Practice Guidelines for Obstetric Anesthesia

*An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology**

PRACTICE guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to the 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 recommendations that are supported by a synthesis and analysis of the current literature, expert and practitioner opinion, open-forum commentary, and clinical feasibility data.

This document updates the "Practice Guidelines for Obstetric Anesthesia: An Updated Report by the ASA Task Force on Obstetric Anesthesia," adopted by ASA in 2006 and published in 2007.†

- What other guidelines are available on this topic?
  - These Practice Guidelines update the "Practice Guidelines for Obstetric Anesthesia: An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia," adopted by the American Society of Anesthesiologists (ASA) in 2006 and published in 2007.[1]
  - Other guidelines on the topic for the anesthetic management of the parturient have been published by the American College of Obstetricians and Gynecologists in 2002 and reaffirmed in 2010 and 2013.[2]
- Why was this guideline developed?
  - In October 2014, the ASA Committee on Standards and Practice Parameters, in collaboration with the Society for Obstetric Anesthesia and Perinatology, elected to collect new evidence to determine whether recommendations in the existing practice guidelines continue to be supported by current evidence. The resultant guidelines, presented in this issue, incorporate an analysis of current scientific literature and expert consultant survey results.
- How does this statement differ from existing guidelines?
  - This statement presents new findings from the scientific literature since 2006 and surveys of both expert consultants and randomly selected ASA members.
  - This document represents the first practice guideline to be developed as a collaborative effort between the ASA and a subspecialty society (Society for Obstetric Anesthesia and Perinatology) with content expertise relevant to the recommendations.
- Why does the statement differ from existing guidelines?
  - The American College of Obstetricians and Gynecologists Practice Bulletin focuses on limited aspects of cesarean anesthesia (*e.g.*, when an anesthesiology consult is appropriate) and of labor analgesia (*e.g.*, parenteral opioids) that an obstetrician would use to counsel their patients.
  - These guidelines also include perianesthetic management of other obstetric procedures and emergencies.

Methodology

Definition of Perioperative Obstetric Anesthesia

For the purposes of these updated guidelines, *obstetric anesthesia* refers to peripartum anesthetic and analgesic activities performed during labor and vaginal delivery, cesarean delivery, removal of retained placenta, and postpartum tubal ligation.

Purposes of the Guidelines

The purposes of these guidelines are to enhance the quality of anesthetic care for obstetric patients, improve patient safety by reducing the incidence and severity of anesthesia-related complications, and increase patient satisfaction.

Focus

These guidelines focus on the anesthetic management of pregnant patients during labor, nonoperative delivery, operative delivery, and selected aspects of postpartum care and analgesia (*i.e.*, neuraxial opioids for postpartum analgesia after neuraxial anesthesia for cesarean delivery). The intended patient population includes, but is not limited,

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† Practice guidelines for obstetric anesthesia: An updated report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia. ANESTHESIOLOGY 2007; 124:270–300.

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to intrapartum and postpartum patients with uncomplicated pregnancies or with common obstetric problems. The guidelines do not apply to patients undergoing surgery during pregnancy, gynecological patients, or parturients with chronic medical disease (*e.g.*, severe cardiac, renal, or neurological disease). In addition, these guidelines do not address (1) postpartum analgesia for vaginal delivery, (2) analgesia after tubal ligation, or (3) postoperative analgesia after general anesthesia (GA) for cesarean delivery.

Application

These guidelines are intended for use by anesthesiologists. They also may serve as a resource for other anesthesia providers and healthcare professionals who advise or care for patients who will receive anesthetic care during labor, delivery, and the immediate postpartum period.

Task Force Members and Consultants

In 2014, the ASA Committee on Standards and Practice Parameters requested that the updated guidelines published in 2007 be reevaluated. This current update consists of a literature evaluation and the reporting of new survey findings of expert consultants and ASA members. A summary of recommendations is found in appendix 1.

This update was developed by an ASA-appointed Task Force of 11 members, consisting of anesthesiologists in both private and academic practices from various geographic areas of the United States, and consulting methodologists from the ASA Committee on Standards and Practice Parameters. The Task Force developed these updated guidelines by means of a multistep process. First, original published research studies from peer-reviewed journals published subsequent to the previous update were reviewed. Second, a panel of expert consultants was asked to (1) participate in opinion surveys on the effectiveness of various anesthetic management strategies and (2) review and comment on a draft of the update developed by the Task Force. Third, survey opinions about the guideline recommendations were solicited from a random sample of active members of the ASA. Finally, all available information was used to build consensus within the Task Force to finalize the update.

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. Scientific evidence used in the development of these updated guidelines is based on cumulative findings from literature published in peer-reviewed journals. Literature citations are obtained from PubMed and other healthcare databases, direct Internet searches, Task Force members, liaisons with other organizations, and manual searches of references located in reviewed articles.

Findings from the aggregated literature are reported in the text of the guidelines by evidence category, level, and direction. Evidence categories refer specifically to the strength and quality of the *research design* of the studies. Category A evidence represents results obtained from randomized controlled trials (RCTs), and Category B evidence represents observational results obtained from nonrandomized study designs or RCTs without pertinent comparison groups. When available, Category A evidence is given precedence over Category B evidence for any particular outcome. These evidence categories are further divided into evidence levels. Evidence levels refer specifically to the strength and quality of the summarized study *findings* (*i.e.*, statistical findings, type of data, and the number of studies reporting/replicating the findings within the evidence categories). In this document, only the highest level of evidence is included in the summary report for each intervention–outcome pair, including a directional designation of benefit, harm, or equivocality for each outcome.

Category A. Randomized controlled trials report comparative findings between clinical interventions for specified outcomes. Statistically significant ($P < 0.01$) outcomes are designated as either beneficial (B) or harmful (H) for the patient; statistically nonsignificant findings are designated as equivocal (E).

Level 1: The literature contains a sufficient number of RCTs to conduct meta-analysis,‡ and meta-analytic findings from these aggregated studies are reported as evidence.
Level 2: The literature contains multiple RCTs, but the number of RCTs is not sufficient to conduct a viable meta-analysis for the purpose of these updated guidelines. Findings from these RCTs are reported separately as evidence.
Level 3: The literature contains a single RCT, and findings are reported as evidence.

Category B. Observational studies or RCTs without pertinent comparison groups may permit *inference* of beneficial or harmful relations among clinical interventions and clinical outcomes. Inferred findings are given a directional designation of beneficial (B), harmful (H), or equivocal (E). For studies that report statistical findings, the threshold for significance is a *P* value of less than 0.01.

Level 1: The literature contains observational comparisons (*e.g.*, cohort and case-control research designs) with comparative statistics between clinical interventions for a specified clinical outcome.
Level 2: The literature contains noncomparative observational studies with associative statistics (*e.g.*, relative risk, correlation, or sensitivity/specificity).

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

Level 3: The literature contains noncomparative observational studies with descriptive statistics (*e.g.*, frequencies and percentages).
Level 4: The literature contains case reports.

Insufficient Literature. The *lack* of sufficient scientific evidence in the literature may occur when the evidence is either unavailable (*i.e.*, no pertinent studies found) or inadequate. Inadequate literature cannot be used to assess relations among clinical interventions and outcomes because a clear interpretation of findings is not obtained due to methodological concerns (*e.g.*, confounding of study design or implementation), or the study does not meet the criteria for content as defined in the "Focus" of the guidelines.

Opinion-based Evidence. All opinion-based evidence (*e.g.*, survey data, Internet-based comments, letters, and editorials) relevant to each topic was considered in the development of these updated guidelines. However, only the findings obtained from formal surveys are reported in the current update. Identical surveys were distributed to expert consultants and a random sample of ASA members who practice obstetric anesthesia.

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 the 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.

Survey responses from expert and membership sources 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 obtained during the development of these guidelines, Internet-based comments, letters, and editorials are all informally evaluated and discussed during the formulation of guideline recommendations. When warranted, the Task Force may add educational information or cautionary notes based on this information.

§ 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

Perianesthetic Evaluation and Preparation

Perianesthetic evaluation and preparation topics include (1) a focused history and a physical examination, (2) an intrapartum platelet count, (3) a blood type and screen, and (4) perianesthetic recording of fetal heart rate patterns.

History and Physical Examination.

Literature Findings: Although it is a well-accepted clinical practice to review medical records and conduct a physical examination, comparative studies are insufficient to directly evaluate the impact of these practices. Studies with observational findings suggest that certain patient or clinical characteristics (*e.g.*, hypertensive disorders of pregnancy such as preeclampsia and hemolysis, elevated liver enzymes, and low platelet count syndrome, obesity, and diabetes mellitus) may be associated with obstetric complications (*Category B2/B3-H evidence*).[3–14]

Survey Findings: The consultants and ASA members both strongly agree (1) to conduct a focused history and physical examination before providing anesthesia care and (2) that a communication system should be in place to encourage early and ongoing contact between obstetric providers, anesthesiologists, and other members of the multidisciplinary team.

Intrapartum Platelet Count.

Literature Findings: The literature is insufficient to assess whether a routine platelet count can predict anesthesia-related complications in uncomplicated parturients. An observational study reported that platelet count and fibrinogen values are associated with the frequency of postpartum hemorrhage (*Category B2 evidence*).[15] Other observational studies and case reports suggest that a platelet count may be useful for diagnosing hypertensive disorders of pregnancy, such as preeclampsia; hemolysis, elevated liver enzymes, and low platelet count syndrome; and other conditions associated with coagulopathy (*Category B3/B4-B evidence*).[16–23]

Survey Findings: The consultants and ASA members strongly agree that the anesthesiologist's decision to order or require a platelet count should be individualized and based on a patient's history (*e.g.*, preeclampsia with severe features), physical examination, and clinical signs.

Blood Type and Screen.

Literature Findings: The literature is insufficient to determine whether obtaining a blood type and screen is associated with fewer maternal anesthetic complications. In addition, the literature is insufficient to determine whether a blood cross-match is necessary for healthy and uncomplicated parturients.

Survey Findings: The ASA members agree and the consultants strongly agree that (1) a routine blood cross-match is not

necessary for healthy and uncomplicated parturients for vaginal or operative delivery and (2) the decision whether to order or require a blood type and screen or cross-match should be based on maternal history, anticipated hemorrhagic complications (*e.g.*, placenta accreta in a patient with placenta previa and previous uterine surgery), and local institutional policies.

Perianesthetic Recording of Fetal Heart Rate Patterns.

Literature findings: Studies with observational findings and case reports indicate that fetal heart rate patterns may change after the administration of neuraxial anesthetics (*Category B3/B4 evidence*).[24–31]

Survey Findings: The consultants and ASA members strongly agree that fetal heart rate patterns should be monitored by a qualified individual before and after administration of neuraxial analgesia for labor.

Recommendations for Perianesthetic Evaluation and Preparation

History and Physical Examination.

- Conduct a focused history and physical examination before providing anesthesia care.
  - This should include, but is not limited to, a maternal health and anesthetic history, a relevant obstetric history, a baseline blood pressure measurement, and an airway, heart, and lung examination, consistent with the ASA "Practice Advisory for Preanesthesia Evaluation."‖
  - When a neuraxial anesthetic is planned, examine the patient's back.
  - Recognition of significant anesthetic or obstetric risk factors should encourage consultation between the obstetrician and the anesthesiologist.
- A communication system should be in place to encourage early and ongoing contact between obstetric providers, anesthesiologists, and other members of the multidisciplinary team.

Intrapartum Platelet Count.

- The anesthesiologist's decision to order or require a platelet count should be individualized and based on a patient's history (*e.g.*, preeclampsia with severe features), physical examination, and clinical signs.#
  - A routine platelet count is not necessary in the healthy parturient.

‖ Practice advisory for preanesthesia evaluation: An updated report by the American Society of Anesthesiologists Task Force on Preanesthesia Evaluation. Anesthesiology 2012; 116:522–38.

A specific platelet count predictive of neuraxial anesthetic complications has not been determined.

** American College of Obstetricians and Gynecologists: ACOG Practice Bulletin No. 106: Intrapartum fetal heart rate monitoring: Nomenclature, interpretation, and general management principles. Obstet Gynecol 2009; 114:192–202.

Blood Type and Screen.

- A routine blood cross-match is not necessary for healthy and uncomplicated parturients for vaginal or operative delivery.
- The decision whether to order or require a blood type and screen or cross-match should be based on maternal history, anticipated hemorrhagic complications (*e.g.*, placenta accreta in a patient with placenta previa and previous uterine surgery), and local institutional policies.

Perianesthetic Recording of Fetal Heart Rate Patterns.

- Fetal heart rate patterns should be monitored by a qualified individual before and after administration of neuraxial analgesia for labor.
  - *Continuous* electronic recording of fetal heart rate patterns may not be necessary in every clinical setting and may not be possible during placement of a neuraxial catheter.**

Aspiration Prevention

Aspiration prevention includes (1) clear liquids, (2) solids, and (3) antacids, H_2-receptor antagonists, and metoclopramide.

Clear Liquids.

Literature Findings: There is insufficient published literature to examine the relation between fasting times for clear liquids and the risk of emesis/reflux or pulmonary aspiration during labor.

Survey Findings: The ASA members agree and the consultants strongly agree that (1) oral intake of moderate amounts of clear liquids may be allowed for uncomplicated laboring patients and (2) the uncomplicated patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) may have moderate amounts of clear liquids up to 2 h before induction of anesthesia.

Solids.

Literature Findings: A specific fasting time for solids that is predictive of maternal anesthetic complications has not been determined. There is insufficient published literature to address the safety of *any* particular fasting period for solids in obstetric patients.

Survey Findings: The consultants and ASA members strongly agree that (1) the patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) should undergo a fasting period for solids of 6 to 8 h depending on the type of food ingested (*e.g.*, fat content); (2) laboring patients with additional risk factors for aspiration (*e.g.*, morbid obesity, diabetes mellitus, and difficult airway) or patients at increased risk for operative delivery (*e.g.*, nonreassuring fetal heart rate pattern) may have further restrictions of oral intake, determined on a case-by-case basis; and (3) solid foods should be avoided in laboring patients.

Antacids, H_2-receptor Antagonists, and Metoclopramide.

Literature Findings: Randomized controlled trials indicate that preoperative nonparticulate antacids (*e.g.*, sodium citrate and sodium bicarbonate) are associated with higher gastric pH values during the peripartum period (*Category A2-B evidence*)[32–35] and are equivocal regarding gastric volume (*Category A2-E evidence*).[32,33] Randomized placebo-controlled trials indicate that H_2-receptor antagonists are associated with higher gastric pH values in obstetric patients (*Category A2-B evidence*) and are equivocal regarding gastric volume (*Category A2-E evidence*).[36–38] Randomized placebo-controlled trials indicate that metoclopramide is associated with reduced peripartum nausea and vomiting (*Category A2-B evidence*).[39–43] Literature is not available that examines the relation between reduced gastric acidity and the frequency of pulmonary aspiration, emesis, morbidity, or mortality in obstetric patients who have aspirated gastric contents.

Survey Findings: The consultants and ASA members both agree that before surgical procedures (*e.g.*, cesarean delivery or postpartum tubal ligation), consider the timely administration of nonparticulate antacids, H_2-receptor antagonists, and/or metoclopramide for aspiration prophylaxis.

Recommendations for Aspiration Prevention††

Clear Liquids.

- The oral intake of moderate amounts of clear liquids may be allowed for uncomplicated laboring patients.
- The uncomplicated patient undergoing elective surgery may have clear liquids up to 2 h before induction of anesthesia.
  - Examples of clear liquids include, but are not limited to, water, fruit juices without pulp, carbonated beverages, clear tea, black coffee, and sports drinks.
  - The volume of liquid ingested is less important than the presence of particulate matter in the liquid ingested.
- Laboring patients with additional risk factors for aspiration (*e.g.*, morbid obesity, diabetes mellitus, and difficult airway) or patients at increased risk for operative delivery (*e.g.*, nonreassuring fetal heart rate pattern) may have further restrictions of oral intake, determined on a case-by-case basis.

Solids.

- Solid foods should be avoided in laboring patients.
- The patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) should undergo a fasting period for solids of 6 to 8 h depending on the type of food ingested (*e.g.*, fat content).‡‡

Antacids, H_2-receptor Antagonists, and Metoclopramide.

- Before surgical procedures (*e.g.*, cesarean delivery or postpartum tubal ligation), consider the timely administration of nonparticulate antacids, H_2-receptor antagonists, and/or metoclopramide for aspiration prophylaxis.

Anesthetic Care for Labor and Vaginal Delivery

Anesthetic care for labor and vaginal delivery includes (1) timing of neuraxial analgesia and outcome of labor, (2) neuraxial analgesia and trial of labor after prior cesarean delivery, and (3) anesthetic/analgesic techniques. Appendix 3 contains an overview of anesthetic care for labor and vaginal delivery.§§

Timing of Neuraxial Analgesia and Outcome of Labor.

Literature Findings: Meta-analyses of RCTs report equivocal findings for spontaneous, instrumented, and cesarean delivery when comparing early administration (*i.e.*, cervical dilations of less than 4 or 5 cm) with late administration (*i.e.*, cervical dilations of greater than 4 or 5 cm) of epidural analgesia (*Category A1-E evidence*).[44–48] An RCT comparing cervical dilations of less than 2 cm with greater than or equal to 2 cm also reports equivocal findings (*Category A3-E evidence*).[49] Finally, RCTs comparing early *versus* late combined spinal–epidural (CSE) analgesia administration report equivocal findings for cesarean, instrumented, and spontaneous delivery (*Category A2-E evidence*).[50,51]

Survey Findings: The consultants and ASA members strongly agree to (1) provide patients in early labor (*i.e.*, less than 5 cm dilation) the option of neuraxial analgesia when this service is available; (2) offer neuraxial analgesia on an individualized basis; and (3) not withhold neuraxial analgesia on the basis of achieving an arbitrary cervical dilation.

Neuraxial Analgesia and Trial of Labor after Prior Cesarean Delivery.

Literature Findings: Nonrandomized comparative studies are equivocal regarding mode of delivery, duration of labor, and adverse outcomes when epidural analgesia is used in a trial of labor for previous cesarean delivery patients (*Category B1-E evidence*).[52–56]

Survey Findings: The consultants and ASA members strongly agree (1) to offer neuraxial techniques to patients attempting vaginal birth after previous cesarean delivery and (2) that for these patients, it is appropriate to consider early placement of a neuraxial catheter that can be used later for labor analgesia or for anesthesia in the event of operative delivery.

Analgesia/Anesthetic Techniques: Considerations for analgesic/anesthetic techniques include (1) early insertion of a neuraxial (*i.e.*, spinal or epidural) catheter for complicated

†† The Task Force recognizes that in laboring patients the timing of delivery is uncertain; therefore, adherence to a predetermined fasting period before nonelective surgical procedures is not always possible.

‡‡ Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: An updated report by the American Society of Anesthesiologists Task Force on Preoperative Fasting. Anesthesiology 2011; 114:495–511.

§§ Note that statements in appendix 3 are intended to provide an overview and are not recommendations.

parturients, (2) continuous infusion epidural (CIE) analgesia, (3) epidural local anesthetics combined with opioids, (4) higher *versus* lower concentrations of local anesthetics, (5) single-injection spinal opioids with or without local anesthetics, (6) pencil-point spinal needles, (7) CSE analgesia, and (8) patient-controlled epidural analgesia (PCEA).

Early Insertion of a Neuraxial Catheter for Complicated Parturients.

Literature Findings: The literature is insufficient to assess whether, when caring for the complicated parturient, the early insertion of a neuraxial catheter, with immediate or later administration of analgesia, improves maternal or neonatal outcomes.

Survey Findings: The consultants and ASA members strongly agree to consider early insertion of a neuraxial catheter for obstetric (*e.g.*, twin gestation or preeclampsia) or anesthetic indications (*e.g.*, anticipated difficult airway or obesity) to reduce the need for GA if an emergent procedure becomes necessary.

CIE Analgesia.

Literature Findings: Randomized controlled trials indicate that CIE local anesthetics are associated with reduced maternal pain and discomfort compared with single-shot IV opioids during labor (*Category A2-B evidence*).[57,58] The literature is insufficient to evaluate CIE compared with continuous infusion of IV opioids. An RCT reports greater pain relief during labor for CIE when compared with intramuscular opioids (*Category A3-B evidence*), with equivocal findings for duration of labor and mode of delivery (*Category A3-E evidence*).[59] A nonrandomized comparative study reports equivocal findings for duration of labor and mode of delivery when CIE local anesthetics are compared with single-injection spinal opioids (*Category B1-E evidence*).[60]

Survey Findings: The consultants and ASA members strongly agree that (1) continuous epidural infusion may be used for effective analgesia for labor and delivery and (2) when a continuous epidural infusion of local anesthetic is selected, an opioid may be added.

Analgesic Concentrations.

Literature Findings: Meta-analyses of RCTs report improved analgesic quality[61–65] when comparing epidural local anesthetics combined with opioids *versus* equal concentrations of epidural local anesthetics *without opioids* (*Category A1-B evidence*). Findings were equivocal for frequency of spontaneous delivery, hypotension, pruritus, and 1-min Apgar scores (*Category A1-E evidence*).[62–73]

Randomized controlled trials are equivocal for analgesic efficacy and duration of labor when continuous epidural infusion of *low concentrations* of local anesthetics with opioids are compared with *higher concentrations* of local anesthetics without opioids for maintenance of analgesia (*Category A2-E evidence*).[74–79] Meta-analyses of RCTs are also equivocal regarding spontaneous delivery and neonatal Apgar scores when continuous epidural infusion of low concentrations of local anesthetics with opioids are compared with higher concentrations of local anesthetics without opioids (*Category A1-E evidence*).[74–80] A lower frequency of motor block was found for lower concentrations of local anesthetics (*Category A1-B evidence*).[74–76,78–80]‖‖ The literature is insufficient to determine the effects of epidural local anesthetics with opioids on other maternal outcomes (*e.g.*, hypotension, nausea, pruritus, respiratory depression, and urinary retention).

Survey Findings: The consultants and ASA members strongly agree to use dilute concentrations of local anesthetics with opioids to produce as little motor block as possible.

Single-injection Spinal Opioids with or without Local Anesthetics.

Literature Findings: An RCT reports a longer duration of analgesia when a spinal opioid is compared with an IV opioid (*Category A1-B evidence*).[81] Nonrandomized comparisons are equivocal for duration of labor, mode of delivery, and other adverse outcomes such as nausea, vomiting, headache, and pruritus (*Category B1-E evidence*).[82–84] The literature is not sufficient to compare single-injection spinal opioids *with* local anesthetics *versus* single-injection spinal opioids *without* local anesthetics.

Survey Findings: The consultants and ASA members agree that single-injection spinal opioids with or without local anesthetics may be used to provide effective, although time-limited, analgesia for labor when spontaneous vaginal delivery is anticipated. The ASA members agree and the consultants strongly agree that a local anesthetic may be added to a spinal opioid to increase duration and improve quality of analgesia.

Pencil-point Spinal Needles.

Literature Findings: Meta-analysis of RCTs indicate that the use of pencil-point spinal needles reduces the frequency of postdural puncture headache when compared with cutting-bevel spinal needles (*Category A1-B evidence*).[85–89]

Survey Findings: The consultants and ASA members strongly agree to use pencil-point spinal needles instead of cutting-bevel spinal needles to minimize the risk of postdural puncture headache.

CSE Analgesia.

Literature Findings: Meta-analyses of RCTs report improved analgesia and a faster onset time (*Category A2-B evidence*) when CSE local anesthetics with opioids are compared with epidural local anesthetics with opioids,[90–96] with equivocal findings for maternal satisfaction with analgesia, mode of delivery, hypotension, pruritus, and 1-min Apgar scores (*Category A1-E evidence*).[90–101] Meta-analysis of RCTs report an increased frequency of motor block with CSE (*Category A1-H evidence*).[90,92,93,96,101]

‖‖ The Task Force notes that the addition of an opioid to a local anesthetic infusion allows an even lower concentration of local anesthetic for providing equally effective analgesia.

Survey Findings: The consultants and ASA members strongly agree that (1) if labor is expected to last longer than the analgesic effects of the spinal drugs chosen, or if there is a good possibility of operative delivery, then consider a catheter technique instead of a single-injection technique and (2) CSE techniques may be used to provide effective and rapid onset of analgesia for labor.

Patient-controlled Epidural Analgesia.

Literature Findings: Meta-analysis of RCTs report reduced analgesic consumption (*Category A1-B evidence*) when PCEA is compared with CIE.[102–107] Meta-analysis of RCTs report equivocal findings for duration of labor, mode of delivery, motor block, and 1- and 5-min Apgar scores when PCEA is compared with CIE (*Category A1-E evidence*).[103–116] Meta-analysis of RCTs indicate greater analgesic efficacy for PCEA with a background infusion compared with PCEA without a background infusion (*Category A1-B evidence*)[117–121] and is equivocal regarding mode of delivery and frequency of motor block (*Category A1-E evidence*).[117–122]

Survey Findings: The consultants and ASA members strongly agree that (1) PCEA may be used to provide an effective and flexible approach for the maintenance of labor analgesia and (2) the use of PCEA may be preferable to fixed-rate CIE for providing fewer anesthetic interventions and reducing dosages of local anesthetics. The consultants and ASA members agree that PCEA may be used with or without a background infusion.

Recommendations for Anesthetic Care for Labor and Vaginal Delivery

Timing of Neuraxial Analgesia and Outcome of Labor.

- Provide patients in early labor (*i.e.*, less than 5 cm dilation) the option of neuraxial analgesia when this service is available.
- Offer neuraxial analgesia on an individualized basis regardless of cervical dilation.
    - Reassure patients that the use of neuraxial analgesia does not increase the incidence of cesarean delivery.

Neuraxial Analgesia and Trial of Labor after Prior Cesarean Delivery.

- Offer neuraxial techniques to patients attempting vaginal birth after previous cesarean delivery.
- For these patients, consider early placement of a neuraxial catheter that can be used later for labor analgesia or for anesthesia in the event of operative delivery.

Analgesia/Anesthetic Techniques.

Early Insertion of a Neuraxial Catheter for Complicated Parturients:

- Consider early insertion of a neuraxial catheter for obstetric (*e.g.*, twin gestation or preeclampsia) or anesthetic indications (*e.g.*, anticipated difficult airway or obesity) to reduce the need for GA if an emergent procedure becomes necessary.
    - In these cases, the insertion of a neuraxial catheter may precede the onset of labor or a patient's request for labor analgesia.

CIE Analgesia:

- Continuous epidural infusion may be used for effective analgesia for labor and delivery.
- When a continuous epidural infusion of local anesthetic is selected, an opioid may be added to reduce the concentration of local anesthetic, improve the quality of analgesia, and minimize the motor block.

Analgesic Concentrations:

- Use dilute concentrations of local anesthetics with opioids to produce as little motor block as possible.

Single-injection Spinal Opioids with or without Local Anesthetics:

- Single-injection spinal opioids with or without local anesthetics may be used to provide effective, although time-limited, analgesia for labor when spontaneous vaginal delivery is anticipated.
- If labor duration is anticipated to be longer than the analgesic effects of the spinal drugs chosen, or if there is a reasonable possibility of operative delivery, then consider a catheter technique instead of a single-injection technique.
- A local anesthetic may be added to a spinal opioid to increase duration and improve quality of analgesia.

Pencil-point Spinal Needles:

- Use pencil-point spinal needles instead of cutting-bevel spinal needles to minimize the risk of postdural puncture headache.

CSE Analgesia:

- If labor duration is anticipated to be longer than the analgesic effects of the spinal drugs chosen, or if there is a reasonable possibility of operative delivery, then consider a catheter technique instead of a single-injection technique.
- CSE techniques may be used to provide effective and rapid onset of analgesia for labor.

Patient-controlled Epidural Analgesia:

- Patient-controlled epidural analgesia may be used to provide an effective and flexible approach for the maintenance of labor analgesia.
- The use of PCEA may be preferable to fixed-rate CIE for administering reduced dosages of local anesthetics.
- PCEA may be used with or without a background infusion.

Removal of Retained Placenta

Techniques for removal of retained placenta include (1) anesthetic techniques for removal of retained placenta and (2) nitroglycerin for uterine relaxation.

Anesthetic Techniques.

Literature Findings: The literature is insufficient to assess whether a particular anesthetic technique is more effective than another for removal of retained placenta.

Survey Findings: The consultants and ASA members strongly agree (1) that the hemodynamic status should be assessed before administering neuraxial anesthesia and (2) if an epidural catheter is in place and the patient is hemodynamically stable, consider providing epidural anesthesia. The consultants and ASA members agree to consider aspiration prophylaxis. The consultants and ASA members strongly agree that (1) titration of sedation/analgesia should be performed carefully due to the potential risks of respiratory depression and pulmonary aspiration during the immediate postpartum period and (2) in cases involving major maternal hemorrhage with hemodynamic instability, GA with an endotracheal tube may be considered in preference to neuraxial anesthesia.

Nitroglycerin for Uterine Relaxation.

Literature Findings: Randomized controlled trials comparing IV or sublingual nitroglycerin with placebo for the purpose of uterine relaxation report inconsistent findings for the successful removal of retained placenta (*Category A2-E evidence*).[123–125] Observational studies and case reports indicate successful uterine relaxation and successful placental removal after IV or sublingual nitroglycerin administration (*Category B3/B4 evidence*).[126–130]

Survey Findings: The ASA members agree and the consultants strongly agree that nitroglycerin may be used as an alternative to terbutaline sulfate or general endotracheal anesthesia with halogenated agents for uterine relaxation during removal of retained placental tissue.

Recommendations for Removal of Retained Placenta

Anesthetic Techniques for Removal of Retained Placenta.

- In general, there is no preferred anesthetic technique for removal of retained placenta.
  - If an epidural catheter is in place and the patient is hemodynamically stable, consider providing epidural anesthesia.
- Assess hemodynamic status before administering neuraxial anesthesia.
- Consider aspiration prophylaxis.
- Titrate sedation/analgesia carefully due to the potential risks of respiratory depression and pulmonary aspiration during the immediate postpartum period.
- In cases involving major maternal hemorrhage with hemodynamic instability, GA with an endotracheal tube may be considered in preference to neuraxial anesthesia.

Nitroglycerin for Uterine Relaxation.

- Nitroglycerin may be used as an alternative to terbutaline sulfate or general endotracheal anesthesia with halogenated agents for uterine relaxation during removal of retained placental tissue.
  - Initiating treatment with incremental doses of IV or sublingual (*i.e.*, tablet or metered dose spray) nitroglycerin may be done to sufficiently relax the uterus.

Anesthetic Care for Cesarean Delivery

Anesthetic care for cesarean delivery consists of (1) equipment, facilities, and support personnel; (2) general, epidural, spinal, or CSE anesthesia; (3) IV fluid preloading or coloading; (4) ephedrine or phenylephrine; and (5) neuraxial opioids for postoperative analgesia after neuraxial anesthesia.

Equipment, Facilities, and Support Personnel.

Literature Findings: The literature is insufficient to evaluate the benefit of providing equipment, facilities, and support personnel in the labor and delivery operating suite comparable to that available in the main operating suite.

Survey Findings: The consultants and ASA members strongly agree that (1) equipment, facilities, and support personnel available in the labor and delivery operating suite should be comparable to those available in the main operating suite; (2) resources for the treatment of potential complications (*e.g.*, failed intubation, inadequate anesthesia, hypotension, respiratory depression, local anesthetic systemic toxicity, pruritus, and vomiting) should also be available in the labor and delivery operating suite; and (3) appropriate equipment and personnel should be available to care for obstetric patients recovering from major neuraxial or GA.

General, Epidural, Spinal, or CSE Anesthesia.

Literature Findings: Randomized controlled trials report higher Apgar scores at 1 and 5 min for epidural anesthesia when compared with GA (*Category A2-B evidence*)[131–135] and equivocal findings for umbilical artery pH values (*Category A2-E evidence*).[133,135–137] When spinal anesthesia is compared with GA, RCTs report equivocal findings for 1- and 5-min Apgar scores and umbilical artery pH values (*Category A1-E evidence*).[132,138–142] RCTs also are equivocal regarding total time in the operating room when epidural[135,137,140,143,144] or spinal[144,145] anesthesia is compared with GA (*Category A2-E evidence*).

When spinal anesthesia is compared with epidural anesthesia, RCTs are equivocal regarding induction-to-delivery times, hypotension, umbilical pH values, and Apgar scores (*Category A2-E evidence*).[132,144,146–153]

When CSE is compared with epidural anesthesia, RCTs report equivocal findings for the frequency of hypotension and for 1-min Apgar scores (*Category A2-E evidence*).[133,135,154–158] RCTs report equivocal findings for delivery times, time in the operating room, hypotension, and 1- and 5-min Apgar scores when CSE is compared with spinal anesthesia (*Category A2-E evidence*).[159–162]

Survey Findings: The consultants and ASA members strongly agree that (1) the decision to use a particular

anesthetic technique for cesarean delivery should be individualized, based on anesthetic, obstetric, or fetal risk factors (*e.g.*, elective *vs.* emergency), the preferences of the patient, and the judgment of the anesthesiologist; (2) uterine displacement (usually left displacement) should be maintained until delivery regardless of the anesthetic technique used; (3) consider selecting neuraxial techniques in preference to GA for most cesarean deliveries; (4) if spinal anesthesia is chosen, use pencil-point spinal needles instead of cutting-bevel spinal needles; (5) for urgent cesarean delivery, an indwelling epidural catheter may be used as an alternative to initiation of spinal anesthesia; and (6) GA may be the most appropriate choice in some circumstances (*e.g.*, profound fetal bradycardia, ruptured uterus, severe hemorrhage, severe placental abruption, umbilical cord prolapse, and preterm footling breech).

IV Fluid Preloading or Coloading.

Literature Findings: Randomized controlled trial findings are inconsistent regarding the frequency of maternal hypotension when IV fluid preloading or coloading for spinal anesthesia is compared with no fluids (*Category A2-E evidence*).[163–169] Meta-analyses of RCTs are equivocal for maternal hypotension when IV fluid preloading is compared with coloading (*Category A2-E evidence*).[168,170–176]

Survey Findings: The consultants and ASA members agree that IV fluid preloading may be used to reduce the frequency of maternal hypotension after spinal anesthesia for cesarean delivery. The ASA members agree and the consultants strongly agree that, although fluid preloading reduces the frequency of maternal hypotension, it does not delay the initiation of spinal anesthesia in order to administer a fixed volume of IV fluid.

Ephedrine or Phenylephrine.

Literature Findings: Meta-analysis of double-blind placebo-controlled RCTs report reduced maternal hypotension during anesthesia for cesarean delivery when IV ephedrine is administered compared with placebo (*Category A1-B evidence*).[177–181] RCTs are equivocal for hypotension when intramuscular ephedrine is compared with placebo (*Category A2-E evidence*).[182–184] RCTs comparing phenylephrine with placebo report a lower frequency of hypotension when higher dosages of phenylephrine are administered (*Category A2-B evidence*) and equivocal findings when lower dosages are administered (*Category A2-E evidence*).[182,185–187] Meta-analysis of double-blind RCTs report lower frequencies of patients with hypotension when infusions of phenylephrine are compared with ephedrine (*Category A1-B evidence*)[188–193]; higher umbilical artery pH values are reported for phenylephrine when compared with ephedrine (*Category A1-H evidence*).[194–199]

Survey Findings: The consultants and ASA members strongly agree that IV ephedrine and phenylephrine both may be used for treating hypotension during neuraxial anesthesia.

Neuraxial Opioids for Postoperative Analgesia.

Literature Findings: Randomized controlled trials comparing epidural opioids with intermittent injections of IV or intramuscular opioids report improved postoperative analgesia for epidural opioids after cesarean delivery (*Category A2-B evidence*)[200–206]; meta-analysis of RCTs report equivocal findings for nausea, vomiting, and pruritus (*Category A1-E evidence*).[200–204,206–211] RCTs report improved postoperative analgesia when PCEA is compared with IV patient-controlled analgesia (*Category A2-B evidence*) with equivocal findings for nausea, vomiting, pruritus, and sedation (*Category A2-E evidence*).[208,211]

Survey Findings: The consultants and ASA members strongly agree that for postoperative analgesia after neuraxial anesthesia for cesarean delivery, selecting neuraxial opioids rather than intermittent injections of parenteral opioids should be considered.

Recommendations for Anesthetic Care for Cesarean Delivery

Equipment, Facilities, and Support Personnel.

- Equipment, facilities, and support personnel available in the labor and delivery operating suite should be comparable to those available in the main operating suite.
- Resources for the treatment of potential complications (*e.g.*, failed intubation, inadequate analgesia/anesthesia, hypotension, respiratory depression, local anesthetic systemic toxicity, pruritus, and vomiting) should also be available in the labor and delivery operating suite.
- Appropriate equipment and personnel should be available to care for obstetric patients recovering from neuraxial or GA.

General, Epidural, Spinal, or CSE Anesthesia.

- The decision to use a particular anesthetic technique for cesarean delivery should be individualized, based on anesthetic, obstetric, or fetal risk factors (*e.g.*, elective *vs.* emergency), the preferences of the patient, and the judgment of the anesthesiologist.
    - Uterine displacement (usually left displacement) should be maintained until delivery regardless of the anesthetic technique used.
- Consider selecting neuraxial techniques in preference to GA for most cesarean deliveries.
- If spinal anesthesia is chosen, use pencil-point spinal needles instead of cutting-bevel spinal needles.
- For urgent cesarean delivery, an indwelling epidural catheter may be used as an alternative to initiation of spinal or GA.
- GA may be the most appropriate choice in some circumstances (*e.g.*, profound fetal bradycardia, ruptured uterus, severe hemorrhage, and severe placental abruption).

IV Fluid Preloading or Coloading.

- IV fluid preloading or coloading may be used to reduce the frequency of maternal hypotension after spinal anesthesia for cesarean delivery.
- Do not delay the initiation of spinal anesthesia in order to administer a fixed volume of IV fluid.

Ephedrine or Phenylephrine.

- Either IV ephedrine or phenylephrine may be used for treating hypotension during neuraxial anesthesia.
- In the absence of maternal bradycardia, consider selecting phenylephrine because of improved fetal acid–base status in uncomplicated pregnancies.

Neuraxial Opioids for Postoperative Analgesia.

- For postoperative analgesia after neuraxial anesthesia for cesarean delivery, consider selecting neuraxial opioids rather than intermittent injections of parenteral opioids.

Postpartum Tubal Ligation

Literature Findings: The literature is insufficient to evaluate the benefits of neuraxial anesthesia compared with GA for postpartum tubal ligation. In addition, the literature is insufficient to evaluate the impact of the timing of a postpartum tubal ligation on maternal outcome.

Survey Findings: The consultants and ASA members strongly agree (1) that before postpartum tubal ligation, the patient should have no oral intake of solid foods within 6 to 8 h of the surgery, depending on the type of food ingested (*e.g.*, fat content), and (2) that both the timing of the procedure and the decision to use a particular anesthetic technique (*i.e.*, neuraxial *vs.* general) should be individualized based on anesthetic risk factors, obstetric risk factors (*e.g.*, blood loss), and patient preferences. The ASA members agree and the consultants strongly agree to consider selecting neuraxial techniques in preference to GA for most postpartum tubal ligations.

Recommendations for Postpartum Tubal Ligation

- Before a postpartum tubal ligation, the patient should have no oral intake of solid foods within 6 to 8 h of the surgery, depending on the type of food ingested (*e.g.*, fat content).‡‡
- Consider aspiration prophylaxis.
- Both the timing of the procedure and the decision to use a particular anesthetic technique (*i.e.*, neuraxial *vs.* general) should be individualized, based on anesthetic and obstetric risk factors (*e.g.*, blood loss), and patient preferences.
- Consider selecting neuraxial techniques in preference to GA for most postpartum tubal ligations.
    - Be aware that gastric emptying will be delayed in patients who have received opioids during labor.
    - Be aware that an epidural catheter placed for labor may be more likely to fail with longer postdelivery time intervals.
    - If a postpartum tubal ligation is to be performed before the patient is discharged from the hospital, do not attempt the procedure at a time when it might compromise other aspects of patient care on the labor and delivery unit.##

Management of Obstetric and Anesthetic Emergencies

Management of obstetric and anesthetic emergencies consists of (1) resources for management of hemorrhagic emergencies, (2) equipment for management of airway emergencies, and (3) cardiopulmonary resuscitation.

Resources for Management of Hemorrhagic Emergencies.

Studies with observational findings and case reports suggest that the availability of resources for hemorrhagic emergencies may be associated with reduced maternal complications (*Category B3/B4-B evidence*).[212–219]

Survey Findings: The consultants and ASA members strongly agree that institutions providing obstetric care should have resources available to manage hemorrhagic emergencies.

Equipment for Management of Airway Emergencies.

Case reports suggest that the availability of equipment for the management of airway emergencies may be associated with reduced maternal, fetal, and neonatal complications (*Category B4-B evidence*).[220–228]

Survey Findings: The consultants and ASA members strongly agree that labor and delivery units should have personnel and equipment readily available to manage airway emergencies consistent with the ASA Practice Guidelines for Management of the Difficult Airway, to include a pulse oximeter and carbon dioxide detector.

Cardiopulmonary Resuscitation.

Literature Findings: The literature is insufficient to evaluate the efficacy of cardiopulmonary resuscitation in the obstetric patient during labor and delivery. In cases of cardiac arrest, the American Heart Association has stated that 4 to 5 min is the maximum time rescuers will have to determine whether the arrest can be reversed by Basic Life Support and Advanced Cardiac Life Support interventions.*** Delivery of the fetus may improve cardiopulmonary resuscitation of the mother by relieving aortocaval compression. The American Heart Association further notes that "the best survival rate for infants more than 24 to 25 weeks in gestation occurs when the delivery of the infant occurs no more than 5 min after the mother's heart stops beating.

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The American College of Obstetricians and Gynecologists (ACOG) has indicated that postpartum tubal ligation "should be considered an urgent surgical procedure given the consequences of a missed procedure and the limited time frame in which it may be performed." ACOG Committee Opinion No. 530: Access to postpartum sterilization. Obstet Gynecol 2012; 120:212–5.

*** 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation* 2010; 122 (18 suppl 3):S640–933.

Table 1. Suggested Resources for Obstetric Hemorrhagic Emergencies

Large-bore IV catheters
Fluid warmer
Forced-air body warmer
Availability of blood bank resources
Massive transfusion protocol
Equipment for infusing IV fluids and blood products rapidly. Examples include, but are not limited to, hand-squeezed fluid chambers, hand-inflated pressure bags, and automatic infusion devices.

The items listed represent suggestions. The items should be customized to meet the specific needs, preferences, and skills of the practitioner and healthcare facility.

Table 2. Suggested Resources for Airway Management during Initial Provision of Neuraxial Analgesia in a Labor Delivery Room Setting

Laryngoscope and assorted blades
Endotracheal tubes, with stylets
Oxygen source
Suction source with tubing and tonsil suction tip
Self-inflating bag and mask for positive-pressure ventilation
Medications for blood pressure support, muscle relaxation, and hypnosis

The items listed represent suggestions. The items should be customized to meet the specific needs, preferences, and skills of the practitioner and healthcare facility.

Survey Findings: The consultants and ASA members strongly agree that (1) basic and advanced life-support equipment should be immediately available in the operative area of labor and delivery units and (2) if cardiac arrest occurs during labor and delivery, initiate standard resuscitative measures with accommodations for pregnancy such as left uterine displacement and preparing for delivery of the fetus.

Recommendations for Management of Obstetric and Anesthetic Emergencies

Resources for Management of Hemorrhagic Emergencies.

- Institutions providing obstetric care should have resources available to manage hemorrhagic emergencies (table 1).
  - In an emergency, type-specific or O-negative blood is acceptable.
  - In cases of intractable hemorrhage, when banked blood is not available or the patient refuses banked blood, consider intraoperative cell salvage if available.†††

Table 3. Suggested Contents of a Portable Storage Unit for Difficult Airway Management for Cesarean Section Rooms

Rigid laryngoscope blades of alternate design and size
Videolaryngoscopic devices
Endotracheal tubes of assorted size
Endotracheal tube guides. Examples include (but are not limited to) semirigid stylets, light wands, and forceps designed to manipulate the distal portion of the endotracheal tube.
At least one device suitable for emergency nonsurgical airway ventilation consisting of a face mask or supraglottic airway device (*e.g.*, laryngeal mask airway, intubating laryngeal mask airway, and laryngeal tube).
Equipment suitable for emergency surgical airway access (*e.g.*, cricothyrotomy)

The items listed represent suggestions. The items should be customized to meet the specific needs, preferences, and skills of the practitioner and healthcare facility.

Adapted from the Practice guidelines for management of the difficult airway: An updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. ANESTHESIOLOGY 2013; 118:251–70.

Equipment for Management of Airway Emergencies.

- Labor and delivery units should have personnel and equipment readily available to manage airway emergencies consistent with the ASA Practice Guidelines for Management of the Difficult Airway‡‡‡ to include a pulse oximeter and carbon dioxide detector.
  - Basic airway management equipment should be immediately available during the provision of neuraxial analgesia (table 2).
  - Portable equipment for difficult airway management should be readily available in the operative area of labor and delivery units (table 3).
  - A preformulated strategy for intubation of the difficult airway should be in place.
  - When tracheal intubation has failed, consider ventilation with mask and cricoid pressure or with a supraglottic airway device (*e.g.*, laryngeal mask airway, intubating laryngeal mask airway, or laryngeal tube) for maintaining an airway and ventilating the lungs.
  - If it is not possible to ventilate or awaken the patient, a surgical airway should be performed.

Cardiopulmonary Resuscitation.

- Basic and advanced life-support equipment should be immediately available in the operative area of labor and delivery units.
- If cardiac arrest occurs, initiate standard resuscitative measures.
  - Uterine displacement (usually left displacement) should be maintained.
  - If maternal circulation is not restored within 4 min, cesarean delivery should be performed by the obstetrics team.§§§

††† Practice guidelines for perioperative blood management: An updated report by the American Society of Anesthesiologists Task Force on Perioperative Blood Management. ANESTHESIOLOGY 2015; 122:241–75.

‡‡‡ Practice guidelines for management of the difficult airway: An updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. ANESTHESIOLOGY 2013; 118:251–70.

§§§ More information on management of cardiac arrest can be found in: Lipman S, Cohen S, Einav S, Jeejeebhoy F, Mhyre JM, Morrison LJ, Katz V, Tsen LC, Daniels K, Halamek LP, Suresh MS, Arafeh J, Gauthier D, Carvalho JC, Druzin M, Carvalho B; Society for Obstetric Anesthesia and Perinatology: The Society for Obstetric Anesthesia and Perinatology consensus statement on the management of cardiac arrest in pregnancy. Anesth Analg 2014; 118:1003.

Appendix 1. Summary of Recommendations

Perianesthetic Evaluation and Preparation

History and Physical Examination

- Conduct a focused history and physical examination before providing anesthesia care.
  - This should include, but is not limited to, a maternal health and anesthetic history, a relevant obstetric history, a baseline blood pressure measurement, and an airway, heart, and lung examination, consistent with the American Society of Anesthesiologists (ASA) "Practice Advisory for Preanesthesia Evaluation."‖
  - When a neuraxial anesthetic is planned or placed, examine the patient's back.
  - Recognition of significant anesthetic or obstetric risk factors should encourage consultation between the obstetrician and the anesthesiologist.
- A communication system should be in place to encourage the early and ongoing contact between obstetric providers, anesthesiologists, and other members of the multidisciplinary team.

Intrapartum Platelet Count

- The anesthesiologist's decision to order or require a platelet count should be individualized and based on a patient's history (*e.g.*, preeclampsia with severe features), physical examination, and clinical signs.‖‖‖
  - A routine platelet count is not necessary in the healthy parturient.

Blood Type and Screen

- A routine blood cross-match is not necessary for healthy and uncomplicated parturients for vaginal or operative delivery.
- The decision whether to order or require a blood type and screen or cross-match should be based on maternal history, anticipated hemorrhagic complications (*e.g.*, placenta accreta in a patient with placenta previa and previous uterine surgery), and local institutional policies.

Perianesthetic Recording of Fetal Heart Rate Patterns

- Fetal heart rate patterns should be monitored by a qualified individual before and after administration of neuraxial analgesia for labor.
  - *Continuous* electronic recording of fetal heart rate patterns may not be necessary in every clinical setting and may not be possible during placement of a neuraxial catheter.**

Aspiration Prevention

Clear Liquids

- The oral intake of moderate amounts of clear liquids may be allowed for uncomplicated laboring patients.
- The uncomplicated patient undergoing elective surgery may have clear liquids up to 2 h before induction of anesthesia.
  - Examples of clear liquids include, but are not limited to, water, fruit juices without pulp, carbonated beverages, clear tea, black coffee, and sports drinks.
  - The volume of liquid ingested is less important than the presence of particulate matter in the liquid ingested.
- Laboring patients with additional risk factors for aspiration (*e.g.*, morbid obesity, diabetes mellitus, and difficult airway) or patients at increased risk for operative delivery (*e.g.*, nonreassuring fetal heart rate pattern) may have further restrictions of oral intake, determined on a case-by-case basis.

Solids

- Solid foods should be avoided in laboring patients.
- The patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) should undergo a fasting period for solids of 6 to 8 h depending on the type of food ingested (*e.g.*, fat content).###

Antacids, H_2-receptor Antagonists, and Metoclopramide

- Before surgical procedures (*e.g.*, cesarean delivery and postpartum tubal ligation), consider the timely administration of nonparticulate antacids, H_2-receptor antagonists, and/or metoclopramide for aspiration prophylaxis.

Anesthetic Care for Labor and Delivery

Timing of Neuraxial Analgesia and Outcome of Labor

- Provide patients in early labor (*i.e.*, less than 5 cm dilation) the option of neuraxial analgesia when this service is available.
- Offer neuraxial analgesia on an individualized basis regardless of cervical dilation.
  - Reassure patients that the use of neuraxial analgesia does not increase the incidence of cesarean delivery.

Neuraxial Analgesia and Trial of Labor after Prior Cesarean Delivery

- Offer neuraxial techniques to patients attempting vaginal birth after previous cesarean delivery.

‖‖‖ A specific platelet count predictive of neuraxial anesthetic complications has not been determined.

Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: An updated report by the American Society of Anesthesiologists Task Force on Preoperative Fasting. Anesthesiology 2011; 114:495–511.

- For these patients, consider early placement of a neuraxial catheter that can be used later for labor analgesia or for anesthesia in the event of operative delivery.

Analgesia/Anesthetic Techniques

Early Insertion of a Neuraxial (*i.e.*, Spinal or Epidural) Catheter for Complicated Parturients.

- Consider early insertion of a neuraxial catheter for obstetric (*e.g.*, twin gestation or preeclampsia) or anesthetic indications (*e.g.*, anticipated difficult airway or obesity) to reduce the need for general anesthesia if an emergent procedure becomes necessary.
    - In these cases, the insertion of a neuraxial catheter may precede the onset of labor or a patient's request for labor analgesia.

Continuous Infusion Epidural Analgesia.

- Continuous epidural infusion may be used for effective analgesia for labor and delivery.
- When a continuous epidural infusion of local anesthetic is selected, an opioid may be added to reduce the concentration of local anesthetic, improve the quality of analgesia, and minimize motor block.

Analgesic Concentrations.

- Use dilute concentrations of local anesthetics with opioids to produce as little motor block as possible

Single-injection Spinal Opioids with or without Local Anesthetics.

- Single-injection spinal opioids with or without local anesthetics may be used to provide effective, although time-limited, analgesia for labor when spontaneous vaginal delivery is anticipated.
- If labor duration is anticipated to be longer than the analgesic effects of the spinal drugs chosen, or if there is a reasonable possibility of operative delivery, then consider a catheter technique instead of a single-injection technique.
- A local anesthetic may be added to a spinal opioid to increase duration and improve quality of analgesia.

Pencil-point Spinal Needles.

- Use pencil-point spinal needles instead of cutting-bevel spinal needles to minimize the risk of postdural puncture headache.

Combined Spinal–Epidural Analgesia.

- If labor duration is anticipated to be longer than the analgesic effects of the spinal drugs chosen, or if there is a reasonable possibility of operative delivery, then consider a catheter technique instead of a single-injection technique.
- Combined spinal–epidural techniques may be used to provide effective and rapid onset of analgesia for labor.

Patient-controlled Epidural Analgesia.

- Patient-controlled epidural analgesia (PCEA) may be used to provide an effective and flexible approach for the maintenance of labor analgesia.
- The use of PCEA may be preferable to fixed-rate continuous infusion epidural analgesia for administering reduced dosages of local anesthetics.
- PCEA may be used with or without a background infusion.

Removal of Retained Placenta

Anesthetic Techniques

- In general, there is no preferred anesthetic technique for removal of retained placenta.
    - If an epidural catheter is in place and the patient is hemodynamically stable, consider providing epidural anesthesia.
- Assess hemodynamic status before administering neuraxial anesthesia.
- Consider aspiration prophylaxis.
- Titrate sedation/analgesia carefully due to the potential risks of respiratory depression and pulmonary aspiration during the immediate postpartum period.
- In cases involving major maternal hemorrhage with hemodynamic instability, general anesthesia with an endotracheal tube may be considered in preference to neuraxial anesthesia.

Nitroglycerin for Uterine Relaxation

- Nitroglycerin may be used as an alternative to terbutaline sulfate or general endotracheal anesthesia with halogenated agents for uterine relaxation during removal of retained placental tissue.
    - Initiating treatment with incremental doses of IV or sublingual (*i.e.*, tablet or metered dose spray) nitroglycerin may be done to sufficiently relax the uterus.

Anesthetic Care for Cesarean Delivery

Equipment, Facilities, and Support Personnel

- Equipment, facilities, and support personnel available in the labor and delivery operating suite should be comparable to those available in the main operating suite.
- Resources for the treatment of potential complications (*e.g.*, failed intubation, inadequate analgesia/anesthesia, hypotension, respiratory depression, local anesthetic systemic toxicity, pruritus, and vomiting) should also be available in the labor and delivery operating suite.
- Appropriate equipment and personnel should be available to care for obstetric patients recovering from neuraxial or general anesthesia.

General, Epidural, Spinal, or Combined Spinal–Epidural Anesthesia

- The decision to use a particular anesthetic technique for cesarean delivery should be individualized, based on anesthetic, obstetric, or fetal risk factors (*e.g.*, elective *vs.* emergency), the preferences of the patient, and the judgment of the anesthesiologist.
    - Uterine displacement (usually left displacement) should be maintained until delivery regardless of the anesthetic technique used.
- Consider selecting neuraxial techniques in preference to general anesthesia for most cesarean deliveries.
- If spinal anesthesia is chosen, use pencil-point spinal needles instead of cutting-bevel spinal needles.
- For urgent cesarean delivery, an indwelling epidural catheter may be used as an alternative to initiation of spinal or general anesthesia.
- General anesthesia may be the most appropriate choice in some circumstances (*e.g.*, profound fetal bradycardia, ruptured uterus, severe hemorrhage, severe placental abruption, umbilical cord prolapse, and preterm footling breech).

IV Fluid Preloading or Coloading

- IV fluid preloading or coloading may be used to reduce the frequency of maternal hypotension after spinal anesthesia for cesarean delivery.
- Do not delay the initiation of spinal anesthesia in order to administer a fixed volume of IV fluid.

Ephedrine or Phenylephrine

- Either IV ephedrine or phenylephrine may be used for treating hypotension during neuraxial anesthesia.
- In the absence of maternal bradycardia, consider selecting phenylephrine because of improved fetal acid–base status in uncomplicated pregnancies.

Neuraxial Opioids for Postoperative Analgesia

- For postoperative analgesia after neuraxial anesthesia for cesarean delivery, consider selecting neuraxial opioids rather than intermittent injections of parenteral opioids.

Postpartum Tubal Ligation

- Before a postpartum tubal ligation, the patient should have no oral intake of solid foods within 6 to 8 h of the surgery, depending on the type of food ingested (*e.g.*, fat content).###
- Consider aspiration prophylaxis.
- Both the timing of the procedure and the decision to use a particular anesthetic technique (*i.e.*, neuraxial *vs.* general) should be individualized, based on anesthetic and obstetric risk factors (*e.g.*, blood loss) and patient preferences.
- Consider selecting neuraxial techniques in preference to general anesthesia for most postpartum tubal ligations.
    - Be aware that gastric emptying will be delayed in patients who have received opioids during labor.
    - Be aware that an epidural catheter placed for labor may be more likely to fail with longer postdelivery time intervals.
    - If a postpartum tubal ligation is to be performed before the patient is discharged from the hospital, do not attempt the procedure at a time when it might compromise other aspects of patient care on the labor and delivery unit.##

Management of Obstetric and Anesthetic Emergencies

Resources for Management of Hemorrhagic Emergencies

- Institutions providing obstetric care should have resources available to manage hemorrhagic emergencies (table 1).
    - In an emergency, type-specific or O-negative blood is acceptable.
    - In cases of intractable hemorrhage, when banked blood is not available or the patient refuses banked blood, consider intraoperative cell salvage if available.†††

Equipment for Management of Airway Emergencies

- Labor and delivery units should have personnel and equipment readily available to manage airway emergencies consistent with the ASA Practice Guidelines for Management of the Difficult Airway,‡‡‡ to include a pulse oximeter and carbon dioxide detector.
    - Basic airway management equipment should be immediately available during the provision of neuraxial analgesia (table 2).
    - Portable equipment for difficult airway management should be readily available in the operative area of labor and delivery units (table 3).
    - A preformulated strategy for intubation of the difficult airway should be in place.
    - When tracheal intubation has failed, consider ventilation with mask and cricoid pressure or with a supraglottic airway device (*e.g.*, laryngeal mask airway, intubating laryngeal mask airway, and laryngeal tube) for maintaining an airway and ventilating the lungs.
    - If it is not possible to ventilate or awaken the patient, a surgical airway should be performed.

Cardiopulmonary Resuscitation

- Basic and advanced life-support equipment should be immediately available in the operative area of labor and delivery units.

- If cardiac arrest occurs, initiate standard resuscitative measures.
  - Uterine displacement (usually left displacement) should be maintained.
  - If maternal circulation is not restored within 4 min, cesarean delivery should be performed by the obstetrics team.§§§

Appendix 2. Methods and Analyses

For these updated guidelines, a review of studies used in the development of the previous update was combined with studies published subsequent to approval of the update in 2006.† The scientific assessment of these guidelines was based on evidence linkages or statements regarding potential relations between clinical interventions and outcomes. The interventions listed below were examined to assess their relation to a variety of outcomes related to obstetric anesthesia.****

Preanesthetic Evaluation and Preparation

- Conducting a focused history (patient condition)
- Conducting a physical examination
- Communication between anesthetic and obstetric providers
- Laboratory tests
  - Routine intrapartum platelet count
  - Platelet count for suspected preeclampsia or coagulopathy
  - Blood type and screen or cross-match
- Recording of fetal heart rate patterns

Aspiration Prevention

- Oral intake of clear liquids for laboring patients
- Oral intake of solids for laboring patients
- A fasting period for solids of 6 to 8 h before an elective cesarean
- Nonparticulate antacids *versus* no antacids before operative procedures (excluding operative vaginal delivery)
- H_2-receptor antagonists (*e.g.*, cimetidine, ranitidine, or famotidine) *versus* no H_2 antagonists before operative procedures (excluding operative vaginal delivery)
- Metoclopramide *versus* no metoclopramide before operative procedures (excluding operative vaginal delivery)

Anesthetic Care for Labor and Vaginal Delivery

- Early *versus* late administration of neuraxial analgesia (*e.g.*, cervical dilations of less than 5 *vs.* greater than 5 cm or less than 4 *vs.* greater than 4 cm)
- Neuraxial techniques for patients attempting vaginal birth after prior cesarean delivery for labor
- Prophylactic neuraxial catheter insertion for obstetric (*e.g.*, twin gestation or preeclampsia) or anesthetic indications (*e.g.*, anticipated difficult airway or obesity)
- Continuous infusion epidural (CIE) of local anesthetics
  - CIE of local anesthetics (with or without opioids) *versus* intramuscular opioids for labor
  - CIE of local anesthetics (with or without opioids) *versus* IV opioids for labor
  - CIE of local anesthetics with or without opioids *versus* spinal opioids with or without local anesthetics for labor
- Analgesic concentrations
  - Induction of epidural analgesia using local anesthetics with opioids *versus* equal concentrations of epidural local anesthetics without opioids for labor
  - Induction of epidural analgesia using local anesthetics with opioids *versus* higher concentrations of epidural local anesthetics without opioids for labor
  - Maintenance of epidural infusion of lower concentrations of local anesthetics with opioids *versus* higher concentrations of local anesthetics without opioids for labor
  - Maintenance of epidural infusion with bupivacaine concentrations less than 0.125% with opioids *versus* bupivacaine concentrations greater than 0.125% without opioids for labor
- Single-injection spinal opioids
  - Single-injection spinal opioids with or without local anesthetics *versus* parenteral opioids for labor
  - Single-injection spinal opioids with local anesthetics *versus* spinal opioids without local anesthetics for labor
- Pencil-point spinal needles
  - Pencil-point spinal needles *versus* cutting-bevel spinal needles
- Combined spinal–epidural (CSE) local anesthetics with opioids
  - CSE local anesthetics with opioids *versus* epidural local anesthetics with opioids for labor
- Patient-controlled epidural analgesia (PCEA)
  - PCEA *versus* CIE for labor
  - PCEA with a background infusion *versus* PCEA without a background infusion for labor
- Removal of retained placenta
  - Anesthetic techniques
  - Administration of nitroglycerin for uterine relaxation

**** Unless otherwise specified, outcomes for the listed interventions refer to the reduction of maternal, fetal, and neonatal complications.

Anesthetic Care for Cesarean Delivery

- Equipment, facilities, and support personnel
  - Availability of equipment, facilities, and support personnel
- General, epidural, spinal, or CSE anesthesia
  - General anesthesia (GA) *versus* epidural anesthesia
  - Epidural *versus* spinal anesthesia
  - CSE anesthesia *versus* epidural anesthesia
    - CSE anesthesia *versus* epidural anesthesia
    - CSE anesthesia *versus* spinal anesthesia
  - *In situ* epidural catheter *versus* no epidural anesthesia in hemodynamically stable patients for removal of retained placenta
  - GA *versus* neuraxial anesthesia in cases involving major maternal hemorrhage for removal of retained placenta
- IV fluid preloading or coloading
  - IV fluid preloading or coloading *versus* no IV fluid preloading or coloading for spinal anesthesia to reduce maternal hypotension
  - IV fluid preloading *versus* coloading
- Ephedrine or phenylephrine
  - Ephedrine *versus* placebo or no ephedrine
  - Phenylephrine *versus* placebo or no ephedrine
  - Ephedrine *versus* phenylephrine
- Neuraxial opioids for postoperative analgesia
  - Neuraxial opioids *versus* intermittent injections of parenteral opioids for postoperative analgesia after neuraxial anesthesia for cesarean
  - PCEA *versus* IV patient-controlled analgesia for postoperative analgesia after neuraxial anesthesia for cesarean
  - Addition of nonsteroidal antiinflammatory drugs *versus* no nonsteroidal antiinflammatory drugs for postoperative analgesia after neuraxial anesthesia for cesarean

Postpartum Tubal Ligation

- A fasting period for solids of 6 to 8 h before postpartum tubal ligation
- Aspiration prophylaxis for postpartum tubal ligation
- Neuraxial anesthesia *versus* GA for postpartum tubal ligation
- Postpartum tubal ligation within 8 h of delivery

Management of Obstetric and Anesthetic Emergencies

Resources for Management of Hemorrhagic Emergencies.

- Equipment, facilities, and support personnel available in the labor and delivery suite comparable to that available in the main operating suite
- Resources for management of hemorrhagic emergencies (*e.g.*, red blood cells, platelets, and cell salvage)
- Invasive hemodynamic monitoring for severe preeclamptic patients

Resources for Management of Airway Emergencies.

- Equipment for management of airway emergencies

Cardiopulmonary Resuscitation.

- Basic and advanced life-support equipment in the labor and delivery suite

State of the Literature. For the literature review, potentially relevant clinical studies were identified *via* electronic and manual searches of the literature. The updated searches covered an 11-yr period from January 1, 2005 to July 31, 2015. New citations were reviewed and combined with pre-2005 articles used in the previous update, resulting in a total of 478 articles that contained direct linkage-related evidence. Search terms consisted of the interventions indicated above guided by the appropriate inclusion/exclusion criteria as stated in the "Focus" section of these Guidelines. A complete bibliography used to develop these guidelines, organized by section, is available as Supplemental Digital Content 2, http://links.lww.com/ALN/B220.

Each pertinent outcome reported in a study was classified by evidence category and level, and designated as either beneficial, harmful, or equivocal. Findings were then summarized for each evidence linkage. Literature pertaining to 13 evidence linkages contained enough studies with well-defined experimental designs and statistical information sufficient to conduct meta-analyses (table 4). These linkages were (1) early *versus* late epidural anesthetics, (2) epidural local anesthetics with opioids *versus* equal concentrations of epidural local anesthetics without opioids, (3) CIE of local anesthetics with opioids *versus* higher concentrations of local anesthetics without opioids, (4) pencil-point *versus* cutting-bevel spinal needles, (5) CSE local anesthetics with opioids *versus* epidural local anesthetics with opioids, (6) PCEA *versus* CIE anesthetics, (7) PCEA with a background infusion *versus* PCEA, (8) GA *versus* epidural anesthesia for cesarean delivery, (9) CSE anesthesia *versus* epidural anesthesia for cesarean delivery, (10) fluid preloading *versus* coloading for cesarean delivery, (11) ephedrine *versus* placebo for cesarean delivery, (12) ephedrine *versus* phenylephrine for cesarean delivery, and (13) neuraxial *versus* parenteral opioids for postoperative analgesia.

General variance-based effect-size estimates or combined probability tests were obtained for continuous outcome measures, and Mantel–Haenszel odds ratios were obtained for dichotomous outcome measures. Two combined probability tests were used as follows: (1) the Fisher combined test, producing chi-square values based on logarithmic

transformations of the reported *P* values from the independent studies, and (2) the Stouffer combined test, providing weighted representation of the studies by weighting each of the standard normal deviates 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 a *P* value of less than 0.01 (one tailed). Tests for heterogeneity of the independent studies were conducted to assure consistency among the study results. DerSimonian–Laird random-effects odds ratios 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, interobserver agreement among Task Force members and two methodologists was established by interrater reliability testing. Agreement levels using a κ statistic for two-rater agreement pairs were as follows: (1) type of study design, κ = 0.83 to 0.94; (2) type of analysis, κ = 0.71 to 0.93; (3) evidence linkage assignment, κ = 0.87 to 1.00; and (4) literature inclusion for database, κ = 0.74 to 1.00. Three-rater chance-corrected agreement values were as follows: (1) study design, Sav = 0.884, Var (Sav) = 0.004; (2) type of analysis, Sav = 0.805, Var (Sav) = 0.009; (3) linkage assignment, Sav = 0.911, Var (Sav) = 0.002; (4) literature database inclusion, Sav = 0.660, Var (Sav) = 0.024. These values represent moderate to high levels of agreement.

Consensus-based Evidence. For the previous update, consensus was obtained from multiple sources, including (1) survey opinion from consultants who were selected based on their knowledge or expertise in obstetric anesthesia or maternal and fetal medicine, (2) survey opinions solicited from active members of the American Society of Anesthesiologists (ASA), (3) testimony from attendees of publicly-held open forums at two national anesthesia meetings, (4) Internet commentary, and (5) Task Force opinion and interpretation. The survey rate of return was 75% (n = 76 of 102) for the consultants, and 2,326 surveys were received from active ASA members. Results of the surveys are reported in tables 5 and 6, and in the text of the guidelines.

The consultants were asked to indicate which, if any, of the evidence linkages would change their clinical practices if the guidelines were instituted. The rate of return was 35%(n = 36). The percent of responding consultants expecting *no change* associated with each linkage were as follows: perianesthetic evaluation: 97%; aspiration prophylaxis: 83%; anesthetic care for labor and delivery: 89%; removal of retained placenta: 97%; anesthetic choices for cesarean delivery: 97%; postpartum tubal ligation: 97%; and management of complications: 94%. Ninety-seven percent of the respondents indicated that the guidelines would have *no effect* on the amount of time spent on a typical case. One respondent indicated that there would be an increase of 5 min in the amount of time spent on a typical case with the implementation of these guidelines.

Appendix 3. Overview of Anesthetic Care for Labor and Delivery††††

Not all women require anesthetic care during labor or delivery. For women who request pain relief for labor and/or delivery, there are many effective analgesic techniques available. Maternal request represents sufficient justification for pain relief. In addition, maternal medical and obstetric conditions may warrant the provision of neuraxial techniques to improve maternal and neonatal outcome.

The choice of analgesic technique depends on the medical status of the patient, progress of labor, and resources at the facility. When sufficient resources (*e.g.*, anesthesia and nursing staff) are available, neuraxial catheter techniques should be one of the analgesic options offered. The choice of a specific neuraxial technique should be individualized and based on anesthetic risk factors, obstetric risk factors, patient preferences, progress of labor, and resources at the facility.

When neuraxial techniques are used for analgesia during labor or vaginal delivery, the primary goal is to provide an adequate maternal analgesia with minimal motor block (*e.g.*, achieved with the administration of local anesthetics at low concentrations with or without opioids).

When a neuraxial technique is chosen, appropriate resources for the treatment of complications (*e.g.*, hypotension, systemic toxicity, and high spinal anesthesia) should be available. If an opioid is added, treatments for related complications (*e.g.*, pruritus, nausea, and respiratory depression) should be available. An IV infusion should be established before the initiation of neuraxial analgesia or general anesthesia and maintained throughout the duration of the neuraxial analgesic or anesthetic. However, administration of a fixed volume of IV fluid is not required before neuraxial analgesia is initiated.

†††† The information in this appendix is intended to provide overview and context for issues concerned with anesthetic care for labor and delivery and are not guideline recommendations.

Table 4. Meta-analysis Summary

Evidence Linkages	N	Fisher Chi-square	*P* Value	Weighted Stouffer Z_c	*P* Value	Effect Size	Mantel–Haenszel OR	CI	Heterogeneity Significance	Heterogeneity Effect Size
Early *vs.* late epidural anesthetics[44–48]										
Spontaneous delivery	5						1.03	0.94–1.13		0.838
Instrumented delivery	5						1.90	0.79–1.03		0.944
Cesarean delivery	5						1.03	0.93–1.15		0.941
Epidural local anesthetics with opioids *vs.* equal concentrations of local anesthetics without opioids[61–73]										
Analgesia (pain relief)	5						4.03	2.14–7.56		0.639
Spontaneous delivery	7						0.98	0.70–1.38		0.251
Hypotension	8						0.79	0.44–1.44		0.664
Pruritus	7						6.15	3.22–11.74		0.899
1 min Apgar	5						0.82	0.44–1.52		0.281
CIE of low concentrations of local anesthetics with opioids *vs.* higher concentrations of local anesthetics without opioids[74–80]										
Spontaneous delivery	7						1.08	0.81–1.44		0.533
Motor block	6						0.29	0.21–0.40		0.011
1 min Apgar	6						0.94	0.60–1.47		0.919
Pencil-point *vs.* cutting-bevel spinal needles[85–89]										
Postdural puncture headache	5						0.34	0.18–0.63		0.272
CSE with opioids *vs.* epidural local anesthetics with opioids[90–101]										
Analgesia (pain relief)	5						0.42	0.24–0.73		0.056
Analgesia (time to onset)	5	56.35	0.001	–5.48	0.001	0.70			0.001	0.001
Maternal satisfaction with analgesia	5						0.97	0.58–2.26		0.056
Spontaneous delivery*	8						0.96	0.71–1.31		0.969
Hypotension	6						1.62	0.63–4.17		0.084
Motor block	5						2.99	1.59–5.60		0.236
Pruritus*†	7						3.56	0.93–10.63		0.001
1 min Apgar	5						1.04	0.56–1.92		0.994
PCEA *vs.* CIE[102–116]										
Analgesic use	6	84.98	0.001	–8.61	0.001	0.47			0.109	0.001
Duration of labor first stage	6	22.41	0.033	–0.46	0.323	0.01			0.272	0.236
Duration of labor second stage	7	21.24	0.096	0.34	0.367	0.01			0.496	0.525
Spontaneous delivery*	8						1.49	0.94–2.36		0.506
Motor block†	7						0.52	0.15–3.44		0.001
1 min Apgar	6						0.63	0.27–1.50		0.602
5 min Apgar	5						2.00	0.44–9.02		0.639
PCEA with background infusion *vs.* PCEA[117–122]										
Analgesia (pain relief)	5						3.33	1.87–5.92		0.399
Spontaneous delivery	5						0.83	0.41–1.69		0.935
Motor block	5						1.18	0.47–2.97		0.546
Fluid preloading *vs.* coloading for cesarean delivery[168,170–174]										
Hypotension	8						1.47	0.99–2.17		0.036
Hypotension (colloids only)	6						1.47	0.78–1.97		0.048

(*Continued*)

Table 4. (*Continued*)

Evidence Linkages	N	Fisher Chi-square	*P* Value	Weighted Stouffer Z_c	*P* Value	Effect Size	Mantel–Haenszel OR	CI	Heterogeneity Significance	Heterogeneity Effect Size
IV ephedrine *vs.* placebo for cesarean delivery[177–181]										
Hypotension	5						0.31	0.53–0.65		0.623
IV phenylephrine *vs.* ephedrine for cesarean delivery[188–199]										
Hypotension*	6						1.36	0.81–2.29		0.184
Umbilical artery pH*	6	57.47	0.001	–5.78	0.001	0.34			0.919	0.992
Neuraxial *vs.* parenteral opioids for postoperative analgesia[200–204,206–211]										
Nausea	9						1.13	0.57–2.22		0.053
Vomiting	6						1.02	0.37–2.81		0.314
Pruritus	9						6.23	3.32–11.68		0.585

* Double-blind studies only; † DerSimonian–Laird random-effects OR.

CIE = continuous infusion epidural; CSE = combined spinal–epidural; OR = odds ratio; PCEA = patient-controlled epidural analgesia.

Table 5. Consultant Survey Responses

	Percent Responding to Each Item					
	N	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Perianesthetic evaluation and preparation						
1. Conduct a focused history and physical examination before providing anesthetic care	61	90.2*	6.6	1.6	1.6	0.0
2. A communication system should be in place to encourage early and ongoing contact between obstetric providers, anesthesiologists, and other members of the multidisciplinary team	61	91.8*	8.2	0.0	0.0	0.0
Intrapartum platelet count						
3. The anesthesiologist's decision to order or require a platelet count should be individualized and based on a patient's history (*e.g.*, severe preeclampsia), physical examination, and clinical signs	61	77.0*	21.3	0.0	1.6	0.0
Blood type and screen						
4. A routine blood cross-match is not necessary for healthy and uncomplicated parturients for vaginal or operative delivery	60	56.7*	35.0	3.3	3.3	1.7
5. The decision whether to order or require a blood type and screen or cross-match should be based on maternal history, anticipated hemorrhagic complications (*e.g.*, placenta accreta in a patient with placenta previa and previous uterine surgery), and local institutional policies	60	75.0*	16.7	1.7	3.3	3.3
Perianesthetic recording of fetal heart rate						
6. The fetal heart rate should be monitored by a qualified individual before and after administration of neuraxial analgesia for labor	60	81.7*	18.3	0.0	0.0	0.0
Aspiration prevention						
7. The oral intake of moderate amounts of clear liquids may be allowed for uncomplicated laboring patients	60	63.3*	35.0	0.0	1.7	0.0
8. The uncomplicated patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) may have moderate amounts of clear liquids up to 2 h before induction of anesthesia	60	53.3*	30.0	6.7	8.3	1.7
9. The patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) should undergo a fasting period for solids of 6–8 h depending on the type of food ingested (*e.g.*, fat content)	60	76.7*	16.7	3.3	3.3	0.0
10. Laboring patients with additional risk factors for aspiration (*e.g.*, morbid obesity, diabetes mellitus, and difficult airway) or patients at increased risk for operative delivery (*e.g.*, nonreassuring fetal heart rate pattern) may have further restrictions of oral intake, determined on a case-by-case basis	60	55.0*	33.3	5.0	6.7	0.0
11. Solid foods should be avoided in laboring patients	60	51.7*	26.7	15.0	6.7	0.0

(*Continued*)

Table 5. (*Continued*)

		Percent Responding to Each Item				
	N	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
12. Before surgical procedures (*e.g.*, cesarean delivery or postpartum tubal ligation), consider the timely administration of nonparticulate antacids, H_2-receptor antagonists, and/or metoclopramide for aspiration prophylaxis	60	41.7	36.7*	13.3	6.7	1.7
Timing of neuraxial analgesia and outcomes of labor						
13. Provide patients in early labor (*i.e.*, < 5 cm dilation) the option of neuraxial analgesia when this service is available	60	96.7*	3.3	0.0	0.0	0.0
14. Offer neuraxial analgesia on an individualized basis	60	71.7*	15.0	5.0	3.3	5.0
15. Do not withhold neuraxial analgesia on the basis of achieving an arbitrary cervical dilation	60	93.3*	5.0	0.0	1.7	0.0
Neuraxial analgesia and trial of labor after prior cesarean delivery						
16. Offer neuraxial techniques to patients attempting vaginal birth after previous cesarean delivery	60	98.3*	1.7	0.0	0.0	0.0
17. For these patients, it is appropriate to consider early placement of a neuraxial catheter that can be used later for labor analgesia or for anesthesia in the event of operative delivery	60	53.3*	26.7	13.3	3.3	3.3
Early insertion of a neuraxial (*i.e.*, spinal or epidural) catheter for complicated parturients						
18. Consider early insertion of a neuraxial catheter for obstetric (*e.g.*, twin gestation or preeclampsia) or anesthetic indications (*e.g.*, anticipated difficult airway or obesity) to reduce the need for general anesthesia if an emergent procedure becomes necessary	60	68.3*	28.3	1.7	0.0	1.7
CIE analgesia						
19. Continuous epidural infusion may be used for effective analgesia for labor and delivery	60	78.3*	20.0	1.7	0.0	0.0
20. When a continuous epidural infusion of local anesthetic is selected, an opioid may be added	60	91.7*	6.7	1.7	0.0	0.0
Analgesic concentrations						
21. Use dilute concentrations of local anesthetics with opioids to produce as little motor block as possible	60	78.3*	20.0	1.7	0.0	0.0
Single-injection spinal opioids with or without local anesthetics						
22. Single-injection spinal opioids with or without local anesthetics may be used to provide effective, although time-limited, analgesia for labor when spontaneous vaginal delivery is anticipated	60	41.7	45.0*	11.7	1.7	0.0
23. A local anesthetic may be added to a spinal opioid to increase duration and improve quality of analgesia	60	65.0*	33.3	1.7	0.0	0.0
Pencil-point spinal needles						
24. Use pencil-point spinal needles instead of cutting-bevel spinal needles to minimize the risk of postdural puncture headache	60	95.0*	1.7	3.3	0.0	0.0
CSE analgesia						
25. If labor is expected to last longer than the analgesic effects of the spinal drugs chosen, or if there is a good possibility of operative delivery, then consider a catheter technique instead of a single-injection technique	60	86.7*	8.3	3.3	0.0	1.7
26. CSE techniques may be used to provide effective and rapid onset of analgesia for labor	60	78.3*	21.7	0.0	0.0	0.0
PCEA						
27. PCEA may be used to provide an effective and flexible approach for the maintenance of labor analgesia	60	85.0*	15.0	0.0	0.0	0.0
28. The use of PCEA may be preferable to fixed-rate CIE for providing fewer anesthetic interventions and reducing dosages of local anesthetics	60	68.3*	21.7	10.0	0.0	0.0
29. PCEA may be used with or without a background infusion	60	28.3	33.3*	18.3	18.3	1.7
Anesthetic techniques for removal of retained placenta						
30. Assess hemodynamic status before administering neuraxial anesthesia	60	91.7*	8.3	0.0	0.0	0.0
31. If an epidural catheter is in place and the patient is hemodynamically stable, consider providing epidural anesthesia	60	83.3*	10.0	1.7	0.0	0.0
32. Consider aspiration prophylaxis	60	46.7	36.7*	13.3	1.7	1.7
33. Titrate sedation/analgesia carefully due to the potential risks of respiratory depression and pulmonary aspiration during the immediate postpartum period	60	58.3*	38.3	1.7	1.7	0.0
34. In cases involving major maternal hemorrhage with hemodynamic instability, general anesthesia with an endotracheal tube may be considered in preference to neuraxial anesthesia	60	61.7*	33.3	5.0	0.0	0.0

(*Continued*)

Table 5. (*Continued*)

	Percent Responding to Each Item					
	N	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Nitroglycerin for uterine relaxation						
35. Nitroglycerin may be used as an alternative to terbutaline sulfate or general endotracheal anesthesia with halogenated agents for uterine relaxation during removal of retained placental tissue	60	73.3*	25.0	1.7	0.0	0.0
Equipment, facilities, and support personnel						
36. Equipment, facilities, and support personnel available in the labor and delivery operating suite should be comparable to those available in the main operating suite	60	93.3*	5.0	1.7	0.0	0.0
37. Resources for the treatment of potential complications (*e.g.*, failed intubation, inadequate analgesia, hypotension, respiratory depression, pruritus, and vomiting) should also be available in the labor and delivery operating suite	60	96.7*	3.3	0.0	0.0	0.0
38. Appropriate equipment and personnel should be available to care for obstetric patients recovering from major neuraxial or GA	60	100*	0.0	0.0	0.0	0.0
General, epidural, spinal, or CSE anesthesia						
39. The decision to use a particular anesthetic technique for cesarean delivery should be individualized, based on anesthetic, obstetric, or fetal risk factors (*e.g.*, elective *vs.* emergency), the preferences of the patient, and the judgment of the anesthesiologist	60	93.3*	6.7	0.0	0.0	0.0
40. Uterine displacement (usually left displacement) should be maintained until delivery regardless of the anesthetic technique used	60	60.0*	25.0	11.7	3.3	0.0
41. Consider selecting neuraxial techniques in preference to general anesthesia for most cesarean deliveries	60	91.7*	8.3	0.0	0.0	0.0
42. If spinal anesthesia is chosen, use pencil-point spinal needles instead of cutting-bevel spinal needles	60	95.0*	3.3	1.7	0.0	0.0
43. For urgent cesarean delivery, an indwelling epidural catheter may be used as an alternative to initiation of spinal anesthesia	59	83.0*	15.2	1.7	0.0	0.0
44. General anesthesia may be the most appropriate choice in some circumstances (*e.g.*, profound fetal bradycardia, ruptured uterus, severe hemorrhage, and severe placental abruption)	60	80.0*	20.0	0.0	0.0	0.0
IV fluid preloading						
45. IV fluid preloading may be used to reduce the frequency of maternal hypotension after spinal anesthesia for cesarean delivery	60	25.0	26.7*	25.0	18.3	5.0
46. Although fluid preloading reduces the frequency of maternal hypotension, do not delay the initiation of spinal anesthesia in order to administer a fixed volume of IV fluid	60	68.3*	26.7	5.0	0.0	0.0
Ephedrine or phenylephrine						
47. IV ephedrine and phenylephrine both may be used for treating hypotension during neuraxial anesthesia	60	60.0*	33.3	3.3	1.7	1.7
Neuraxial opioids for postoperative analgesia						
48. For postoperative analgesia after neuraxial anesthesia for cesarean delivery, consider selecting neuraxial opioids rather than intermittent injections of parenteral opioids	60	85.0*	11.7	1.7	1.7	0.0
Postpartum tubal ligation						
49. Before postpartum tubal ligation, the patient should have no oral intake of solid foods within 6–8 h of the surgery, depending on the type of food ingested (*e.g.*, fat content)	60	55.0*	28.3	6.7	10.0	0.0
50. Both the timing of the procedure and the decision to use a particular anesthetic technique (*i.e.*, neuraxial *vs.* general) should be individualized, based on anesthetic risk factors, obstetric risk factors (*e.g.*, blood loss), and patient preferences	60	78.3*	18.3	1.7	1.7	0.0
51. Consider selecting neuraxial techniques in preference to general anesthesia for most postpartum tubal ligations	60	73.3*	18.3	6.7	0.0	1.7
Management of hemorrhagic emergencies						
52. Institutions providing obstetric care should have resources available to manage hemorrhagic emergencies	58	100.0*	0.0	0.0	0.0	0.0
53. Labor and delivery units should have personnel and equipment readily available to manage airway emergencies consistent with the ASA Practice Guidelines for Management of the Difficult Airway, to include a pulse oximeter and carbon dioxide detector	58	98.3*	1.7	0.0	0.0	0.0
54. Basic and advanced life-support equipment should be immediately available in the operative area of labor and delivery units	58	100.0*	0.0	0.0	0.0	0.0
55. If cardiac arrest occurs during labor and delivery, initiate standard resuscitative measures with accommodations for pregnancy such as left uterine displacement and preparing for delivery of the fetus	58	98.3*	1.7	0.0	0.0	0.0

* Median response.

ASA = American Society of Anesthesiologists; CIE = continuous infusion epidural; CSE = combined spinal–epidural; GA = general anesthesia; N = the number of consultants who responded to each item; PCEA = patient-controlled epidural analgesia.

Table 6. ASA Membership Survey Responses

	N	Percent Responding to Each Item: Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Perianesthetic evaluation and preparation						
1. Conduct a focused history and physical examination before providing anesthetic care	373	73.2*	21.4	3.2	1.3	0.8
2. A communication system should be in place to encourage early and ongoing contact between obstetric providers, anesthesiologists, and other members of the multidisciplinary team	373	81.0*	16.6	2.1	0.0	0.3
Intrapartum platelet count						
3. The anesthesiologist's decision to order or require a platelet count should be individualized and based on a patient's history (*e.g.,* severe preeclampsia), physical examination, and clinical signs	370	51.3*	29.7	5.9	10.8	2.2
Blood type and screen						
4. A routine blood cross-match is not necessary for healthy and uncomplicated parturients for vaginal or operative delivery	367	38.4	38.7*	8.2	12.0	2.7
5. The decision whether to order or require a blood type and screen or cross-match should be based on maternal history, anticipated hemorrhagic complications (*e.g.*, placenta accreta in a patient with placenta previa and previous uterine surgery), and local institutional policies	367	49.3	33.0*	4.1	11.4	2.2
Perianesthetic recording of fetal heart rate						
6. The fetal heart rate should be monitored by a qualified individual before and after administration of neuraxial analgesia for labor	366	68.3*	24.3	6.3	0.6	0.6
Aspiration prevention						
7. The oral intake of moderate amounts of clear liquids may be allowed for uncomplicated laboring patients	357	30.0	47.3*	9.5	10.4	2.8
8. The uncomplicated patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) may have moderate amounts of clear liquids up to 2 h before induction of anesthesia	357	21.3	36.7*	9.0	25.5	7.6
9. The patient undergoing elective surgery (*e.g.*, scheduled cesarean delivery or postpartum tubal ligation) should undergo a fasting period for solids of 6–8 h depending on the type of food ingested (*e.g.*, fat content)	357	70.3*	27.7	0.3	0.8	0.8
10. Laboring patients with additional risk factors for aspiration (*e.g.*, morbid obesity, diabetes mellitus, and difficult airway) or patients at increased risk for operative delivery (*e.g.*, nonreassuring fetal heart rate pattern) may have further restrictions of oral intake, determined on a case-by-case basis	357	56.9*	37.8	3.1	1.7	0.6
11. Solid foods should be avoided in laboring patients	357	63.0*	28.3	5.0	3.1	0.6
12. Before surgical procedures (*e.g.*, cesarean delivery and postpartum tubal ligation), consider the timely administration of nonparticulate antacids, H_2-receptor antagonists, and/or metoclopramide for aspiration prophylaxis	355	43.9	38.6*	13.8	2.2	1.4
Timing of neuraxial analgesia and outcomes of labor						
13. Provide patients in early labor (*i.e.*, < 5 cm dilation) the option of neuraxial analgesia when this service is available	354	62.7*	31.9	3.1	1.9	0.3
14. Offer neuraxial analgesia on an individualized basis	354	57.1*	28.8	8.2	4.8	1.1
15. Do not withhold neuraxial analgesia on the basis of achieving an arbitrary cervical dilation	354	66.1*	26.5	5.1	1.7	0.6
Neuraxial analgesia and trial of labor after prior cesarean delivery						
16. Offer neuraxial techniques to patients attempting vaginal birth after previous cesarean delivery	354	64.1*	28.2	4.8	1.7	1.1
17. For these patients, it is appropriate to consider early placement of a neuraxial catheter that can be used later for labor analgesia or for anesthesia in the event of operative delivery	354	53.4*	32.8	10.2	1.7	2.0
Early insertion of a neuraxial (*i.e.*, spinal or epidural) catheter for complicated parturients						
18. Consider early insertion of a neuraxial catheter for obstetric (*e.g.*, twin gestation or preeclampsia) or anesthetic indications (*e.g.*, anticipated difficult airway or obesity) to reduce the need for general anesthesia if an emergent procedure becomes necessary	352	56.2*	32.1	7.7	3.4	0.6
CIE analgesia						
19. Continuous epidural infusion may be used for effective analgesia for labor and delivery	351	82.6*	15.7	1.4	0.3	0.0
20. When a continuous epidural infusion of local anesthetic is selected, an opioid may be added	351	80.3*	17.1	2.0	0.6	0.0

(*Continued*)

Table 6. (*Continued*)

	Percent Responding to Each Item					
	N	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Analgesic concentrations						
21. Use dilute concentrations of local anesthetics with opioids to produce as little motor block as possible	351	62.7*	30.2	5.1	1.4	0.6
Single-injection spinal opioids with or without local anesthetics						
22. Single-injection spinal opioids with or without local anesthetics may be used to provide effective, although time-limited, analgesia for labor when spontaneous vaginal delivery is anticipated	349	32.4	41.3*	17.5	7.7	1.2
23. A local anesthetic may be added to a spinal opioid to increase duration and improve quality of analgesia	349	46.7	39.5*	10.0	2.9	0.9
Pencil-point spinal needles						
24. Use pencil-point spinal needles instead of cutting-bevel spinal needles to minimize the risk of postdural puncture headache	349	81.1*	15.8	2.9	0.0	0.3
CSE analgesia						
25. If labor is expected to last longer than the analgesic effects of the spinal drugs chosen, or if there is a good possibility of operative delivery, then consider a catheter technique instead of a single-injection technique	348	75.0*	19.2	3.4	2.3	0.0
26. CSE techniques may be used to provide effective and rapid onset of analgesia for labor	348	51.2*	33.3	11.8	2.0	1.7
PCEA						
27. PCEA may be used to provide an effective and flexible approach for the maintenance of labor analgesia	344	69.2*	26.4	4.1	0.0	0.3
28. The use of PCEA may be preferable to fixed-rate CIE for providing fewer anesthetic interventions and reducing dosages of local anesthetics	344	52.6*	28.5	14.2	4.1	0.6
29. PCEA may be used with or without a background infusion	344	29.1	31.4*	15.1	22.1	2.3
Anesthetic techniques for removal of retained placenta						
30. Assess hemodynamic status before administering neuraxial anesthesia	344	81.1*	18.3	0.6	0.0	0.0
31. If an epidural catheter is in place and the patient is hemodynamically stable, consider providing epidural anesthesia	344	63.1*	34.0	2.3	0.3	0.3
32. Consider aspiration prophylaxis	344	45.6	42.7*	9.3	1.2	1.2
33. Titrate sedation/analgesia carefully due to the potential risks of respiratory depression and pulmonary aspiration during the immediate postpartum period	344	57.3*	38.9	2.9	0.9	0.0
34. In cases involving major maternal hemorrhage with hemodynamic instability, general anesthesia with an endotracheal tube may be considered in preference to neuraxial anesthesia	344	64.2*	30.8	4.9	0.0	0.0
Nitroglycerin for uterine relaxation						
35. Nitroglycerin may be used as an alternative to terbutaline sulfate or general endotracheal anesthesia with halogenated agents for uterine relaxation during removal of retained placental tissue	344	46.8	45.1*	7.6	0.3	0.3
Equipment, facilities, and support personnel						
36. Equipment, facilities, and support personnel available in the labor and delivery operating suite should be comparable to those available in the main operating suite	342	84.5*	13.4	1.7	0.3	0.0
37. Resources for the treatment of potential complications (*e.g.*, failed intubation, inadequate analgesia, hypotension, respiratory depression, pruritus, and vomiting) should also be available in the labor and delivery operating suite	342	93.0*	6.4	0.0	0.3	0.3
38. Appropriate equipment and personnel should be available to care for obstetric patients recovering from major neuraxial or general anesthesia	342	92.4*	7.6	0.0	0.0	0.0
General, epidural, spinal, or CSE anesthesia						
39. The decision to use a particular anesthetic technique for cesarean delivery should be individualized, based on anesthetic, obstetric, or fetal risk factors (*e.g.*, elective *vs.* emergency), the preferences of the patient, and the judgment of the anesthesiologist	340	87.3*	11.5	0.6	0.6	0.0
40. Uterine displacement (usually left displacement) should be maintained until delivery regardless of the anesthetic technique used	340	53.5*	34.1	9.1	3.2	0.0
41. Consider selecting neuraxial techniques in preference to general anesthesia for most cesarean deliveries	340	81.8*	17.3	0.6	0.3	0.0
42. If spinal anesthesia is chosen, use pencil-point spinal needles instead of cutting-bevel spinal needles	340	78.2*	18.8	2.3	0.3	0.3

(*Continued*)

Table 6. (*Continued*)

	Percent Responding to Each Item					
	N	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
43. For urgent cesarean delivery, an indwelling epidural catheter may be used as an alternative to initiation of spinal anesthesia	340	65.0*	27.9	4.7	1.8	0.6
44. General anesthesia may be the most appropriate choice in some circumstances (*e.g.*, profound fetal bradycardia, ruptured uterus, severe hemorrhage, and severe placental abruption)	340	82.3*	16.5	0.6	0.3	0.3
IV fluid preloading						
45. IV fluid preloading may be used to reduce the frequency of maternal hypotension after spinal anesthesia for cesarean delivery	339	41.3	41.9*	12.1	3.8	0.9
46. Although fluid preloading reduces the frequency of maternal hypotension, do not delay the initiation of spinal anesthesia in order to administer a fixed volume of IV fluid	339	42.5	35.7*	8.0	11.5	2.4
Ephedrine or phenylephrine						
47. IV ephedrine and phenylephrine both may be used for treating hypotension during neuraxial anesthesia	339	67.9*	28.3	1.8	1.8	0.3
Neuraxial opioids for postoperative analgesia						
48. For postoperative analgesia after neuraxial anesthesia for cesarean delivery, consider selecting neuraxial opioids rather than intermittent injections of parenteral opioids	339	56.0*	33.6	8.3	0.9	1.2
Postpartum tubal ligation						
49. Before postpartum tubal ligation, the patient should have no oral intake of solid foods within 6–8 h of the surgery, depending on the type of food ingested (*e.g.*, fat content)	337	73.6*	24.3	1.2	0.9	0.0
50. Both the timing of the procedure and the decision to use a particular anesthetic technique (*i.e.*, neuraxial *vs.* general) should be individualized, based on anesthetic risk factors, obstetric risk factors (*e.g.*, blood loss), and patient preferences	337	73.6*	22.8	2.1	1.5	0.0
51. Consider selecting neuraxial techniques in preference to general anesthesia for most postpartum tubal ligations	337	39.5	33.8*	20.2	5.6	0.9
Management of hemorrhagic emergencies						
52. Institutions providing obstetric care should have resources available to manage hemorrhagic emergencies	331	95.9*	4.2	0.3	0.6	0.0
53. Labor and delivery units should have personnel and equipment readily available to manage airway emergencies consistent with the ASA Practice Guidelines for Management of the Difficult Airway, to include a pulse oximeter and carbon dioxide detector	331	94.0*	5.7	0.0	0.3	0.0
54. Basic and advanced life-support equipment should be immediately available in the operative area of labor and delivery units	331	94.3*	5.1	0.3	0.3	0.0
55. If cardiac arrest occurs during labor and delivery, initiate standard resuscitative measures with accommodations for pregnancy such as left uterine displacement and preparing for delivery of the fetus	331	92.1*	7.5	0.0	0.3	0.

* Median response.

ASA = American Society of Anesthesiologists; CIE = continuous infusion epidural; CSE = combined spinal–epidural; N = the number of members who responded to each item; PCEA = patient-controlled epidural analgesia.

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Competing Interests

The authors declare no competing interests.

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Address correspondence to the American Society of Anesthesiologists: 1061 American Lane, Schaumburg, Illinois 60173. These updated Practice Guidelines, and all ASA Practice Parameters, may be obtained at no cost through the Journal Web site, www.anesthesiology.org.

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