Pediatric Patients.** The Task Force believes that optimal care for infants and children (including adolescents) requires special attention to the biopsychosocial nature of pain. This specific patient population presents developmental differences in their experience and expression of pain and suffering, and their response to analgesic pharmacotherapy. Caregivers in both the home and hospital may have misconceptions regarding the importance of analgesia as well as its risks and benefits. In the absence of a clear source of pain or obvious pain behavior, caregivers may assume that pain is not present and defer treatment. Safe methods for providing analgesia are underused in pediatric patients for fear of opioid-induced respiratory depression.

The emotional component of pain is particularly strong in infants and children. Absence of parents, security objects, and familiar surroundings may cause as much suffering as the surgical incision. Children’s fear of injections makes intra-muscular or other invasive routes of drug delivery aversive. Even the valuable technique of topical analgesia before injection may not lessen this fear.

A variety of techniques may be effective in providing analgesia in pediatric patients. Many are the same as for adults, although some (e.g., caudal analgesia) are more commonly used in children. The Task Force believes that it is important for caregivers to recognize that pediatric patients require special consideration to ensure optimal perioperative analgesia.

The ASA members and consultants strongly agree that (1) perioperative care for children undergoing painful procedures or surgery requires developmentally appropriate pain assessment and therapy; (2) analgesic therapy should depend upon age, weight, and comorbidity, and unless contraindi-
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Practice Guidelines

I. Institutional Policies and Procedures for Providing Perioperative Pain Management

- Anesthesiologists offering perioperative analgesia services should provide, in collaboration with other healthcare professionals as appropriate, ongoing education and training to ensure that hospital personnel are knowledgeable and skilled with regard to the effective and safe use of the available treatment options within the institution.

Appendix 1: Summary of Recommendations

1. Institutional Policies and Procedures for Providing Perioperative Pain Management

- Anesthesiologists offering perioperative analgesia services should provide, in collaboration with other healthcare professionals as appropriate, ongoing education and training to ensure that hospital personnel are knowledgeable and skilled with regard to the effective and safe use of the available treatment options within the institution.

- Educational content should range from basic bedside pain assessment to sophisticated pain management techniques (e.g., regional analgesia and multimodal analgesia) and include a multimodal approach that considers the physical, social, emotional, and cognitive changes associated with aging. Vigilant dose titration is necessary to ensure adequate treatment while avoiding adverse effects such as somnolence in this vulnerable group, who are often taking other medications (including alternative and complementary agents).

- Behavioral modalities and techniques such as PCA that depend upon self-administration of analgesics are generally less suitable for the cognitively impaired. The literature is insufficient to evaluate the application of pain assessment methods or pain management techniques specific to these populations (Category D evidence).

- The consultants and ASA members strongly agree that anesthesiologists should recognize that patients who are critically ill, cognitively impaired (e.g., Alzheimer’s disease), or who otherwise have difficulty communicating (e.g., cultural or language barriers) present unique challenges to perioperative pain management. Moreover, the ASA members agree and the consultants strongly agree that anesthesiologists should consider a therapeutic trial of an analgesic in patients with increased blood pressure and heart rate or agitated behavior, when causes other than pain have been excluded.

- The Task Force believes that techniques that reduce drug dosages required to provide effective analgesia (e.g., regional analgesia and multimodal analgesia) may be suitable for such patients. Behavioral modalities and techniques such as PCA that depend upon self-administration of analgesics are generally less suitable for the cognitively impaired. The literature is insufficient to evaluate the application of pain assessment methods or pain management techniques specific to these populations (Category D evidence).

- The ASA members and consultants strongly agree that (1) pain assessment and therapy should be integrated into the perioperative care of geriatric patients; (2) pain assessment tools appropriate to a patient’s cognitive abilities should be used; and (3) dose titration should be done to ensure adequate treatment while avoiding adverse effects such as somnolence in this vulnerable group, who may be taking other medications. The ASA members agree and the consultants strongly agree that extensive and proactive evaluation and questioning should be conducted to overcome barriers that hinder communication regarding unrelieved pain.

- The Task Force believes that techniques that reduce drug dosages required to provide effective analgesia (e.g., regional analgesia and multimodal analgesia) may be suitable for such patients. Behavioral modalities and techniques such as PCA that depend upon self-administration of analgesics are generally less suitable for the cognitively impaired. The literature is insufficient to evaluate the application of pain assessment methods or pain management techniques specific to these populations (Category D evidence).

- The consultants and ASA members strongly agree that anesthesiologists should recognize that patients who are critically ill, cognitively impaired, or have communication difficulties may require additional interventions to ensure optimal perioperative pain management. Moreover, the ASA members agree and the consultants strongly agree that anesthesiologists should consider a therapeutic trial of an analgesic in patients with increased blood pressure and heart rate or agitated behavior, when causes other than pain have been excluded.

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- The consultants and ASA members strongly agree that anesthesiologists should recognize that patients who are critically ill, cognitively impaired, or have communication difficulties may require additional interventions to ensure optimal perioperative pain management. Moreover, the ASA members agree and the consultants strongly agree that anesthesiologists should consider a therapeutic trial of an analgesic in patients with increased blood pressure and heart rate or agitated behavior, when causes other than pain have been excluded.
Anesthesiologists who manage perioperative pain should use IV. Perioperative Techniques for Pain Management

Anesthesiologists offering perioperative analgesia services should...
relationships between clinical interventions and outcomes. The
interventions listed below were examined to assess their relation-
ship to a variety of outcomes related to the management of acute
pain in the perioperative setting.

Institutional Policies and Procedures for Providing Perioperative Pain
Management

Education and training of healthcare providers
Monitoring of patient outcomes
Documentation of monitoring activities
Monitoring of outcomes at an institutional level
24-h availability of anesthesiologists providing perioperative
pain management
Acute pain service

Preoperative Evaluation of the Patient

A directed pain history (e.g., medical record review and patient
interview to include current medications, adverse effects, preex-
isting pain conditions, medical conditions that would influence a
pain therapy, nonpharmacologic pain therapies, alternative and
complementary therapies)
A directed physical examination
Consultations with other healthcare providers (e.g., nurses, sur-
geons, pharmacists)

Preoperative Preparation of the Patient

Preoperative adjustment or continuation of medications whose sud-
den cessation may provoke an abstinence syndrome
Preoperative treatment(s) to reduce preexisting pain and anxiety
Premedication(s) before surgery as part of a multimodal analgesic
pain management program
Patient and family education

Perioperative Techniques for Pain Management

Epidural or intrathecal analgesia with opioids (vs. epidural placebo,
epidural local anesthetics, or IV, intramuscular, or oral opioids)
Patient-controlled analgesia with opioids:
IV PCA versus nurse-controlled or continuous IV
IV PCA versus intramuscular
Epidural PCA versus epidural bolus or infusion
Epidural PCA versus IV PCA
IV PCA with background infusion of opioids versus no back-
ground infusion
Regional analgesia with local anesthetics or opioids
Intercostal or interpleural blocks
Plexus and other blocks
Intraarticular opioids, local anesthetics or combinations
Infiltration of incisions

Multimodal Techniques (Epidural, IV, or Regional Techniques)

Two or more analgesic agents, one route versus a single agent, one route
Epidural or intrathecal analgesia with opioids combined with:
Local anesthetics versus epidural opioids
Local anesthetics versus epidural local anesthetics
Clonidine versus epidural opioids
IV opioids combined with:
Clonidine versus IV opioids
Ketorolac versus IV opioids
Ketamine versus IV opioids
Oral opioids combined with NSAIDs, COXIBs, or acetamin-
ophen versus oral opioids

Two or more drug delivery routes versus a single route
Epidural or intrathecal analgesia with opioids combined with IV,
intramuscular, oral, transdermal, or subcutaneous analgesics versus
epidural opioids
IV opioids combined with oral NSAIDs, COXIBs, or acetamin-
ophen versus IV opioids
Nonpharmacologic, alternative, or complementary pain man-
agement combined with pharmacologic pain management versus
pharmacologic pain management

Special Patient Populations

Pain management techniques for pediatric patients
Pain assessment techniques
Dose level adjustments
Avoidance of repetitive diagnostic evaluation (heel sticks) for neonates
Pain management techniques for geriatric patients
Pain assessment techniques
Dose level adjustments
Pain management techniques for other special populations (e.g., cognitively
impaired, critically ill, patients with difficulty communicating)
Pain assessment methods specific to special populations
Pain management techniques specific to special populations

For the literature review, potentially relevant clinical studies
were identified via electronic and manual searches of the literature.
The electronic and manual searches covered a 49-yr period from
1963 through 2011. More than 2,000 citations were identified
initially, yielding a total of 1,784 nonoverlapping articles that ad-
dressed topics related to the evidence linkages. After the articles were
reviewed, 1,153 studies did not provide direct evidence and were elim-
inated subsequently. A total of 631 articles contained direct linkage-
related evidence. A complete bibliography used to develop these
Guidelines, organized by section, is available as Supplemental Digital
Content 2, http://links.lww.com/ALN/A781.

Initially, each pertinent outcome reported in a study was classified
as supporting an evidence linkage, refuting a linkage, or equivocal.
The results were then summarized to obtain a directional assessment for
each evidence linkage before conducting formal meta-analyses. Litera-
ture pertaining to four evidence linkage categories contained enough
studies with well-defined experimental designs and statistical informa-
tion sufficient for meta-analyses (table 1). These linkages were: (1)
epidural or intrathecal opioids, (2) patient-controlled analgesia, (3) regional
analgesia, and (4) two or more anesthetic drugs versus a single drug.

General variance-based, effect-size estimates or combined probabil-
ity tests were obtained for continuous outcome measures, and Mantel-
Haenszel odds ratios were obtained for dichotomous outcome mea-
sures. Two combined probability tests were used as follows: (1) the
Fisher combined test, producing chi-square values based on logarit-
hmic transformations of the reported P values from the independent
studies, and (2) the Stouffer combined test, providing weighted repre-
sentation of the studies by weighting each of the standard normal de-
viation by the size of the sample. An odds ratio procedure based on the
Mantel-Haenszel method for combining study results using 2 × 2
tables was used with outcome frequency information. An acceptable
significance level was set at P < 0.01 (one-tailed). Tests for heteroge-
nity of the independent studies were conducted to assure consistency
among the study results. DerSimonian-Laird random-effects odds ra-
tios were obtained when significant heterogeneity was found (P <
0.01). To control for potential publishing bias, a “fail-safe” n value was
 calculated. No search for unpublished studies was conducted, and no
reliability tests for locating research results were done. To be accepted as significant findings, Mantel-Haenszel odds ratios must agree with combined test results whenever both types of data are assessed. In the absence of Mantel-Haenszel odds ratios, findings from both the Fisher and weighted Stouffer combined tests must agree with each other to be acceptable as significant.

For the previous update of the Guidelines, interobserver agreement among Task Force members and two methodologists was established by intrarater reliability testing. Agreement levels using a kappa (k) statistic for two-rater agreement pairs were as follows: (1) type of analysis, k = 0.63–0.94; (2) type of analysis, k = 0.39–0.89; (3) evidence linkage assignment, k = 0.74–0.96; and (4) literature inclusion for database, k = 0.75–0.88. Three-rater chance-corrected agreement values were: (1) study design, k = 0.88. Three-rater chance-corrected agreement values were: (1) study design, k = 0.88.

These values represent moderate levels of agreement. For the updated Guidelines, k = 0.88. Three-rater chance-corrected agreement values were: (1) study design, k = 0.88; (2) type of analysis, k = 0.59, Var (Sav) = 0.032; (3) linkage assignment, Sav = 0.73 Var (Sav) = 0.010; (4) literature database inclusion, Sav = 0.83 Var (Sav) = 0.015. These values represent moderate levels of agreement. For the updated Guidelines, the same two methodologists involved in the original Guidelines conducted the literature review.

The findings of the literature analyses were supplemented by the opinions of Task Force members after considering opinions derived from a variety of sources, including informal commentary and comments from postings of the draft document on the ASA web site. In addition, opinions obtained from consultant surveys, open forum commentary, and other sources used in the original Guidelines were reviewed and considered.

B. Consensus-based Evidence

Consensus was obtained from multiple sources, including (1) survey opinion from consultants who were selected based on their knowledge or expertise in acute pain management, (2) survey opinions solicited from active members of the ASA, (3) testimony from attendees of a publicly held open forum at a national anesthesia meeting (original Guidelines only), (4) Internet commentary, and (5) Task Force opinion and interpretation. The survey rate of return was 62% (n = 53 of 85) for the consultants (table 2), and 268 surveys were received from active ASA members (table 3).

For the previous update of the Guidelines, an additional survey was sent to the expert consultants asking them to indicate which, if any, of the evidence linkages would change their clinical practices if the Guidelines were instituted. The rate of return was 70.1% (n = 61 of 87). The percentages of responding consultants expecting no change associated with each linkage were as follows: (1) proactive planning 82.0%, (2) education and training 88.5%, (3) education or participation of patient and family 80.3%, (4) monitoring or documentation 77.0%, (5) availability of anesthesiologists 90.2%, (6) institutional protocols 86.9%, (7) use of PCA, epidural, or regional techniques 90.2%, (8) use of multimodality techniques 88.5%, (9) organizational characteristics 90.2%, (10) pediatric techniques 95.1%, (11) geriatric techniques 91.8%, and (12) ambulatory surgery techniques 85.2%.

Sixty-five percent of the respondents indicated that the Guidelines would have no effect on the amount of time spent on a typical case, and 24% indicated that there would be an increase of the amount of time spent on a typical case with the implementation of these Guidelines (mean time increase = 3.4 min). Eighty-nine percent indicated that new equipment, supplies, or training would not be needed to implement the Guidelines, and 92% indicated that implementation of the Guidelines would not require changes in practice that would affect costs.

Table 1. Meta-analysis Summary

| Evidence Linkages | N | Fisher Chi-square | P Value | Weighted Stouffer Zc | P Value | Effect Size | Odds Ratio | Confidence Interval | Heterogeneity | P Values | Effect Size |
|-------------------|---|-------------------|---------|----------------------|---------|-------------|------------|----------------------|---------------|-----------|-------------|
| **Perioperative techniques** |     |                   |         |                      |         |             |            |                      |               |           |             |
| **Epidural/intrathecal opioids** |     |                   |         |                      |         |             |            |                      |               |           |             |
| **Postincisional** |     |                   |         |                      |         |             |            |                      |               |           |             |
| Morphine vs. saline |     |                   |         |                      |         |             |            |                      |               |           |             |
| Pain scores or relief | 6  | 51.50             | 0.001   | -3.50                | 0.001   | -0.35       | 0.342      | 0.694                |               |           |             |
| Nausea or vomiting | 9  |                   |         |                      |         |             |            |                      |               |           |             |
| Pruritus | 8  |                   |         |                      |         |             |            |                      |               |           |             |
| Morphine vs. IM morphine |     |                   |         |                      |         |             |            |                      |               |           |             |
| Pain scores | 6  | 52.16             | 0.001   | -3.79                | 0.001   | -0.44       | 0.995      | 0.788                |               |           |             |
| Pruritus | 6  |                   |         |                      |         |             |            |                      |               |           |             |
| **Postoperative** |     |                   |         |                      |         |             |            |                      |               |           |             |
| Morphine vs. IM morphine |     |                   |         |                      |         |             |            |                      |               |           |             |
| Pain scores or relief | 7  | 81.29             | 0.001   | -7.52                | 0.001   | -0.57       | 0.097      | 0.001                |               |           |             |
| Nausea or vomiting | 9  |                   |         |                      |         |             |            |                      |               |           |             |
| Pruritus | 5  |                   |         |                      |         |             |            |                      |               |           |             |
| Urinary retention | 7  |                   |         |                      |         |             |            |                      |               |           |             |
| Fentanyl vs. IV fentanyl |     |                   |         |                      |         |             |            |                      |               |           |             |
| Nausea or vomiting | 5  |                   |         |                      |         |             |            |                      |               |           |             |
| Pruritus | 5  |                   |         |                      |         |             |            |                      |               |           |             |
| PCA |     |                   |         |                      |         |             |            |                      |               |           |             |
| IV PCA vs. IM morphine |     |                   |         |                      |         |             |            |                      |               |           |             |

(continued)
### Table 1. Continued

| Evidence Linkages | N  | Fisher Chi-square P Value | Weighted Stouffer Zc P Value | Effect Size | Odds Ratio Confidence Interval | Heterogeneity P Values Effect Size |
|-------------------|----|---------------------------|-------------------------------|-------------|-------------------------------|-----------------------------------|
| Pain scores       | 8  | 52.26 0.001               | −4.01 0.001                  | −0.22       | 0.700 0.550                   |
| Epidural vs. IV PCA opioids | | | | | |
| Pain scores       | 5  | 37.91 0.001               | −2.17 0.015                  | −0.33       | 0.999 0.951                   |
| Pain scores or relief | 6 | 99.78 0.001               | 6.12 0.001                  | 0.35        | 0.001 0.001                   |
| Nausea or vomiting| 9  |                           | 1.01 0.57–1.78              | 0.07        | 0.315 0.138                   |
| Pruritus          | 7  |                           | 0.99 0.43–2.29              | 0.07        | 0.666 0.522                   |
| Sedation          | 6  | 16.44 0.172               | −1.62 0.053                 | −0.03       | 0.675 0.628                   |
| Regional analgesia | | | | | |
| Intercostal or interpleural blocks | | | | | |
| Postoperative vs. saline | | | | | |
| Pain scores       | 7  | 54.12 0.001               | −1.79 0.037                 | −0.38       | 0.663 0.479                   |
| Analgesic use     | 5  | 36.30 0.001               | −1.51 0.066                 | −0.34       | 0.263 0.381                   |
| Plexus and other blocks | | | | | |
| Preincisional vs. saline | | | | | |
| Analgesic use     | 5  | 52.13 0.001               | −5.62 0.001                | −0.37       | 0.146 0.057                   |
| Nausea/vomiting   | 5  |                           | 0.51 0.15–1.73             | 0.769       |
| Pain scores       | 5  | 45.15 0.001               | −4.41 0.001                 | −0.32       | 0.061 0.174                   |
| Infiltration of incisions | | | | | |
| Preincisional bupivacaine vs. saline | | | | | |
| Pain scores or relief | 9 | 84.83 0.001               | −3.51 0.001                 | −0.32       | 0.002 0.001                   |
| Analgesic use     | 6  | 21.27 0.047               | −2.01 0.022                 | −0.11       | 0.662 0.605                   |
| Postincisional bupivacaine vs. saline | | | | | |
| Pain scores       | 8  | 42.53 0.001               | −2.10 0.018                 | −0.17       | 0.044 0.051                   |
| Analgesic use     | 9  | 53.71 0.001               | −2.12 0.017                 | −0.20       | 0.039 0.024                   |
| Pre- vs. postincisional bupivacaine | | | | | |
| Pain scores       | 6  | 39.28 0.001               | 1.02 0.154                  | 0.02        | 0.001 0.001                   |
| Pain scores or relief | 5 | 44.14 0.001               | −3.96 0.001                 | −0.31       | 0.964 0.556                   |
| Analgesic use     | 7  | 45.51 0.001               | −3.90 0.001                 | −0.43       | 0.001 0.001                   |
| Multimodality techniques | | | | | |
| Two or more vs. single drug, same route | | | | | |
| Epidural morphine + local anesthetics vs. morphine | | | | | |
| Pain scores       | 7  | 42.95 0.001               | −2.32 0.010                 | −0.22       | 0.466 0.167                   |
| Nausea or vomiting | 6  |                           | 0.80 0.40–1.57             | 0.829       |
| Pruritus          | 6  |                           | 2.02 0.93–4.36             | 0.176       |
| Epidural fentanyl + local anesthetics vs. fentanyl | | | | | |
| Pain scores       | 10 | 67.21 0.001               | −3.11 0.001                | −0.29       | 0.006 0.001                   |
| Nausea or vomiting | 11 |                           | 0.77 0.46–1.27             | 0.304       |
| Pruritus          | 12 |                           | 0.93 0.55–1.56             | 0.266       |
| Motor weakness    | 9  |                           | 3.23 1.57–6.65             | 0.011       |
| Epidural morphine + bupivacaine vs. bupivacaine | | | | | |
| Pain scores       | 9  | 52.91 0.001               | −3.03 0.001                | −0.25       | 0.470 0.245                   |
| Pain relief       | 5  |                           | 3.41 1.31–8.92             | 0.352       |
| Nausea or vomiting | 8  |                           | 1.25 0.62–2.48             | 0.858       |
| Pruritus          | 6  |                           | 7.35 2.82–19.15            | 0.584       |
| Epidural fentanyl + bupivacaine vs. bupivacaine | | | | | |
| Nausea or vomiting | 7  |                           | 1.27 0.58–2.80             | 0.329       |
| Pruritus          | 5  |                           | 2.89 1.02–8.23             | 0.840       |
| Epidural sufentanil + ropivacaine vs. ropivacaine | | | | | |
| Pain scores       | 5  | 28.54 0.001               | −2.09 0.018                | −0.17       | 0.730 0.425                   |
| Pruritus          | 6  |                           | 4.32 2.31–8.07             | 0.705       |

(continued)
Table 1. Continued

| Evidence Linkages | Fisher Chi-square | Weighted Stouffer Zc | P Value | P Value | Effect Size | Odds Ratio | Confidence Interval | P Values | Effect Size |
|-------------------|------------------|----------------------|---------|---------|-------------|------------|---------------------|----------|-------------|
| **Epidual opioids + clonidine vs. opioids** | | | | | | | | | |
| Pain scores       | 6 45.77 0.001   | -1.27                | 0.102   | -0.12   | 0.001       | 0.001      |                     |          |             |
| IV morphine + ketorolac vs. IV morphine | | | | | | | | | |
| Pain scores       | 6 44.18 0.001   | -3.95                | 0.001   | -0.30   | 0.987       | 0.992      |                     |          |             |
| Analgesic use     | 6 72.42 0.001   | -7.17                | 0.001   | -0.59   | 0.001       | 0.001      |                     |          |             |
| Nausea or vomiting| 6 1.04 0.54–2.00|                     |         |         | 0.937       |            |                     |          |             |
| IV morphine + ketamine vs. IV morphine | | | | | | | | | |
| Pain scores or relief | 6 39.95 0.001 | -0.81                | 0.209   | -0.11   | 0.056       | 0.001      |                     |          |             |
| Analgesic use     | 6 37.12 0.001   | -1.00                | 0.159   | -0.08   | 0.027       | 0.001      |                     |          |             |
| Nausea            | 6 26.45 0.009   | 0.48                 | 0.316   | -0.04   | 0.165       | 0.037      |                     |          |             |
| Two or more routes vs. single route | | | | | | | | | |
| IV opioids combined with calcium channel blockers (gabapentin, pregabalin) vs. IV opioids | | | | | | | | | |
| Pain scores       | 7 54.03 0.001   | -3.82                | 0.001   | -0.29   | 0.700       | 0.850      |                     |          |             |
| Opioid use        | 10 111.66 0.001 | -12.07               | 0.001   | -0.48   | 0.001       | 0.001      |                     |          |             |
| Nausea            | 6 1.04 0.55–1.98|                     |         |         | 0.800       |            |                     |          |             |
| Vomiting          | 5 0.86 0.41–1.83|                     |         |         | 0.970       |            |                     |          |             |

* Random effects odds ratio.
IM = intramuscular; IV = intravenous; PCA = patient-controlled analgesia.

Table 2. Consultant Survey Responses*

| Percent Responding to Each Item | N | Strongly Agree | Agree | Equivocal | Disagree | Strongly Disagree |
|--------------------------------|---|----------------|-------|-----------|----------|------------------|
| **I. Institutional Policies and Procedures for Providing Perioperative Pain Management** | | | | | | |
| 1. Anesthesiologists offering perioperative analgesia services should provide, in collaboration with other healthcare professionals as appropriate, ongoing education and training of hospital personnel regarding the effective and safe use of the available treatment options within the institution | 53 | 86.8* | 11.3 | 1.9 | 0.0 | 0.0 |
| 2. Anesthesiologists and other healthcare providers should use standardized, validated instruments to facilitate the regular evaluation and documentation of pain intensity, the effects of pain therapy, and side effects caused by the therapy | 53 | 67.9* | 26.4 | 5.7 | 0.0 | 0.0 |
| 3. Anesthesiologists responsible for perioperative analgesia should be available at all times to consult with ward nurses, surgeons, or other involved physicians and should assist in evaluating patients who are experiencing problems with any aspect of perioperative pain relief | 53 | 56.6* | 26.4 | 17.0 | 0.0 | 0.0 |
| 4. Anesthesiologists should provide analgesia services within the framework of an Acute Pain Service and participate in developing standardized institutional policies and procedures | 53 | 73.6* | 26.4 | 0.0 | 0.0 | 0.0 |

(continued)
Table 2. Continued

| Item                                                                 | N   | Percent Responding to Each Item | Strongly Agree | Agree | Equivocal | Disagree | Strongly Disagree |
|----------------------------------------------------------------------|-----|---------------------------------|----------------|-------|-----------|----------|-------------------|
| 5. An integrated approach to perioperative pain management (e.g., ordering, administering, and transitioning therapies, transferring responsibility for pain therapy, outcomes assessment, continuous quality improvement) should be used to minimize analgesic gaps | 53  |                                 | 73.6*          | 24.5  | 1.9       | 0.0      | 0.0               |
| II. **Preoperative Evaluation of the Patient**                      |     |                                 |                |       |           |          |                   |
| 6. A directed pain history, a directed physical examination, and a pain control plan should be included in the anesthetic preoperative evaluation | 52  |                                 | 57.7*          | 36.5  | 3.8       | 1.9      | 0.0               |
| III. **Preoperative Preparation of the Patient**                    |     |                                 |                |       |           |          |                   |
| 7. Patient preparation for perioperative pain management should include appropriate adjustments or continuation of medications to avert an abstinence syndrome, treatment of preexistent pain, or preoperative initiation of therapy for postoperative pain management | 53  |                                 | 77.4*          | 18.9  | 3.8       | 0.0      | 0.0               |
| 8. Anesthesiologists offering perioperative analgesia services should provide, in collaboration with others as appropriate, patient and family education | 53  |                                 | 50.9*          | 35.8  | 7.5       | 5.7      | 0.0               |
| 9. Perioperative patient education should include instruction in behavioral modalities for control of pain and anxiety | 53  |                                 | 37.7           | 39.6* | 13.2      | 7.5      | 1.9               |
| IV. **Perioperative Techniques for Pain Management**                |     |                                 |                |       |           |          |                   |
| 10. Anesthesiologists who manage perioperative pain should use therapeutic options such as epidural or intrathecal opioids, systemic opioid PCA, and regional techniques after thoughtfully considering the risks and benefits for the individual patient | 53  |                                 | 86.8*          | 13.2  | 0.0       | 0.0      | 0.0               |
| 11. These modalities should be used in preference to intramuscular opioids ordered “as needed” | 53  |                                 | 79.2*          | 11.3  | 3.8       | 1.9      | 3.8               |
| 12. The therapy selected should reflect the individual anesthesiologist’s expertise, as well as the capacity for safe application of the modality in each practice setting | 53  |                                 | 79.2*          | 17.0  | 0.0       | 3.8      | 0.0               |
| 13. Special caution should be taken when continuous infusion modalities are used because drug accumulation may contribute to adverse events | 53  |                                 | 69.8*          | 26.4  | 1.9       | 1.9      | 0.0               |
| V. **Multimodal Techniques for Pain Management**                    |     |                                 |                |       |           |          |                   |
| 14. Whenever possible, anesthesiologists should use multimodal pain management therapy | 53  |                                 | 71.7*          | 28.3  | 0.0       | 0.0      | 0.0               |

(continued)
Table 2. Continued

| Percent Responding to Each Item | N | Strongly Agree | Agree | Equivocal | Disagree | Strongly Disagree |
|---------------------------------|---|----------------|-------|-----------|----------|-------------------|
| 15. The following drugs should be considered as part of a postoperative multimodal pain management regimen: |   |                |       |           |          |                   |
| COX-2 selective NSAIDs (COXIBs)  | 53 | 49.1           | 34.0* | 15.1      | 1.9      | 0.0              |
| Nonselective NSAIDs              | 52 | 19.2           | 57.7* | 23.1      | 0.0      | 0.0              |
| Acetaminophen                     | 53 | 62.3*          | 32.1  | 5.7       | 0.0      | 0.0              |
| Calcium channel α-2-δ antagonists (e.g., gabapentin, pregabalin) | 53 | 22.6           | 50.9* | 26.4      | 0.0      | 0.0              |
| 16. Unless contraindicated, all patients should receive an around-the-clock regimen of NSAIDs, COXIBs, or acetaminophen | 51 | 54.9*          | 23.5  | 7.8       | 9.8      | 3.9              |
| 17. Regional blockade with local anesthetics should be considered as part of a multimodal approach for pain management | 52 | 73.1*          | 25.0  | 1.9       | 0.0      | 0.0              |
| 18. Dosing regimens should be administered to optimize efficacy while minimizing the risk of adverse events | 52 | 86.5*          | 13.5  | 0.0       | 0.0      | 0.0              |
| 19. The choice of medication, dose, route, and duration of therapy should be individualized | 52 | 73.1*          | 26.9  | 0.0       | 0.0      | 0.0              |

VI. Patient Subpopulations

**Pediatric patients**

20. Perioperative care for children undergoing painful procedures or surgery requires developmentally appropriate pain assessment and therapy | 53 | 73.6* | 24.5 | 1.9 | 0.0 | 0.0 |
21. Analgesic therapy should depend upon age, weight, and comorbidity and unless contraindicated should involve a multimodal approach | 53 | 67.9* | 30.2 | 1.9 | 0.0 | 0.0 |
22. Behavioral techniques, especially important in addressing the emotional component of pain, should be applied whenever feasible | 53 | 50.9* | 30.2 | 18.9 | 0.0 | 0.0 |
23. Because many analgesic medications are synergistic with sedating agents, it is imperative that appropriate monitoring be used during the procedure and recovery | 53 | 83.0* | 17.0 | 0.0 | 0.0 | 0.0 |

**Geriatric patients**

24. Pain assessment and therapy should be integrated into the perioperative care of geriatric patients | 53 | 73.6* | 26.4 | 0.0 | 0.0 | 0.0 |
25. Pain assessment tools appropriate to a patient’s cognitive abilities should be used | 53 | 77.4* | 22.6 | 0.0 | 0.0 | 0.0 |
26. Extensive and proactive evaluation and questioning should be conducted to overcome barriers that hinder communication regarding unrelieved pain | 53 | 58.5* | 35.8 | 5.7 | 0.0 | 0.0 |

(continued)
Table 2. Continued

| Percent Responding to Each Item |
|-------------------------------|
| N   | Strongly Agree | Agree | Equivocal | Disagree | Strongly Disagree |

27. Dose titration should be done to ensure adequate treatment while avoiding adverse effects such as somnolence in this vulnerable group, who may be taking other medications

53 | 77.4* | 22.6 | 0.0 | 0.0 | 0.0 |

Other Subpopulations

28. Anesthesiologists should recognize that patients who are critically ill, cognitively impaired, or have communication difficulties may require additional interventions to ensure optimal perioperative pain management

53 | 73.6* | 24.5 | 1.9 | 0.0 | 0.0 |

29. Anesthesiologists should consider a therapeutic trial of an analgesic in patients with elevated blood pressure and heart rate or agitated behavior when causes other than pain have been excluded

53 | 50.9* | 37.7 | 9.4 | 1.9 | 0.0 |

* Indicates the median.

COX-2 = cyclooxygenase-2; N = number of consultants who responded to each item; NSAID = nonsteroidal antiinflammatory drug; PCA = patient-controlled analgesia.

Table 3. ASA Member Survey Responses*

| Percent Responding to Each Item |
|-------------------------------|
| N   | Strongly Agree | Agree | Equivocal | Disagree | Strongly Disagree |

I. Institutional Policies and Procedures for Providing Perioperative Pain Management

1. Anesthesiologists offering perioperative analgesia services should provide, in collaboration with other healthcare professionals as appropriate, ongoing education and training of hospital personnel regarding the effective and safe use of the available treatment options within the Institution

268 | 53.0* | 37.7 | 4.1 | 3.7 | 1.5 |

2. Anesthesiologists and other healthcare providers should use standardized, validated instruments to facilitate the regular evaluation and documentation of pain intensity, the effects of pain therapy, and side effects caused by the therapy

268 | 52.2* | 35.5 | 7.5 | 3.7 | 1.1 |

3. Anesthesiologists responsible for perioperative analgesia should be available at all times to consult with ward nurses, surgeons, or other involved physicians and should assist in evaluating patients who are experiencing problems with any aspect of perioperative pain relief

267 | 38.9 | 36.0* | 12.4 | 10.1 | 2.6 |

(continued)
Table 3. Continued

| N | Percent Responding to Each Item |
|---|--------------------------------|
|   | Strongly Agree | Agree | Equivocal | Disagree | Strongly Disagree |
| 4. | Anesthesiologists should provide analgesia services within the framework of an Acute Pain Service and participate in developing standardized institutional policies and Procedures |
|   | 268 | 39.9 | 39.2* | 14.9 | 3.4 | 2.6 |
| 5. | An integrated approach to perioperative pain management (e.g., ordering, administering, and transitioning therapies, transferring responsibility for pain therapy, outcomes assessment, continuous quality improvement) should be used to minimize analgesic gaps |
|   | 269 | 46.5 | 44.6* | 7.4 | 1.5 | 0.0 |
| II. | Preoperative Evaluation of the Patient |
| 6. | A directed pain history, a directed physical examination, and a pain control plan should be included in the anesthetic preoperative evaluation |
|   | 267 | 30.3 | 39.7* | 18.4 | 9.4 | 2.2 |
| III. | Preoperative Preparation of the Patient |
| 7. | Patient preparation for perioperative pain management should include appropriate adjustments or continuation of medications to avert an abstinence syndrome, treatment of preexistent pain, or preoperative initiation of therapy for postoperative pain management |
|   | 266 | 51.5* | 41.7 | 5.7 | 1.1 | 0.0 |
| 8. | Anesthesiologists offering perioperative analgesia services should provide, in collaboration with others as appropriate, patient and family education |
|   | 268 | 28.7 | 56.7* | 10.1 | 3.7 | 0.8 |
| 9. | Perioperative patient education should include instruction in behavioral modalities for control of pain and anxiety |
|   | 269 | 22.7 | 42.8* | 27.1 | 5.9 | 1.5 |
| IV. | Perioperative Techniques for Pain Management |
| 10. | Anesthesiologists who manage perioperative pain should use therapeutic options such as epidural or intrathecal opioids, systemic opioid PCA, and regional techniques after thoughtfully considering the risks and benefits for the individual patient |
|   | 269 | 65.4* | 31.2 | 1.9 | 1.1 | 0.4 |
| 11. | These modalities should be used in preference to intramuscular opioids ordered “as needed” |
|   | 269 | 65.8* | 24.9 | 7.5 | 1.1 | 0.7 |
| 12. | The therapy selected should reflect the individual anesthesiologist’s expertise, as well as the capacity for safe application of the modality in each practice setting |
|   | 269 | 70.6* | 26.8 | 1.9 | 0.7 | 0.0 |
| 13. | Special caution should be taken when continuous infusion modalities are used because drug accumulation may contribute to adverse events |
|   | 268 | 67.6* | 30.2 | 1.1 | 1.1 | 0.0 |

(continued)
### Table 3. Continued

| V. Multimodal Techniques for Pain Management |
|--------------------------------------------|
| 14. Whenever possible, anesthesiologists should use multimodal pain management therapy | 267 | 56.2* | 28.1 | 12.4 | 2.6 | 0.7 |
| 15. The following drugs should be considered as part of a postoperative multimodal pain management regimen: |  |
| - COX-2 selective NSAIDs (COXIBs) | 268 | 35.8 | 47.4* | 14.2 | 1.9 | 0.7 |
| - Nonselective NSAIDs | 267 | 26.6 | 57.3* | 12.7 | 2.6 | 0.8 |
| - Acetaminophen | 267 | 41.9 | 44.2* | 12.4 | 1.5 | 0.0 |
| - Calcium channel α2-δ antagonists (e.g., gabapentin, pregabalin) | 265 | 15.1 | 38.5* | 38.5 | 6.8 | 1.1 |
| 16. Unless contraindicated, all patients should receive an around-the-clock regimen of NSAIDs, COXIBs, or acetaminophen | 264 | 24.2 | 34.1* | 25.0 | 14.4 | 2.3 |
| 17. Regional blockade with local anesthetics should be considered as part of a multimodal approach for pain management | 264 | 58.3* | 37.1 | 2.7 | 1.1 | 0.8 |
| 18. Dosing regimens should be administered to optimize efficacy while minimizing the risk of adverse events | 264 | 71.2* | 27.3 | 1.1 | 0.4 | 0.0 |
| 19. The choice of medication, dose, route, and duration of therapy should be individualized | 266 | 70.7* | 27.1 | 1.1 | 1.1 | 0.0 |

| VI. Patient Subpopulations |
|---------------------------|
| Pediatric patients |
| 20. Perioperative care for children undergoing painful procedures or surgery requires developmentally appropriate pain assessment and therapy | 265 | 63.4* | 35.1 | 1.5 | 0.0 | 0.0 |
| 21. Analgesic therapy should depend upon age, weight, and comorbidity and unless contraindicated should involve a multimodal approach | 268 | 58.6* | 34.7 | 4.5 | 2.2 | 0.0 |
| 22. Behavioral techniques, especially important in addressing the emotional component of pain, should be applied whenever feasible | 266 | 34.2 | 42.5* | 21.4 | 1.5 | 0.4 |
| 23. Because many analgesic medications are synergistic with sedating agents, it is imperative that appropriate monitoring be used during the procedure and recovery | 268 | 69.4* | 30.2 | 0.4 | 0.0 | 0.0 |

| Geriatric Patients |
|--------------------|
| 24. Pain assessment and therapy should be integrated into the perioperative care of geriatric patients | 268 | 60.1* | 37.7 | 1.8 | 0.4 | 0.0 |
| 25. Pain assessment tools appropriate to a patient’s cognitive abilities should be used | 268 | 58.6* | 39.9 | 1.1 | 0.4 | 0.0 |
| 26. Extensive and proactive evaluation and questioning should be conducted to overcome barriers that hinder communication regarding unrelieved pain | 265 | 35.9 | 41.1* | 20.0 | 3.0 | 0.0 |

(continued)
References

1. Coleman SA, Booker-Milburn J: Audit of postoperative pain control: Influence of a dedicated acute pain nurse. Anesthesiology 1996; 51:1093–6

2. Harmer M, Davies KA: The effect of education, assessment and a standardised prescription on postoperative pain management. The value of clinical audit in the establishment of acute pain services. Anesthesia 1998; 53:424–30

3. Rose DK, Cohen MM, Yee DA: Changing the practice of pain management. Anesth Analg 1997; 84:764–72

4. White CL: Changing pain management practice and impacting on patient outcomes. Clin Nurse Spec 1999; 13:166–72

5. Briggs M, Dean KL: A qualitative analysis of the nursing documentation of post-operative pain management. J Clin Nurs 1998; 7:155–63

6. Camp LD, O'Sullivan PS: Comparison of medical, surgical and oncology patients’ descriptions of pain and nurses’ documentation of pain assessments. J Adv Nurs 1987; 12:593–8

7. Clarke EB, French B, Bilodeau ML, Capasso VC, Edwards A, Empoliti J: Pain management knowledge, attitudes and clinical practice: The impact of nurses’ characteristics and education. J Pain Symptom Manage 1996; 11:18–31

8. Davis BD, Billings JR, Ryland RK: Evaluation of nursing process documentation. J Adv Nurs 1994; 19:960–8

9. Ehnfors M, Smedby B: Nursing care as documented in patient records. Scand J Caring Sci 1993; 7:209–20

10. Idvall E, Ehrenberg A: Nursing documentation of postoperative pain management. J Clin Nurs 2002; 11:734–42

11. Salanter à S, Lauri S, Salmi TT, Aantaa R: Nursing activities and outcomes of care in the assessment, management, and documentation of children’s pain. J Pediatr Nurs 1999; 14:408–15

12. Bardiaux FM, Taviaux NF, Albert A, Boogaerts JG, Stadler M: An intervention study to enhance postoperative pain management. Anesth Analg 2003; 96:179–85

13. Gould TH, Crosby DL, Harmer M, Lloyd SM, Lunn JN, Rees GA, Roberts DE, Webster JA: Policy for controlling pain after surgery: Effect of sequential changes in management. BMJ 1992; 305:1187–93

14. Mackintosh C, Bowles S: Evaluation of a nurse-led acute pain service. Can clinical nurse specialists make a difference? J Adv Nurs 1997; 25:30–7

15. Miaskowski C, Crews J, Ready LB, Paul SM, Ginsberg B: Anesthesia-based pain services improve the quality of post-operative pain management. Pain 1999; 80:23–9

16. Pesut B, Johnson J: Evaluation of an acute pain service. Can J Nurs Adm 1997; 10:86–107

17. Sartain JB, Barry JJ: The impact of an acute pain service on postoperative pain management. Anaesth Intensive Care 1999; 27:375–80

18. Stacey BR, Rudy TE, Nelhaus D: Management of patient-controlled analgesia: A comparison of primary surgeons and a dedicated pain service. Anesth Analg 1997; 85:130–4

19. Stadler M, Schlender M, Braeckman M, Nguyen T, Boogaerts JG: A cost-utility and cost-effectiveness analysis of an acute pain service. J Clin Anesth 2004; 16:159–67

20. Tighe SQ, Bie JA, Nelson RA, Skues MA: The acute pain service: Effective or expensive care? Anaesthesia 1998; 53:397–403

21. Furdon SA, Eastman M, Benjamin K, Horgan MJ: Outcome measures after standardized pain management strategies in postoperative patients in the neonatal intensive care unit. J Perinat Neonatal Nurs 1998; 12:58–69

22. Anderson EA: Preoperative preparation for cardiac surgery facilitates recovery, reduces psychological distress, and reduces the incidence of acute postoperative hypertension. J Consult Clin Psychol 1987; 55:513–20

23. Daltroy LH, Morlino CI, Eaton HM, Poss R, Liang MH: Preoperative education for total hip and knee replacement patients. Arthritis Care Res 1998; 11:469–78

24. Doering S, Katzberger F, Rumpold G, Roessler S, Hofstoetter B, Schatz DS, Behensky H, Krismer M, Luz G, Innerhofer...
39. Abboud TK, Dror A, Mosaad P, Zhu J, Mantilla M, Swart F, Fitzpatrick GJ, Moriarty DC: Intrathecal morphine in the 37. management of pain following cardiac surgery. A comparison of three analgesic regimens. Anaesth Intensive Care 36. 1983; 11:320–4.

38. Fortin F, Kirouac S: A randomized controlled trial of preoperative education on pain management outcomes after coronary artery bypass graft surgery: A pilot. Can J Nurs Res 2001; 24:402–9.

37. Shuldham CM, Fleming S, Goodman H: The impact of pre-operative education on recovery following coronary artery bypass surgery. A randomized controlled clinical trial. Eur Heart J 2002; 23:666–74.

36. McDonald DD, Freeland M, Thomas G, Moore J: Testing a preoperative pain management intervention for elders. Res Nurs Health 2001; 24:402–9.

35. Lam KK, Chan MT, Chen PP, Ngn Kee WD: Structured preoperative patient education for patient-controlled analgesia. J Clin Anesth 2001; 13:465–9.

34. Watt-Watson J, Stevens B, Costello J, Katz J, Reid G: Impact of preoperative education on postoperative pain in patients before hip replacement surgery. Psychosom Med 2000; 62:365–73.

33. Elsass P, Eikard B, Junge J, Lykke J, Staun P, Feldt-Rasmussen M: Psychological effect of detailed preanesthetic information. Acta Anaesth Scand 1987; 31:579–83.

29. Knoerl DV, Faut-Callahan M, Paice J, Shott S: Preoperative education and outcome of patient controlled analgesia. Can J Anaesth 1998; 65:943–8.

28. Griffin MJ, Brennan L, McShane AJ: Preoperative education and outcome of patient controlled analgesia. Can J Anaesth 1998; 45:943–8.

27. Fortin F, Kirouac S: A randomized controlled trial of preoperative patient education. Int J Nurs Stud 1976; 13:11–24.

26. Egbert LD, Battit GE, Welch CE, Bartlett MK: Reduction of postoperative pain by encouragement and instruction of patients. N Engl J Med 1964; 270:825–7.

25. Elsass P, Eikard B, Junge J, Lykke J, Staun P, Feldt-Rasmussen M: Psychological effect of detailed preanesthetic information. Acta Anaesth Scand 1987; 31:579–83.

24. Fitzpatrick GJ, Moriarty DC: Intrathecal morphine in the management of pain following cardiac surgery. A comparison with morphine IV. Br J Anaesth 1988; 60:639–44.

23. Banning AM, Schmidt JF, Chraemmer-Jørgensen B, Risbo A: Reduction of postoperative pain after upper abdominal surgery. Acta Anaesthesiol Scand 1986; 41:582–5.

22. McDonald DD, Freeland M, Thomas G, Moore J: Testing a preoperative pain management intervention for elders. Res Nurs Health 2001; 24:402–9.

21. Lilja Y, Rydén S, Fridlund B: Effects of extended preoperative education on postoperative pain after lumbar spinale surgery. A randomized, prospective, double-blind study. Surgery 1985; 98:718–28.

20. Jacobson L, Chabal C, Brody MC: A dose-response study of intrathecal morphine: Efficacy, duration, optimal dose, and side effects. Anesth Analg 1988; 67:1082–8.

19. Kawana Y, Sato H, Shimada H, Fujita N, Ueda Y, Hayashi A, Araki Y: Epidural ketamine for postoperative pain relief after gynecologic operations: A double-blind study and comparison with epidural morphine. Anesth Analg 1987; 66:735–8.

18. Logas WG, el-Baz N, el-Ganzouri A, Cullen M, Staren E, Faber LP, Ivanovich AD: Continuous thoracic epidural analgesia for postoperative pain relief following thoracotomy: A randomized prospective study. Anesthesiology 1987; 67:787–91.

17. Ross DA, Drasner K, Weinstein PR, Flaherty JF, Barbaro NM: Use of intrathecally administered morphine in the treatment of postoperative pain after lumbar spinal surgery: A prospective, double-blind, placebo-controlled study. Neurosurgery 1991; 28:700–4.

16. Sarma VJ, Boström UV: Intrathecal morphine for the relief of post-hysterectomy pain—a double-blind, dose-response study. Acta Anaesth Scand 1993; 37:223–7.

15. Waikakul W, Chumniprasas K: Direct epidural morphine injection during lumbar discectomy for postoperative analgesia. J Med Assoc Thai 1992; 75:428–33.

14. Writer WD, Hurtig JB, Evans D, Needs RE, Hope CE, Forrest JB: Epidural morphine prophylaxis of postoperative pain: Report of a double-blind multicentre study. Can Anaesth Soc J 1985; 32:330–8.

13. Yamaguchi H, Watanabe S, Harukuni I, Hamaya Y: Effective doses of epidural morphine for relief of posthysterectomy pain. Anesth Analg 1991; 72:80–3.

12. Bourke DL, Spatz E, Motara R, Ordia JI, Reed J, Hlavacek JM: Epidural opioids during laminectomy surgery for postoperative pain. J Clin Anesth 1992; 4:277–81.

11. Harrison DM, Sinatra R, Morgese L, Chung JH: Epidural narcotic and patient-controlled analgesia for postcesarean section pain relief. Anesthesiology 1988; 68:454–7.

10. Klink JC, Lindop MJ: Epidural morphine in the elderly. A controlled trial after upper abdominal surgery. Anesthesia 1982; 37:907–12.

9. Thind GS, Wells JC, Wilkes RG: The effects of continuous intravenous naloxone on epidural morphine analgesia. Anesthesia 1986; 41:582–5.

8. Youngstrom PC, Cowan RI, Surheimer C, Eastwood DW, Yu JC: Pain relief and plasma concentrations from epidural and intramuscular morphine in postcesarean patients. Anesthesiology 1982; 57:404–9.

7. Chan JH, Heilpern GN, Packham I, Trehan RK, Marsh GD, P, Benzer H, Saria A, Schweusser G: Videotape preparation of patients before hip replacement surgery reduces stress. Psychosom Med 2000; 62:365–73.

6. Egbert LD, Battit GE, Welch CE, Bartlett MK: Reduction of postoperative pain by encouragement and instruction of patients. N Engl J Med 1964; 270:825–7.

5. Binsted RJ: Epidural morphine after caesarean section. Anesthesiology 1982; 57:404–9.

4. Katz J, Kavanagh BP, Sandler AN, Nielenberg H, Boylan JF, Friedlander M, Shaw BF: Preemptive analgesia. Clinical evidence of neuroplasticity contributing to postoperative pain. Anesthesiology 1992; 77:439–46.

3. Cullen ML, Staren ED, el-Ganzouri A, Logas WG, Ivanovich AD, Economou SG: Continuous epidural infusion for analgesia after major abdominal operations: A randomized, prospective, double-blind study. Surgery 1985; 98:718–28.
64. Daley MD, Sandler AN, Turner KE, Vosu H, Slavchenko P: A comparison of epidural and intramuscular morphine in patients following cesarean section. Anesthesiology 1990; 72: 289–94

65. Farag H, Naguib M: Caudal morphine for pain relief following anal surgery. Ann R Coll Surg Engl 1985; 67: 257–8

66. Gustafsson LL, Friberg-Nielsen S, Garle M, Mohall A, Rane A, Schildt B, Symreng T: Extradural and parenteral morphine: Kinetics and effects in postoperative pain. A controlled clinical study. Br J Anaesth 1982; 54: 1167–74

67. Rawal N, Sjöstrand U, Christoffersson E, Dahlström B, Arvill R, Stenfors T, Kinneberg L: Comparison of extradural and epidural morphine for postoperative analgesia in the grossly obese: Influence on postoperative ambulation and pulmonary function. Anesth Analg 1984; 63: 583–92

68. Reiz S, Ahlin J, Ahrenfeldt B, Andersson M, Andersson S: Epidural morphine for postoperative pain relief. Acta Anaesthesiol Scand 1981; 25: 111–4

69. Rosen MA, Hughes SC, Shnider SM, Abboud TK, Norton M, Di Chiro G: Epidural morphine for the relief of postoperative pain after cesarean delivery. Anesth Analg 1983; 62: 666–72

70. Ibrahim AW, Farag H, Naguib M: Epidural morphine for pain relief after lumbar laminectomy. Spine 1986; 11: 1024–6

71. Ellis DJ, Millar WL, Reisner LS: A randomized double-blind comparison of epidural versus intravenous fentanyl infusion for analgesia after cesarean section. Anesthesiology 1990; 72: 981–6

72. Imagaki Y, Mashimo T, Yoshiya I: Segmental analgesic effect and reduction of halothane MAC from epidural fentanyl in humans. Anesth Analg 1992; 74: 856–64

73. Salomäki TE, Laitinen JO, Nuutinen LS: A randomized double-blind comparison of epidural versus intravenous fentanyl infusion for analgesia after thoracotomy. Anesthesiology 1991; 75: 790–5

74. Sandler AN, Stringer D, Panos L, Badner N, Friedlander M, Koren G, Katz J, Klein J: A randomized, double-blind comparison of lumbar epidural and intravenous fentanyl infusions for postthoracotomy pain relief: Analgesic, pharmacokinetic, and respiratory effects. Anesthesiology 1992; 77: 626–34

75. Guinard JP, Mavracodoratos P, Chiolero R, Carpenter RL: A randomized comparison of intravenous versus lumbar and thoracic epidural fentanyl for analgesia after thoracotomy. Anesthesiology 1992; 77: 1108–15

76. van Lersbergh C, Camu F, de Keersmaecker E, Sacré S: Continuous administration of fentanyl for postoperative pain: A comparison of the epidural, intravenous, and transdermal routes. J Clin Anesth 1994; 6: 308–14

77. Boldt J, Thaler E, Lehmann A, Papsdorf M, Isgro F: Pain management in cardiac surgery patients: Comparison between standard therapy and patient-controlled analgesia regimen. J Cardiothorac Vasc Anesth 1998; 12: 654–8

78. Murphy DJ, Graziotti P, Chalkiadis G, McKenna M: Patient-controlled analgesia: A comparison with nurse-controlled intravenous opioid infusions. Anesth Intensive Care 1994; 22: 589–92

79. Myles PS, Buckland MR, Cannon GB, Bujor MA, Langley M, Breaden A, Salamonsen RF, Davis BB: Comparison of patient-controlled analgesia and nurse-controlled infusion analgesia after cardiac surgery. Anesth Intensive Care 1994; 22: 672–8

80. O'Halloran P, Brown R: Patient-controlled analgesia compared with nurse-controlled infusion analgesia after heart surgery. Intensive Crit Care Nurs 1997; 13: 126–9

81. Berde CB, Lehn BM, Yee JD, Sethna NF, Russo D: Patient-controlled analgesia in children and adolescents: A randomized, prospective comparison with intramuscular administration of morphine for postoperative analgesia. J Pediatr 1991; 118: 460–6

82. Bollish SJ, Collins CL, Kinking DM, Bartlett RH: Efficacy of patient-controlled versus conventional analgesia for postoperative pain. Clin Pharm 1985; 4: 48–52

83. Chan VW, Chung F, McQuestion M, Gomez M: Impact of patient-controlled analgesia on required nursing time and duration of postoperative recovery. Reg Anesth 1995; 20: 506–14

84. Choinière M, Rittenhouse BE, Perreault S, Charrand D, Rousseau P, Smith B, Pepler C: Efficacy and costs of patient-controlled analgesia versus regularly administered intramuscular opioid therapy. Anesthesiology 1998; 89: 1377–88

85. Egbert AM, Parks LH, Short LM, Burnett ML: Randomized trial of postoperative patient-controlled analgesia vs intramuscular narcotics in frail elderly men. Arch Intern Med 1990; 150: 1897–903

86. Passchier J, Ruprecht J, Koenders ME, Olree M, Luiwieler RL, Loenke B: Patient-controlled analgesia (PCA) leads to more postoperative pain relief, but also to more fatigue and less vigour. Acta Anaesthesiol Scand 1993; 37: 659–63

87. Sanansilp V, Lertakamneekes J, Udompunturak S: Cost-effectiveness analysis of patient-controlled analgesia, intramuscular q.i.d. injection and p.r.n. injection for postoperative pain relief. J Med Assoc Thai 1995; 78: 600–4

88. Wheatley RG, Shepherd D, Jackson IJ, Madej TH, Hunter D: Hyponaemia and pain relief after upper abdominal surgery: Comparison of i.m. and patient-controlled analgesia. Br J Anaesth 1992; 69: 558–61

89. Grant RP, Dolman JF, Harper JA, White SA, Parsons DG, Evans KG, Merrick CP: Patient-controlled lumbar epidural fentanyl compared with patient-controlled intravenous fentanyl for post-thoracotomy pain. Can J Anaesth 1992; 39: 214–9

90. Ngan Kee WD, Lamm KC, Chen PP, Gin T: Comparison of patient-controlled epidural analgesia with patient-controlled intravenous analgesia using pethidine or fentanyl. Anaesthesia Intensive Care 1997; 25: 126–32

91. Packer MJ, Moore JS, Evans SF: Meperidine for patient-controlled analgesia after cesarean section. Intravenous versus patient-controlled analgesia using pethidine or fentanyl. Anaesthesia Intensive Care 1994; 22: 1268–76

92. Stoddart PA, Cooper A, Russell R, Reynolds F: A comparison of epidural diamorphine with intravenous patient-controlled analgesia using the Baxter infusor following caesarean section. Anaesthesia 1993; 48: 1086–90

93. Welchew EA, Breen DP: Patient-controlled on-demand epidural fentanyl: A comparison of patient-controlled on-demand fentanyl delivered epidurally or intravenously. Anaesthesia 1991; 46: 438–41

94. Guler T, Unlugenc H, Gundogan Z, Ozalevli M, Balcioglu O, Topcuoglu MS: A background infusion of morphine does not enhance postoperative analgesia after cardiac surgery. Can J Anaesth 2004; 51: 718–22

95. Dal D, Kanbak M, Caglar M, Aypar U: A background infusion of morphine does not enhance postoperative analgesia after cardiac surgery. Can J Anaesth 2003; 50: 476–9

96. Doyle E, Robinson D, Morton NS: Patient-controlled analgesia with low dose background infusions after lower abdominal surgery in children. Br J Anaesth 1993; 71: 818–22

97. Doyle E, Robinson D, Morton NS: Comparison of patient-controlled analgesia with and without a background infusion after lower abdominal surgery in children. Br J Anaesth 1993; 71: 670–3

98. McNeely JK, Trentadue NC: Comparison of patient-controlled analgesia with and without nighttime morphine infusion following lower extremity surgery in children. J Pain Symptom Manage 1997; 13: 268–73
Sabanathan S, Mearns AJ, Bickford-Smith PJ, Eng J, Mozell EJ, Sabanathan S, Mearns AJ, Bickford-Smith PJ, Ma-

Dryden CM, McMenemin I, Duthie DJ: Efficacy of continu-

Chan VW, Chung F, Cheng DC, Seyone C, Chung A, Kirby

Barron DJ, Tolan MJ, Lea RE: A randomized controlled trial

Rademaker BM, Sih IL, Kalkman CJ, Henny CP, Filedt Kok

Eng J, Sabanathan S: Continuous extrapleural intercostal

Smythe MA, MB Zak, O’Donnell MP, Schad RF,

Russell AW, Owen H, Ilsley AH, Kluger MT, Plummer JL:

Parker RK, Holtmann B, White PF: Effects of a nighttime

variables of patient-controlled analgesia: 2. Concurrent in-

106. Barron DJ, Tolan MJ, Lea RE: A randomized controlled trial of continuous extra-pleural analgesia versus pa-

tient-controlled analgesia plus continuous infusion after hip replacement surgery. Ann Pharmacother 1996; 30:224–7

104. J. Sabanathan S: Continuous extrapleural intercostal nerve block and post-thoracotomy pulmonary complica-

tions. Scand J Thorac Cardiovasc Surg 1992; 26:219–23

105. Rademaker BM, Sih IL, Kalkman CJ, Henny CP, Filedt Kok

100. Parker RK, Holtmann B, White PF: Effects of a nighttime opioid infusion with PCA therapy on patient comfort and analgesic requirements after abdominal hysterectomy. Anesthesiology 1992; 76:362–7

101. Russell AW, Owen H, Ilsley AH, Kluger MT, Plummer JL:

Background infusion with patient-controlled analgesia: Ef-

fect on postoperative oxyhaemoglobin saturation and pain control. Anaesth Intensive Care 1993; 21:174–9

102. Sinatra R, Chung KS, Silverman DG, Brull SJ, Chung J, Harrison DM, Donielsen D, Weinstock A: An evaluation of morphine and oxymorphone administered via patient-con-

trolled analgesia (PCA) or PCA plus basal infusion in post-

cesarean-delivery patients. Anesthesiology 1989; 71:502–7

103. Smythe MA, MB Zak, O’Donnell MP, Schad RF,

Intrapleural bupivacaine in the control of postthoracotomy pain. Can J Anaesth 1991; 38:389–9

109. Lee A, Boon D, Bagshaw P, Kemphorne P: A randomized double-blind study of interpleural analgesia after cholecys-

tectomy. Anesthesia 1990; 45:1028–31

110. Chan VW, Chung F, Cheng DC, Seyone C, Chung A, Kirby

111. Dryden CM, McNeminen I, Duthie DJ: Efficacy of continu-

ous intercostal bupivacaine for pain relief after thoracot-

omy. Br J Anaesth 1993; 70:508–10

112. Mann LJ, Young GR, Williams JK, Dent OF, McQuaughan BC:

Intravepular block in the control of postthoracotomy pain. Ann Thorac Surg 1992; 53:449–54

113. Mozell EJ, Sabanathan S, Mearns AJ, Bickford-Smith PJ, Ma-

jid MR, Zografos G: Continuous extrapleural intercostal nerve block after pleurectomy. Thorax 1991; 46:21–4

114. Sabanathan S, Mearns AJ, Bickford Smith PJ, Eng J, Berris-

ford RG, Bibby SR, Majid MR. Efficacy of continuous extra-

pleural intercostal nerve block on post-thoracotomy pain and pulmonary mechanics. Br J Surg 1990; 77:221–5

115. Schneider RF, Villamena PC, Harvey J, Surick BG, Surick JW,

Beattie EJ. Lack of efficacy of intravepular bupivacaine for postoperative analgesia following thoracotomy. Chest

1993; 103:414–6

116. Symreng T, Gomez MN, Rossi N: Intravepular bupivacaine versus saline after thoracotomy: Effects on pain and lung function: A double-blind study. J Cardiothorac Anesth 1989; 3:144–9

117. VadeBoncouer TR, Riegler FX, Gauth RS, Weinberg GL: A randomized, double-blind comparison of the effects of in-

terpleural bupivacaine and saline on morphine require-

ments and pulmonary function after cholecystectomy. Anesthesiology 1989; 71:359–43
154. Heard SO, Edwards WT, Ferrari D, Hanna D, Wong PD, Liland A, Willock MM: Analgesic effects of intraarticular bupivacaine or morphine after arthroscopic knee surgery: A randomized, prospective, double-blind study. Anesth Analg 1992; 74:822–6

155. Kanbak M, Akpolat N, Ocal T, Doral MN, Erkan M, Erdem K: Intraarticular morphine administration provides pain relief after knee arthroscopy. Eur J Anaesthesiol 1997; 14:153–6

156. Raja SN, Dickstein RE, Johnson CA: Comparison of postoperative analgesic effects of intraarticular bupivacaine and morphine following arthroscopic knee surgery. Anesthesiology 1992; 77:1143–7

157. Rosseland LA, Stubhaug A, Skoglund A, Breivik H: Intraarticular morphine for pain relief after knee arthroscopy. Acta Anaesth Scand 1999; 43:252–7

158. Chirwa SS, MacLeod BA, Day B: Intraarticular bupivacaine (Marcaine) after arthroscopic meniscectomy: A randomized double-blind controlled study. Arthroscopy 1989; 5:33–5

159. Henderson RC, Campion ER, DeMasi RA, Taft TN: Postarthroscopy analgesia with bupivacaine: A prospective, randomized blinded evaluation. Am J Sports Med 1990; 18:614–7

160. Fong SY, Pavy TJ, Yeo ST, Paech MJ, Gurrin LC: Assessment of wound infiltration with bupivacaine in women undergoing day-case gynaecological laparoscopy. Reg Anesth Pain Med 2001; 26:131–6

161. Goldsher M, Podoshin L, Fradis M, Malatskey S, Gerstel R, Fong SY, Pavy TJ, Yeo ST, Paech MJ, Gurrin LC: Assessment of wound infiltration with bupivacaine in women undergoing day-case gynaecological laparoscopy. Reg Anesth Pain Med 2001; 26:131–6

162. Johansen H, Harbo G, Illum P: Preincisional infiltration with bupivacaine in tonsillotomy. Acta Otolaryngol Head Neck Surg 1996; 122:261–3

163. Ke RW, Portera SG, Bagous W, Lincoln SR: A randomized, double-blinded trial of preemptive analgesia in laparoscopy. Obstet Gynecol 1998; 92:972–5

164. Marsh GD, Huddy SP, Rutter KP: Bupivacaine infiltration after haemorrhoidectomy. J R Coll Surg Edinb 1993; 38:41–2

165. Molliex S, Haond P, Baylot D, Prades JM, Navez M, Elkhoury Z, Auboyer C: Effect of pre-incisional infiltration of tonsils with bupivacaine on the pain following tonsillectomy under general anaesthesia. Pain 1997; 47:305–8

166. Johansen H, Harbo G, Illum P: Preincisional infiltration with bupivacaine in tonsillectomy. Arch Otolaryngol Head Neck Surg 1996; 122:261–3

167. Björkman SE, Kristoffersson M, Eklund J, Moldenhauer C, Karlsson S, Eriksson-Mjöberg M, Kristiansson M, Carlström K, Wamsley ME, Smith RR: Intraarticular bupivacaine and morphine following arthroscopic knee surgery. Anesthesiology 1992; 77:1143–7

168. Klein JR, Heaton JP, Thompson JP, Cotton BR, Davidson AC, Smith G: Infiltration of the abdominal wall with local anaesthetic after total abdominal hysterectomy has no opioid-sparing effect. Br J Anaesth 2000; 84:248–9

169. Kounitakis SE: Effectiveness of perioperative bupivacaine infiltration in tonsillectomy patients. Am J Otolaryngol 2002; 23:76–80

170. Owen H, Galloway DJ, Mitchell KG: Analgesia by wound infiltration after surgical excision of benign breast lumps. Ann R Coll Surg Engl 1985; 67:114–5

171. Partridge BL, Stable BE: The effects of incisional bupivacaine on postoperative narcotic requirements, oxygen saturation and length of stay in the post-anesthesia care unit. Acta Anaesthes Scand 1990; 34:486–91

172. Patel JM, Lanzafame RJ, Williams JS, Mullen BV, Hinshaw JR: The effect of incisional infiltration of bupivacaine hydrochloride upon pulmonary function, stress response and narcotic need following elective cholecystectomy. Surg Gynecol Obstet 1983; 157:338–40

173. Russell WC, Ramsay AH, Fletcher DR: The effect of incisional infiltration of bupivacaine upon pain and respiratory function following open cholecystectomy. Aust N Z J Surg 1993; 63:756–9

174. Trotter TN, Hayes-Gregson P, Robinson S, Cole L, Coley S, Fell D: Wound infiltration of local anaesthetic after lower segment caesarean section. Anaesthesia 1991; 46:404–7

175. Wright JE: Controlled trial of wound infiltration with bupivacaine for postoperative pain relief after appendicectomy in children. Br J Surg 1993; 80:110–1

176. Bourget JL, Clark J, Joy N: Comparing preincisional with postincisional bupivacaine infiltration in the management of postoperative pain. Arch Surg 1997; 132:766–9

177. Clarker SJ, Umu C, Cevizici N, Kayagolu S, Oba S: Effects of levobupivacaine infiltration on postoperative analgesia and stress response in children following inguinal hernia repair. Eur J Anaesthesiol 2009; 26:430–4

178. Dahl V, Raeder JC, Enro PE, Kovald A: Pre-emptive effect of pre-incisional bupivacaine on postsurgical pain in children undergoing inguinal hernia repair. Acta Anaesthesiol Scand 1996; 40:847–51

179. O’Hanlon DM, Colbert ST, Keane PW, Given FH: Preemptive bupivacaine offers no advantages to postoperative wound infiltration in analgesia for outpatient breast biopsy. Am J Surg 2000; 180:29–32

180. Gemma M, Piccion LO, Gioia L, Beretta L, Bussi M: Ropivacaine peritonsillar infiltration for analgesia after adenotonsillectomy in children. Acta Anaesthesiol Scand 2009; 44:1093–8

181. Johansson A, Axelson J, Ingvar C, Luttropp H-H, Lundberg J: Preoperative ropivacaine infiltration in breast surgery. Acta Anaesthesiol Scand 2000; 44:1093–8

182. Johansson B, Hallerbäck B, Stubberöd A, Janhu T, Edwin B, Glise H, Solhaug HH: Preoperative local infiltration with ropivacaine for postoperative pain relief after inguinal hernia repair. Randomized controlled trial. Eur J Surg 1997; 163:371–8

183. Kato J, Ogawa S, Katz J, Nagai H, Kashiwazaki M, Saeki H, Suzuki H: Effects of presurgical local infiltration of bupivacaine in the surgical field on postsurgical wound pain in laparoscopic gynecological examinations: A possible pre-emptive analgesic effect. Clin J Pain 2000; 16:12–7

184. Papaziogas B, Argiriadou H, Papagiannopoulou P, Pavlidis T, Georgiou M, Styra E, Papaziogas T: Preincisional intravenous low-dose ketamine and local infiltration with ropivacaine reduces postoperative pain after laparoscopic cholecystectomy. Surg Endosc 2001; 15:1030–3
171. Vinson-Bonnet B, Coltart JC, Fingerhut A, Bonnet F: Local infiltration with ropivacaine improves immediate postoperative pain control after hemorrhoidal surgery. Dis Colon Rectum 2002; 45:104–8

172. Asantila R, Eklund P, Rosenberg PH: Continuous epidural infusion of bupivacaine and morphine for postoperative analgesia after hysterectomy. Acta Anaesth Scand 1991; 35:513–7

173. Crews JC, Hord AH, Denson DD, Schatzman C: A comparison of the analgesic efficacy of 0.25% levobupivacaine combined with 0.005% morphine, 0.25% levobupivacaine alone, or 0.005% morphine alone for the management of postoperative pain in patients undergoing major abdominal surgery. Anesth Analg 1999; 89:1504–9

174. Douglas MJ, McMorland GH, Janzar JA: Influence of bupivacaine as an adjuvant to epidural morphine for analgesia after caesarean section. Anesth Analg 1988; 67:1138–41

175. Hesselgard K, Strömblad LG, Reinstrup P: Morphine with or without a local anaesthetic for postoperative intrathoracic pain treatment after selective dorsal rhizotomy in children. Paediatr Anaesth 2001; 11:75–9

176. Liu SS, Carpenter RL, Mackey DC, Thirlby RC, Rupp SM, Shine TS, Feinglass NG, Metzger PP, Fulmer JT, Smith SL: Effects of perioperative analgesic technique on rate of recovery after colon surgery. Anesthesiology 1995; 83:757–65

177. Benzon HT, Wong CA, Wong HY, Brooke C, Wade L: The effect of low-dose bupivacaine on postoperative epidural fentanyl analgesia and thrombelastography. Anesth Analg 1994; 79:911–7

178. Cohen S, Lowenwirt LG, Reinsonstrup P: Morphine with or without a local anaesthetic for postoperative intrathoracic pain treatment after selective dorsal rhizotomy in children. Paediatr Anaesth 2001; 11:75–9

179. Cooper DW, Ryall DM, McHardy FE, Lindsay SL, Eldabe SS: Patient-controlled extradural analgesia with bupivacaine, fentanyl, or a mixture of both, after Caesarean section. Br J Anaesth 1996; 76:611–5

180. Cooper DW, Turner G: Patient-controlled extradural analgesia to compare bupivacaine, fentanyl and bupivacaine with fentanyl in the treatment of postoperative pain. Br J Anaesth 1993; 70:503–7

181. George KA, Chisakuta AM, Gamble JA, Browne GA: Thoracic epidural infusion for postoperative pain relief following abdominal aortic surgery. Bupivacaine, fentanyl or a mixture of both? Anaesthesia 1992; 47:588–94

182. George KA, Wright PM, Chisakuta A: Continuous thoracic epidural fentanyl for post-thoracotomy pain relief. With or without bupivacaine? Anaesthesia 1991; 46:732–6

183. Kostomava PA, Larulla JJ, Alahhu S, Salomäki TE: Ropivacaine 1 mg x ml(−1) does not decrease the need for epidural fentanyl after hip replacement surgery. Acta Anaesthesiol Scand 2001; 45:483–94

184. Mahon SV, Berry PD, Jackson M, Russell GN, Pennefather SH: Thoracic epidural infusions for post-thoracotomy pain: A comparison of fentanyl-bupivacaine mixtures vs. fentanyl alone. Anaesthesia 1999; 54:641–6

185. Paech MJ, Westmore MD: Postoperative epidural fentanyl infusion—is the addition of 0.1% bupivacaine of benefit? Anaesth Intensive Care 1994; 22:9–14

186. Reinoso-İbarro B, Saavedra B, Hervilla S, de Vicente J, Ramírez-Barbero F, Saavedra B, Hervilla S, de Vicente J, Tabarés B, Gómez-Criado MS: Lidocaine with fentanyl, compared to morphine, marginally improves postoperative epidural analgesia in children. Can J Anaesth 2002; 49:67–71

187. Salomäki TE, Laitinen JO, Naatunen P, Virtanen P, Vuustinen LS: 0.1% bupivacaine does not reduce the requirement for epidural fentanyl infusion after major abdominal surgery. Reg Anesth 1995; 20:435–43

188. Torda TA, Kann P, Mills G, De Leon G, Pennman D: Comparison of extradural fentanyl, bupivacaine and two fentanyl–bupivacaine mixtures of pain relief after abdominal surgery. Br J Anaesth 1995; 74:35–40

189. Cullen ML, Staren ED, El-Ganzouri A, Logas WG, Ivankovich AD, Economou SG: Continuous epidural infusion for analgesia after major abdominal operations: A randomized, prospective, double-blind study. Surgery 1985; 98:718–28

190. Jorgensen H, Fonsgaard JS, Dirks J, Weterslev J, Andreasen B, Dahl JB: Effect of epidural bupivacaine vs. epidural epidural fentanyl and morphine on gastrointestinal function and pain after major gynaecological surgery. Br J Anaesth 2001; 87:727–32

191. Martin LV: Postoperative analgesia after circumcision in children. Br J Anaesth 1982; 54:1263–6

192. Scott NB, Mogensen T, Bigler D, Lund C, Kehelet H: Continuous thoracic extradural 0.5% bupivacaine with or without morphine: Effect on quality of blockade, lung function and the surgical stress response. Br J Anaesth 1989; 62:253–7

193. Wolf AR, Hughes D, Hobbs AJ, Prys-Roberts C: Combined morphine-bupivacaine caudals for reconstructive penile surgery in children: Systemic absorption of morphine and postoperative analgesia. Anaesth Intensive Care 1991; 19:17–21

194. Wolf AR, Hughes D, Wade A, Mather SJ, Prys-Roberts C: Postoperative analgesia after paediatric orchidectomy: Evaluation of a bupivacaine-morphine mixture. Br J Anaesth 1990; 64:430–5

195. Campbell FA, Yentis SM, Fear DW, Bissonnette B: Analogic efficacy and safety of a caudal bupivacaine-fentanyl mixture in children. Can J Anaesth 1992; 39:661–4

196. Laurreti GR, Mattos AL, Reis MP, Pereira NL: Combined intrathecal fentanyl and neostigmine: Therapy for postoperative abdominal hysterectomy pain relief. J Clin Anesth 1998; 10:291–6

197. Łostowad Z, Zienowicz R, Sten R: Postoperative epidural analgesia in children after major orthopaedic surgery: A randomised study of the effect on PONV of two anaesthetic techniques: Low and high dose I.V. fentanyl and epidural infusions with and without fentanyl. Acta Anaesthesiol Scand 2001; 45:482–8

198. Berti M, Casati A, Fanelli G, Albertini A, Palmisano S, Danelli G, Comotti L, Torri G: 0.2% ropivacaine with or without fentanyl for patient-controlled epidural analgesia after major abdominal surgery: A double-blind study. J Clin Anesth 2000; 12:292–7

199. Buggy DJ, Hall NA, Shah J, Brown J, Williams J: Motor block during patient-controlled epidural analgesia with ropivacaine or ropivacaine/fentanyl after intrathecal bupivacaine for caesarean section. Br J Anaesth 2000; 85:468–70

200. Finucane BT, Ganapathy S, Carli F, Priddy JM, Vong BY, Shukla RC, Kriftersson AH, Huiziar KM, Nevin K, Ahlen KG, Canadian Ropivacaine Research Group: Prolonged epidural infusions of ropivacaine (2 mg/ml) after colonic surgery: The impact of adding fentanyl. Anesth Analg 2001; 92:1276–85

201. Scott DA, Blake D, Buckland M, Titchell R, Halliwell R, Adams AD, Economou SG, Canadian Ropivacaine Research Group: Prolonged epidural infusions of ropivacaine (2 mg/ml) after colonic surgery: The impact of adding fentanyl. Anesth Analg 2001; 92:1276–85

202. Hübner M, Litz RJ, Sengbusch KH, Kreinecker I, Frank MD, Hakenberg OW, Albrecht DM: A comparison of fentanyl–bupivacaine infusions and in combination with 1, 2, and 4 microg/ml fentanyl for seventy-two hours of postoperative analgesia after major abdominal surgery. Acta Anaesthesiol Scand 1998; 98:1354–61

203. Kampe S, Weigand C, Kaufmann J, Klimek M, König DP, Schena J, Spahn DR, Brügger C, Bielefeldt KP, Frey U, Koller G, Nistor A, Reisser D, Scheremet MR, Schneiberg K, Schöniger M, Tuset J: A comparison of epidural ropivacaine infusions alone. Anaesthesia 1999; 54:641–6
Lynch J: Postoperative analgesia with no motor block by continuous epidural infusion of ropivacaine 0.1% and sufentanil after total hip replacement. Anesth Analg 1999; 89: 595–8

204. Lorenzini C, Moreira LB, Ferreira MB: Efficacy of ropivacaine compared with ropivacaine plus sufentanil for postoperative analgesia after major knee surgery. Anaesthesia 2002; 57:424–8

205. Pouzeratte Y, Delay JM, Brunat G, Boccara G, Vergne C, Jaber S, Fabre JM, Colson P, Mann C: Patient-controlled epidural analgesia after abdominal surgery: Ropivacaine versus bupivacaine. Anesth Analg 2001; 93:1587–92

206. Wiebelack A, Brodner G, Van Aken H: The effects of adding sufentanil to bupivacaine for postoperative patient-controlled epidural analgesia. Anesth Analg 1997; 85:124–9

207. Carabine UA, Milligan KR, Mulholland D, Moore J: Extra- dural clonidine infusions for analgesia after total hip replacement. Br J Anaesth 1992; 68:338–43

208. Motsch J, Gra¨ber E, Ludwig K: Addition of clonidine en- dine admixture. Anaesthesia 1994; 49:767–71

209. Rockemann MG, Seeling W, Brinkmann A, Goertz AW, Hau- ber N, Junge J, Georgieff M: Analgesic and hemodynamic effects of epidural clonidine, clonidine/morphine, and morphine after pancreatic surgery—a double-blind study. Anesth Analg 1995; 80:869–74

210. van Essen EJ, Bovill JG, Ploeger EF: Epidural clonidine does not potentiate analgesia produced by extradural morphine after meniscectomy. Br J Anaesth 1991; 66:237–41

211. Vercauteren MP, Saldien V, Bosschaerts P, Adriaensen HA: Potentiation of sufentanil by clonidine in PCEA with or without basal infusion. Eur J Anaesthesiol 1996; 13:571–6

212. Vercauteren MP, Vandeput DM, Meert TF, Adriaensen HA: Patient-controlled epidural analgesia with sufentanil follow- ing caesarean section: The effect of adrenaline and cloni- dine admixture. Anaesthesia 1994; 49:767–71

213. Burns JW, Aitken HA, Bullingham RE, McArdle CS, Kenny GN: Double-blind comparison of the morphine sparing effect of continuous and intermittent I.M. administration of ketorolac. Br J Anaesth 1991; 67:255–8

214. Cataldo PA, Senagore AJ, Kilbride MJ: Ketorolac and patient controlled analgesia in the treatment of postoperative pain. Surg Gynecol Obstet 1993; 176:435–8

215. Munro HM, Walton SR, Malviya S, Merveil-Lewis T, Loder RT, Farley FA: Low-dose ketorolac improves analgesia and reduces morphine requirements following posterior spinal fusion in adolescents. Can J Anaesth 2002; 49:461–6

216. Reuben SS, Connelly NR, Lurie S, Klatt M, Gibson CS: Dose-response of ketorolac as an adjunct to patient-con- trolled analgesia morphine in patients after spinal fusion surgery. Anesth Analg 1998; 87:98–102

217. Reuben SS, Connelly NR, Steinberg R: Ketorolac as an adjunct to patient-controlled morphine in postoperative spine surgery patients. Reg Anesth 1997; 22:543–6

218. Sevarino FB, Sinatra RS, Puige D, Silverman DG: Intravenous ketorolac as an adjunct to patient-controlled analgesia (PCA) for management of postgynecologic surgical pain. J Clin Anesth 1994; 6:23–7

219. Sutters KA, Shaw BA, Gerardt JA, Hebert D: Comparison of morphine patient-controlled analgesia with and without ketorolac for postoperative analgesia in pediatric orthopae- dic surgery. Am J Orthop 1999; 28:351–8

220. Vetter TR, Heiner EJ: Intravenous ketorolac as an adjuvant to pediatric patient-controlled analgesia with morphine. J Clin Anesth 1994; 6:110–3

221. Adriaenssens G, Vermeyen KM, Hoffmann VL, Mertens E, Adriaenssens HF: Postoperative analgesia with i.v. patient- controlled morphine: Effect of adding ketamine. Br J An- aesth 1999; 83:393–6

222. Edwards ND, Fletcher A, Cole JR, Peacock JE: Combined infusions of morphine and ketamine for postoperative pain in elderly patients. Anaesthesia 1993; 48:124–7

223. Javery KB, Ussery TW, Steger HG, Colclough GW: Compari- son of morphine and morphine with ketamine for postop- erative analgesia. Can J Anaesth 1996; 43:216–5

224. Michals P, Guerrilh C, Helaire A, Avaro JP, Blayac D, Gaillat F, Dantin T, Thomas P, Kerbaul F: Adding ketamine to morphine for patient-controlled analgesia after thoracic surgery: Influence on morphine consumption, respiratory function, and nocturnal desaturation. Br J Anaesth 2007; 99:396–403

225. Reeves M, Lindholm DE, Myles PS, Fletcher H, Hunt JO: Adding ketamine to morphine for patient-controlled analgesia after major abdominal surgery: A double-blinded, ran- domized controlled trial. Anesth Analg 2001; 95:116–20

226. Sveticic G, Farzaneeg F, Zmoos P, Zmoos S, Eichenberger U, Curatolo M: Is the combination of morphine with ket- amine better than morphine alone for postoperative intra- venous patient-controlled analgesia? Anesth Analg 2008; 106:287–93

227. Huang YM, Wong CM, Wang CT, Lin WP, Horng LC, Jiang CC: Perioperative celexcoxib administration for pain man- agement after total knee arthroplasty: A randomized, con- trolled study. BMC Musculoskeletal Disorders 2008; 9:77

228. Plummer JL, Owen H, IsleyAH, Tordoff K: Sustained- release ibuprofen as an adjunct to morphine patient-con- trolled analgesia. Anesth Analg 1996; 85:92–6

229. Serpell MG, Thomson MF: Comparison of piroxicam with placebo in the management of pain after total hip replace- ment. Br J Anaesth 1989; 63:354–6

230. Schug SA, Sidebotham DA, McGuinness M, Thomas J, Fox L: Acetaminophen as an adjunct to morphine by patient-con- trolled analgesia in the management of acute postoperative pain. Anesth Analg 1998; 87:368–72

231. Agarwal A, Gautam S, Gupta D, Agarwal S, Singh PK, Singh U: Evaluation of a single preoperative dose of pregabalin for attenuation of postoperative pain after laparoscopic chole- cystectomy. Br J Anaesth 2008; 101:700–4

232. Al-Mujadi H, A-Refai AR, Katzarov MG, Dehrab NA, Batra YK, Al-Qattan AR: Preemptive gabapentin reduces postop- erative pain and opioid demand following thyroid surgery. Can J Anaesth 2006; 53:268–73

233. Clarke H, Pereira S, Kennedy D, Gilron I, Katz J, Gollish J, Kay J: Gabapentin decreases morphine consumption and improves functional recovery following total knee arthroplasty. Pain Res Manag 2009; 14:217–22

234. Dirks J, Fredsensborg BB, Christensen D, Fomsgaard J, Flyger H, Dahl JB: A randomized study of the effects of single-dose gabapentin versus placebo on postoperative pain and morphine consumption after mastectomy. Anes- thesiology 2002; 97:560–4

235. Grover VK, Mathew PJ, Yaddanapudi S, Sehgal S: A single dose of preoperative gabapentin for pain reduction and requirement of morphine after total mastectomy and axil- lary dissection: Randomized placebo-controlled double- blind trial. J Postgrad Med 2009; 55:257–60

236. Pandey CK, Singhal V, Kumar M, Lakra A, Ranjan R, Pal R, Raza M, Singh U, Singh PK: Gabapentin provides effective pain relief and morphine sparing for postoperative pain and morphine consumption after mastectomy. Anes- thesiology 2002; 97:560–4

237. Pandey CK, Sahay S, Gupta D, Ambesh SP, Singh RB, Raza M, Singh U, Singh PK: Preemptive gabapentin decreases postoperative pain after lumbar discectomy. Can J Anaesth 2004; 51:986–9

238. Radhakrishnan M, Bithal PK, Chaturvedi A: Effect of pre- emptive gabapentin on postoperative pain relief and mor-
phine consumption following lumbar laminectomy and discectomy: A randomized, double-blinded, placebo-controlled study. J Neurosurg Anesthesiol 2005; 17:125-8

239. Rapchuk IL, O’Connell L, Liessmann CD, Cornelissen HR, Fraser JF: Effect of gabapentin on pain after cardiac surgery: A randomised, double-blind, placebo-controlled trial. Anaesath Intensive Care 2010; 38:445-51

240. Srivastava U, Kumar A, Saxena S, Mishra AR, Saraswat N, Mishra S: Effect of preoperative gabapentin on postoperative pain and tramadol consumption after minilap open cholecystectomy: A randomized double-blind, placebo-controlled trial. Eur J Anaesthesiol 2010; 27:331-5

241. Dierking G, Duedahl TH, Rasmussen ML, Fomsgaard JS, Møiniche S, Romsing J, Dahl JB: Effects of gabapentin on postoperative morphine consumption and pain after abdominal hysterectomy: A randomized, double-blind trial. Acta Anaesthesiol Scand 2004; 48:322-7

242. Elander G, Hellström G: Analgesic administration in children and adults following open heart surgery. Scand J Caring Sci 1992; 6:17-21