

Practice Guidelines for Obstetric Anesthesia: An Updated Report
American Society of Anesthesiologists

Bibliography by Section

I. Perianesthetic evaluation

Reviewing medical records (patient condition).

Observational studies, case reports, or comparisons without pertinent control groups

1. Abouleish E: Caudal analgesia for quadruplet delivery. *Anesth Analg* 1976; 55:61-66
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Conducting a physical examination.

No entries

Communication between anesthetic and obstetric providers.

Observational studies, case reports, or non-pertinent comparison groups

1. Kinney MA, Rose CH, Traynor KD, Deutsch E, Memon HU, Tanouye S, Arendt KW, Hebl JR: Emergency bedside cesarean delivery: lessons learned in teamwork and patient safety. *BMC Res Notes* 2012; 5:412

Laboratory tests.

Routine platelet count:

Observational studies, case reports, or non-pertinent comparison groups

1. Simon L, Santi TM, Sacquin P, Hamza J: Pre-anaesthetic assessment of coagulation abnormalities in obstetric patients: usefulness, timing and clinical implications. *Br J Anaesth* 1997; 78:678-683

Platelet count for suspected preeclampsia or coagulopathy:

Observational studies, case reports, or non-pertinent comparison groups

1. de Vries JI, Vellenga E, Aarnoudse JG: Plasma beta-thromboglobulin in normal pregnancy and pregnancy-induced hypertension. *Eur J Obstet Gynecol Reprod Biol* 1983; 14:209-216
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Blood type & screen, hold, or cross-match:

Nonrandomized comparative studies

1. Cousins LM, Teplick FB, Poeltler DM: Pre-cesarean blood bank orders: a safe and less expensive approach. *Obstet Gynecol* 1996; 87:912-916

Observational studies, case reports, or non-pertinent comparison groups

1. Ransom SB, Fundaro G, Dombrowski MP: The cost effectiveness of routine type and screen admission testing from expected vaginal delivery. *Obstet Gynecol* 1998; 92:493-495
2. Ransom SB, Fundaro G, Dombrowski MP: Cost-effectiveness of routine blood type and screen testing for cesarean section. *J Reprod Med* 1999; 44:592-594

Recording of fetal heart rate before or after neuraxial anesthesia.

Observational studies, case reports, or non-pertinent comparison groups

1. Abboud TK, Khoo SS, Miller F, Doan T, Henriksen EH: Maternal, fetal, and neonatal responses after epidural anesthesia with bupivacaine, 2-chloroprocaine, or lidocaine. *Anesth Analg* 1982; 61:638-644
2. Abouleish E: Foetal bradycardia during caudal analgesia: A discussion of possible causative factors. *Br J Anaesth* 1976; 48:481-484
3. Boehm FH, Woodruff LF, Jr., Growdon JH, Jr: The effect of lumbar epidural anesthesia on fetal heart rate baseline variability. *Anesth Analg* 1975; 54:779-782
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5. Spencer JA, Koutsoukis M, Lee A: Fetal heart rate and neonatal condition related to epidural analgesia in women reaching the second stage of labour. *Eur J Obstet Gynecol Reprod Biol* 1991; 41:173-178
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8. Ziliani M, Salazar JR, Aller J, Agüero O: Fetal heart rate and pH of fetal capillary blood during epidural analgesia in labor. *Obstet Gynecol* 1970; 36(6):881-886

II. Aspiration prevention

Oral intake of clear liquids for labor.

Observational studies, case reports, or comparisons without pertinent control groups

1. Adams AP, Morgan M, Jones BC, McCormick PW: A case of massive aspiration of gastric contents during obstetric anaesthesia. Treatment by tracheostomy and prolonged intermittent positive pressure ventilation. *Br J Anaesth* 1969; 41:176-183

Oral intake of solids during labor.

No entries

A fasting period for solids of 6 to 8 hours before an elective cesarean.

No entries

Non-particulate antacids versus no antacids prior to operative procedures (excluding operative vaginal delivery).

Randomized controlled trials

1. Dewan DM, Floyd HM, Thistlewood JM, Bogard TD, Spielman FJ: Sodium citrate pretreatment in elective cesarean section patients. *Anesth Analg* 1985; 64:34-37
2. Jasson J, Lefevre G, Tallet F, Talafre ML, Legagneux F, Conseiller C: Oral sodium citrate before general anesthesia for elective cesarean section. Effects on pH and volume of gastric content. *Ann Fr Anesth Reanim* 1989; 8:12-18
3. Ormezzano X, Francois TP, Viaud JY, Bukowski JG, Bourgeonneau MC, Cottron D, Ganansia MF, Gregoire FM, Grinand MR, Wessel PE: Aspiration pneumonitis prophylaxis in obstetric anaesthesia: comparison of effervescent cimetidine-sodium citrate mixture and sodium citrate. *Br J Anaesth* 1990; 64:503-506
4. Palmer AW, Waugaman WR, Conklin KA, Kotelko DM: Does the administration of oral bicitra before elective cesarean section affect the incidence of nausea and vomiting in the parturient? *Nurse Anesth* 1991; 2:126-133
5. Wig J, Biswas GC, Malhotra SK, Gupta AN: Comparison of sodium citrate with magnesium trisilicate as pre-anaesthetic antacid in emergency caesarean sections. *Indian J Med Res* 1987; 85:306-310

Observational studies, case reports, or non-pertinent comparison groups

1. Lim SK, Elegbe EO: The use of single dose of sodium citrate as a prophylaxis against acid aspiration syndrome in obstetric patients undergoing caesarean section. *Med J Malaysia* 1991; 46:349-355

H₂ antagonists (e.g., cimetidine, ranitidine, famotidine) versus no H₂ antagonists prior to operative procedures (excluding operative vaginal delivery).

Randomized controlled trials

1. Lin CJ, Huang CL, Hsu HW, Chen TL: Prophylaxis against acid aspiration in regional anesthesia for elective cesarean section: a comparison between oral single-dose ranitidine, famotidine and omeprazole assessed with fiberoptic gastric aspiration. *Acta Anaesthesiol Sin* 1996; 34:179-184

2. O'Sullivan GM, Sear JW, Bullingham RES, Carrie LES: The effect of magnesium trisilicate mixture, metoclopramide and ranitidine on gastric pH, volume and serum gastrin. *Anaesthesia* 1985; 40:246-253
3. Qvist N, Storm K: Cimetidine pre-anesthetic. A prophylactic method against Mendelson's syndrome in cesarean section. *Acta Obstet Gynecol Scand* 1983; 62:157-159
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Nonrandomized comparative studies

1. McCaughey W, Howe JP, Moore J, Dundee JW: Cimetidine in elective Caesarean section. Effect on gastric acidity. *Anaesthesia* 1981; 36:167-172

Metoclopramide versus no metoclopramide prior to operative procedures (excluding operative vaginal delivery).

Randomized controlled trials

1. Cohen SE, Jasson J, Talafre ML, Chauvelot Moachon L, Barrier G: Does metoclopramide decrease the volume of gastric contents in patients undergoing cesarean section? *Anesthesiology* 61:604-607, 1984
2. Cooke RD, Comyn DJ, Ball RW: Prevention of postoperative nausea and vomiting by domperidone: A double-blind randomized study using domperidone, metoclopramide and a placebo. *S Afr Med J* 1979; 56:827-829
3. Danzer BI, Birnbach DJ, Stein DJ, Kuroda MM, Thys DM: Does metoclopramide supplement postoperative analgesia using patient-controlled analgesia with morphine in patients undergoing elective cesarean delivery? *Reg Anesth* 1997; 22:424-427
4. Lussos SA, Bader AM, Thornhill ML, Datta S: The antiemetic efficacy and safety of prophylactic metoclopramide for elective cesarean delivery during spinal anesthesia. *Reg Anesth* 1992; 17:126-130
5. Murphy DF, Nally B, Gardiner J, Unwin A. Effect of metoclopramide on gastric emptying before elective and emergency caesarean section. *Br J Anaesth* 1984; 56:1113-1116
6. O'Sullivan GM, Sear JW, Bullingham RES, Carrie LES: The effect of magnesium trisilicate mixture, metoclopramide and ranitidine on gastric pH, volume and serum gastrin. *Anaesthesia* 1985; 40:246-253
7. Pan PH, Moore CH: Comparing the efficacy of prophylactic metoclopramide, ondansetron, and placebo in cesarean section patients given epidural anesthesia. *J Clin Anesth* 2001; 13:430-435
8. Stein DJ, Birnbach DJ, Danzer BI, Kuroda MM, Grunebaum A, Thys DM: Acupressure versus intravenous metoclopramide to prevent nausea and vomiting during spinal anesthesia for cesarean section. *Anesth Analg* 1997; 84:342-345

Observational studies, case reports, or non-pertinent comparison groups

1. Hussain S, Khan RA, Iqbal M, Shafiq M, Khan FA: A comparison of the effects of erythromycin and metoclopramide on gastric fluid volume and pH patients undergoing elective caesarean section. *Anaesth Pain Intensive Care* 2011; 15:148-152

III. Anesthetic care for labor and vaginal delivery

Early versus late administration of epidural analgesia.

Randomized controlled trials: epidural analgesia

1. Chestnut DH, McGrath JM, Vincent RD, Jr., Penning DH, Choi WW, Bates JN, McFarlane C: Does early administration of epidural analgesia affect obstetric outcome in nulliparous women who are in spontaneous labor? *Anesthesiology* 1994; 80:1201-1208
2. Chestnut DH, Vincent Jr RD, McGrath JM, Choi WW, Bates JN: Does early administration of epidural analgesia affect obstetric outcome in nulliparous women who are receiving intravenous oxytocin? *Anesthesiology* 1994; 80:1193-2000
3. Luxman E, Wolman I, Groutz A, Cohen JR, Lottan M, Pauzner D, David MP: The effect of early epidural block administration on the progression and outcome of labor. *Int J Obstet Anesth* 1998; 7:161-164
4. Ohel G, Gonen R, Vaida S, Barak S, Gaitini L: Early versus late initiation of epidural analgesia in labor: Does it increase the risk of cesarean section? A randomized trial. *Am J Obstet Gynecol* 2006; 194:600-605
5. Parameswara G, Kshama K, Murthy HK, Jalaja K, Venkat S: Early epidural labour analgesia: Does it increase the chances of operative delivery? *Br J Anaesth* 2012; 108 (Suppl 2):ii213-ii214
6. Wang F, Shen X, Guo X, Peng Y, Gu X, The Labor Analgesia Examining Group: Epidural analgesia in the latent phase of labor and the risk of cesarean delivery. *Anesthesiology* 2009; 111:871-880

Randomized controlled trials: CSE analgesia

1. Wang LZ, Chang XY, Hu XX, Tang BL, Xia F: The effect on maternal temperature of delaying initiation of the epidural component of combined spinal-epidural analgesia for labor: A pilot study. *Int J Obstet Anesth* 2011; 20:312-317
2. Wong CA, McCarthy RJ, Sullivan JT, Scavone BM, Gerber SE, Yaghmour EA: Early compared with late neuraxial analgesia in nulliparous labor induction: a randomized controlled trial. *Obstet Gynecol* 2009; 113:1066-1074

Nonrandomized comparative studies

1. Lieberman E, Lang JM, Cohen A, D'Agostino R, Jr., Datta S, Frigoletto FD, Jr: Association of epidural analgesia with cesarean delivery in nulliparas. *Obstet Gynecol* 1996; 88:993-1000
2. Matouskova A, Hanson B, Elm'en H: Continuous mini-infusion of bupivacaine into the epidural space during labor. Part III: A clinical study of 225 patients. *Acta Obstet Gynecol Scand Suppl* 1979; 83:43-52
3. Ohel G, Harats H: Epidural anesthesia in early compared with advanced labor. *Int J Gynaecol Obstet* 1994; 45:217-219
4. Rogers R, Gilson G, Hammerer-Doak D: Epidural analgesia and active management of labor and mode of delivery. *Obstet Gynecol* 1999; 93:995-998
5. Thorp JA, Hu DH, Albin RM, McNitt J, Meyer BA, Cohen GR, Yeast JD: The effect of intrapartum epidural analgesia on nulliparous labor: a randomized, controlled, prospective trial. *Am J Obstet Gynecol* 1993; 169:851-858

Neuraxial techniques for patients attempting vaginal birth after prior cesarean delivery (VBAC) for labor.

Nonrandomized comparative studies

1. Carlsson C, Nybell-Lindahl G, Ingemarsson I: Extradural block in patients who have perviously undergone caesarean section. *Br J Anaesth* 1980; 52:827-830
2. Flamm BL, Lim OW, Jones C, Fallon D, Newman LA, Mantis JK: Vaginal birth after cesarean section: results of a multicenter study. *Am J Obstet Gynecol* 1988; 158:1079-1084
3. Meehan FP, Burke G, Kehoe JT: Update on delivery following prior cesarea section: a fifteen year review 1972-1987. *Int J Gynecol Obstet* 1989; 30:205-212
4. Sakala EP, Kaye S, Murray RD, Munson LJ: Epidural analgesia: effect on the liklihood of a successful trial of labor after cesarean section. *J Reprod Med* 1990; 35:886-890
5. Stovall TG, Shaver DC, Solomon SK, Anderson GD: Trial of labor in previous cesarean section patients, excluding classical cesarean sections. *Obstet Gynecol* 1987; 70:713-717

Observational studies, case reports, or non-pertinent comparison groups

1. Ben Aissia N, Batar S, Sadfi A, Bouhaja B, Haddad Ben Ammar MS, Gara MF: The obstetrical advantages of epidural analgesia in a trial of labor. *Tunis Med* 2004 82:37-40
2. Rudick V, Niv D, Hetman Peri M, Geller E, Avni A, Golan A: Epidural analgesia for planned vaginal delivery following previous cesarean section. *Obstet Gynecol* 1984; 64:621-623

Early (prophylactic) spinal or epidural catheter insertion for complicated parturients.

No entries

Continuous epidural infusion (CIE).

CIE local anesthetics (with or without opioids) versus IV opioids for labor:

Randomized controlled trials: CIE local anesthetics versus IV single-shot opioids

1. Bofill JA, Vincent RD, Road EI, Martin RW, Norman PF, Werham CF, Morrison JC: Nulliparous active labor, epidural analgesia, and cesarean delivery for dystocia. *Am J Obstet Gyn* 1997; 177:1465-1470
2. Ramin SM, Gambling DR, Lucas MJ, Sharma SK, Sidawi JE, Leveno KJ: Randomized trial of epidural versus intravenous analgesia during labor. *Obstet Gynecol* 1995; 86:783-789

Nonrandomized comparative studies: CIE versus IV single-shot opioids

1. Camann WR, Hortvet LA, Hughes N, Bader AM, Datta S: Maternal temperature regulation during extradural analgesia for labour. *Br J Anaesth* 1991; 67:565-568
2. Newton ER, Schroeder BC, Knape KG, Bennett BL: Epidural analgesia and uterine function. *Obstet Gynecol* 1995; 85:749-755
3. Vahratian A, Zhang J, Hasling J, Troendle JF, Klebanoff MA, Thorp JM, Jr: The effect of early epidural versus early intravenous analgesia use on labor progression: a natural experiment. *Am J Obstet Gynecol* 2004; 191:259-265
4. Weissman A, Torkhov O, Weissman A, Drugan A: The effects of meperidine and epidural analgesia in labor on maternal heart rate variability. *Int J Obstet Anesth* 2009; 18:118-124

Randomized controlled trials: CIE versus IV PCA opioids

1. Hill JB, Alexander JM, Sharma SK, McIntire DD, Leveno KJ: A comparison of the effects of epidural and meperidine analgesia during labor on fetal heart rate. *Obstet Gynecol* 2003; 102:333-337
2. Lucas MJ, Sharma SK, McIntire DD, Wiley J, Sidawi JE, Ramin SM, Leveno KJ, Cunningham EG: A randomized trial of labor analgesia in women with pregnancy-induced hypertension. *Am J Obstet Gynecol* 2001;185:970-975

Nonrandomized comparative studies: CIE versus IV PCA opioids

1. El-Kerdawy H, Farouk A: Labor analgesia in preeclampsia: remifentanyl patient controlled intravenous analgesia versus epidural analgesia. *MEJ Anesth* 2010; 20:539-545

CIE local anesthetics (with or without opioids) versus IM opioids for labor:

Randomized controlled trials

1. Loughnan BA, Carli F, Romney M, Dore CJ, Gordon H: Epidural analgesia and backache: a randomized controlled comparison with intramuscular meperidine for analgesia during labour. *Br J Anaesth* 2002; 89:466-472
2. Loughnan BA, Carli F, Romney M, Doré CJ, Gordon H: Randomized controlled comparison of epidural bupivacaine versus pethidine for analgesia in labour. *Br J Anaesth* 2000;84:715-719

Nonrandomized comparative studies

1. Lindblad A, Bernow J, Mars'al K: Obstetric analgesia and fetal aortic blood flow during labour. *Br J Obstet Gynaecol* 1987; 94:306-311
2. Pearson JF, Davies P: The effect of continuous lumbar epidural analgesia on the acid-base status of maternal arterial blood during the first stage of labour. *J Obstet Gynaecol Br Commonw* 1973; 80:218-224
3. Pearson JF, Davies P: The effect of continuous lumbar epidural analgesia upon fetal acid-base status during the second stage of labour. *J Obstet Gynaecol Br Commonw* 1974; 81:975-979

CIE local anesthetics with or without opioids versus spinal opioids with or without local anesthetics for labor:

Nonrandomized comparative studies

1. Nielsen PE, Erickson JR, Abouleish EI, Perriatt S, Sheppard C: Fetal heart rate changes after intrathecal sufentanil or epidural bupivacaine for labor analgesia: incidence and clinical significance. *Anesth Analg* 1996; 83:742-746

Epidural analgesia using local anesthetics with opioids.

Epidural analgesia using local anesthetics with opioids versus equal concentrations of epidural local anesthetics without opioids for labor:

Randomized controlled trials

1. Abboud TK, Afrasiabi A, Zhu J, Mantilla M, Reyes A, D'Onofrio L, Khoo N, Mosaad P, Richardson M, Kalra M, Cheung M, Paul R: Epidural morphine or butorphanol augments bupivacaine analgesia during labor. *Reg Anesth* 1989; 14:115-120
2. Abboud TK, Zhu J, Afrasiabi A, Reyes A, Sherman G, Khan R, Vera Cruz R, Steffens Z: Epidural butorphanol augments lidocaine sensory anesthesia during labor. *Reg Anesth* 1991; 16:265-267
3. Bang E, Lee H, Kang Y, Cho K, et al. Onset of labor epidural analgesia with ropivacaine and a varying dose of fentanyl: a randomized controlled trial *Int J Obstet Anesth* 2012; 21:45-50.
4. Celleno D, Capogna G: Epidural fentanyl plus bupivacaine 0.125 per cent for labour: analgesic effects. *Can J Anaesth* 1988; 35:375-378
5. Desprats R, Mandry J, Grandjean H, Amar B, Pontonnier G, Lareng L: Peridural analgesia during labor: comparative study of a fentanyl-marcaïne combination and marcaïne alone. *J Gynecol Obstet Biol Reprod Paris* 1983; 12:901-905
6. Edwards ND, Hartley M, Clyburn P, Harmer M: Epidural pethidine and bupivacaine in labour. *Anaesthesia* 1992; 47:435-437
7. Hunt CO, Naulty JS, Malinow AM, Datta S, Ostheimer GW: Epidural butorphanol-bupivacaine for analgesia during labor and delivery. *Anesth Analg* 1989; 68:323-327
8. Lehmann KA, Stern S, Breuker KH: Obstetrical peridural anesthesia with bupivacaine and buprenorphine. A randomized double-blind study in comparison with untreated controls. *Anaesthesist* 1992; 41:414-422
9. Lirzin JD, Jacquinet P, Dailland P, Jorrot JC, Jasson J, Talafre ML, Conseiller C: Controlled trial of extradural bupivacaine with fentanyl, morphine or placebo for pain relief in labour. *Br J Anaesth* 1989; 62:641-644
10. Milon D, Lavenac G, Noury D, Allain H, Van den Driessche J, Saint Marc C: Epidural anesthesia during labor: comparison of 3 combinations of fentanyl-bupivacaine and bupivacaine alone. *Ann Fr Anesth Reanim* 1986; 5:18-23
11. Niv D, Rudick V, Golan A, Chayen MS: Augmentation of bupivacaine analgesia in labor by epidural morphine. *Obstet Gynecol* 1986; 67:206-209
12. Phillips GH: Epidural sufentanil/bupivacaine combinations for analgesia during labor: effect of varying sufentanil doses. *Anesthesiology* 1987; 67:835-838
13. Polley LS, Columb MO, Lyons G, Nair SA: The effect of epidural fentanyl on the minimum local analgesic concentration of epidural chloroprocaine in labor. *Anesth Analg* 1996; 83:987-990
14. Sinatra RS, Goldstein R, Sevarino FB: The clinical effectiveness of epidural bupivacaine, bupivacaine with lidocaine, and bupivacaine with fentanyl for labor analgesia. *J Clin Anesth* 1991; 3:219-224
15. Van Steenberge A, Debroux HC, Noorduyn H: Extradural bupivacaine with sufentanil for vaginal delivery. A double-blind trial. *Br J Anaesth* 1987; 59:1518-1522
16. Vertommen JD, Vandermeulen E, Van Aken H, Vaes L, Soetens M, Van Steenberge A, Mourisse P, Willaert J, Noorduyn H, Devlieger H, Van Assche AF: The effects of the addition of sufentanil to 0.125% bupivacaine on the quality of analgesia during labor and on the incidence of instrumental deliveries. *Anesthesiology* 1991; 74:809-814

17. Viscomi CM, Hood DD, Melone PJ, Eisenach JC: Fetal heart rate variability after epidural fentanyl during labor. *Anesth Analg* 1990; 71:679-683
18. Wright PMC, Allen RW, Moore J, Donnelly JP: Gastric emptying during lumbar extradural analgesia in labour: effect of fentanyl supplementation. *Br J Anaesth* 1992; 68:248-251
19. Yau G, Gregory MA, Gin T, Bogod DG, Oh TE: The addition of fentanyl to epidural bupivacaine in first stage labour. *Anaesth Intensive Care* 1990; 18:532-535
20. Yau G, Gregory MA, Gin T, Oh TE: Obstetric epidural analgesia with mixtures of bupivacaine, adrenaline and fentanyl. *Anaesthesia* 1990; 45:1020-1023

Nonrandomized comparative studies

1. Shehabi Y, Gatt S, Buckman T, Isert P: Effect of adrenaline, fentanyl and warming of injectate on shivering following extradural analgesia in labour. *Anaesth Intensive Care* 1990; 18:31-37

Epidural analgesia using local anesthetics with opioids versus higher concentrations of epidural local anesthetics without opioids for labor:

Randomized controlled trials

1. James KS, McGrady E, Quasim I, Patrick A: Comparison of epidural bolus administration of 0.25% bupivacaine and 0.1% bupivacaine with 0.0002% fentanyl for analgesia during labour. *Br J Anaesth* 1998; 81:507-510
2. Yau G, Gregory MA, Gin T, Bogod DG, Oh TE: The addition of fentanyl to epidural bupivacaine in first stage labour. *Anaesth Intensive Care* 1990; 18:532-535
3. Yau G, Gregory MA, Gin T, Oh TE: Obstetric epidural analgesia with mixtures of bupivacaine, adrenaline and fentanyl. *Anaesthesia* 1990; 45:1020-1023

Continuous epidural infusion (CIE) or local anesthetics for maintenance of analgesia.

CIE of lower concentrations of local anesthetics with opioids versus higher concentrations of local anesthetics without opioids for labor:

Randomized controlled trials

1. Chestnut DH, Owen CL, Bates JN, Ostman LG, Choi WW, Geiger MW: Continuous infusion epidural analgesia during labor: a randomized, double-blind comparison of 0.0625% bupivacaine/0.0002% fentanyl versus 0.125% bupivacaine. *Anesthesiology* 1988; 68:754-759
2. Elliott RD: Continuous infusion epidural analgesia for obstetrics: bupivacaine versus bupivacaine-fentanyl mixture. *Can J Anaesth* 1991; 38:303-310
3. Lee BB, Ngan Kee WD, Ng FF, Lau TK, Wong EL: Epidural infusions for labor analgesia: a comparison of 0.2% ropivacaine, 0.1% ropivacaine, and 0.1% ropivacaine with fentanyl. *Reg Anesth Pain Med* 2002; 27:31-36
4. Porter JS, Bonello E, Reynolds F: The effect of epidural opioids on maternal oxygenation during labour and delivery. *Anaesthesia* 1996; 51:899-903
5. Reynolds F, Russell R, Porter J, Smeeton M: Does the use of low dose bupivacaine/opioid epidural infusion increase the normal delivery rate? *Int J Obstet Anesth* 2003; 12:156-163
6. Rodriguez J, Abboud TK, Reyes A, Payne M, Zhu J, Steffens Z, Afrasiabi A: Continuous infusion epidural anesthesia during labor: a randomized, double-blind comparison of 0.0625% bupivacaine/0.002% butorphanol and 0.125% bupivacaine. *Reg Anesth* 1990; 15:300-303

7. Russell R, Reynolds F: Epidural infusion of low-dose bupivacaine and opioid in labour. Does reducing motor block increase the spontaneous delivery rate? *Anaesthesia* 1996; 51:266-273

Observational studies, case reports, or comparisons without pertinent control groups

1. Salim R, Nachum Z, Moscovici R, Lavee M, Shalev E: Continuous compared with intermittent epidural infusion on progress of labor and patient satisfaction. *Obstet Gynecol* 2005;106:301-306

Maintenance of epidural infusion with bupivacaine concentrations < 0.125% with opioids versus bupivacaine concentrations > 0.125% without opioids for labor:

Randomized controlled trials

1. Elliott RD: Continuous infusion epidural analgesia for obstetrics: bupivacaine versus bupivacaine-fentanyl mixture. *Can J Anaesth* 1991; 38:303-310

Single-injection spinal opioids.

Single-injection spinal opioids with or without local anesthetics versus parenteral opioids for labor:

Randomized controlled trials

1. Camann WR, Denney RA, Holby ED, Datta S: A comparison of intrathecal, epidural, and intravenous sufentanil for labor analgesia. *Anesthesiology* 1992; 77:884-887

Nonrandomized comparative studies

1. Edwards RD, Hansel NK, Pruessner HT, Barton B: Intrathecal morphine sulfate for labor pain. *Tex Med* 1985; 81:46-48
2. Edwards RD, Hansel NK, Pruessner HT, Barton B: Intrathecal morphine as analgesia for labor pain. *J Am Board Fam Pract* 1988; 1:245-250
3. Herpolsheimer A, Schretenthaler J: The use of intrapartum intrathecal narcotic analgesia in a community-based hospital. *Obstet Gynecol* 1994; 84:931-936

Single-injection spinal opioids with local anesthetics versus spinal opioids without local anesthetics for labor:

Randomized controlled trials

1. Campbell DC, Camann WR, Datta S: The addition of bupivacaine to intrathecal sufentanil for labor analgesia. *Anesth Analg* 1995; 81:305-309

CSE local anesthetics with opioids.

CSE local anesthetics with opioids versus epidural local anesthetics with opioids for labor:

Randomized controlled trials: CSE versus epidural

1. Cooper G, MacArthur C, Wilson M, Moore P, Shennan A (COMET Study Group): Satisfaction, control and pain relief: short-and long-term assessments in a randomised controlled trial of low-dose and traditional epidurals and a non-epidural comparison group. *Int J Obstet Anesth* 2010; 19:31-37

2. Cortes CAF, Sanchez CA, Oliveira AS, Sanchez FM: Labor Analgesia: a comparative study between combined spinal-epidural anesthesia versus continuous epidural anesthesia. *Rev Bras Anesthesiol* 2007; 57:39-51
3. Gambling D, Berkowitz J, Farrell T, Pue A, Shay D: A randomized controlled comparison of epidural analgesia and combined spinal-epidural analgesia in a private practice setting: pain scores during first and second stages of labor and delivery. *Anesth Anal* 2013; 116:636-643
4. Hepner DL, Gaiser RR, Cheek TG, Gutsche BB: Comparison of combined spinal-epidural and low dose epidural for labour analgesia. *Can J Anaesth* 2000; 47:232-236
5. Kartawiadi L, Vercauteren MP, van Steenberge AL, Adriaensen HA: Spinal analgesia during labor with low-dose bupivacaine, sufentanil, and epinephrine. A comparison with epidural analgesia. *Reg Anesth* 1996; 21:191-196
6. Nickells JS, Vaughan DJ, Lillywhite NK, Loughnan B, Hasan M, Robinson PN: Speed of onset of regional analgesia in labour: a comparison of the epidural and spinal routes. *Anaesthesia* 2000; 55:17-20
7. Pascual-Ramirez J, Haya J, Perez-Lopez F, Gil-Trujillo S, Garrido-Esteban R, Berna G: Effect of combined spinal-epidural analgesia versus epidural analgesia on labor and delivery duration. *Int J Gynaecol Obstet* 2011; 114:246-250
8. Patel N, Armstrong S, Fernando R, Columb M, Bray J, Sodhi V, Lyons G: Combined spinal epidural versus epidural labour analgesia: does initial intrathecal analgesia reduce the subsequent minimum local analgesic concentration of epidural bupivacaine? *Anaesthesia* 2012; 67:584-593
9. Patel NP, El-Wahab N, Fernando R, Wilson S, Robson SC, Columb MO, Lyons GR: Fetal effects of combined spinal-epidural versus epidural labour analgesia: a prospective, randomised double-blind study. *Anaesthesia* 2014; 69:458-467
10. Price C, Lafreniere L, Brosnan C, Findlay I: Regional analgesia in early active labour: combined spinal-epidural versus epidural. *Anaesthesia* 1998; 53:951-955
11. Roux M, Wattrisse G, Tai RB, Dufosse F, Krivosic-Horber R: Obstetric analgesia: peridural analgesia versus combined spinal and peridural analgesia. *Ann Fr Anesth Reanim* 1999; 18:487-498
12. Sezer O, Gunaydin B: Efficacy of patient-controlled epidural analgesia after initiation with epidural or combined spinal-epidural analgesia. *Int J Obstet Anesth* 2007; 16:226-230
13. Vernis L, Duale C, Storme B, Mission JP, Rol B, Schoeffler P: Perispinal analgesia for labour followed by patient-controlled infusion with bupivacaine and sufentanil: combined spinal-epidural versus epidural analgesia alone. *Eur J Anaesthesiol* 2004; 21:186-192

Randomized controlled trials: CSE versus CIE

14. Caldwell LE, Rosen MA, Shnider SM: Subarachnoid morphine and fentanyl for labor analgesia. Efficacy and adverse effects. *Reg Anesth* 1994; 19:2-8

Nonrandomized comparative studies

1. Norris MC, Grieco WM, Borkowski M, Leighton BL, Arkoosh VA, Huffnagle HJ, Huffnagle S: Complications of labor analgesia: epidural versus combined spinal epidural techniques. *Anesth Analg* 1994; 79:529-537
2. Van de Velde M, Vercauteren M, Vandermeersch E: Fetal heart rate abnormalities after regional analgesia for labor pain: the effect of intrathecal opioids. *Reg Anesth Pain Med* 2001; 26:257-262
3. Aneiros F, Vazquez M, Valino C, Taboada M, Sabate S, Otero P, Costa J, Carceller J, Vazquez R, Diaz-Vieito M, Rodriguez A, Alvarez J: Does epidural versus combined

spinal-epidural analgesia prolong labor and increase the risk of instrumental and cesarean delivery in nulliparous women? J Clin Anesth 2009; 21:94-97

4. Miro M, Guasch E, Gilsanz F: Comparison of epidural analgesia with combined spinal-epidural analgesia for labor: a retrospective study of 6497 cases. Int J Obstet Anesth 2008; 17:15-19

Observational studies, case reports, or comparisons without pertinent control groups

1. Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK: Effects of low-dose mobile versus traditional epidural techniques on mode of delivery: a randomized controlled trial. Lancet 2001; 358:19-23
2. Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK: Randomized controlled trial comparing traditional with two "mobile" epidural techniques: anesthetic and analgesic efficacy. Anesthesiology 2002; 97:1567-1575
3. Dresner M, Bamber J, Calow C, Freeman J, Charlton P: Comparison of low-dose epidural with combined spinal-epidural analgesia for labour. Br J Anaesth 1999; 83:756-760
4. Gomez P, Echevarria M, Calderon J, Caba F, Martinez A, Rodriguez R: The efficacy and safety of continuous epidural analgesia versus intradural-epidural analgesia during labour. Revista Espanola de Anesthesiol y Reanim 2001; 48:217-222
5. Ismail M, Hassanin M: Neuraxial analgesia versus intravenous remifentanyl for pain relief in early labor in nulliparous women. Arch Gynecol Obstet 2012; 286:1375-1381
6. Nageotte MP, Larson D, Rumney PJ, Sidhu M, Hollenbach K: Epidural analgesia compared with combined spinal-epidural analgesia during labor in nulliparous women. New Eng J Med 1997; 337:1715-1719
7. Norris MC, Fogel ST, Conway-Long C: Combined spinal-epidural versus epidural labor analgesia. Anesthesiology 2001; 95:913-920
8. Skupski D, Abramovitz S, Samuels J, Pressimone V, Kjaer K: Adverse effects of combined spinal-epidural versus traditional epidural analgesia during labor. Int J Obstet Anesth 2009; 106:242-245
9. Tsen LC, Thue B, Datta S, Segal S: Is combined spinal-epidural analgesia associated with more rapid cervical dilation in nulliparous patients when compared with conventional epidural analgesia? Anesthesiology 1999; 91:920-925
10. Van de Velde M, Mignolet K, Vandermeersch E, Van Assche A: Prospective, randomized comparison of epidural and combined spinal epidural analgesia during labor. Acta Anaesthesiol Belg 1999; 50:129-136

Patient-controlled epidural analgesia (PCEA).

PCEA versus continuous infusion epidurals (CIE) for labor:

Randomized controlled trials

1. Boutros A, Blary S, Bronchard R, Bonnet F: Comparison of intermittent epidural bolus, continuous epidural infusion and patient controlled-epidural analgesia during labor. Int J Obstet Anesth 1999; 8:236-241
2. Collis RE, Plaat FS, Morgan BM: Comparison of midwife top-ups, continuous infusion and patient-controlled epidural analgesia for maintaining mobility after a low-dose combined spinal-epidural. Br J Anaesth 1999; 82:233-236
3. Curry PD, Pacsoo C, Heap DG: Patient-controlled epidural analgesia in obstetric anaesthetic practice. Pain 1994; 57:125-127

4. Ferrante FM, Barber MJ, Segal M, Hughes NJ, Datta S: 0.0625% bupivacaine with 0.0002% fentanyl via patient-controlled epidural analgesia for pain of labor and delivery. *Clin J Pain* 1995; 11:121-126
5. Ferrante FM, Lu L, Jamison SB, Datta S: Patient-controlled epidural analgesia: demand dosing. *Anesth Analg* 1991; 73:547-552
6. Ferrante FM, Rosinia FA, Gordon C, Datta S: The role of continuous background infusions in patient-controlled epidural analgesia for labor and delivery. *Anesth Analg* 1994; 79:80-84
7. Gambling DR, Huber CJ, Berkowitz J, Howell P, Swenerton JE, Ross PL, Crochetiere CT, Pavy TJ: Patient-controlled epidural analgesia in labour: varying bolus dose and lockout interval. *Can J Anaesth* 1993; 40:211-217
8. Gambling DR, Yu P, Cole C, McMorland GH, Palmer L: A comparative study of patient controlled epidural analgesia (PCEA) and continuous infusion epidural analgesia (CIEA) during labour. *Can J Anaesth* 1988; 35:249-254
9. Haydon ML, Larson D, Reed E, Shrivastava V, Preslicka C, Nageotte M: Obstetric outcomes and maternal satisfaction in nulliparous women using patient-controlled epidural analgesia. *Am J Obstet Gynecol* 2011; 205:271.e1-6
10. Ledin Eriksson S, Gentile C, Olofsson CH: PCEA compared to continuous epidural infusion in an ultra-low-dose regimen for labor pain relief: a randomized study. *Acta Anaesthesiol Scand* 2003; 47:1085-1090
11. Lysak SZ, Eisenach JC, Dobson CE II: Patient-controlled epidural analgesia during labor: a comparison of three solutions with a continuous infusion control. *Anesthesiology* 1990; 72:44-49
12. Purdie J, Reid J, Thorburn J, Asbury AJ: Continuous extradural analgesia: comparison of midwife top-ups, continuous infusions and patient controlled administration. *Br J Anaesth* 1992; 68:580-584, 1992
13. Saito M, Okutomi T, Kanai Y, Mochizuki J, Tani A, Amano K, Hoka S: Patient-controlled epidural analgesia during labor using ropivacaine and fentanyl provides better maternal satisfaction with less local anesthetic requirement. *J Anesth* 2005; 19:208-212
14. Sia AT, Chong JL: Epidural 0.2% ropivacaine for labour analgesia: parturient-controlled or continuous infusion? *Anaesth Intensive Care* 1999; 27:154-158
15. Smedvig JP, Soreide E, Gjessing L: Ropivacaine 1 mg/ml, plus fentanyl 2 microg/ml for epidural analgesia during labour. Is mode of administration important? *Acta Anaesth Scand* 2001; 45:595-599
16. Tan S, Reid J, Thorburn J: Extradural analgesia in labour: complications of three techniques of administration. *Br J Anaesth* 1994; 73:619-623
17. Vallejo M, Ramesh V, Phelps A, Sah N: Patient-controlled epidural analgesia with background infusion versus without a background infusion. *J Pain* 2007; 8:970-975
18. Viscomi C, Eisenach JC: Patient-controlled epidural analgesia during labor. *Obstet Gynecol* 1991; 77:348-351

Nonrandomized comparative studies

1. Chen Sheng-Huan, Liou Shiue-Chin, Hung Chao-Tsen, Shih Ming-Hung, Chen Chit, Tsai Shih-Chang, Tseng Chi-Hao, Wong Shu-Yam: Comparison of patient-controlled epidural analgesia and continuous epidural infusion for labor analgesia. *Chang Gung Med J* 2006; 29:576-582

PCEA with a background infusion versus PCEA without a background infusion for labor:

Randomized controlled trials

1. Boselli E, Debon R, Cimino Y, Rimmele T, Allaouchiche B, Chassard D: Background infusion is not beneficial during labor patient-controlled analgesia with 0.1% ropivacaine plus 0.5 microg/ml sufentanil. *Anesthesiology* 2004; 100: 968-72
2. Bremerich DH, Waibel HJ, Mierdl S, Meininger D, Byhahn C, Zwissler BC, Ackermann HH: Comparison of continuous background infusion plus demand dose and demand-only parturient-controlled epidural analgesia (PCEA) using ropivacaine combined with sufentanil for labor and delivery. *Int J Obstet Anesth* 2005; 14:114-120
3. Lim Y, Sia AT, Ocampo CE: Comparison of computer integrated patient controlled epidural analgesia versus conventional patient controlled epidural analgesia for pain relief in labour. *Anaesthesia* 2006; 61:339-344
4. Missant C, Teunkenst A, Vandermeersch E, Van de Velde M: Patient-controlled epidural analgesia following combined spinal-epidural analgesia in labour: the effects of adding a continuous epidural infusion. *Anaesth Intensive Care* 2005; 33:452-456
5. Paech MJ: Patient-controlled epidural analgesia in labour--is a continuous infusion of benefit? *Anaesth Intensive Care* 1992; 20:15-20
6. Petry J, Vercauteren M, Van Mol I, Van Houwe P, Adriaensen HA: Epidural PCA with bupivacaine 0.125%, sufentanil 0.75 microgram and epinephrine 1/800.000 for labor analgesia: is a background infusion beneficial? *Acta Anaesthesiol Belg* 2000; 51:163-166
7. Brogly N, Schiraldi R, Vazquez B, Perez J, Guasch E, Gilsanz F: A randomized control trial of patient-controlled epidural analgesia (PCEA) with and without a background infusion using levobupivacaine and fentanyl. *Minerva Anesthesiol* 2011; 77:1149-1154
8. Sia A, Leo S, Ocampo C: A randomised comparison of variable-frequency automated mandatory boluses with a basal infusion for patient-controlled epidural analgesia during labour and delivery. *Anaesthesia* 2013; 68:267-275

In situ epidural catheter *versus* no epidural anesthesia in hemodynamically stable patients for removal of retained placenta.

No entries

General anesthesia (GA) versus neuraxial anesthesia in cases involving major maternal hemorrhage for removal of retained placenta.

No entries

IV. Removal of retained placenta

Administration of nitroglycerin for uterine relaxation for removal of retained placenta.

Randomized controlled trials

1. Bullarbo M, Tjugum J, Ekerhovd E: Sublingual nitroglycerin for management of retained placenta. *Int J Gynaecol Obstet* 2005; 91:228-232
2. Bullarbo M, Bokström H, Lilja H, Almström E, Lassenius N, Hansson A, Ekerhovd E: Nitroglycerin for management of retained placenta: a multicenter study. *Obstet Gynecol Int.* 2012;2012:321207

3. Visalyaputra S, Prechapanich J, Suwanvichai S, Yimyam S, Permpolprasert L, Suksopee P: Intravenous nitroglycerin for controlled cord traction in the management of retained placenta. *Int J Gynaecol Obstet* 2011; 112:103-106

Observational studies, case reports, or comparisons without pertinent control groups

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V. Anesthetic choices for cesarean delivery

General anesthesia (GA) versus epidural anesthesia for cesarean.

Randomized controlled trials

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General anesthesia (GA) versus spinal anesthesia for cesarean.

Randomized controlled trials

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Nonrandomized comparative studies

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Epidural anesthesia versus spinal anesthesia for cesarean.

Randomized controlled trials

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Nonrandomized comparative studies

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Combined spinal-epidural (CSE) anesthesia for cesarean.

CSE anesthesia versus epidural anesthesia:

Randomized controlled trials

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Nonrandomized comparative studies

1. Bloom SL, Spong CY, Weiner SJ, Landon MB, Rouse DJ, Varner MW, Moawad AH, Caritis SN, Harper M, Wapner RJ, Sorokin Y, Miodovnik M, O'Sullivan MJ, Sibai B, Langer O, Gabbe SG: Complications of anesthesia for cesarean delivery. *Obstet Gynecol* 2005; 106:281-287
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CSE local anesthetics with or without opioids versus spinal anesthetics with or without opioids for cesarean:

Randomized controlled trials

1. Choi DH, Ahn HJ, Kim JA. Combined low-dose spinal-epidural anesthesia versus single-shot spinal anesthesia for elective cesarean delivery. *Int J of Obstet Anesth* 2006; 15:13-17

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Nonrandomized comparative studies

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Pencil-point spinal needles *versus* cutting-bevel spinal needles.

Randomized controlled trials

1. Cesarini M, Torrielli R, Lahaye F, Mene JM, Cabiro C: Sprotte needle for intrathecal anaesthesia for caesarean section: incidence of postdural puncture headache. *Anaesthesia* 1990; 45:656-658
2. Devcic A, Sprung J, Patel S, Kettler R, Maitra DA: PDPH in obstetric anesthesia: comparison of 24-gauge Sprotte and 25-gauge Quincke needles and effect of subarachnoid administration of fentanyl. *Reg Anesth* 1993; 18:222-225
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Nonrandomized comparative studies

1. Hwang JJ, Ho ST, Wang JJ, Liu HS: Post dural puncture headache in cesarean section: comparison of 25-gauge Whitacre with 25- and 26-gauge Quincke needles. *Acta Anaesthesiol Sin* 1997; 35:33-37
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3. Ross AW, Greenhalgh C, McGlade DP, Balson IG, Chester SC, Hutchinson RC, Ashley JE: The Sprotte needle and post dural puncture headache following caesarean section. *Anaesth Intensive Care* 1993; 21:280-283
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Intravenous fluid preloading or coloadng *versus* no intravenous fluid preloading or coloadng for spinal anesthesia to reduce maternal hypotension.

Randomized controlled trials; preloading (colloids)

1. Ngan Kee WD, Khaw KS, Lee BB, Ng FF, Wong MMS: Randomized controlled study of colloid preload before spinal anaesthesia for Caesarean section. *Br J Anaesth* 2001; 87:772-774
2. Nishikawa K, Yokoyama N, Saito S, Goto F: Comparison of effects of rapid colloid loading before and after spinal anesthesia on maternal hemodynamics and neonatal outcomes in cesarean section. *J Clin Monit Comput* 2007; 21:125-129

Randomized controlled trials; preloading (crystalloids)

1. Husaini SW, Russell IF: Volume preload: lack of effect in the prevention of spinal-induced hypotension at caesarean section. *Int J Obstet Anesth* 1998; 7:76-81
2. Kamenik M, Paver-Erzen V: The effects of lactated Ringer's solution infusion on cardiac output changes after spinal anesthesia. *Anesth Analg* 2001; 92:710-714
3. Mojica JL, Melendez HJ, Bautista LE: The timing of intravenous crystalloid administration and incidence of cardiovascular side effects during spinal anesthesia: the results from a randomized controlled trial. *Anesth Analg* 2002; 94:432-437
4. Ngan Kee WD, Khaw KS, Lee BB, Wong MM, Ng FF: Metaraminol infusion for maintenance of arterial blood pressure during spinal anesthesia for cesarean delivery: the effect of a crystalloid bolus. *Anesth Analg* 2001; 93:703-708

Randomized controlled trials; preloading (CSE)

5. Berends N, Teunkens A, Vandermeersch E, Van de Velde M: A randomized trial comparing low-dose combined spinal-epidural anesthesia and conventional epidural anesthesia for cesarean section in severe preeclampsia. *Acta Anaesthesiol Belg* 2005; 56:155-162

Randomized controlled trials; coloadng (colloids)

1. Nishikawa K, Yokoyama N, Saito S, Goto F: Comparison of effects of rapid colloid loading before and after spinal anesthesia on maternal hemodynamics and neonatal outcomes in cesarean section. *J Clin Monit Comput* 2007; 21:125-129

Randomized controlled trials; coloadng (crystalloids)

1. Kamenik M, Paver-Erzen V: The effects of lactated Ringer's solution infusion on cardiac output changes after spinal anesthesia. *Anesth Analg* 2001; 92:710-714

2. Mojica JL, Melendez HJ, Bautista LE: The timing of intravenous crystalloid administration and incidence of cardiovascular side effects during spinal anesthesia: the results from a randomized controlled trial. *Anesth Analg* 2002; 94:432-437

Randomized controlled trials; coload (CSE)

1. Lee SY, Choi DH, Park HW: The effect of colloid co-hydration on the use of phenylephrine and hemodynamics during low-dose combined spinal-epidural anesthesia for cesarean delivery. *Korean J Anesthesiol* 2008; 55:685-690

Randomized controlled trials; preloading versus coload (colloids)

1. Carvalho B, Mercier FJ, Riley ET, Brummel C, Cohen SE: Hetastarch co-loading is as effective as pre-loading for the prevention of hypotension following spinal anesthesia for cesarean delivery. *Int J Obstet Anesth* 2009; 18:150-155
2. Nishikawa K, Yokoyama N, Saito S, Goto F: Comparison of effects of rapid colloid loading before and after spinal anesthesia on maternal hemodynamics and neonatal outcomes in cesarean section. *J Clin Monit Comput* 2007; 21:125-129
3. Oh AY, Hwang JW, Song IA, Kim MH, Ryu JH, Park HP, Jeon YT, Do SH: Influence of the timing of administration of crystalloid on maternal hypotension during spinal anesthesia for cesarean delivery: preload versus coload. *BMC Anesthesiol* 2014; 14:36
4. Siddik-Sayyid SM1, Nasr VG, Taha SK, Zbeide RA, Shehade JM, Al Alami AA, Mokadem FH, Abdallah FW, Baraka AS, Aouad MT: A randomized trial comparing colloid preload to coload during spinal anesthesia for elective cesarean delivery. *Anesth Analg* 2009; 109:1219-1224
5. Tawfik MM1, Hayes SM2, Jacoub FY2, Badran BA2, Gohar FM2, Shabana AM3, Abdelkhalik M2, Emara MM: Comparison between colloid preload and crystalloid coload in cesarean section under spinal anesthesia: a randomized controlled trial. *Int J Obstet Anesth.* 2014; 23:317-323
6. Teoh WH, Sia AT: Colloid preload versus coload for spinal anesthesia for cesarean delivery: the effects on maternal cardiac output. *Anesth Analg* 2009; 108:1592-1598
7. Varshney R, Jain G: Comparison of colloid preload versus coload under low dose spinal anesthesia for cesarean delivery. *Anesth, Essays Res* 2013; 7:376-380

Randomized controlled trials; preloading versus coload (crystalloids)

1. Dyer RA, Farina Z, Joubert IA, DuToit P, Meyer M, Torr G, Wells K, James MFM: Crystalloid preload versus rapid crystalloid administration after induction of spinal anaesthesia (coload) for elective caesarean section. *Anaesth Intensive Care* 2004; 32:351-357
2. Jacob JJ WA, Verghese M, Afzal L: Crystalloid preload versus crystalloid coload for parturients undergoing cesarean section under spinal anaesthesia. *J Obstet Anaesth Crit Care* 2012; 2:10-15
3. Kamenik M, Paver-Erzen V: The effects of lactated Ringer's solution infusion on cardiac output changes after spinal anesthesia. *Anesth Analg* 2001; 92:710-714
4. Khan M, ul-Nisai W, Farooqi A, Ahmad N, Qaz S: Crystalloid co-load: a better option than crystalloid pre-load for prevention Of postspinal hypotension in elective caesarean section. *Internet J Anesthesiol.* 2013; 32: <https://ispub.com/IJA/32/1/1503#>. Accessed July 8, 2015.
5. Mojica JL, Melendez HJ, Bautista LE: The timing of intravenous crystalloid administration and incidence of cardiovascular side effects during spinal anesthesia: the results from a randomized controlled trial. *Anesth Analg* 2002; 94:432-437

6. Shakil Y: Efficacy of crystalloid preload and co-load in prevention of hypotension in spinal anesthesia for elective caesarean section [abstract]. *Anaesth, Pain & Intensive Care* 2011; 15:151

Nonrandomized comparative studies (crystalloids)

1. Clark RB, Thompson DS, Thompson CH: Prevention of spinal hypotension associated with Cesarean section. *Anesthesiology* 1976; 45:670-674
2. Collins KM, Bevan DR, Beard RW: Fluid loading to reduce abnormalities of fetal heart rate and maternal hypotension during epidural analgesia in labour. *Br Med J* 1978; 2:1460-1461
3. Rout CC, Rocke DA, Levin J, Gouws E, Reddy D: A reevaluation of the role of crystalloid preload in the prevention of hypotension associated with spinal anesthesia for elective cesarean section. *Anesthesiology* 1993 79:262-269

Ephedrine to reduce maternal hypotension during neuraxial anesthesia.

Ephedrine versus placebo or no ephedrine:

Randomized controlled trials: intravenous ephedrine

1. Desalu I, Kushimo OT: Is ephedrine infusion more effective at preventing hypotension than traditional prehydration during spinal anaesthesia for caesarean section in African parturients? *Int J Obstet Anesth* 2005; 14:294-299
2. King SW, Rosen MA: Prophylactic ephedrine and hypotension associated with spinal anesthesia for cesarean delivery. *Int J Obstet Anesth* 1998; 7:18-22
3. Loughrey JP, Walsh F, Gardiner J: Prophylactic intravenous bolus ephedrine for elective Caesarean section under spinal anaesthesia. *Eur J Anaesthesiol* 2002; 19:63-68
4. Ngan Kee WD, Khaw KS, Lee BB, Lau TK, Gin T: A dose-response study of prophylactic intravenous ephedrine for the prevention of hypotension during spinal anesthesia for cesarean delivery. *Anesth Analg* 2000; 90:1390-1395
5. Ramin SM, Ramin KD, Cox K, Magness RR, Shearer VE, Gant NF: Comparison of prophylactic angiotensin II versus ephedrine infusion for prevention of maternal hypotension during spinal anesthesia. *Am J Obstet Gynecol* 1994; 171:734-739

Randomized controlled trials: intramuscular ephedrine

6. Ayorinde BT, Buczkowski P, Brown J, Shah J, Buggy DJ: Evaluation of pre-emptive intramuscular phenylephrine and ephedrine for reduction of spinal anaesthesia-induced hypotension during Caesarean section. *Br J Anaesth* 2001; 86:372-376
7. Gutsche BB: Prophylactic ephedrine preceding spinal analgesia for cesarean section. *Anesthesiology* 1976; 45:462-465
8. Webb AA, Shipton EA: Re-evaluation of i.m. ephedrine as prophylaxis against hypotension associated with spinal anaesthesia for Caesarean section. *Can J Anaesth* 1998; 45:367-369

Nonrandomized comparative studies

1. Cooper D, Sharma S, Orakkan P, Gurung S: Retrospective study of association between choice of vasopressor given during spinal anaesthesia for high-risk caesarean delivery and fetal pH. *Int J Obstet Anesth* 2010; 19:44-49

2. Datta S, Alper MH, Ostheimer GW, Weiss JB: Method of ephedrine administration and nausea and hypotension during spinal anesthesia for cesarean section. *Anesthesiology* 1982 56:68-70

Observational studies, case reports, or comparisons without pertinent control groups

1. Kluger MT: Ephedrine may predispose to arrhythmias in obstetric anaesthesia. *Anaesth Intensive Care* 2000; 28:336
2. Mercier FJ, Riley ET, Frederickson WL, Roger-Christoph S, Benhamou D, Cohen SE: Phenylephrine added to prophylactic ephedrine infusion during spinal anesthesia for elective cesarean section. *Anesthesiology* 2001; 95:668-674
3. Simon L, Provenchere S, de Saint Blanquat L, Boulay G, Hamza J: Dose of prophylactic intravenous ephedrine during spinal anesthesia for cesarean section. *J Clin Anesth* 2001; 13:366-369
4. Turkoz A, Togonal T, Gokdeniz R, Toprak HI, Ersoy O: Effectiveness of intravenous ephedrine infusion during spinal anaesthesia for caesarean section based on maternal hypotension, neonatal acid-base status and lactate levels. *Anaesth Intensive Care* 2002; 30:316-320
5. Vercauteren MP, Coppejans HC, Hoffmann VH, Mertens E, Adriaensen HA: Prevention of hypotension by a single 5-mg dose of ephedrine during small-dose spinal anesthesia in prehydrated cesarean delivery patients. *Anesth Analg* 2000; 90:324-327

Phenylephrine versus placebo or no phenylephrine:

Randomized controlled trials

1. Ayorinde BT, Buczkowski P, Brown J, Shah J, Buggy DJ: Evaluation of pre-emptive intramuscular phenylephrine and ephedrine for reduction of spinal anaesthesia-induced hypotension during Caesarean section. *Br J Anaesth* 2001; 86:372-376
2. Allen T, George R, White W, Muir H, Habib A: A double-blind, placebo-controlled trial of four fixed rate infusion regimens of phenylephrine for hemodynamic support during spinal anesthesia for cesarean delivery. *Anesth Analg* 2010; 111:1221-1229
3. Langesaeter E, Rosseland L A, Stubhaug A: Continuous invasive blood pressure and cardiac output monitoring during cesarean delivery. *Anesthesiology* 2008; 109:856-863
4. Siddik-Sayyid S, Taha S, Kanazi E, Aouad: A randomized controlled trial of variable rate phenylephrine infusion with rescue phenylephrine boluses versus rescue boluses alone on physician interventions during spinal anesthesia for elective cesarean delivery. *Anesth Analg* 2014; 118:611-618

Nonrandomized comparative studies

1. Cooper D, Sharma S, Orakkan P, Gurung S: Retrospective study of association between choice of vasopressor given during spinal anaesthesia for high-risk caesarean delivery and fetal pH. *Int J Obstet Anesth* 2010; 19:44-49

Observational studies, case reports, or comparisons without pertinent control groups

1. Cooper D, Schofield L, Hynd R, Selvan D, Lloyd A, Meed T, Winnard J: Prospective evaluation of systolic arterial pressure control with a phenylephrine infusion regimen during spinal anaesthesia for caesarean section. *Int J Obstet Anesth* 2012; 21:245-252
2. Ishiyama T, Oguchi T, Iijima T, Matsukawa T, Kashimoto S, Kumazawa T: Combined spinal and epidural anesthesia for cesarean section in a patient with hypertrophic obstructive cardiomyopathy. *Anesth Analg* 2003; 96:629-630

Phenylephrine versus ephedrine:

Randomized controlled trials: intravenous

1. Alahuhta S, Rasanen J, Jouppila P, Hollmen AI: Ephedrine and phenylephrine for avoiding maternal hypotension due to spinal anaesthesia for caesarean section. *Int J Obstet Anesth* 1992; 1:129-134
2. Cooper DW, Carpenter M, Mowbray P, Desira WR, Ryall DM, Kokri MS: Fetal and maternal effects of phenylephrine and ephedrine during spinal anesthesia for cesarean delivery. *Anesthesiology* 2002; 97:1582-1590
3. Cooper DW, Jeyaraj L, Hynd R, Thompson R, Meek T, Ryall DM, Kokri MS: Evidence that intravenous vasopressors can affect rostral spread of spinal anesthesia in pregnancy. *Anesthesiology* 2004; 101:28-33
4. Dyer R, Reed An, vanDyk D, Arcache M, Hodges O, Lombard C, Greenwood J, James M: Hemodynamic effects of ephedrine, phenylephrine, and the coadministration of phenylephrine with oxytocin during spinal anesthesia for elective cesarean delivery. *Anesthesiology* 2009; 111:753-765
5. Hall PA, Bennett A, Wilkes MP, Lewis M: Spinal anaesthesia for caesarean section: comparison of infusions of phenylephrine and ephedrine. *Br J Anaesth* 1994; 73:471-474
6. LaPorta RF, Arthur GR, Datta S: Phenylephrine in treating maternal hypotension due to spinal anaesthesia for caesarean delivery: effects on neonatal catecholamine concentrations, acid base status and Apgar scores. *Acta Anaesth Scand* 1995; 39:901-905
7. Moran DH, Perillo M, LaPorta RF, Bader AM, Datta S: Phenylephrine in the prevention of hypotension following spinal anesthesia for cesarean delivery. *J Clin Anesth* 1991; 3:301-305
8. Ngan Kee W, Khaw K, Lau T, Ng F, Chui K, Ng K: Randomised double-blinded comparison of phenylephrine versus ephedrine for maintaining blood pressure during spinal anesthesia for non-elective Caesarean section. *Anaesthesia* 2008; 63:1319-1326
9. Ngan Kee WD, Khaw KS, Tan PE, Ng FF, Karmakar MK: Placental transfer and fetal metabolic effects of phenylephrine and ephedrine during spinal anesthesia for cesarean delivery. *Anesthesiology* 2009; 111: 506-512
10. Ngan Kee WD, Lee A, Khaw KS, Ng FF, Karmakar MK, Gin T: A randomized double-blinded comparison of phenylephrine and ephedrine combinations given by infusion to maintain blood pressure during spinal anesthesia for cesarean delivery: effects on fetal acid-base status and hemodynamic control. *Anesth Analg* 2008; 107:1295– 1302
11. Pierce ET, Carr DB, Datta S: Effects of ephedrine and phenylephrine on maternal and fetal atrial natriuretic peptide levels during elective cesarean section. *Acta Anaesth Scand* 1994; 38:48-51
12. Prakash S, Pramanik V, Chellani H, Salhan S, Gogia A: Maternal and neonatal effects of bolus administration of ephedrine and phenylephrine during spinal anaesthesia for caesarean delivery: a randomised study. *Int J Obstet Anesth* 2010; 19:24-30
13. Thomas DG, Robson SC, Redfern N, Hughes D, Boys RJ: Randomized trial of bolus phenylephrine or ephedrine for maintenance of arterial pressure during spinal anaesthesia for Caesarean section. *Br J Anaesth* 1996; 76:61-65

Randomized controlled trials: intravenous infusion

14. Saravanan S, Kocarev M, Wilson RC, Watkins E, Columb MO, Lyons G: Equivalent dose of ephedrine and phenylephrine in the prevention of post-spinal hypotension in Caesarean section. *Br J Anaesth* 2006; 96:95-99

Randomized controlled trials: intramuscular

15. Ayorinde BT, Buczkowski P, Brown J, Shah J, Buggy DJ: Evaluation of pre-emptive intramuscular phenylephrine and ephedrine for reduction of spinal anaesthesia-induced hypotension during Caesarean section. *Br J Anaesth* 2001; 86:372-376

Nonrandomized comparative studies

1. Cooper D, Sharma S, Orakkan P, Gurung S: Retrospective study of association between choice of vasopressor given during spinal anaesthesia for high-risk caesarean delivery and fetal pH. *Int J Obstet Anesth* 2010; 19:44-49

Neuraxial opioids versus intermittent injections of parenteral opioids for postoperative analgesia after neuraxial anesthesia for cesarean.

Randomized controlled trials

1. Chambers WA, Mowbray A, Wilson J: Extradural morphine for the relief of pain following caesarean section. *Br J Anaesth* 1983, 55:1201-1203
2. Cohen SE, Tan S, White PF: Sufentanil analgesia following caesarean section: Epidural versus intravenous administration. *Anesthesiology* 1988, 68:129-134
3. Cohen SE, Woods WA: The role of epidural morphine in the postcesarean patient: Efficacy and effects on bonding. *Anesthesiology* 1983, 58:500-504
4. Daley MD, Sandler AN, Turner KE, Vosu H, Slavchenko P: A comparison of epidural and intramuscular morphine in patients following caesarean section. *Anesthesiology* 1990, 72:289-294
5. Eisenach JC, Grice SC, Dewan DM. Patient-controlled analgesia following caesarean section: a comparison with epidural and intramuscular narcotics. *Anesthesiology* 1988; 68:444-448
6. Harrison DM, Sinatra R, Morgese L, Chung JH: Epidural narcotic and patient-controlled analgesia for post-caesarean section pain relief. *Anesthesiology* 1988; 68:454-457
7. Henderson SK, Matthew E, Cohen H, Avram MJ: Epidural hydromorphone: A double blind comparison with intramuscular hydromorphone for postcesarean section analgesia. *Anesthesiology* 1987; 66:825-830
8. Macrae DJ, Munishankrappa S, Burrow LM, Milne MK, Grant IS: Double-blind comparison of the efficacy of extradural diamorphine, extradural phenoperidine and i.m. diamorphine following caesarean section. *Br J Anaesth* 1987, 59:354-359
9. Perriss BW, Latham BV, Wilson IH: Analgesia following extradural and i.m. pethidine in post-caesarean section patients. *Br J Anaesth* 1990, 64:355-357
10. Rosen MA, Hughes SC, Shnider SM, Abboud TK, Norton M, Dailey PA, Curtis JD: Epidural morphine for the relief of postoperative pain after caesarean delivery. *Anesth Analg* 1983, 62:666-672
11. Smith ID, Klubien KE, Wood MLB, Macrae DJ, Carli F: Diamorphine analgesia after caesarean section: comparison of intramuscular and epidural administration of four dose regimens. *Anaesthesia* 1991, 46:973-976

Nonrandomized comparative studies

1. Liang CC, Chang SD, Wong SY, Chang YL, Cheng PJ: Effects of postoperative analgesia on postpartum urinary retention in women undergoing caesarean delivery. *J Obstet Gynaecol Res* 2010; 36:991-995

Patient-controlled epidural analgesia (PCEA) versus IV PCA for postoperative analgesia after neuraxial anesthesia for cesarean.

Randomized controlled trials

1. Cohen S, Pantuck CB, Amar D, Burley E, Pantuck EJ: The primary action of epidural fentanyl after cesarean delivery is via a spinal mechanism. *Anesth Analg* 2002; 94:674-679
2. Parker RK, White PF: Epidural patient-controlled analgesia: an alternative to intravenous patient-controlled analgesia for pain relief after cesarean delivery. *Anesth Analg* 1992, 75:245-251

Addition of NSAIDs versus no NSAIDs for postoperative analgesia after neuraxial anesthesia for cesarean.

No entries

VI. Postpartum tubal ligation

Neuraxial anesthesia versus general anesthesia for postpartum tubal ligation.

No entries

Postpartum tubal ligation within 8 hours of delivery.

Nonrandomized comparative studies

1. Abouleish EI: Postpartum tubal ligation requires more bupivacaine for spinal anesthesia than does cesarean section. *Anesth Analg* 1986; 65:897-900

Observational studies, case reports, or comparisons without pertinent control groups

1. Ghosh AK, Tipton RH: Early postpartum tubal ligation under epidural analgesia. *Br J Obstet Gynaecol* 1976; 83:731-732

VII. Emergency care

Equipment, facilities, and support personnel available in the labor and delivery suite should be comparable to that available in the main operating suite.

Observational studies, case reports, or comparisons without pertinent control groups

1. Ferguson E, Paech M, Veltman M: Hypertrophic cardiomyopathy and caesarean section: intraoperative use of transthoracic echocardiography. *Int J Obstet Anesth* 2006; 15:311-316
2. Finegold H, Darwich A, Romeo R, Vallejo M, Ramanathan S: Successful resuscitation after maternal cardiac arrest by immediate cesarean section in the labor room. *Anesthesiology* 2002; 96:1278

Resources for management of hemorrhagic emergencies (e.g., RBCs, platelets, cell-salvage).

Observational studies, case reports, or comparisons without pertinent control groups

1. Alfirovic Z, Elbourne D, Pavord S, Bolte An, Van Geijin H, Mercier F, Ahonen J, Bremme K, Bodker B, Magnusdottir E, Salvesen K, Prendiville W, Truesdale A, Clemens F, Piercy D, Gyte G: Primary postpartum hemorrhage-the Northern European Registry 200-2004. *Obstet Gynecol* 2007; 110:1270-1278
2. King M, Wrench I, Galimberti A, Spray R: Introduction of cell salvage to a large obstetric unit: the first six months. *Int J Obstet Anesth* 2009; 18:111-117
3. Kjaer K, Comerford M, Gadalla F: General anesthesia for cesarean delivery in a patient with paroxysmal nocturnal hemoglobinuria and thrombocytopenia. *Anesth Analg* 2004; 98: 1471-1472
4. Lilker S, Meyer, R, Downey K, Macarthur A: Anesthetic considerations for placenta accreta. *Int J Obstet Anesth* 2011; 20:288-292
5. Margaron MP: Delayed amniotic fluid embolism following caesarean section under spinal anaesthesia. *Anaesthesia* 1995; 50:804-806
6. Nagy C, Wheeler A, Archer T: Acute normovolemic hemodilution, intraoperative cell salvage and Pulse CO hemodynamic monitoring in a Jehovah's Witness with placenta percreta. *Int J Obstet Anesth* 2008; 17:159-163
7. Potter PS, Waters JH, Burger GA, Mraovic B: Application of cell-salvage during cesarean section. *Anesthesiology* 1999; 90:619-621
8. Rogers W, Wernimont S, Kumar G, Bennett E, Chestnut D: Acute hypotension associated with intraoperative cell salvage using a leukocyte depletion filter during management of obstetric hemorrhage due to amniotic fluid embolism. *Anesth Anag* 2013; 117:449-452

Invasive hemodynamic monitoring for severe preeclamptic patients.

Observational studies, case reports, or comparisons without pertinent control groups

1. Gilbert WM, Towner DR, Field NT, Anthony J: The safety and utility of pulmonary artery catheterization in severe preeclampsia and eclampsia. *Am J Obstet Gynecol* 2000; 182:1397-1403
2. Hjertberg R, Belfrage P, Hagnevik K: Hemodynamic measurements with Swan-Ganz catheter in women with severe proteinuric gestational hypertension (pre-eclampsia). *Acta Obstet Gynecol Scand* 1991; 70:193-198
3. Rafferty TD, Berkowitz RL: Hemodynamics in patients with severe toxemia during labor and delivery. *Am J Obstet Gynecol* 1980; 138:263-270

Equipment for management of airway emergencies.

Observational studies, case reports, or comparisons without pertinent control groups

1. Boys JE: Failed intubation in obstetric anaesthesia. A case report. *Br J Anaesth* 1983; 55:187-188
2. Chadwick LS, Vohra A: Anaesthesia for emergency Caesarean section using the Brain laryngeal mask airway. *Anaesthesia* 1989; 44:261-262
3. de Mello WF, Kocan M: The laryngeal mask in failed intubation. *Anaesthesia* 1990; 41:689-690

4. Dobb G: Laryngeal oedema complicating obstetric anaesthesia. *Anaesthesia* 1978; 33:839-840
5. Ferouz F, Norris MC, Leighton BL: Risk of respiratory arrest after intrathecal sufentanil. *Anesth Analg* 1997; 85:1088-1090
6. Godley M, Reddy AR: Use of LMA for awake intubation for caesarean section. *Can J Anaesth* 1996; 43:299-302
7. Greenhalgh CA: Respiratory arrest in a parturient following intrathecal injection of sufentanil and bupivacaine. *Anaesthesia* 1996; 51:173-175
8. Hasham FM, Andrews PJD, Juneja MM, Ackermann III WE: The laryngeal mask airway facilitates intubation at cesarean section: a case report of difficult intubation. *Int J Obstet Anesth* 1993; 2:181-182
9. Hawksworth CR, Purdie J: Failed combined spinal epidural then failed intubation at an elective caesarean section. *Hosp Med* 1998; 59:173
10. Hinchliffe D, Norris A: Management of failed intubation in a septic parturient. *Br J Anaesth* 2002; 89:328-330
11. Kehl F, Erfkamp S, Roewer N: Respiratory arrest during caesarean section after intrathecal administration of sufentanil in combination with 0.1% bupivacaine 10 ml. *Anaesth Intensive Care* 2002; 30:698-699
12. Keller C, Brimacombe J, Lirk P, Puhlinger F: Failed obstetric tracheal intubation and postoperative respiratory support with the ProSeal laryngeal mask airway. *Anesth Analg* 2004; 98:1467-1470
13. McClune S, Regan M, Moore J: Laryngeal mask airway for caesarean section. *Anaesthesia* 1990; 45:227-228
14. McFarlane C: Failed intubation in an obese obstetric patient and the laryngeal mask. *Int J Obstet Anesth* 1993; 2:183-184
15. Parker J, Balis N, Chester S, Adey D: Cardiopulmonary arrest in pregnancy: successful resuscitation of mother and infant following immediate caesarean section in labour ward. *Aust N Z J Obstet Gynaecol* 1996; 36:207-210
16. Popat MT, Chippa JH, Russell R: Awake fiberoptic intubation following failed regional anaesthesia for caesarean section in a parturient with Still's disease. *Eur J Anaesthesiol* 2000; 17:211-214
17. Priscu V, Priscu L, Soroker D: Laryngeal mask for failed intubation in emergency Caesarean section. *Can J Anaesth* 1992; 39:893
18. Storey J: The laryngeal mask for failed intubation at caesarean section. *Anaesth Intensive Care* 1992; 20:118-119
19. Sutcliffe N, Remington SA, Ramsay TM, Mason C: Severe tracheal stenosis and operative delivery. *Anaesthesia* 1995; 50:26-29
20. Tunstall ME, Geddes C. "Failed intubation" in obstetric anesthesia. *Be J Anaesth* 1984; 56:659-661

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

Observational studies, case reports, or comparisons without pertinent control groups

1. Greenhalgh CA: Respiratory arrest in a parturient following intrathecal injection of sufentanil and bupivacaine. *Anaesthesia* 1996; 51:173-175
2. Katsiris S, Williams S, Leighton BL, Halpern S: Respiratory arrest following intrathecal injection of sufentanil and bupivacaine in a parturient. *Can J Anaesth* 1998; 45:880-883

3. Ou CH, Tsou MY, Ting CK, Chiou CS, Chan KH, Tsai SK: Occurrence of the Bezold-Jarisch reflex during Cesarean section under spinal anesthesia--a case report. *Acta Anaesthesiol Taiwan* 2004; 42:175-178
4. Pan PH, Moore CH, Ross VH: Severe maternal bradycardia and asystole after combined spinal-epidural labor analgesia in a morbidly obese parturient. *J Clin Anesth* 2004; 16: 461-4