Emergency Manual, Processes and Guidelines for Obstetric Anesthesia

Obstetric Anesthesiology
Department of Anesthesia, Critical Care and Pain Medicine
Beth Israel Deaconess Medical Center

Version 1.0
Preface

Division of Obstetric Anesthesia in the Department of Anesthesia, Critical Care and Pain Medicine at Beth Israel Deaconess Medical Center was credentialed as a CENTER OF EXCELLENCE by Society for Obstetric Anesthesia and Perinatology in 2019.

The division had been led by our extraordinary founders Dr. Nancy Oriol and Dr. Phil Hess for 40+ years.

The cognitive aids contained within this emergency manual concentrate our institutional tradition and achievements along with significant contributions from our young star physicians. It contains recommendations as well as descriptions of safety and standards. The recommendations are advisory in nature, informational in content and are intended to assist anesthesiologists in providing safe and standardized care in Obstetric Anesthesia.

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All content subject to change, updates and addition.

Yunping Li, MD
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# Important Phone Numbers

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COMMONLY USED MEDICATIONS
IN OBSTETRIC ANESTHESIA

Azithromycin
- 500mg, diluted in 20ml of NS/LR, infuse slowly over 1 hour.
- 4mg of ondansetron IV before infusion due to significant nausea and vomiting
- Indications: intrapartum cesarean section, spontaneous rupture of membranes
  Reference: NEJM 2016; 375:1231-1241

Bicitrate
- 30ml per container
- PO, before epidural placement and before cesarean section

3% Chloroprocaine
- Alkalization of chloroprocaine: in a 30-ml syringe, add 2ml of 8.4% bicarbonate to 20ml of preservative free (PF) 3% chloroprocaine
- Use for emergent cesarean section or for forceps delivery
- STAT Cesarean Kit: prepackage in OB Anesthesia Office:
  (1) 3% chloroprocaine (1) 8.4% bicarbonate (1) 30ml syringe (1) blunt needle.
  Replace it after use.

Dexmedetomidine
- Dilute 200 mcg in 20 ml of NS, final concentration 10 mcg/ml.
- Indications:
  - Severe shivering after delivery: 10 mcg IV, may repeat up to 30 mcg
  - Severe pruritus associated with epidural fentanyl, see separate chapter
  Reference: SOAP annual meeting abstract 2019

Ephedrine
- Premixed by pharmacy, 5mg/ml
- Historically, ephedrine was used as the “Gold standard” for spinal hypotension.
- Higher placental transfer than phenylephrine; it can cause clinically insignificant fetal acidosis.
- Since late 1990s, used as a second line medicine for maternal hypotension.

Epinephrine
- Add 250 mcg to 150 ml premixed bupivacaine/fentanyl epidural solution; final concentration of epinephrine will be 1.67 mcg/ml
- Add 5mcg/ml of epinephrine into 2% lidocaine for cesarean section
- Mechanism: alpha -2 synergic effect, alpha-1 vasoconstriction to prolong the duration of anesthesia and decrease systemic absorption.

2% Lidocaine
- Alkalization of lidocaine: in a 30-ml syringe, add 2ml of 8.4% bicarbonate to 20ml of preservative free (PF) 2% lidocaine
- For cesarean section, add 5mcg/ml of epinephrine

Magnesium
- 2g/hr as maintenance dose
- For preeclampsia, continue magnesium for entire cesarean delivery
- For fetal neuroprotection, discontinue magnesium after delivery
COMMONLY USED MEDICATIONS IN OBSTETRIC ANESTHESIA

**Morphine PF**
- 0.5mg/ml for spinal use; 1mg/ml for epidural use
- Pre-made by pharmacy, store at 4°C
- Indications: Cesarean delivery - spinal 250mcg, epidural 3mg
  Labor CSE for dysfunctional labor – spinal 100 mcg
  S/p 3rd degree vaginal laceration repair – epidural 2mg
- Refer to separate chapters for details

**Nitroglycerine**
- 400mcg/ml, light sensitive. Kept in Omnicell the same drawer with oxytocin.
  Dilute to 40 mcg/ml or 100 mcg/ml.
- Dose: 80-100 mcg IV, may repeat, titrate to effect
- Indications: cervico-uterine relaxation, uterine inversion, difficult extraction at cesarean delivery
  Reference: Am J Obstet Gynecol 1998; 179:813

**Phenylephrine**
- Pre-made by Pharmacy, 100 mcg/ml
- Indications: first line medication for maternal hypotension
- Phenylephrine use is associated with a decrease in maternal cardiac output, but the clinical significance is not clear
- Infusion 0.5-0.7 mcg/kg/min or bolus 100mcg, titrate to effect

**Terbutaline**
- 1mg/ml, use 0.25mg SC, administrated by L&D nurse
- Indication: Tachysystole contraction with associated FHR changes
  Before external cephalic version (ECV) at Obstetrician's discretion
  ACOG Practice Bulletin No. 106

**Tranexamic acid**
- 1 gram (10ml), infuse over 10 min
- Treatment of postpartum hemorrhage (PPH) after vaginal or Cesarean delivery
- Prophylaxis in patients at high risk for PPH, or women with hypertensive disorder or asthma
- Discourage use of TXA for prophylaxis in low risk women
- Exclusion: Hx of DVT/PE/MI/CVA, metastatic neoplasm, or acquired color blindness.
- Decreased dose (5mg/kg) for renal failure

**Uterotonics**
- Including oxytocin, methylergonovine (Methergine), carboprost (Hemabate), misoprostol (Cytotec) and calcium chloride
- Refer to separate chapter for details

Yunping Li, MD
**OB Anesthesia dosage cookbook**

### Spinal

#### Contents:
- Fentanyl 12.5 mcg
- Bupivacaine 2 mg

*Premixed in Omnicell*

**Mix**: 0.25 cc of Fent (50 mcg/cc) with 0.8 cc of Bupivacaine (0.25%)

### Epidural

#### Contents:
- Bupivacaine 0.04% + Fentanyl 1.67 mcg/cc.

*May add 0.25 cc of epinephrine to 150 cc bag (1.67 mcg/cc).*

**Top up**: 10-15 cc of BEF or 5-10 cc of 0.0625% or 0.125% bupivacaine

*Add 50-100 mcg of fentanyl for synergy*

### C/S

#### Contents:
- Fentanyl 25 mcg
- Bupivacaine 11.25 mg

**Mix**: 0.5 cc of Fent (50 mcg/cc) with 1.5 cc of Bupiv 0.75% (hyperbaric)

*May also be mixed with preservative free (PF) morphine 0.25 mg (0.5 cc)*

### Spinal

#### Contents:
- Fentanyl 25 mcg
- Bupivacaine 11.25 mg

**Mix**: 0.5 cc of Fent (50 mcg/cc) with 1.5 cc of Bupiv 0.75% (hyperbaric)

*May also be mixed with preservative free (PF) morphine 0.25 mg (0.5 cc)*

### Epidural

#### Contents:
- Lido 2% x 15-20 cc + Fent 100 mcg (2 cc)

*Inject divided doses (3-5 cc at a time)*

### After delivery:
- May give Morphine (PF) 3 mg (6 cc). Lido may be replaced with: 0.5% bupivacaine or Chloroprocaine (CPC3%)

### Bicarbonation

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<tr>
<td>Bupivacaine</td>
<td>10 cc</td>
<td></td>
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</table>

(*will precipitate*)

### Uterotonic agents

- **Oxytocin**: 20 IU in 1L of LR
  - *Beware* hypotension

- **Methergine**: 0.2 mg IM *not IV*
  - *Beware* hypertension

- **Hemabate**: 250 µg IM or Intrauterine *not IV*
  - *Beware* bronchospasm

- **Cytotec** (misoprostol) 1 mg PR
**Background:** Obstetric hemorrhage is the leading cause of maternal mortality worldwide. Despite active management during the third stage of labor, postpartum hemorrhage remains a problem and is increasing in the United States, primarily due to the increasing incidence of atony. Tranexamic Acid (TXA) is a lysine analogue and works by binding to plasminogen, thereby inhibiting fibrinolysis. TXA has been used for years in the management and prevention of hemorrhage in the surgical setting including cardiac, orthopedic and trauma surgery.

Prior studies have established the safety and efficacy of using TXA in the treatment of PPH. More recently, a large multi-center international RCT (The WOMAN trial) demonstrated a significant reduction in postpartum hemorrhage and death due to bleeding when TXA was used early in the treatment of PPH. Although there is significantly less data, a few of other small studies have demonstrated its efficacy in preventing postpartum hemorrhage in patients at both average or increased risk when given either prior to or immediately after delivery in cesarean deliveries. Although less well studied, TXA has also been used to prevent PPH in vaginal delivery. Despite concerns for potentially increasing thromboembolic events, no study to date has indicated any increased risk in gravid patients receiving TXA. Given this data, our goals are outlined below.

**Goals:**

1. To reduce the incidence of postpartum hemorrhage in patients at high risk for hemorrhage due to known risk factors
2. To reduce the severity of postpartum hemorrhage once a patient has been identified as having a hemorrhage (EBL > 500 ml in vaginal delivery or > 1000 ml in Cesarean delivery)

**Clinical Practice:**

1. Prophylactic use: Consider prophylactic use in cesarean or vaginal delivery with patients at increased risk for hemorrhage (see criteria below), especially in circumstances where uterotonics may be contraindicated. Discuss possible use at briefing or at team meeting.
2. Therapeutic use: Consider use when patient has been identified as having a hemorrhage. Team agreement prior to administration.
Method of administration:
Dosage: 1 gram given intravenously over 10 minutes. Possible methods of administration include 1g diluted into 10 ml of normal saline or 1g diluted into 100 ml of normal saline.
Timing: Administer immediately after delivery of baby in either vaginal or cesarean delivery, or when hemorrhage has been identified. Consider redosing 1g after 30 minutes in continuing hemorrhage. Consider infusion (5mg/kg/hr) if prolonged bleeding period is expected.

Side effects:
Minor: nausea, vomiting, GI upset, headaches, dizziness, hypotension, color blindness
Major: thromboembolic complications (PE, DVT, MI), seizure, anaphylaxis

At increased risk for hemorrhage:
- Abnormal placentation (previa, accreta)
- Polyhydramnios
- History of prior postpartum hemorrhage
- Multiple gestation
- Grand multiparity
- Chorioamnionitis
- Fetal macrosomia (fetal weight > 5000 g)
- Morbid obesity (BMI > 40)
- Known coagulopathy
- Retained placenta
- Suspected placental abruption
- Prolonged induction

Contraindications:
- History of thromboembolic disease (DVT, PE or CVA)
- History of ischemic heart disease
- Known disorder of hypercoagulability (ex. Factor V Leiden)
- Prior reaction to TXA
**Relative contraindications:**
Oliguria

**References**


4. WOMAN Trial Collaborators. Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomized, double-blind, placebo-controlled trial. Lancet 2017; 389:2105–16


Phil Hess, MD
PART II

Obstetric Emergencies

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ACLS IN PREGNANCY

Cardiac arrest in pregnancy follows the SAME algorithms and principles in AHA Guidelines, but has a few IMPORTANT DIFFERENCES, which will be highlighted here.

**CHEST COMPRESSIONS ARE IDENTICAL** (no longer recommended to go higher), **CODE MEDICATIONS ARE SAME DOSAGE, DEFIBRILLATION VOLTAGE IS IDENTICAL AS NON-PARTURIENTS.**

**REMEMBER TO CALL FOR HELP, CALL FOR A CODE BLUE AND OB EMERGENCY**, which will alert OB staff and NICU, as a STAT Cesarean delivery is a likely outcome.

Location of Code Cart: Alcove between room 7 and 8

**CONTINUOUS LEFT UTERINE DISPLACEMENT (LUD) IS ESSENTIAL TO MINIMIZE AORTOCAVAAL COMPRESSION—WHICH RENDERS CPR INEFFICIENT.** Continuous MANUAL LUD is likely the best form of LUD

Prefer IV’s ABOVE the diaphragm since venous return is hindered

Place lateral defibrillation pad below breast tissue

Before administering a shock consider removing fetal monitors if it can be done quickly, do not delay shock for that concern

If patient is on Magnesium, d/c the Magnesium and strongly consider administering calcium

Prepare to face a DIFFICULT AIRWAY IN PREGNANCY. First attempt by senior provider with a smaller ETT (6.5)

If no ROSC after 4 minutes, call for a STAT Cesarean delivery ON SITE. Baby’s delivery will improve mother’s hemodynamics and chances for ROSC Delivery within 5 minutes

Assess possible etiology of arrest. Hypoxemia should be considered as a cause, O2 reserves lower (LOW FRC) and the metabolic demands are higher in the pregnant patient.
**Etiology ABCDEFG:**

Anesthesia complications: high/total block, hypotension, airway loss, aspiration, respiratory depression, LAST

Accident: trauma, suicide

Bleeding: massive hemorrhage, coagulopathy, uterine atony, placenta accreta, placental abruption, placenta
previa, retained POC, uterine rupture, surgical (retroperitoneal), transfusion reaction

Cardiovascular: MI, peripartum cardiomyopathy, aortic dissection, arrhythmias, valve disease, CHD

Drugs: oxytocin, Magnesium, drug error, illicit drugs, opioids, insulin, anaphylaxis

Embolic: amniotic fluid, air, PE, stroke

Fever: sepsis

General H’s & T’s

Hypertension: preeclampsia, eclampsia, HELLP

Cardiac Arrest in Pregnancy A Scientific Statement from the American Heart Association Farida M. Jeejeebhoy et.al. 6 Oct 2015 [https://doi.org/10.1161/CIR.0000000000000300](https://doi.org/10.1161/CIR.0000000000000300) Circulation. 2015; 132:1747–1773

Advanced Cardiac Life Support of the Pregnant Patient Chapter 17 Robert A. Raschke

Lior Levy, MD
# Amniotic Fluid Embolism

## Introduction

A syndrome of 3H’s – Hypoxia, Hemodynamic collapse, Hemorrhage

Low frequency 1:8,000 deliveries, but High clinical acuity, High mortality condition.

Very high mortality (50% will die in the first hour, another 10-20% in the next 5 hours).

Overall 40-80% mortality with at least 50% permanent neurological damage in survivors.

High vigilance, prompt resuscitation and modern ICU have significantly improved outcomes.

## Etiology

Disruption of the fetal/maternal interface w/ fetal debris in the maternal circulation causing an abnormal activation of anaphylactoid inflammatory response. AFE during labor (70%), during 3rd stage (10%), during c-section (20%), or even during postpartum. Occasionally occurring in 1st or 2nd trimester or during termination of pregnancy.

## Risk factors

Operative (forceps) vaginal or cesarean delivery, placenta previa, accreta, abruption, meconium, and induction of labor. Other: cervical lacerations, uterine rupture, eclampsia, polyhydramnios, multiple gestation.

## Pathophysiology

Passage of amniotic fluid into maternal blood releases pulmonary vasoconstrictors, causing acute RV and late LV failure, cardiopulmonary collapse, severe hypoxemia; Activation of FVII and platelet causes DIC, hemorrhage and organ failure.

## Diagnosis

- AFE remains a clinical diagnosis. AFE causes a SUDDEN change in clinical presentation. NOT initially via diagnostic modality such as TEE/TTE.
- Must quickly exclude other possible primary causes such as anaphylaxis, eclampsia, seizure disorder, venous air embolism, PE, total spinal.
- Many patients will initially exhibit sense of doom, anxiety, altered mentation, possible bronchospasm in 15% only.
- Progression to cardiac arrest, PEA, VF, or VT is rapid in severe cases. Gravid patient may have fetus with terminal bradycardia secondary to poor uterine perfusion.
Clinical Responses to AFE From an Anesthesiologist Perspective

Call for Help
- call for code cart, high quality CPR, consider massive transfusion protocol activation.
- Place patient in left uterine displacement (LUD) to reduce aortocaval compression
- Consider early intubation
- Place additional Central Line and arterial access
- Cesarean delivery indicated if no maternal ROSC after 4 minutes
- Overall Goals: Oxygenation, cardiovascular support, treatment of coagulopathy

Early Phase: characterized by RV failure.
- Consider TTE/TEE for fluid resuscitation
- Consider norepinephrine, dobutamine, milrinone.

Second Phase: characterized by LV failure.
- Avoid fluid overload which exacerbates RV function and thus LV function.
- Pressors: norepinephrine, epinephrine, dobutamine, milrinone or vasopressin.

DIC Phase (later): Severe coagulopathy can occur early and late. DIC is present in 83%.
- Aggressive treatment of uterine atony and repair other bleeding sites.
- Blood products in 1:1:1
- TEG guidance for replacement
- TXA and rVIIa are controversial

Drugs for cardiovascular support in AFE (RV support)

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<tr>
<td>Milrinone (0.25-0.75 mcg/kg/min)</td>
<td>Inhaled NO (5-40 ppm)</td>
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<tr>
<td>Inhaled prostacyclin (10-50 ng/kg/min)</td>
<td>IV prostacyclin 1-2 ng/kg/min</td>
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<tr>
<td>Norepinephrine (0.025-0.5 mcg/kg/min)</td>
<td>Epinephrine (0.03-0.5 mcg/kg/min)</td>
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Additional Thoughts
- Post-ROSC mild hypothermia (32-36°C for 12-24 hour) treatment is indicated
- Treatment with PVR reduction is indicated- prostacyclin, inhaled NO, sildenafil


Joan Spiegel, MD
Caring for patients with Preeclampsia (PEC) and Eclampsia

**Review: Pathophysiology and Clinical Diagnosis of PEC**

- Multisystem disease attributable to endothelial dysfunction
- Clinically defined by **new onset, after 20 weeks gestational age**, of **hypertension** (SBP > 140 mm Hg or DBP > 90 mm Hg) **plus one or more systemic manifestations**
- Early onset (< 34 weeks GA) typically carries greater risk of severe disease and maternal/fetal complications
- Occurrence of seizures not attributable to any other cause = Eclampsia (may be a presenting sign)

**Systemic manifestations**

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<th>Clinical criteria</th>
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<td>Proteinuria</td>
<td>&gt; 300 mg over 24h, or Protein: creatinine ratio &gt; 0.3</td>
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<tr>
<td>Thrombocytopenia</td>
<td>&lt; 100,000 / uL</td>
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<tr>
<td>Renal insufficiency</td>
<td>Serum Cr &gt; 1.1 mg/dL, or doubling from baseline</td>
</tr>
<tr>
<td>Liver dysfunction</td>
<td>Transaminases &gt; 2x baseline</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>Low pulse OX reading</td>
</tr>
<tr>
<td>Cerebral symptoms</td>
<td>Unexplained HA not responsive to medical treatment, or visual disturbance</td>
</tr>
</tbody>
</table>

**Potential Complications**

- Cardiomyopathy
- Seizure
- Thrombocytopenia
- DIC
- Hepatic injury/rupture
- Fetal growth restriction
- Pulmonary edema
- Intracranial hemorrhage
- Stroke
- Renal failure
- Liver subcapsular bleeding
- Placental abruption
Clinical Management

Obstetric decision-making guidelines

PEC without severe features → expectant management until 37 weeks GA, then IOL (or CD)

PEC with severe features, > 34 weeks GA OR < 34 weeks GA with any clinical instability → delivery soon after maternal stabilization

Intrapartum management cornerstones:

1. BP monitoring and treatment
   • At least once per hour pre-delivery
   • Target SBP < 160, DBP < 110 mm Hg. Be aware that excessive lowering BP can cause a rapid decrease in uteroplacental perfusion.
   • 1st line therapy: labetalol. 2nd-line: hydralazine, nifedipine

2. Seizure prophylaxis – MgSO₄
   • 4-6g bolus followed by 1-2g/h infusion (renally cleared; reduce dose if renal insufficiency)
   • Target range: 4.8-8.4 mg/dL
   • Signs of toxicity: loss of DTR (9.6-12 mg/dL), hypotension, respiratory depression (12-18 mg/dL), hypoxia, EKG changes and cardiac arrest (24-30 mg/dL)
   • Treatment of Magnesium toxicity: CaCl₂ intravenously

3. Mild fluid restriction (< 1 mL/kg/h maintenance during L&D)

1. Eclamptic seizure treatment
   • 1st-line: MgSO₄ (4g bolus over 5min, then 1g/h infusion)
   • Adjuncts: benzodiazepines, phenytoin
   • Consider alternative causes (LA toxicity, electrolyte derangement)
   • Fetal bradycardia is common due to temporary hypoxemia and hypercarbia, not a necessarily indication for STAT cesarean delivery

Anesthesia Considerations

1. Check platelets prior to neuraxial in any patient with hypertension
2. General anesthesia is less desirable due to the risk of severe hypertension/cerebral hemorrhage with intubation/extubation and possible difficult intubation
3. Spinal anesthesia for cesarean delivery is not contraindicated
4. Consider early epidural or epidural with dural puncture for labor analgesia if platelet is trending down.
5. Fluid restriction (preload/co-load not necessary in PEC; judicious crystalloid use in CD)
6. Beware Magnesium toxicity, especially if renal impairment
7. Beware high risk of postpartum hemorrhage
8. Uterotonic agents: Avoid Methergine. Consider Tranexamic acid and calcium chloride in addition to regular uterotonic agents.
9. Avoid ketorolac if renal insufficiency

Erin Ciampa, MD, PhD
Accretia/Percreta Preparation

OR PREPARATION

Right side of bed
Arterial line transducer
Infusion pump with large neo stick primed
Infusion pump with large norepi stick, not primed
Infusion pump with large epi stick, not primed
Plasmalyte with blood tubing through Ranger warmer
LR with microdrip tubing through gang of 5 (to 20g IV)

Left side of bed
Belmont rapid infuser
Plasmalyte through Belmont
Second Ranger with Plasmalyte with blood tubing

Extra equipment
Red hemorrhage folder contains all necessary paperwork.
Pre-fill ABG and lab paperwork
Patient labels prepped (name, phone extension, date)
SuperSTAT stickers
Bair Hugger X 2 (underbody and upper)
Activate PPV on aline waveform on monitor
Take head segment off top and put on foot end
Ensure RIC kit and CVL kit (MAC line) available in emergency cart

PHARMACY

Workroom Omnicell
Calcium chloride (5) (may need to call pharmacy 7-4247)
50ml phenylephrine & norepinephrine

OR Omnicell
Confirm Hemabate and methergine available in OR fridge (2 of each)

Reminders
Re-dose cefazolin with 1.5L blood loss
1gm TXA load after delivery
Re-dose TXA if excessive bleeding, consider infusion
Accreta/Percreta Preparation

FROM BLOODBANK
Cooler with 4 RBC, 2 FFP to start
Massive transfusion protocol, as needed. Change ratio to 1:1 if fibrinogen <300 mg/dl

DURING CASE
Move regional cart and other equipment out of room after use (create space)
Move nursing computer workstation out of room
Move cysto tower out of room when done
OR C has metal cart used for papers / blood cooler
Make sure nursing is prepared to weigh lap pads

PATIENT PREP
16G or 14G peripheral IV (X2)
Radial arterial line (better on right but not important)
20G IV for infusions (good vein so can be changed for RIC in OR)
CSE or CSE -> GA, as per plan for individual patient

EMERGENCY PHONE #S
Blood bank 7-4480  All communication is through the blood runner ONLY
Main Pharmacy 7-4247
STAT Lab 7-1493
STAT lab ABG- 73131
Perfusion pager on-call schedule (should put # on board if they step out)
## Workflows for PPH

<table>
<thead>
<tr>
<th>Additional Monitoring</th>
<th>Medications</th>
<th>Laboratory Test</th>
<th>Transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Arterial line</td>
<td>□ Uterotonics</td>
<td>Labs sent q30 min for massive PPH</td>
<td>□ Notify resource nurse</td>
</tr>
<tr>
<td>□ PPV – validated in non-intubated patients (AA 2015;120:76-84)</td>
<td>□ Tranexamic acid 1g</td>
<td>□ PT/PTT/INR</td>
<td>□ Activate Massive Blood Transfusion Protocol</td>
</tr>
<tr>
<td>□ Base excess – with prognostic value (M Colella et al. SOAP annual meeting, 2018)</td>
<td>□ Cefazolin 2g q4h, repeat when EBL=1500ml</td>
<td>□ Fibrinogen</td>
<td>□ Start 1:1:2, switch to 1:1:1 when coags affected</td>
</tr>
<tr>
<td>□ Lactic acid</td>
<td>□ CaCl2, IV when ionized Calcium is low, or with 3rd set of RBC/FFP</td>
<td>□ ABG/VBG with pH, BE, K, iCa, Hct, Lactic acid</td>
<td>□ Designate a Blood Bank runner</td>
</tr>
<tr>
<td>□ Quantitative Blood Loss (QBL): ask the circulating nurse</td>
<td></td>
<td></td>
<td>□ Designate a person to run Belmont</td>
</tr>
<tr>
<td>□ Temperature</td>
<td>□ Uterotonics</td>
<td>Labs sent q60 min for massive PPH</td>
<td>□ Cell saver – call perfusion</td>
</tr>
<tr>
<td>□ Urine output</td>
<td>□ Tranexamic acid 1g</td>
<td>□ CBC</td>
<td>□ Transfusion Guidelines (PTO)</td>
</tr>
<tr>
<td>□ Ultrasound: volume and contractility assessment</td>
<td>□ Cefazolin 2g q4h, repeat when EBL=1500ml</td>
<td>Note: Consider TEG if coags delayed or not matching clinical picture</td>
<td></td>
</tr>
</tbody>
</table>

Phil Hess, MD
### Transfusion Guidelines

<table>
<thead>
<tr>
<th>RBC</th>
<th>FFP</th>
<th>Cryoprecipitate</th>
<th>Crystalloid</th>
<th>Platelet</th>
</tr>
</thead>
</table>
| PPV > 10  
Hct < 27%  
Fibrin > 3 g/L | PPV > 10  
Hct > 27%  
Fibrin < 3 g/L | PPV < 10  
Hct > 27%  
Fibrin < 2 g/L | PPV > 10  
Hct > 27%  
Fibrin > 3 g/L | Platelet  
< 50 K/mm³ OR  
< 75K/mm³ with active uncontrolled bleeding |

Phil Hess, MD
FETAL DISTRESS AND INTRAUTERINE RESUSCITATION

Abnormalities in fetal heart tracing (FHT) pattern can be concerning for progressive fetal hypoxia and acidosis. When a “pattern check” is called, resuscitative measures are taken to increase O2 delivery to the placenta and umbilical blood flow.

ANESTHESIA TEAM SHOULD GO TO THE LABOR ROOM WITH THE “STAT CESAREAN KIT” (CHLOROPROCAINE 3 % 20 cc, AN EMPTY 30 CC SYRINGE, A BOTTLE OF 8.4% BICARBONATE) IN CASE A STAT CESAREAN SECTION IS CALLED

Maternal positioning
- Left Uterine Displacement (LUD) to decrease aortocaval compression and improve maternal hemodynamics and utero-placental blood flow
- “Hands and knees” also used as alternative position

Maternal hemodynamics and oxygenation
- Correct maternal hypotension:
  - IV Fluids
  - Vasopressors as needed (phenylephrine preferred)
- Supplemental O2 to be used ONLY to correct maternal hypoxemia. Empirical use of O2 to improve FHT is not evidence-based, no longer in practice particularly with concerns of COVID-19 transmission

Tocolysis
In the presence of uterine hyperstimulation (uterine tachysystole leading to non-reassuring FHT)
- Administer IV fluids
- Stop oxytocin administration
- Administer terbutaline 250 mcg subcutaneously
- No evidence to use tocolytics unless tachysystole (>5 contractions in 10 min averaged over 30 min period) or uterine hypertonus (single contraction lasting >2 min) are present

Progression of labor
- Cervical exam to check for rapid cervical dilation, descent of fetal head or umbilical cord prolapse
- In trial of labor after cesarean (TOLAC) patients, CONSIDER uterine rupture (abdominal pain)

- In the presence of variable decelerations, uterine AMNIO-INFUSION with saline can be considered (bolus or continuous)

Intrauterine Resuscitation During Labor GARITE, THOMAS J. MD*; SIMPSON, KATHLEEN RICE PhD, RNC'

Lior Levy, MD
Shoulder Dystocia

5-9% 4000-4500g  
14-21% 4500-5000g  
ACOG Recommends c/s for 5000g without diabetes, 4500g with diabetes  
*Diagnosis of macrosomia is imprecise

Turtle Sign - Retraction of head against maternal perineum  
Resistance of delivery of anterior shoulder with usual traction to fetal head

**Risk Factors**

- **Maternal**
  - Abnormal pelvic anatomy
  - Gestational or pregestational diabetes
  - Previous shoulder dystocia
  - Short stature (<60in)
  - Obese (>200lbs)
  - Previous large infant (>4000g)
  - Excessive weight gain

- **Fetal**
  - Suspected macrosomia

- **Labor**
  - Operative vaginal delivery
  - Protracted active phase
  - Prolonged 2nd stage
  - Precipitous lab

**BE CALM**

- Breathe, don’t push
- Elevate legs, McRoberts position (knee/chest supine)
- Call for help
- Apply suprapubic NOT fundal pressure
- Enlarge vaginal opening with episiotomy
- Maneuvers to rotate baby to deliver posterior arm

**Extraordinary Maneuvers**

- Fracture clavicle
- Zavenelli Maneuver - cephalic replacement for cesarean delivery
- Symphysiotomy

**Complications**

- **Maternal**
  - PPH
  - Rectovaginal fistula
  - Symphysial separation or diathesis with or without femoral neuropathy
  - 3rd-4th degree tear or episiotomy
Uterine rupture

Fetal
- Brachial plexus injury
- Clavicle or humeral fracture
- Fetal hypoxia with or without permanent neurological injury
- Fetal death

**Umbilical Cord Prolapse**

Sudden and significant cord compression leading to immediate and sustained fetal bradycardia

**Risks**
- PROM, iatrogenic AROM with presenting part not well applied to cervix,
- vaginal delivery of twins
- vaginal delivery of footling breech

**Intervention**
- Manual elevation of fetal head off cervix until emergent cesarean delivery

**Uterine Inversion**

Uterus turns itself inside out with the fundus passing through the cervix into the vagina leading to severe and sudden PPH, significant discomfort and severe nausea and vomiting.

**Risk**
- Excess traction on cord applied to facilitate delivery of placenta, or excess fundal pressure on a relaxed uterus

**Treatment**
- Manually pushing the fundus back through the cervix, should be done immediately before cervical constriction, delay delivery of placenta if still attached to limit additional bleeding while maintaining an elevated concern for abnormal placentation
- Uterine relaxation can be facilitated with tocolytics: volatile anesthesia, Terbutaline or Nitroglycerine (50-100mcg)
- After uterine inversion resolved, immediately provide uterotonics and continue resuscitation of patient.

Justin Stiles, MD
**Maternal Early Warning Systems (MEWS)**

**Labor and Delivery**

### EARLY WARNING SIGNS

<table>
<thead>
<tr>
<th>VITAL SIGNS (New onset)</th>
<th>OB EVENTS</th>
<th>NEW LAB ABNORMALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR &lt; 45 or &gt; 120</td>
<td>Retained Placenta</td>
<td>Hct &lt; 25</td>
</tr>
<tr>
<td>RR &lt; 8 or &gt; 30</td>
<td>Use of 2nd uterotonic</td>
<td>Platelets &lt; 100,000</td>
</tr>
<tr>
<td>SBP &lt; 90 mm of Hg</td>
<td>Opening second 10-pack of laps (vaginal delivery)</td>
<td>Fibrinogen &lt; 200 mg/dl</td>
</tr>
<tr>
<td>SPO₂ &lt; 94%</td>
<td></td>
<td>OTHER</td>
</tr>
<tr>
<td>Temp &lt; 35°C (95°F) or &gt; 38.9°C (102°F)</td>
<td></td>
<td>Provider/Family Concern</td>
</tr>
<tr>
<td>SBP &gt; 160 mm of Hg</td>
<td></td>
<td>Shortness of Breath</td>
</tr>
<tr>
<td>DBP &gt; 110 mm of Hg</td>
<td></td>
<td>Maternal confusion/agitation</td>
</tr>
<tr>
<td>UO &lt; 30 mL for 2 consecutive hours</td>
<td></td>
<td>Non-remitting Headache; Right upper quadrant pain</td>
</tr>
</tbody>
</table>

### EARLY WARNING RESPONSE

<table>
<thead>
<tr>
<th>ACTION:</th>
<th>PRIMARY NURSE</th>
<th>RESOURCE NURSE</th>
<th>MEWS RESPONSE TEAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activates OB MEWS by calling Resource nurse and stating: &quot;Patient X meets MEWS criteria of _____.&quot;</td>
<td>Calls/pages to contact MEWS response team:</td>
<td>Meets at patient’s bedside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attending OB (or Coord. OB)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OB and anesthesia resident</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anesthesia attending</td>
<td></td>
</tr>
</tbody>
</table>

### MEWS TEAM RESPONSE

- **HEMORRHAGE**
  - Follow OB Hemorrhage protocol
- **HTN/PREECLAMPSIA**
  - Follow Preeclampsia protocol
- **EMBOLISM**
  - Follow Embolism protocol
- **SEPSIS**
  - Follow Sepsis protocol
- **OTHER**
  - Appropriate consult service

**Follow up for all MEWS**

- MEWS response team reconvene no later than one hour to re-evaluate.
- If unresolved after one hour consideration for other interventions, ICU admission and other consult services
PART III

Evaluation and Assessment

- Evaluation of Hemorrhage Risks (H Scores) 28
- Blood Bank Type Screen and Crossmatch 29
- NPO Guidelines 30
- Anesthesia Consult 31
- Transition of Care 33
### Average Risk: H1
- No previous uterine incision or injury
- Singleton Pregnancy
- <5 previous births
- No known bleeding disorder
- No history of postpartum hemorrhage

### Above Average Risk: H2
- Previous Cesarean Delivery
- Multiple Gestation
- 5 or more births
- History of Postpartum Hemorrhage
- Platelets <100,000
- BMI > 40
- Hematocrit <28%
- Macrosomia (EFW >5000gm)
- Polyhydramnios (AFI >24)
- Uterine fibroid (>6cm)
- 5 or more doses of misoprostol
- IV oxytocin for >30 continuous hours
- Chorioamnionitis
- Operative vaginal delivery
- Second stage of labor > 3 hours
*Consider changing risk group to significant if 3 or more average risk factors exist

### Significant Risk: H3
- Placenta Previa
- Suspected Abnormal Placentation
- Active Vaginal Bleeding
- Known Coagulopathy
- Suspected Placenta Abruption
- Retained Placenta
- Known antibody (except Rhogam antibody)*
*antibody increases difficulty of cross match; not higher risk for hemorrhage

### Actions
- **Type and Screen**
- Identify if candidate for electronic crossmatch
- Identify as “H2” at team meeting and/or pre-op briefing
- Confirm adequate IV access
- All care staff review Obstetrical Hemorrhage Protocol
All parturients will have a sample in Blood Bank.

Patients who require a type and screen prior to Cesarean include:

- Significant Uterine Surgery x3 or greater
- Previous post-partum hemorrhage
- Known Significant Uterine Fibroids (>6cm)
- Multiple Gestations
- Grand multiparous (Para >4)
- Macrosomia (EFW > 5000g)
- Polyhydramnios (AFI > 24)
- Known Antibodies (Except Rhogam Antibodies)
- Placenta Previa
- Abruption in Current Pregnancy
- Concern for abnormal placentation
- Known Coagulopathy

Patients who require a type and crossmatch:

- Placenta previa, abruption, accreta, increta and percreta
- Active postpartum hemorrhage and hemodynamic unstable
- Known antibodies (except Rhogam antibodies)
- Known coagulopathy

Be aware:

- After Rhogam administration, the patient will not be “Electronic Crossmatch Eligible” because presence of the Rhogam antibody. The blood bank needs 75 min to perform blood crossmatch.
- If a Blood Bank sample will be sent on the day of Cesarean section, please label as “STAT”, because non-urgent type and screen specimen will be sent to WEST campus.
- Page the Blood Bank Resident Pager at 30003 if you have any questions.

Reference:
BIDMC OB/Gyn guidelines
ACOG: Optimizing protocols in Obstetrics – management of obstetric hemorrhage

Yunping Li, MD
<table>
<thead>
<tr>
<th></th>
<th>Guidelines</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor Epidural</strong></td>
<td>• Moderate amounts of <strong>clear liquids</strong> for uncomplicated laboring patients&lt;br&gt;• Solid foods should be <strong>avoided</strong></td>
<td>• Clear liquids must be <strong>non-particulate</strong> (e.g. water, carbonated/sports drinks, Fruit juices (no pulp), jello, popsicles, Italian ice&lt;br&gt;• <strong>NO</strong> milk/cream/gum/candy</td>
</tr>
<tr>
<td><strong>Elective Cesarean</strong></td>
<td>• Last regular meal <strong>prior to midnight</strong> before surgery&lt;br&gt;• Light, low fat snack (e.g. crackers or one slice of dry toast) up to <strong>6 hours</strong> prior to surgery&lt;br&gt;• Clear liquids up until <strong>2 hours</strong> before surgery</td>
<td>• Non-diabetic patients may be instructed to consume carbonated, non-particulate 45g carbohydrate beverage up to <strong>2 hours</strong> prior to surgery</td>
</tr>
<tr>
<td><strong>Unplanned Cesarean</strong></td>
<td>• NPO as <strong>soon as the decision</strong> for cesarean section is made</td>
<td>• Depending on the urgency of delivery, anesthesia and obstetric team discuss appropriate timing based on last intake&lt;br&gt;• May utilize ultrasound to assess gastric contents</td>
</tr>
</tbody>
</table>

2) Considerations for NPO Guidelines and Gastric Emptying during Labor, SOAP Task Force for OB/GYN Continuing Education, 2019
3) Cesarean ERAC CarePath, Department of Obstetric Anesthesiology, Beth Israel Deaconess Medical Center

Maria Borrelli DO
Purpose:

Consultation with an anesthesiologist allows for advance planning and preparation for the patients who are at increased risk for anesthetic or obstetric complications. The anesthesia consult will help to determine what additional tests, consults or treatment should be obtained. Antepartum OB anesthesia consults should be obtained after fetal viability, but early enough in gestation to allow for scheduling of appropriate diagnostic tests (Generally between 24 and 34 weeks gestation)

Reasons to request an anesthesia consult:

• Pre-pregnancy BMI >40 or current weight over 300#
• Severe facial and neck edema
• Extremely short stature
• Abnormally short neck (or after a surgery with fusion of the neck)
• Difficulty opening the mouth
• Large thyroid
• Asthma (Severe)
• Serious medical or obstetrical complications, including, but not limited to, medical conditions such as:
  o Cardiac ((e.g., valvular stenosis or moderate to severe regurgitation, significant arrhythmia, cardiomyopathy).
  o Pulmonary, including severe asthma
  o Neurologic
  o Hematologic
  o Spine (hx spinal surgery, significant active or unstable lumbar pain syndrome)
  o Any other significant problem that the obstetrician or patient believes could negatively impact the safe or effective administration of anesthesia for delivery.
• History of complications with anesthetics

Consultation for inpatients may be considered with:

• Pregnancy-associated hypertensive disorders (preeclampsia, HELLP).
• Placental abruption.
• Placenta previa.
• Abnormal placentation (accreta, increta, percreta).
• Platelet count less than 100K.
• Plan for non-obstetric surgery during pregnancy.
• Serious conditions that may necessitate emergency cesarean delivery
To obtain an anesthesia consult:

- Call extension 617-667-3353 to request the consult appointment (Day and Time). The following information is needed:
  - Patient name, MRN and contact information
  - OB name and contact information
  - Indication for consult
  - Estimated delivery date (EDD)
  - Whether interpreter is necessary

An anesthesiologist (a senior resident or fellow, with an attending) will see the patient on Labor and Delivery for the consult, or on the labor floor if the patient is currently admitted.

- For inpatient consultation, please email Yunping Li and OB Anesthesia Fellow.
- There is no fee for this consult.
- The anesthesiologist will write a note in the Online Medical Record and forward this note to the obstetrician. If needed, further communication with the obstetrician of any additional tests, consults, therapies will be made.

Phil Hess, MD
# TRANSITION OF CARE ON L&D

<table>
<thead>
<tr>
<th>GOALS</th>
<th>EXPECTATIONS</th>
<th>RATIONALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The junior residents are expected to arrive at <strong>6:45am</strong>. Please be ready to work. Check ORs and prepare medications.</td>
<td>The on-call residents could be busy in the early morning. It is not the on-call residents’ responsibility to check ORs. Arrival at 6:45am has been our tradition for many years.</td>
<td></td>
</tr>
<tr>
<td>2. The afternoon sign out is at <strong>4:30pm</strong>. The on-call residents (even if you do pre-call or work in the OR) need to be here for sign out.</td>
<td>Please let your attending and the floor manager know <strong>EARLY</strong> that you are on OB call so they can plan ahead. The day resident can only be relieved when you are here.</td>
<td></td>
</tr>
<tr>
<td>3. If the on-call residents split the night, please allocate at least 30 minutes to get preops ready for sign out.</td>
<td>Work as a team - if one resident is doing a cesarean in the morning, the other resident should get sign out ready</td>
<td></td>
</tr>
</tbody>
</table>
| Comprehensive sign out is important for patient care and required by ACGME¹ | 4. Comprehensive sign out includes:  
- Brief general information  
- Significant medical history  
- Airway  
- BMI  
- IF PIH, criteria for severe features, results of PIH labs  
- IF TOLAC, indication for prior Cesarean  
- IF high risk of hemorrhage (H2 and H3), reasons for H2 and H3  
- IF thrombocytopenia, the trend of platelet counts  
- Any significant events / issues | For better patient care |

¹ACGME Common Program Requirements (Residency). July 2019
VI.E.3.a - Structured transition of care  
VI.E.3.b – Monitor effective hand over  
VI.E.3.c – Competency in hand over  
VI.E.3.d – Communication with attending  
VI.E.3.e – Continuity of patient care
PART IV

Labor Analgesia

- Test Dose 35
- Labor Epidural Analgesia 37
- Labor CSE Analgesia 39
- PCA for Labor Analgesia 41
- Epidural Morphine following Vaginal Delivery 43
- Recipes for Labor Analgesia 44
- Breakthrough Pain Algorithm 45
- Management of Failed Epidural 46
- Management of Pruritus from Labor Analgesia 48
- Vacuum Delivery and Forceps Delivery 49
- Delivery of Twin 50
## Test Dose

| Typical BIDMC Dose | • 3 mL of 1.5% lidocaine (45 mg) + 1:200,000 epinephrine (15 µg). Available in the epidural kit |
| Purpose | • To identify intravascular or intrathecal catheters |
| Rate of Catheter Misplacement | • Incidence of unintended intravascular catheter is 4.9-7% in the obstetric population (plastic catheter)  
• Incidence of unintended intravascular catheter is as low as 1% with flexible epidural catheter (BJA 2009; 103:400-5)  
• Incidence of unintended intrathecal catheter is 0.6%-1.6% in pregnant women |
| Aspiration | • Incidence of intravascular injection undetected by aspiration:  
  o 2.3% for single-orifice catheters  
  o 0.6% for multi-orifice catheters  
• Incidence of subarachnoid injection after negative aspiration:  
  o Between 0.06% and 0.0008%  
• **EVERY DOSE IS A TEST DOSE** |
| Positive Test Result | • **POSITIVE** test dose:  
  o HR increase >10 bpm at **25-30 seconds** after the injection of 10 or 15 µg epinephrine  
  o Observation of both a metallic taste and tinnitus after the injection of at least 100 mg lidocaine  
  o Warm or heavy sensation in the lower extremities, sensory level at 3 minutes  
  o Inability to raise legs at 4-10 min after injection of 30 or 45 mg lidocaine (Anesth Analg 2013; 116:125-32) |
| Potential Side Effects | • Potential for decreased uteroplacental blood flow leading to fetal bradycardia after IV or epidural injection of epinephrine |
# Potential Side Effects

- Potential for tachy-arrhythmia induction by intravascular injection of epinephrine
  - Epinephrine test dose is considered contraindicated in patients with history of tachy-arrhythmia (e.g. SVT, atrial fibrillation, WPW) or in whom tachycardia would be poorly tolerated (e.g. mitral stenosis or aortic stenosis)

- Potential for total spinal block and respiratory paralysis with injection of intrathecal lidocaine

- Potential for sympathectomy and maternal hypotension leading to decreased uteroplacental perfusion and possible fetal bradycardia after intrathecal lidocaine injection
  - Lidocaine test dose is considered contraindicated in patients who would not tolerate sympathectomy (e.g. aortic stenosis, mitral stenosis, HOCM)

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Sources:

Lindsay Sween, MD
## Labor Epidural

| Indications | • Per ASA and ACOG: “In the absence of a medical contraindication, maternal request is a sufficient medical indication for pain relief during labor”.
• **Consider early epidural for:**
  - Patients at risk for difficult placement (e.g. scoliosis, obesity)
  - Patients with difficult or challenging airway
  - Patients with history of obstructive cardiac disease, in whom tachycardia and sudden decrease in SVR would be poorly tolerated (e.g. aortic stenosis, mitral stenosis, HOCM)
  - Patients with history of tachy-arrhythmias (e.g. atrial fibrillation, SVT)
  - Patients with concerning (e.g. category 2) fetal heart rate tracing, in whom emergent cesarean delivery may become necessary
  - Patients if platelet count is trending down |
| Contraindications | • Patient refusal or inability to cooperate
• Increased intracranial pressure secondary to a mass lesion
• Skin or soft tissue infection at the site of needle placement
• Coagulopathy
• Recent pharmacologic anticoagulation administration
• Uncorrected maternal hemorrhage or hypovolemia |
| Advantages | • Continuous analgesia
• Ability to extend analgesia to anesthesia for cesarean delivery
• Immediate confirmation that catheter is functional
• Lower concentration and higher infusion rate: lower incidence of hypotension, muscle weakness and better coverage |
<table>
<thead>
<tr>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Slow onset of analgesia</td>
</tr>
<tr>
<td>• Larger drug doses required to attain effective analgesia when</td>
</tr>
<tr>
<td>compared to spinal techniques -&gt; greater risk for maternal local</td>
</tr>
<tr>
<td>anesthetic systemic toxicity</td>
</tr>
<tr>
<td>• Slightly higher failure rate than CSE or Epidural with dural</td>
</tr>
<tr>
<td>puncture</td>
</tr>
<tr>
<td>• Slightly higher rate of persistent unilateral/asymmetric catheter</td>
</tr>
<tr>
<td>(paravertebral catheter)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hypotension (14%)</td>
</tr>
<tr>
<td>• Pruritus</td>
</tr>
<tr>
<td>• Shivering</td>
</tr>
<tr>
<td>• Urinary retention</td>
</tr>
<tr>
<td>• Post-dural puncture headache (~1%)</td>
</tr>
<tr>
<td>• Inadequate analgesia (catheter replacement rate 5-13%)</td>
</tr>
<tr>
<td>• Accidental dural puncture with large bore needle (1.5%)</td>
</tr>
<tr>
<td>• Unintentional intravascular injection of local anesthetic medications (0.02%, 1:5000)</td>
</tr>
<tr>
<td>• High neuraxial blockade and total spinal anesthesia (0.006%, 1:16,200)</td>
</tr>
<tr>
<td>• Back pain (~30%)</td>
</tr>
<tr>
<td>• Epidural hematoma (~0.2:100,000)</td>
</tr>
<tr>
<td>• Epidural abscess (~0.5:100,000)</td>
</tr>
<tr>
<td>• Nerve root injury</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PCEA Patient-controlled epidural analgesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Initiation of epidural: bolus of 10-15ml of Epidural solution</td>
</tr>
<tr>
<td>For very painful, active labor, could top up with 0.125%</td>
</tr>
<tr>
<td>Bupivacaine 8ml, add 100 mcg of Fentanyl</td>
</tr>
<tr>
<td>• Maintenance: 15 ml/hr, self-bolus: 10ml, lockout 20min</td>
</tr>
</tbody>
</table>

Source:

Lindsay Sween, MD
# Labor CSE

<table>
<thead>
<tr>
<th><strong>Indications</strong></th>
<th>Per ASA and ACOG: “In the absence of a medical contraindication, maternal request is a sufficient medical indication for pain relief during labor”.</th>
</tr>
</thead>
</table>
| **Contraindications** | Patient refusal or inability to cooperate  
Increased intracranial pressure secondary to a mass lesion  
Skin or soft tissue infection at the site of needle placement  
Coagulopathy  
Recent pharmacologic anticoagulation administration  
Uncorrected maternal hemorrhage or hypovolemia |
| **Advantages** | Continuous analgesia  
Induction of analgesia with low doses of local anesthetic and opioid or opioid alone  
Rapid onset of analgesia  
Ability to extend analgesia to anesthesia for cesarean delivery  
Decreased incidence of failed epidural analgesia (catheter replacement rate ~3% with CSE, compared with ~7% for epidural) |
| **Disadvantages** | Increased incidence of pruritis compared to epidural  
Possible higher risk for fetal bradycardia (likely due to uterine tachysystole)  
Spinal dose containing both local anesthetic and opioid may increase the incidence of hypotension, which would be poorly tolerated in patients with stenotic heart lesions  
Delayed recognition of epidural catheter failure  
- Epidural with dural puncture may be a good choice for some patients (e.g. non-reassuring fetal heart tracing or high BMI) |
<table>
<thead>
<tr>
<th>Potential Side Effects</th>
<th>CSE Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hypotension (14%)</td>
<td>• Injection of a spinal dose (premixed Bupivacaine 2mg, Fentanyl 12.5 mcg)</td>
</tr>
<tr>
<td>• Pruritus</td>
<td>• Place an epidural catheter, then give a test dose</td>
</tr>
<tr>
<td>• Shivering</td>
<td>• No epidural bolus, follow with epidural infusion 15ml/h</td>
</tr>
<tr>
<td>• Urinary retention</td>
<td></td>
</tr>
<tr>
<td>• Post-dural puncture headache (~1%, same as epidural rate)</td>
<td></td>
</tr>
<tr>
<td>• Inadequate analgesia</td>
<td></td>
</tr>
<tr>
<td>• Accidental dural puncture with large bore needle (0.5 to 1.5%)</td>
<td></td>
</tr>
<tr>
<td>• Unintentional intravascular injection of local anesthetic medications (0.02%, 1:5000)</td>
<td></td>
</tr>
<tr>
<td>• High neuraxial blockade and total spinal anesthesia (0.006%, 1:16,200)</td>
<td></td>
</tr>
<tr>
<td>• Back pain (~30%)</td>
<td></td>
</tr>
<tr>
<td>• Epidural hematoma (~0.2:100,000)</td>
<td></td>
</tr>
<tr>
<td>• Epidural abscess (~0.5:100,000) or meningitis (~1:40,000)</td>
<td></td>
</tr>
<tr>
<td>• Nerve root injury</td>
<td></td>
</tr>
</tbody>
</table>

Reference:
### PCA for Labor Analgesia

- Use it only when neuraxial analgesia is contraindicated

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fentanyl</strong></td>
<td><strong>Side Effects</strong></td>
</tr>
<tr>
<td>• Dose: start with 10 mcg, lockout interval 6 min. Can increase to 20 mcg q6min. No basal rate.</td>
<td>• Significantly higher VAS pain scores compared to epidural analgesia</td>
</tr>
<tr>
<td>• Provides an initial moderate reduction in labor pain in some women (BUT pain scores return to baseline as labor advances)</td>
<td>• Possible decrease in fetal umbilical artery pH and possible increased risk of Apgar score &lt;7 at 1 minute compared to epidural analgesia or no analgesia</td>
</tr>
<tr>
<td>• Fairly rapid onset (transfer half-life into CNS 4.7-6.6 min)</td>
<td>• Risk of respiratory depression</td>
</tr>
<tr>
<td>• Highly lipophilic, so rapid distribution from plasma into highly vascularized compartments, muscle, and fat</td>
<td></td>
</tr>
<tr>
<td>○ Elimination half-life 3-8 hr</td>
<td></td>
</tr>
<tr>
<td><strong>Remifentanil</strong></td>
<td></td>
</tr>
<tr>
<td>• Dose: 0.2-0.8 µg/kg, with increment 0.05 µg/kg, lockout interval 2-3 min</td>
<td>• Higher incidence of hypoxemia compared to epidural analgesia</td>
</tr>
<tr>
<td>• Faster onset and metabolism compared to fentanyl</td>
<td>• Must be monitored with RR and pulse oximetry</td>
</tr>
<tr>
<td>○ Onset 20-30 sec, peak effect 80-90 sec</td>
<td>• Significantly increased sedation compared to fentanyl</td>
</tr>
<tr>
<td>• Metabolism is by tissue and plasma esterase</td>
<td>• Higher cost</td>
</tr>
<tr>
<td>○ Effective analgesic half-life ~6 min; elimination half-life ~10 min</td>
<td></td>
</tr>
<tr>
<td>• Significantly greater decrease in VAS pain scores at 1-hour post-initiation compared to fentanyl</td>
<td></td>
</tr>
<tr>
<td>• No reported adverse neonatal outcomes</td>
<td></td>
</tr>
<tr>
<td>• <strong>Note</strong>** our current IV PCA pumps the minimum lockout interval is 5min</td>
<td></td>
</tr>
</tbody>
</table>
Sources:


Lindsay Sween, MD
Epidural Morphine Following Vaginal Delivery

Patient selection:
- Did the patient undergo either of the following?
  - 3rd or 4th degree perineal laceration
  - Prolonged or complicated repair of perineal or cervical laceration
- Is the patient also complaining of above average pain prior to removal of epidural?
  - A common marker of above average pain is the need for additional epidural bolus medication following the laceration repair.

If YES:
- Discuss with OB team and make suggestion for epidural morphine
- Explain benefits and possible side effects to patient
- Consider giving epidural morphine prior to removal of epidural catheter

If administration of epidural morphine is desired, be sure to do the following steps:
- Give 2 mg epidural morphine (not the full dose of 3 mg in the syringe)
  - Remember to document any waste appropriately in Tab 11
- Document administration dose, time and route via POE
  - Part of the “OB Anesthesia” order set under “OB” tab in “Enter Orders”
  - Include the orders for ketorolac, acetaminophen, naloxone bolus, naloxone drip, and antiemetics as provided in the OB anesthesia order set
- Attach the form titled “Monitoring Flow Record: Neuraxial Morphine for Obstetric Patients” to the outside of the patient’s chart and fill out the following:
  - Date and time of morphine administration
  - Date, time, and mode of delivery
- Give appropriate sign-out to OB team and L&D nurse – L&D nurse should communicate with postpartum nursing.
- Alert OB anesthesia team and give sign-out to oncoming call team
- Remember: No PO/IV/SQ narcotics or sedatives should then be given to the patient for the following 24 hours, except by order of the OB anesthesiology team

Meredith Colella, MD
## Recipes for Labor Analgesia

<table>
<thead>
<tr>
<th>Contents</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **Labor Spinal** | - Fentanyl 12.5 mcg  
- Bupivacaine 2 mg total in 1ml  
- Premixed in Omnicell  
- To make from scratch:  
  o 0.25 cc of fentanyl (50 mcg/cc)  
  o 0.8 cc of 0.25% bupivacaine |
| **Labor Epidural Solution** | - Bupivacaine 0.04%  
- Fentanyl 1.67 mcg/cc  
- May add 0.25 cc (250 mcg) of epinephrine to 150 cc bag (1.67 mcg/cc)  
- Premixed in Omnicell  
- After negative test dose, bolus 10-15ml of BEF, then run at 15ml/hr |
| **Labor Epidural Bolus** | - 10 cc of BEF bolus off the pump OR  
- 8 cc of 0.125% bupivacaine (10 mg) + 2 cc (100 mcg) fentanyl  
- Fentanyl: limit 100 mcg per hour, total fentanyl ≤400 mcg for whole labor epidural course |

Note: for breakthrough pain, please refer to “Treating breakthrough pain” and “Management of failed epidural”.

Lindsay Sween, MD
Breakthrough pain in previously functioning catheter

Assess sensory level with ice
Check catheter position and connections
Ensure bag is being emptied

8 ml 0.125% bupivacaine
100 mcg fentanyl

Assess in 15 minutes

8 ml 0.125% bupivacaine

Assess in 15 minutes

8 ml 0.125% bupivacaine if improving

Replace catheter

If patient requires 3 or more treatments for breakthrough pain:
Increase epidural solution concentration to:
• Bupivacaine 0.125%, fentanyl 3.33 mcg/ml at 10 – 12 ml/hr
For intractable pain
• Consider dexmedetomidine 0.5 – 1.0 mcg/ml
• Consider replacement with CSE including morphine 100 mcg IT

Phil Hess, MD
Management of failed epidural pain relief

Catheter **NOT** in epidural space (no bilateral sensory level), patient not comfortable

- Migrated (skin depth same as time of placement?)
- Improperly sited (e.g. Paravertebral – overthreaded, asymmetric block)

Replace with new CSE (if no contraindications)

*also check for catheter-filter-tubing disconnects!

Catheter **IN** epidural space (√ bilateral sensory level), patient not comfortable

- Level not high enough? (T10 for labor) → bolus off pump (raise level with volume)
- Adequate level but not covering breakthrough pain? → bolus with more concentrated solution (make block denser, eg. 0.125% bupivacaine)

*also consider:

1. Alternative reason for pain (e.g. full bladder, uterine rupture, chorioamnionitis, hepatic hematoma). Interrogate pain characteristics (Remits between contractions? Radiating?) and accompanying signs (maternal vital signs, FHR)

2. Dysfunctional labor with secondary hyperalgesia (still uncomfortable despite concentrated LA boluses). This is usually a patient making relatively slow or stalled labor progress.
   - Consider increasing epidural infusion solution from 0.04% to 0.125% bupivacaine (see recipes next page), run at 10-12cc/h, PCA dose 0-5mL q20min.
   - Consider new CSE - dense block from new labor spinal will usually provide temporary relief.
   - Consider other adjuncts given epidurally (dexmedetomidine 0.5-1.0 mcg/mL infusion) or intrathecally (morphine 100mcg IT)

References:
Recipes for 0.125% epidural infusion solution:

A. Made from scratch:

<table>
<thead>
<tr>
<th>Solution</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25% Bupivacaine</td>
<td>30 mL</td>
</tr>
<tr>
<td>Normal Saline</td>
<td>26 mL</td>
</tr>
<tr>
<td>Fentanyl (50 mcg/mL ampule)</td>
<td>4 mL</td>
</tr>
</tbody>
</table>

Total volume = 60 mL (0.125% bupivacaine + fentanyl 3.33 mcg/mL)

B. Made from standard 150cc pre-mixed 0.04% bupivacaine/fentanyl infusion bag from pharmacy:

<table>
<thead>
<tr>
<th>Solution</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bupivacaine/Fentanyl bag from Omnicell</td>
<td>150 mL</td>
</tr>
<tr>
<td>0.5% Bupivacaine</td>
<td>36 mL</td>
</tr>
<tr>
<td>Fentanyl (50 mcg/mL ampule)</td>
<td>8 mL</td>
</tr>
</tbody>
</table>

Total volume = 194 mL (0.125% bupivacaine + fentanyl 3.35 mcg/mL)

Erin Ciampa, MD, PhD
# Management of Pruritus from Labor Analgesia

**Initial evaluation and guidance**
- Itching is often mild and may be self-limiting if associated with spinal fentanyl.
- Often assurance is a good start before the treatment

**Prophylaxis (if history of severe pruritus)**
- Consider avoiding neuraxial fentanyl if history of intractable pruritus. Discuss with OB team and the patient, other options including omission of IT and epidural fentanyl, or epidural dexmedetomidine.

**Omission of Neuraxial Opioid**
- Severe itching during labor or prior h/o unremitting severe itching, opioids may be removed from labor epidural infusion.
- Consider bupivacaine 0.125% with epinephrine 2 mcg/ml at 10 ml/hr
- Consider dexmedetomidine (0.5-1 mcg.ml) instead of fentanyl for labor epidural.

**Nalbuphine**
- Dose: 2.5 mg IV, may repeat times two.
- More effective than placebo, diphenhydramine, propofol or naloxone.
- May also improve opioid induced N/V and respiratory depression.
- Can cause sedation and pain scores at higher doses.

**Naloxone**
- Dose: 40 mcg IV, may repeat or utilize infusion (on standard order set).
- May also improve opioid induced N/V and respiratory depression.
- Does not cause sedation.
- Aware of reversal of analgesia at higher doses.

**Ondansetron**
- 8mg IV
- Controversy on the efficacy

**Diphenhydramine**
- Limited success compared to placebo, less effective than nalbuphine.
- Opioid-induced histamine release from mast cells is not mechanism for pruritus

---


John Kowalczyk, MD
# ASSISTED VAGINAL DELIVERY

<table>
<thead>
<tr>
<th>INDICATIONS</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FORCEPS/VACUUM</strong></td>
<td></td>
</tr>
<tr>
<td>• Prolonged second stage of labor</td>
<td>Maternal: post-partum hemorrhage (PPH).</td>
</tr>
<tr>
<td>• Non-reassuring fetal heart rate (NRFHR)</td>
<td>Obstetric: anal sphincter injury, cervical/vaginal laceration</td>
</tr>
<tr>
<td>• Elective shortening of the second stage: pushing is contraindicated (maternal cardiovascular or neurologic disease)</td>
<td>Fetal: bradycardia, scalp injuries, cephalohematoma, intracranial hemorrhage</td>
</tr>
<tr>
<td>• Maternal exhaustion</td>
<td></td>
</tr>
<tr>
<td><strong>ANESTHETIC MANAGEMENT:</strong> How we do it</td>
<td></td>
</tr>
<tr>
<td>• Unit coordinator or resource nurse notifies anesthesia attending/team and NICU. Anesthesia provider stands by in the labor room</td>
<td>• Anticipate emergency C-SECTION, PPH.</td>
</tr>
<tr>
<td>• 5-10ml of 3% Chloroprocaine epidurally could help forceps delivery without hampering maternal pushing effort</td>
<td>• Get medications for emergency C-section (3% CPC, bicarbonate) have them available in the emergency bag, don’t draw them up</td>
</tr>
</tbody>
</table>


Galina Korsunsky, MD
Delivery of Twins

Background:

- About 40-60% of twin pregnancies enter spontaneous labor before 37 weeks.
- The optimal route of delivery in women with twin gestations depends on the type of twins, fetal presentations, fetal weight, gestational age and the judgment of obstetricians.
- Vaginal delivery is a reasonable option.
- Options for delivery of the second non-vertex presenting twin include:
  - Breech extraction with experienced provider
  - Internal podalic version with breech extraction
  - External cephalic version
  - Cesarean delivery – often emergent

For Anesthesiologists:

- As always, ensure that you have a working epidural;
- Once the patient is about to deliver, she will move to an OR (usually OR C is reserved);
- For multiparous, she may enter OR C earlier in anticipation of a quick delivery;
- Close the AIMS in the labor room and continue the same record in the OR;
- Assist the nurse to transfer the patient to an Operating Room so that you can safely set up the epidural pump and your monitors/medications;
- Continue labor epidural infusion;
- The anesthesiologists will be notified when the delivery time is close;
- An anesthesia resident and attending should be present for delivery;
- Be prepared for STAT cesarean delivery. Have 3% chloroprocaine and bicarbonate ready (do not draw it up);
- Anesthesia team may step out once both babies have been delivered and things have settled down;
- After delivery, make sure the epidural pump is taken back to the labor room.

Reference:

BIDMC PPGD CP-OB 29

Yunping Li, MD
PART V

Anesthesia For Cesarean Delivery

- Conversion of Labor Analgesia for CD 52
- Spinal Anesthesia for Cesarean Delivery 53
- General Anesthesia for Cesarean Delivery 54
- ERAS After Cesarean Delivery 56
- Anesthesia for External Cephalic Version 58
- Anesthesia For EXIT Procedure 59
- Uterotonics 60
Conversion of Labor Epidural for Cesarean Delivery

**Emergent**
- Evaluate airway
- Functional Epidural?
- Bolus bicarbonated 3% chloroprocaine while transporting the patient

**Urgent (DDI=30’)**
- Evaluate airway
- Functional Epidural?
- 5 ml bicarbonated 2% lidocaine + 5 mcg/ml epinephrine (in room or in OR)

No level
- Prepare for general anesthesia
- CPC can take 6 min. If working epidural, continue maintaining epidural level for pain control and use it for epidural morphine

Rising
- Check Level in the OR

Rising
- Check Level in the OR

Dysfunctional
- Epidural does not work well,
  - Replace epidural or new CSE
  - IV ketamine (10 mg x 3), or fentanyl (50 mcg x 2), or propofol (20 mg x 3)
  - Dexmedetomidine 20-30 mcg epidurally
  - Pour 20 ml of bicarbonated 3% CPC intraperitoneally
  - Consider GA

**How to Maintain Epidural level during Cesarean Delivery?**
- Check level every 20 minutes
- Anticipate moments when highest coverage is needed (delivery, putting uterus back in)
- Bolus epidural **When:**
  - Patient in pain (chest or epigastric often first sign)
  - Epidural level is receding
  - Bolus 5 ml of chloroprocaine q 15 min unless the level > T4
  - Bolus 5 ml of lidocaine q 20-25 min unless the level > T4

Yunping Li, MD
Spinal Anesthesia for Cesarean Delivery

### Spinal Anesthesia
- Expect <90 minutes
- Primary or 1st repeat CD
- Thin patient

### CSE
- Possible > 90 minutes
- Multiple repeat, previous surgery, high BMI
- Elevated hemorrhage risk: accreta

### Epidural with Dural Puncture
- Expect > 90 minutes
- Multiple surgeries, surgical mesh

### Spinal medications
- Bupivacaine 0.75%
  - 1.5 ml, +/− 0.2 ml for ≤60 & ≥70 inches
- Fentanyl 0.5 ml (25 mcg)
- Morphine 0.5 ml (250 mcg)

### Blood pressure
- Phenylephrine 10ml syringe (HR >70 give 100 mcg)
- Can also run as infusion 0.5 mcg/kg/min, titrated
- Ephedrine 5 ml syringe (HR< 90 give 5 – 10 mg)

### Other Medications
- Antibiotics
- Oxytocin bag (bottom drawer)
- Uterotonics (in-room fridge)
- Oxygen via Face mask – only if O₂ Sat < 96%

---

Phil Hess, MD
# General Anesthesia for Cesarean Delivery

**Background:**
- General anesthesia associated with higher maternal mortality and morbidity.
- Indications:
  - Maternal refusal
  - Severe psychiatric or developmental disorder
  - Coagulopathy
  - Local infection at neuraxial site
  - Severe, uncorrected hypovolemia
  - Intracranial mass with increased ICP
  - Emergent cesarean without preexisting epidural catheter
  - Incomplete coverage of spinal segments
  - Multiple failed neuraxial placements
  - Persistent intraoperative pain that is uncontrolled
- STAT or intrapartum indications for general anesthesia should involve constant communication between the OB and anesthesiologist

## Pre-operative
- Perform **AIRWAY EXAM** and preop evaluation.
- Place 16 or 18 G IV and obtain CBC and T&S.
- Administer nonparticulate antacid <30 min before induction.
- Consider metoclopramide 10 mg and/or ranitidine 30 mg IV if >30 minutes prior to induction.
- Place patient in Left Uterine Displacement and attach monitors.
- Preoxygenation with either 100% O2 for 3 minutes or 4-8 vital capacity breaths.
- **Before induction**, ensure patient is prepped and draped, perform time-out and confirm surgeon is ready for incision.

## Induction
- Initiate rapid sequence induction.
- Propofol 2.0-2.5 mg/kg of IBW and succinylcholine 1.0-1.5 mg/kg of TBW.
  - Avoid opioids and benzodiazepines (neonatal respiratory depression).
- Tracheal intubation:
  - Airway edema associated with pregnancy, labor and pre-eclampsia
  - Consider video laryngoscopy as first choice.
  - Endotracheal tube size 6.5 or 6.0 mm due to airway edema.
- Confirm ET tube placement and inform OB team it is safe to initiate surgery.
### Intra-operative prior to Delivery

- Use volatile anesthetic (sevoflurane, isoflurane) at approximately 1 MAC.
- Recommended initial ventilator settings of 6-8 ml/kg of IBW and a RR of 14-18.
  - There is a respiratory alkalosis in pregnancy with a normal PaCO2 of 30 mmHg. Ventilator setting should be titrated to limit hypercapnia.

### Intra-operative post Delivery

- Initiate continuous infusion of oxytocin.
  - Consider additional IV boluses of Oxytocin 2-3 IU
  - Consider early use of secondary uterotonics
  - Consider TIVA instead of volatile agent.
- Adjust maintenance anesthetic:
  - Reduce volatile anesthetic to 0.5 MAC (cause uterine relaxation).
  - Add nitrous oxide (60% to 70%).
  - Midazolam 2mg (increased risk of awareness).
  - Place temperature probe and upper body forced air warmer.
  - Administer intravenous ketorolac and opioids for post-operative pain and ondansetron for PONV.
- Extubation
  - Majority of respiratory-related deaths occurred during emergence, extubation and recovery.
  - Insert an OGT to empty the gastric contents if patient did not meet NPO guidelines or concern for full stomach.

### Post-operative

- Evaluate post-operative issues in PACU.
- Consider Quadratus Lumborum or Transversus Abdominis Plane Block for post-operative pain.

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John J. Kowalczyk, MD
## Enhanced Recovery After Cesarean Delivery CarePath

<table>
<thead>
<tr>
<th></th>
<th>Scheduled Cesarean CarePath</th>
<th>Unscheduled Cesarean CarePath</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>Increase patient satisfaction and outcomes by reducing post-op pain, nausea/vomiting, time to void and time to ambulation by minimizing opioids and maximizing alternative medications and techniques</td>
<td></td>
</tr>
<tr>
<td><strong>To whom it applies</strong></td>
<td>Patients with scheduled cesarean sections at BIDMC</td>
<td>Patients with unscheduled cesarean sections at BIDMC (e.g. intrapartum)</td>
</tr>
<tr>
<td><strong>NPO guidelines</strong></td>
<td>Patients should keep their usual diet until midnight on the night before surgery. They may have a light, low fat snack (e.g. crackers or one slice of dry toast) up to 6 hours prior to surgery. They may have clear liquids up until 2 hours before surgery. Patients will be instructed to drink a non-carbonated, non-particulate 45-gram carbohydrate beverage (e.g. Gatorade or apple juice) up to two hours prior to surgery for nondiabetic patients.</td>
<td>Patients should be NPO as soon as the decision for cesarean section is made. Depending on the urgency of delivery, the anesthesia and obstetric team will discuss appropriate timing based on last intake. If patients have neuraxial anesthesia during labor, their diet should be changed to clear liquids at time of placement.</td>
</tr>
<tr>
<td><strong>Pre-op (anesthesia)</strong></td>
<td>Anesthesia assessment</td>
<td></td>
</tr>
<tr>
<td><strong>Intraop (anesthesia)</strong></td>
<td>- Antibiotics within 60 minutes of skin incision (Cephalosporin preferred. Add azithromycin if patient in labor or membranes ruptured) &lt;br&gt; - Regional anesthesia preferred method &lt;br&gt; - Aspiration prophylaxis with non-particulate antacid &lt;br&gt; - Appropriate patient monitoring &lt;br&gt; - <strong>IV fluid warming</strong> and increased OR temperature to at least 68°F are recommended to prevent hypothermia in patients under neuraxial anesthesia; forced air warming can be added for patient</td>
<td></td>
</tr>
<tr>
<td>Post-op orders</td>
<td>Order set to be placed by OB and anesthesia teams</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| L&D recovery   | **Pain medications:**  
|                | - IV ketorolac 30mg q6h x 24 hours, then transition to PO ibuprofen 800mg q8h and acetaminophen 1gm q8h  
|                | - Oxycodone 5mg q4h PRN severe pain  
|                | - Pre-emptive or rescue supplementary regional blocks as indicated by anesthesia  
|                | **Nausea medications:**  
|                | Ondansetron 4mg PRN and Haldol 0.5-1mg once PRN |

Sources:

1. SOAP ERAC Statement

Lindsay Sween, MD and Phil Hess, MD
Anesthesia for ECV
Anesthesia for EXIT Procedure
# Uterotonics

**- Be proactive to fight PPH**

<table>
<thead>
<tr>
<th>How to give it</th>
<th>Side effects and contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Line</strong></td>
<td><strong>Second Line</strong></td>
</tr>
</tbody>
</table>
| Immediately after delivery:  
1. Start Oxytocin: 20 IU in 1L of LR: titrate to uterine tone. Generally, 100-200U/hr.  
2. If C-section for labor arrest after oxytocin augmentation, may consider additional 2-3 IU oxytocin IV (0.2-0.3ml from 10 IU/ml bottle) before infusion | Hypotension  
Nausea  
When given in large doses or over extended periods, antidiuretics may produce water intoxication, hyponatremia and seizures |
| 1. Methergine 0.2mg IM **NOT IV**  
Can be repeated q2-4 hours | Beware hypertension due to direct vasoconstriction (do not give if patient has hypertensive disorder) |
| 2. Carboprost- PGF2α (Hemabate) 250 µg IM **NOT IV**  
Can be repeated q15min, not to exceed four doses | Beware bronchospasm (do not give if history of asthma or reactive airway) |
| 3. Cytotec (misoprostol, a synthetic analog of PGE1)  
1mg PR | Beware of severe rigors and fever |

(3) California Maternal Quality Care Collaborative. Obstetric Hemorrhage Toolkit 2015

Dillon Schafer, MD and Yunping Li, MD
PART VI

Postpartum Care

- Caring Patients after Neuraxial Morphine 62
- Treatment of Pain after Cesarean Delivery 65
- Treatment of Pruritis after Cesarean Delivery 66
- Treatment of Nausea and Vomiting after CD 66
- Treatment of Hypothermia after CD 67
- PACU Flowchart 68
Background Information:
● Neuraxial morphine (intrathecal or epidural) has been used since the early 1980s to provide postpartum post-surgical pain relief. It is effective and safe (Anesth Analg 2013; 117:1368-70)

● The respiratory depression associated with neuraxial morphine occurs with an average time of onset of 8-12 hours.
  ○ Vigilant monitoring of the patient’s respiratory status must therefore occur for 24 hours after injection.
  ○ Respiratory depression is most often associated with the use of supplemental narcotics or sedatives.

● For breastfeeding patients, the newborn is not appreciably affected by morphine excretion in the colostrum after neuraxial administration of morphine in small doses.

Procedure for Implementation:
● It is prohibited to administer any opioids or sedatives in 24 hours after neuraxial morphine installation. Please discuss with your attending if patient needs an early dose of opioid.

● Document administration dose, time and route via POE
  ○ Part of the “OB Anesthesia” order set under “OB” tab in “Enter Orders”
  ○ Order set also includes orders for:
    ■ Ketorolac and acetaminophen for first 24 hours post-surgery for management of possible breakthrough pain
    ■ Naloxone (both single PRN dose and infusion) for management of pruritis, respiratory depression, or oversedation
    ■ Antiemetics for management of nausea and vomiting

● Attach the form titled “Monitoring Flow Record: Neuraxial Morphine for Obstetric Patients” to the outside of the patient’s chart and fill out the following:
  ○ Date and time of morphine administration
  ○ Date, time, and mode of delivery
● Inform postpartum L&D nurse when giving report that patient has received neuraxial morphine

● The postpartum L&D nurse will monitor the patient for the following every 30 minutes until transfer to the postpartum unit, or for the first 6 hours post-surgery:
  ○ Respiratory status
  ○ Sedation level

● Patients at high risk for respiratory depression will also require monitoring every hour for the remaining 18 hours following neuraxial morphine administration:
  ○ Patients who received any additional opioid for breakthrough pain
  ○ Morbidly obese patients
  ○ Patients diagnosed with obstructive sleep apnea (OSA)
  ○ Patients who have received or are still receiving an infusion of magnesium sulfate for treatment of preeclampsia

Management of Other Issues:

● OB Anesthesiology team will be consulted within the first 24 hours of morphine administration to manage breakthrough pain or adverse effects of neuraxial morphine

● Please discuss with your attending regarding the treatment plan for breakthrough pain.

● Breakthrough pain:
  ○ Orders should be entered at time of morphine administration for ketorolac and acetaminophen around-the-clock dosing for first 24 hours post-surgery
  ○ Our research identified that the patients underwent cesarean after labor are at high risk for persistent pain despite use of neuraxial morphine. Consider a TAP or QL block prior to transfer of patient to the postpartum unit (J Anesth Perioper Med 2019; 6:15-22)
  ○ If patient declines a TAP/QL block, or has breakthrough pain despite block, ketorolac and acetaminophen, administration of an additional narcotic may be considered
    ■ If the patient is on the postpartum floor, give a single dose of oxycodone (5-10 mg), and the patient needs to be monitored with RR and pulse oximetry
    ■ If the patient is in the PACU, consider using small dose of intravenous Fentanyl or Morphine
● Moderate to severe pruritis:
  ○ Exclude other possible causes of itching
  ○ Orders should be entered at time of morphine administration for:
    ■ Naloxone bolus, 40-80 mcg IV
      ● May be repeated after 5 minutes if necessary, for a maximum total of 3 boluses
    ■ Naloxone IV infusion, to be started if severe pruritis recurs after 3 boluses
      ● Infuse for 2 hours at a rate of 200 mcg/hr
    ■ Infusion should be stopped, and OB anesthesiology team called if pruritis persists, or if pain returns

● Nausea/vomiting:
  ○ Orders should be entered at time of morphine administration for multiple antiemetics, including ondansetron as a first line

● Respiratory depression or oversedation/somnolence:
  ○ OB anesthesiology team should be called immediately to bedside for evaluation
  ○ Naloxone bolus of 40-80 mcg IV from OB anesthesia order set should be administered by bedside nurse immediately

References

ASA Practice Guidelines for the prevention, detection, and management of respiratory depression associated with neuraxial opioid administration. Anesthesiology 2016; 124(3): 535-552

Meredith Colella, MD
TREATMENT OF PAIN AFTER CD
TREATMENT OF PRURITUS POST CESAREAN DELIVERY

**PROPHYLAXIS (if Hx severe pruritus)**
1. Consider Morphine via epidural instead of spinal
2. Consider neuraxial Dexmedetomidine
   a. 10 mcg lasts 4 to 6 hr
3. Consider avoiding Morphine if Hx intractable pruritus (discuss with patient, other options may include regional techniques or a PCA)

**TREATMENT**
1. Assess the patient, often assurance is a good start before treatment
2. Small dose of Naloxone (on standard order set), aware of reversal of analgesia
3. Nalbuphine (partial mu-receptor agonist/antagonist) 2.5mg IV
4. Ondansetron (5HT3 receptors) 8 mg IV
5. Dexmedetomidine 10 mcg IT/EP/IV
6. Benadryl does not work but might help with sedation and sleep

---

TREATMENT OF NAUSEA/VOMITING POST CESAREAN DELIVERY

**PREVENTION**
1. Ondansetron 4 mg IV (5HT3)
2. Dexamethasone 4-8 mg IV (slow onset)
3. Avoid Scopolamine patch (anticholinergic) in breastfeeding women
4. Consider avoiding Morphine if Hx intractable PONV (discuss with patient, other options may include regional techniques or a PCA)

**TREATMENT**
1. Ondansetron 4-8 mg IV
2. Second line agents for Hx of PONV
   a. Haloperidol 0.5-1mg IV
   b. Promethazine (Phenergan) 6.25 mg IV
3. Low dose propofol (20 mg IV)
4. Dexmedetomidine (slow onset)

---


Galina Korsunsky, MD 2020
# Treatment of Hypothermia after Use of Intrathecal Morphine

<table>
<thead>
<tr>
<th>Background</th>
<th>Intrathecal morphine can produce hypothermia after Cesarean delivery, likely due to a central effect on opioid receptor for thermoregulation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing</td>
<td>Hypothermia is identified after Cesarean delivery while in the recovery room.</td>
</tr>
</tbody>
</table>
| Diagnosis  | Core temperature $< 35.8^\circ C (\!<96.4^\circ F)$  
Paradoxical symptoms: diaphoresis, subjectively feeling hot.  
Can be sedated or feel dizzy.  
The incidence is about 6-7% in elective cesarean cases. |
| Treatment  | Conservative treatment: warm blankets, heating lamps and Bair hugger forced hot air warmer;  
Patients often feel uncomfortable with heat  
Medication: Lorazepam 0.5-1mg, IV |
| Observation| After Lorazepam administration, immediate cessation of symptoms and an increase to normothermia temperature within 90 minutes were observed. |
## PACU Nursing Notification Pathways

<table>
<thead>
<tr>
<th>What is Altered</th>
<th>Primary Manager</th>
<th>Ensure Notification</th>
<th>Associated MEWS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glucose</strong></td>
<td>Joslin or OB Resident</td>
<td>Anesthesia</td>
<td></td>
</tr>
<tr>
<td>HIGH or LOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hemodynamics</strong></td>
<td>OB Resident</td>
<td>Anesthesia</td>
<td>SBP &gt; 160 / DBP &gt; 110</td>
</tr>
<tr>
<td>HIGH BP</td>
<td>OB Resident</td>
<td></td>
<td>2ND Uterotonic</td>
</tr>
<tr>
<td>Bleeding</td>
<td>Anesthesia</td>
<td></td>
<td>SBP &lt; 90</td>
</tr>
<tr>
<td>LOW BP</td>
<td>Anesthesia</td>
<td>OB Resident</td>
<td>UO &lt; 30ml X 2 Hrs</td>
</tr>
<tr>
<td>Fluid management</td>
<td>Anesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine Output</td>
<td>Anesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td>Anesthesia</td>
<td>OB Resident for PCA</td>
<td>RR &lt; 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Headache / RUQ Pain</td>
</tr>
<tr>
<td><strong>Nausea / Vomitting</strong></td>
<td>Anesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>Anesthesia</td>
<td>OB Resident for MEWS</td>
<td>Temp &gt; 102 °F (38.9 °C)</td>
</tr>
<tr>
<td><strong>CNS</strong></td>
<td>Anesthesia</td>
<td>OB Resident</td>
<td>Maternal Confusion or Agitation</td>
</tr>
<tr>
<td>Seizure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory / Motor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PART VII

High Risk Obstetrics

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- Cardiac Parturients – Anesthesia for CD 74
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- Caring Parturients Who are on Anticoagulants 77
- Anesthesia Consideration for Pregnant Women Undergoing Non-Obstetric Surgery 78
Cardiac Patient in Obstetrics

Anesthetic
Determined on individual basis.
No evidence of different outcome for labor or cesarean

Patient preparation
One or two IV’s as indicated
Arterial line for NYHA 3 or 4, or high risk patient
Central line for major vasopressors (e.g. epi, norepi)
ECG monitoring
Pulse oximetry for pulmonary hypertension

Medications
From main Omnicell
Cardiac syringe pack
  Phenylephrine 50 ml
  Norepinephrine 50 ml
  Nitroglycerine 20 ml
  Epinephrine 50 ml

From Main Pharmacy (as needed)
  Nitroprusside
  Anti-arrhythmic agents

Uterotonics
  Oxytocin – no contraindication
  Hemabate – use with caution in Pulmonary hypertension
  Methergine – use with caution with obstructive lesions, coronary disease, pulmonary hypertension
  Misoprostil – Large doses may cause rigors and fever (increased oxygen demand)

Goals
- Maintain vital signs near baseline
- Avoid sympathetic stress
- Maintain fetal perfusion
- Tolerate post-delivery volume expansion

This is intended as a general pathway, which can be modified as needed.

Phil Hess, MD
## Risk Definitions

### NYHA functional classification
1 – No limitations of physical activity.
2 – Slight limitation with physical activity, comfortable at rest.
3 – Symptoms with less than ordinary physical activity, comfortable at rest
4 – Symptoms present at rest

### CARPREG risk score

<table>
<thead>
<tr>
<th># Predictors</th>
<th>Risk in Pregnancy (12 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5%</td>
</tr>
<tr>
<td>1</td>
<td>27%</td>
</tr>
<tr>
<td>&gt;1</td>
<td>75%</td>
</tr>
</tbody>
</table>

### High Risk
- Pulmonary Hypertension (SBP>70mmHg)
- Mitral stenosis
- Aortic stenosis
- Systolic dysfunction (LVEF <40%)

### Variable Risk
- HOCM
- Mitral Valve Prolapse with regurgitation
- Arrhythmias

### Lower Risk (usually)
- Mitral regurgitation
- Aortic Regurgitation

This is intended as a general pathway, which can be modified as needed.

Phil Hess, MD
Titration for Labor Epidural Analgesia: Vaginal Cardiac Delivery

Placement as per usual
- May use spinal needle to ensure epidural space.
- NO test dose (epinephrine may be deleterious).
- Aspirate catheter prior to all injections
- If in painful labor, may give 25mcg fentanyl IT
  - NO bupivacaine
- No PCEA
- Begin infusion of 0.04% bupivacaine with fentanyl 1.7mcg/cc at 15cc/hr.
  - NO bolus to avoid hypotension
- After 1 hour, check for sensory change.
  - Usually tingling in both feet and/or sensory level to cold
- May change to 0.0625% after 1 to 2 hours
- Can Increase bupivacaine concentration every 2 hours.
  - Maintain infusion rate at 15cc/hr
  - 0.08%, 0.125%, 0.1875% as needed to have dense sacral level.

After sympathectomy has been achieved additional local anesthetic should not cause a significant change in BP.
- i.e. OK to use lido or CPC for cesarean.

This is intended as a general pathway, which can be modified as needed.

Phil Hess, MD

Goals
- Reduce stress during labor
- Maintain fetal perfusion
- Maintain maternal BP

Target
- Slow onset sympathectomy
- Dense blockade during second stage
Cardiac Delivery Epidural Titration

1. **Bupivacaine 0.04%, Fentanyl 1.7mcg/ml**
   a. Pre-made BF bag from Omnicell
   b. No epinephrine added

2. **Bupivacaine 0.0625%, Fentanyl 1.7 mcg/ml**
   a. Bupivacaine 0.25% 15ml
   b. Fentanyl 50mcg/ml 2ml
   c. Normal saline 43 ml
   Total 60ml

3. **Bupivacaine 0.08%, Fentanyl 1.7 mcg/ml**
   a. Bupivacaine 0.25% 19ml
   b. Fentanyl 50mcg/ml 2ml
   c. Normal saline 39ml
   Total 60ml

4. **Bupivacaine 0.125%, Fentanyl 1.7 mcg/ml**
   a. Bupivacaine 0.25% 30ml
   b. Fentanyl 50mcg/ml 2ml
   c. Normal saline 28ml
   Total 60ml

5. **Bupivacaine 0.1875%, Fentanyl 1.7 mcg/ml**
   a. Bupivacaine 0.25% 112.5ml
   b. Fentanyl 50 mcg/ml 5ml
   c. Normal saline 32.5ml
   Total 150ml

Phil Hess, MD
Cesarean Epidural Management
Obstetric Cardiac Patient

**Preparation**
Phenylephrine infusion in line
Norepinephrine (not primed) (obstructive lesions, Cardiomyopathy)
Nitroglycerine (not primed) (Mitral stenosis, Coronary disease)
Minimize fluid administration

**Epidural Anesthesia**
Placement as per usual
- May use spinal needle to ensure epidural space
- NO test dose for obstructive lesion or arrhythmia
  (epinephrine may be deleterious)

Example of Titrated Dosing
- Bupivacaine 0.5%
- 2 cc given every 5 min
- 50 mcg fentanyl on 3rd dose
- Test level after 5th dose
  - Assess for sensory changes in feet
  - Level to cold
- After 20 cc wait for level to T10
- Fentanyl 50 mcg when level T10
- May use lidocaine 2% with Bicarb (no epinephrine) after T6 level achieved

**After Delivery**
Autotransfusion management for Mitral Stenosis
- 10mg furosemide
- Nitroglycerine infusion titrated to symptoms or CVP/PA
- Consider phlebotomy for acute decompression of volume overload (obtain from Blood bank)

This is intended as a general pathway, which can be modified as needed.

Phil Hess, MD
CARING PATIENTS WHO HAVE OPIOID USE DISORDER UNDERGOING FOR CESAREAN DELIVERY

Obstetric Anesthesia | Beth Israel Deaconess Medical Center | 2020

SCOPE OF THE PROBLEM

Substance use in pregnancy has escalated in recent years. Opioid dependent patients frequently have severe postoperative pain due to buprenorphine-induced hyperalgesia or methadone-induced opioid tolerance (Am J Drug Alcohol Abuse. 2009; 35:151-156).

Currently, lacking research data and guidelines at national level hampers healthcare providers to optimize the management for this group of patients.

LIST OF MEDICATIONS

<table>
<thead>
<tr>
<th>Medications</th>
<th>Mechanisms</th>
<th>Half life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methadone</td>
<td>Full agonist</td>
<td>8-59 hrs</td>
</tr>
<tr>
<td>Buprenorphine (Subutex)</td>
<td>Partial agonist</td>
<td>24-60 hrs</td>
</tr>
<tr>
<td>Suboxone (Buprenorphine +Naloxone)</td>
<td>Agonist and antagonist</td>
<td>~ 37 hrs</td>
</tr>
<tr>
<td>Naltrexone</td>
<td>Pure opioid Antagonist</td>
<td>13-14 hrs</td>
</tr>
</tbody>
</table>

- The human mu opioid receptor occupancy by buprenorphine is dose-related: 27-47% at 2mg and 89-98% at 32mg (Biological Psychiatry 2007; 61:101-110).
- Naloxone is not orally active. It is used to reduce diversion because Suboxone causes severe withdrawal symptoms when injected (ACOG Committee Opinion Number 711, August 2017).

GOALS

Multimodal analgesia and team collaboration are preferable to achieve the best possible postoperative pain control and patient satisfaction.

SUGGESTIONS

Preoperative

- In patients taking buprenorphine or suboxone,
  1. Continue buprenorphine if the patients are on low dose (< or = 8mg)
  2. Give daily total dose in divided q8h doses if the patients are on high doses (>or = 16mg)
3). Taper to stop 72 hr prior to scheduled Cesarean delivery, then transition to traditional opioid (it may not be practical).

- In patients taking methadone, continue the medicine.
- In patients taking Naltrexone, taper to stop 72 hr prior to scheduled Cesarean delivery.
- Obstetric Anesthesia consult and discussion of patient wishes for postpartum opioids.

**On the Day of Surgery**

- The team will discuss the multimodal plan for pain control that tailors to individual patient.
- Neuraxial anesthesia is preferred.
- Consider NOT to use neuraxial morphine in patients on high dose of methadone (> 60-80mg) or buprenorphine (>8mg).
- May consider using intrathecal dexmedetomidine.
- Consider low dose intraoperative ketamine intravenously.
- Consider thoracic epidural for postoperative analgesia.

**Postoperative**

- Continue the baseline dose of methadone or buprenorphine.
- Use hydromorphone PCA for postop analgesia for breakthrough pain at 1.5-2 times the routine dose if the patient did not receive intrathecal morphine.
- Round-the-clock ketorolac and acetaminophen.
- Consider TAP or QL blocks.
- Consider using thoracic or high lumbar epidural and using plain bupivacaine only
- Patients on methadone required 70% more opioids following cesarean delivery.
- Opiate agonist/antagonist medications such as nalbuphine or butorphanol are contraindicated as opiate withdrawal may be precipitated in the opioid dependent patient.

**References**

1. Anesth Analg 2017; 125(5): 1779-1783

By Merry Colella, MD and Yunping Li, MD
Guidelines for Patients on Unfractured Heparin

Additional Guidelines:

1. For patients on enoxaparin, adhere to the ASRA guidelines for timing of neuraxial as there is insufficient data currently to change this practice.

2. For patients on heparin for >4 days, check a platelet count from within the past 24 hours prior to performing neuraxial procedures, due to the risk of heparin-induced thrombocytopenia.

Merry Colella, MD
Non-Obstetric Surgery during Pregnancy

Background & Planning

- Non-Obstetric Surgery during Pregnancy occurs in between 0.3-2.2% of pregnancies.
- Human studies have **not conclusively shown** that any anesthetic agent results in increased congenital abnormalities. (previous studies that suggested teratogenic effects of nitrous oxide and benzodiazepines are not supported by more recent studies and epidemiologic data).
- General timing principals include:
  - If surgery is elective, defer until postpartum if appropriate.
  - If surgery is non-elective and can be delayed without maternal harm, postpone until second trimester (1st trimester - potential teratogenic risk, 3rd trimester - preterm labor risk).
  - If surgery is emergent, proceed as necessary.

- **Early communication** with Obstetrician for appropriate pre-, post- and possible intra-operative monitoring.
- Intra-operative monitoring typically reserved for after the age of viability (>24 weeks) and per OB and patient discretion.
  - Requires a L&D nurse in the OR and that an OB be available on stand-by.
  - Cesarean section tray needs to be in the OR at the start of the case along with neonatal resuscitation equipment (including a neonatal warmer).
  - OBs may want to dose perioperative glucocorticoids for infant lung maturity (requires 48 hours).
- Increased maternal sensitivity to sedatives, narcotics and local anesthetics.

Pre-operative

- Perform evaluation, consent and discuss plan with OB and surgery team.
- Administer Sodium citrate 30 ml PO <30 min before induction, if >12-16 weeks gestation.
  - May consider metoclopramide 10 mg and/or ranitidine 30 mg IV, >30 minutes prior to induction.
- Midazolam is not contraindicated, utilize if necessary.

Induction

- Place patient in Left Uterine Displacement, if >18-20 weeks gestation. Maintain throughout surgery, if possible.
  - If prone, ensure abdomen is uncompressed.
- Preoxygenation with either 100% O2 for 3 minutes or 4-8 vital capacity breaths.
- Rapid sequence induction.
- Tracheal intubation:
Airway edema associated with pregnancy
- Video laryngoscopy may be considered first choice.
- Endotracheal tube size 6.5 or 6.0 mm in light of possible airway edema.

**Intra-operative**
- Goal is to maintain appropriate pregnancy homeostasis.
- Maintain normotension.
- Recommended initial ventilator settings of 6-8 ml/kg of IBW and a RR of 14-18.
  - There is a respiratory alkalosis in pregnancy with a normal PaCO2 of 30 mmHg. Ventilator setting should be titrated to limit hypercapnia.
- Volatile anesthetics
  - MAC decreased by 20-30%.
  - May cause decreased variability of fetal heart rate (>25-27 weeks).
  - Dose dependent uterine relaxation.
- If uterine contractions noted, consider tocolytics in consult with OB attending (nitroglycerin 50-200 mcg IV or terbutaline 0.25 mg IM).
- Laparoscopy: maintain a low pneumoperitoneum pressure (< 15 mmHg).
- Avoid NSAID’s due to risk of prematurely closure of ductus arteriosus.
- Safe to use opioids.
- Dexmedetomidine crosses placenta and may cause fetal bradycardia at high dose, use with caution.
- For reversal of Neuromuscular Blockade:
  - Sugammadex appears safe to use, although there is limited data.
  - Be aware that neostigmine crosses the uteroplacental barrier to a greater degree than glycopyrrolate. The use of glycopyrrolate with neostigmine may lead to marked fetal bradycardia, which may prompt OB’s to initiate emergent cesarean.
  - Atropine will cross the uteroplacental barrier and may be used as an adjunct for reversal. This may cause both maternal and fetal tachycardia.
- Pay careful attention to extubation with patient maintaining appropriate respiratory physiology, fully awake and following commands.
  - Majority of respiratory-related deaths occurred during emergence, extubation and recovery.

**Post-operative**
- Avoid NSAIDs.
- Evaluate for normal post-operative issues including pain, nausea and vomiting.
- Patient may need transport to L&D. OBs will likely obtain post-operative Fetal Heart Rate tracing and monitor for contractions.
- Venous thrombosis prophylaxis should be considered, if the patient is expected to be admitted.

John J. Kowalczyk, MD
PART VIII

Anesthetic Complications

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- Local Anesthetic Systemic Toxicity 84
- Postdural Puncture Headache 85
- What the Patient Needs to Know after a Dural Puncture 86
- Post Epidural Blood Patch Instructions 87
Management of Intrathecal Catheter

**An Accident Wet Tap**

**Easy Placement**
- Re-do placement in another space
- Pros: avoid intrathecal catheter
- Cons: Potential risk for **high spinal**, especially during Cesarean section

**Difficult Placement**
- Insert an epidural catheter into subarachnoid space. Keep 4-5 cm in space,
- No test dose if confirmed IT catheter
- You could do a test dose and a glucose test to confirm or rule out an IT catheter
- Label “IT” EVERYWHERE: the catheter, the pump and the white board.

**Notify attending and the team**

**Management**
- Proceed with usual epidural management
- Check level often
- You may need to decrease epidural infusion rate if the level is too high
- May need less volume for cesarean

**Management for Labor**
- Start IT infusion with regular BEF at 3 ml/h. Could bolus 2ml of BEF at a time if needed
- Remove the self-bolus button
- Check level q1h
- May adjust epidural infusion rate up according to the level

**Management for CD**
- Bolus 0.5ml of 0.75% hyperbaric Bupivacaine first and check level to ensure IT catheter works
- Then bolus 25 mcg Fentanyl and 0.25mg PF Morphine
- Titrate in small dose of 0.75% Bupivacaine to achieve T4 level

Yunping Li, MD
High Neuroblockade & Total Spinal Block

Clinical Significance
High neuraxial block was the leading cause of anesthesia-related maternal death\textsuperscript{1}. It was also the leading cause of legal claims for maternal death or permanent brain injury filed between 1990-2003\textsuperscript{2}.

Risk Factors
- Unrecognized intrathecal catheter – Immediate onset
- Subdural catheter -delayed onset
- Spinal after failed epidural anesthesia for cesarean delivery -immediate
- After an unintentional dural puncture, the epidural catheter was inserted in a different space. During cesarean delivery, epidural local anesthetics enters subarachnoid space through the dural defect -delayed onset
- Overdose of local anesthetics in the epidural space

Symptoms and Signs – vary in presentation
- Agitation to sudden loss of consciousness, coma or seizures
- Inability to speak to difficult of breathing to respiratory arrest
- Mild hypotension to cardiac collapse
- Paralysis and dysphasia
- Subdural block – may involve the cranial nerves, apnea and Horner’s syndrome can occur

Prevention
- Aspiration of the catheter before each bolus
- Administration of test dose and careful assessment of the patient’s response
- During labor epidural analgesia, when late onset of hypotension and high block occur, you need to rule out the possibility of intrathecal catheter.
- Incremental dosing of epidural (5ml), \textbf{EACH DOSE IS A TEST DOSE}

Treatment
- Maintain oxygenation, ventilation (may need intubation) and circulation

References:

Yunping Li, MD
Local Anesthetic Systemic Toxicity (LAST)

Background
- Incidence after peripheral nerve blocks is higher than epidural
- The first case of successful use of a 20% lipid emulsion in a patient after LAST with cardiac arrest (Anesthesiology 2006; 105:217-8)
- Use of epinephrine in LA decreases systemic absorption.

Risk Factors
- Extremes of age
- Nerve block site
- Patient-related factors: cardiac, renal and hepatic diseases
- Multiple procedures, like labor analgesia to cesarean section, regional block after cesarean section
- Multiple routes of administration: local infiltration, irrigation, neuraxial, nerve blocks and lidocaine patch.

Diagnosis
- The signs, symptoms and timing of LAST are unpredictable and can be subtle
- Mental status change to convulsions.
- Cardiac instability to cardiac arrest.
- Be vigilant. Early diagnosis is the key for successful resuscitation.

Treatment (ASRA guidelines)
- **Bolus** 1.5ml/kg, of 20% Lipid IV over 1min (100ml for 70 kg)
- **Infusion** 0.25 ml/kg/min for 30-60 min
- **Repeat Bolus** 1-2 times for persistent cardiovascular collapse
- **Double Infusion** if BP returns but remains low
- **Avoid** vasopressin, beta blockers, calcium channel blockers and propofol

Reg Anesth Pain Med 2010; 35: 152-161

Yunping Li, MD
Management of Postdural Puncture Headache

Assessment by Anesthesia Team

**Diagnosis:** Positional component of Headache and/or neck stiffness
- Consent: balance benefits and risk (possible wet tap, HA may return)
- OMR note – can use Macro template
- Add to OB log

Mild headache and patient is functional
Able to stand, walk and take care of her baby

**CONSERVATIVE**

- Maintain hydration
- **1st line:** Acetaminophen, NSAID’s
- **2nd line:** Tramadol, Oxycodone
- Cosyntropin 1 mg IV (over 20’)

Moderate to severe headache
Limitations to perform ADL or Presence of diplopia or auditory disturbances (Cranial nerve stretched)

Conservative + Epidural Blood Patch

Declines EBP or Contraindications: coagulopathy or infection

Epidural Blood Patch
1. Informed consent
2. Nurse for time out
3. Sterile procedure
4. up to 40 ml of autologous blood
5. Post EBP, lay supine for 60 min
6. Give patient a post EBP info sheet
7. OMR note – Macro template
8. May consider a dose of Tylenol/ketorolac

Follow up
- OMR note,
- Update OB log
- Follow up till patient is asymptomatic
- Remove from OB log once follow up complete

If the PDPH returns
- Assess for change in character of headache
- Consider other causes of headache
- Repeat EBP
- Consider Cosyntropin 1 mg IV (over 20 min)
- Consider 3rd EBP if other causes are ruled out

Reference:

Vimal K. Akhouri, MD
What you need to know

During the placement of your epidural, a layer around the spinal fluid, called the dura, was punctured with a needle. The puncture of the dura happens on occasion during the placement of an epidural catheter. The hole allows spinal fluid to slowly drain.

You are at risk of developing a ‘spinal’ headache.

A spinal headache usually starts one to three days after the puncture of the dura, and can range from mild to severe. The headache is usually felt in the front or back of the head, or may even cause a muscle cramping between your shoulder blades. It always gets worse when you stand or sit. It improves or goes away when you lie down.

Other symptoms may include: nausea and vomiting, ringing in your ears, sensitivity to light, and double vision.

We can discuss treatment options with you.

If you develop a headache, please call:

- OB Anesthesia Office: 617-667-3077, or
- Labor and Delivery: 617-667-2295, or
- Department of Anesthesia: 617-667-3112

Ask for the OB Anesthesiologist.

You may also call your Obstetrician (OB), who can get in touch with us.

Things you should know:

- These headaches ultimately go away without treatment – it can take days to a couple of weeks.
- The most effective treatment is an epidural blood patch, which your provider can explain in detail.
- Drink enough water to avoid being dehydrated, eat, and sleep to the best of your ability as you would normally.
- Do not stand for prolonged periods of time, even if the headache is mild.
- If the headache is severe or you think you need treatment, please contact us.
- You can use Tylenol (acetaminophen) or Ibuprofen for pain control, if you do not have any other contraindications to these medications. You may also trial caffeine.
Post-Epidural Blood Patch Instructions

1. No heavy lifting, bending, or straining for the first 48 hrs

2. Take Tylenol as needed for back discomfort

3. You may shower

4. If you have symptoms of fever, chills, worsening headache and/or severe back pain, please call your obstetrician’s office

5. Expect a call from an Obstetric Anesthesiologist tomorrow to follow up

6. If you have further questions/concerns about blood patch, please feel free to call 617-667-2295 and ask for an Obstetric Anesthesiologist. We are here 24 hours a day and are happy to address your questions/concerns as soon as possible
THANK YOU

CONTRIBUTING AUTHORS

Vimal Akhouri, MD
Maria Borrelli, MD
Erin Ciampa, MD, PhD
Merry Colella, MD
Phil Hess, MD
Galina Korsunsky, MD
John Kowalczyk, MD
Lior Levy, MD
Yunping Li, MD
Dillon Schafer, MD
Aidan Sharkey, MD
Joan Spiegel, MD
Justin Stiles, MD
Lindsay Sween, MD, MPH