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# Obstetrical Crisis Management

## What is your Plan B?

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# Conflict of Interest Disclosure Statement

I have no financial relationships with any commercial interest related to the content of this activity.

I will discuss the following off-label use during my presentation:

- Fentanyl
  - Bupivacaine
  - Atropine
  - Ondansetron
  - Ketorolac
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# Post Partum Hemorrhage

- Early cumulative EBL > 1000 ml
- OR - loss associated with s/sx of hypovolemia

Case reviews:

***Denial and delay***

# National Partnership for Maternal Safety: Consensus Bundle on Obstetric Hemorrhage

Elliott K. Main, MD, Dena Goffman, MD, Barbara M. Scavone, MD, Lisa Kane Low, PhD, CNM, Debra Bingham, DrPH, RN, Patricia L. Fontaine, MD, MS, Jed B. Gorlin, MD, David C. Lagrew, MD, and Barbara S. Levy, MD

## **Box 1. Obstetric Hemorrhage Safety Bundle From the National Partnership for Maternal Safety, Council on Patient Safety in Women's Health Care**

### **Readiness (Every Unit)**

1. Hemorrhage cart with supplies, checklist, and instruction cards for intrauterine balloons and compression stitches
2. Immediate access to hemorrhage medications (kit or equivalent)
3. Establish a response team—who to call when help is needed (blood bank, advanced gynecologic surgery, other support and tertiary services)
4. Establish massive and emergency-release transfusion protocols (type-O negative or uncrossmatched)
5. Unit education on protocols, unit-based drills (with postdrill debriefs)

### **Recognition and Prevention (Every Patient)**

6. Assessment of hemorrhage risk (prenatal, on admission, and at other appropriate times)
7. Measurement of cumulative blood loss (formal, as quantitative as possible)
8. Active management of the 3rd stage of labor (department-wide protocol)

### **Response (Every Hemorrhage)**

9. Unit-standard, stage-based obstetric hemorrhage emergency management plan with checklists
10. Support program for patients, families, and staff for all significant hemorrhages

### **Reporting and Systems Learning (Every Unit)**

11. Establish a culture of huddles for high-risk patients and postevent debriefs to identify successes and opportunities
12. Multidisciplinary review of serious hemorrhages for systems issues
13. Monitor outcomes and process metrics in perinatal quality improvement committee

<http://www.safehealthcareforeverywoman.org>

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# Obstetrical Hemorrhage – **Best Clinical Practice**

- Hemorrhage cart
- Hemorrhage meds – immediate access
- Response team
- Transfusion protocol
- Unit based drills

## **Recognition and prevention**

Assessment of risk

Precise measurement of EBL

Active management of 3<sup>rd</sup> stage by OB

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# Cell Salvage in Obstetrics

- Risks of cell saver use in OB population parallel those in the general population
  - *No definite cases of AFE reported with contemporary equipment*

**Waste blood and amniotic fluid prior to delivery of the placenta**

**Use a leukocyte depletion filter**

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# Amniotic Fluid Embolus

- Peripartum syndrome
  - Rapid onset dyspnea, hypoxia
  - Cardiac collapse
  - Consumptive coagulopathy

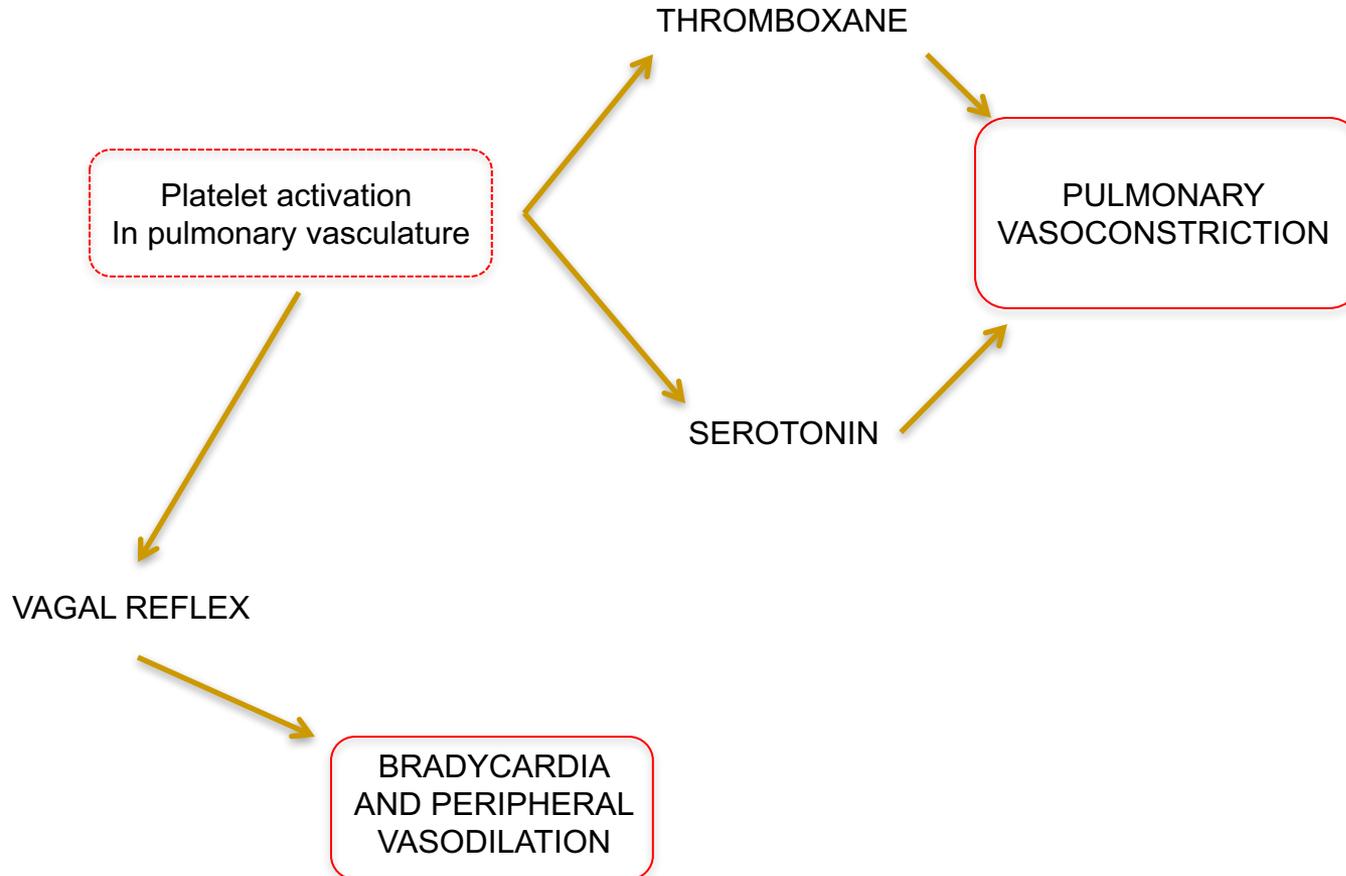
**Likely an anaphylactoid syndrome caused by an unknown fetal antigen**

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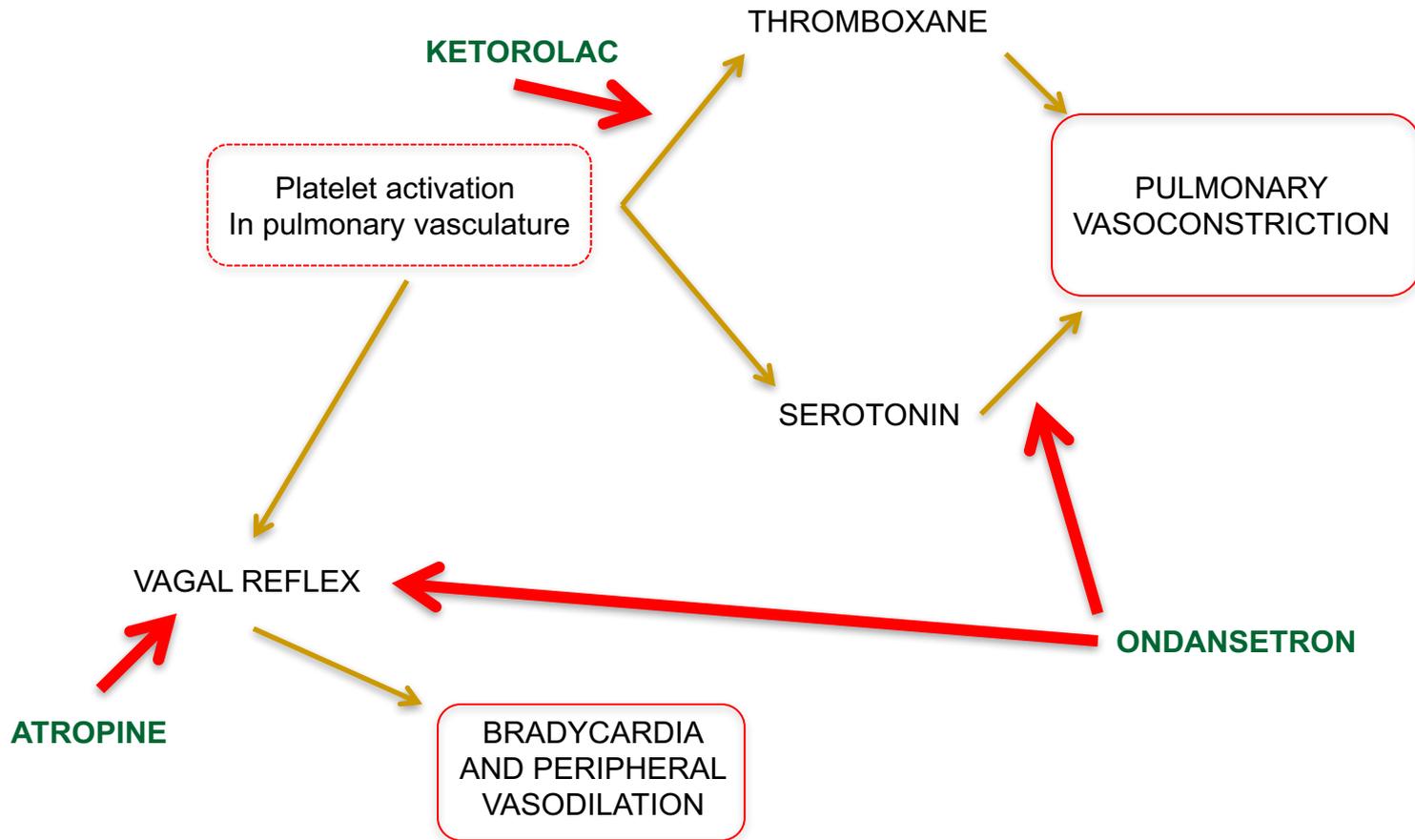
# Pathophysiology of any PE - Amniotic Fluid Embolus

- Platelet activation and degranulation
    - Thromboxane – serotonin release
      - Severe pulmonary hypertension
    - Vagal reflex
      - Bradycardia and vasodilation
  - TEE
    - Profound RV dilation and failure
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# Amniotic Fluid Embolus – AOK protocol – proposed mechanism



# Amniotic Fluid Embolus – AOK protocol – proposed mechanism



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# AOK Protocol (*off-label uses*)

CPR, delivery, call for CPB

- Atropine 1 mg
  - vagolysis
- Ondansetron 8 mg
  - block serotonin receptors
- Ketorolac 30 mg
  - block thromboxane release

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# Preeclampsia

- 5-7% of pregnancies
    - Preeclampsia (HTN after 20 wks, renal or liver sx)
    - Eclampsia (CNS involvement – seizures)
    - HELLP
      - Hemolysis
      - Elevated liver enzymes
      - Low platelets
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# PIH - Implications for anesthesia

- ↓ plasma volume
- ↑ upper airway edema
- ↓ renal function – renal arteriolar vasoconstriction
- ↑ liver enzymes – splanchnic vasoconstriction
- CNS irritability – hyperreflexia

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# PIH therapy

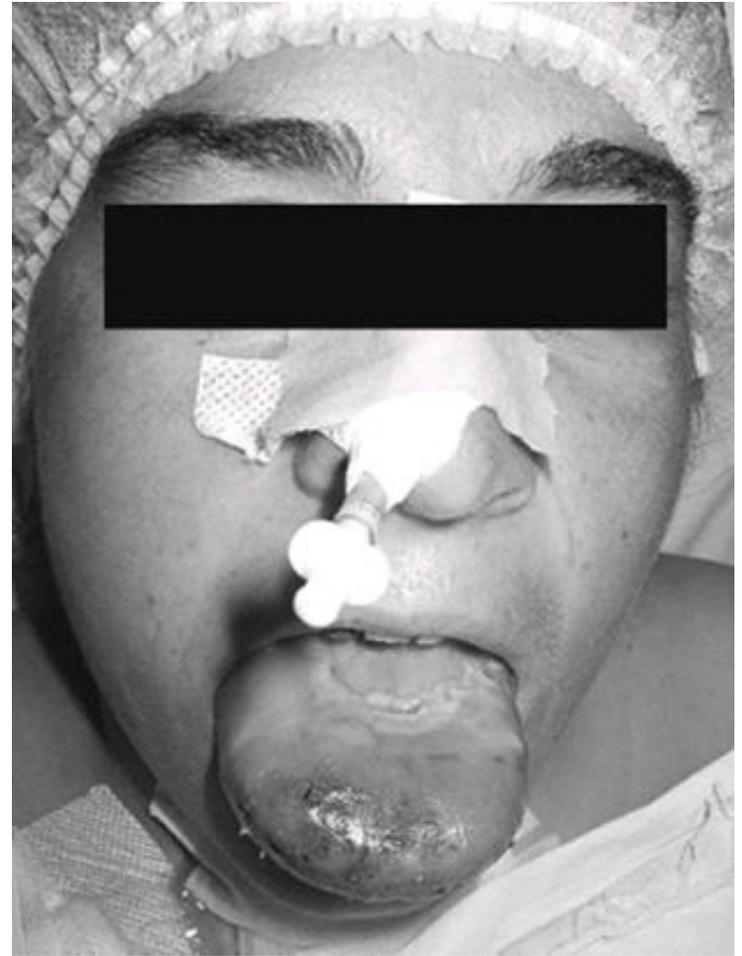
- Magnesium sulfate (anticonvulsant, tocolytic, vasodilator)
- Plasma levels
  - Normal 1.5-2.0 mg/dl<sup>-1</sup>
  - Therapeutic range 4.0-8.0 mg/dl<sup>-1</sup>
  - Loss of deep tendon reflex 10 mg/dl<sup>-1</sup>

↑ potency and duration of nondepolarizing muscle relaxants

**No need to pretreat prior to succinylcholine**

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# Traumatic macroglossia



# C/S in severe preeclampsia – *Evidence Based Best Practice*

## SAB for C/S –

- ❑ Preeclamptic is 6x *less* likely to develop ↓ BP than a healthy parturient
- ❑ No bolus needed

***If*** – platelets are > 80,000 and PT/PTT are normal

**CME** **Neuraxial Anesthesia in Parturients with  
Thrombocytopenia: A Multisite Retrospective  
Cohort Study**

Christopher G. Goodier, MD,\* Jeffrey T. Lu, MD,† Latha Hebbar, MD, FRCA,‡ B. Scott Segal, MD, MHCM,§  
and Laura Goetzl, MD, MPH||

- 280 women with plt counts < 100k/mm<sup>3</sup>
  - GETA 41%
  - SAB 36%
  - EPI 23%
- Hematoma cases - 0
- GETA morbidity rate - 6.5%

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# Preeclampsia – GETA and CVA

- 2002-2007
- 304,000 CS deliveries
- 8500 had preeclampsia

***Risk of stroke 2.38 x greater in  
GA group v neuraxial group***

# Leading Cause of Maternal Death?

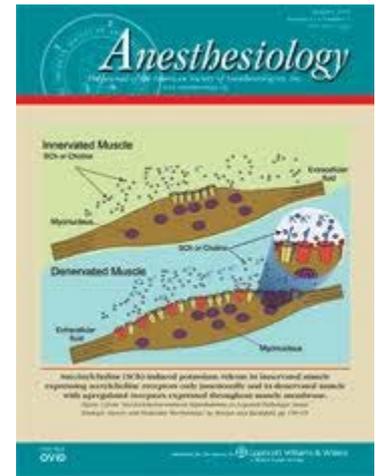


Table 5. Causes of Maternal Death/Permanent Brain Damage (n = 69) 1990 or Later

	Overall (n = 69), %	General Anesthesia (n = 28), %	Regional Anesthesia (n = 41), %
High neuraxial block	15 (22)	0 (0)	15 (37)
Maternal hemorrhage	11 (16)	8 (29)	3 (7)
Embolic events	8 (12)	2 (7)	6 (15)
Difficult intubation	7 (10)	7 (25)	0 (0)
Preeclampsia/HELLP syndrome	5 (7)	3 (11)	2 (5)
Medication	5 (7)	0 (0)	5 (12)
Inadequate oxygenation/ventilation	3 (4)	1 (4)	2 (5)
Aspiration of gastric contents	2 (3)	1 (4)	1 (2)
Neuraxial cardiac arrest	2 (3)	0 (0)	2 (5)
Hypertensive intracranial hemorrhage	2 (3)	1 (4)	1 (2)
Central venous catheter	1 (1)	1 (4)	0 (0)
Chorioamnionitis/ARDS	1 (1)	1 (4)	0 (0)
Airway obstruction	1 (1)	1 (4)	0 (0)
Other/unknown	6 (9)	2 (7)	4 (10)

**High block – 22%**

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# Identification of subarachnoid placement

- Lidocaine 1.5% 1:200,000 epi 3 ml (45 mg)

*perform a careful assessment of sympathetic, motor and sensory function 3-5 min after injection*

However:

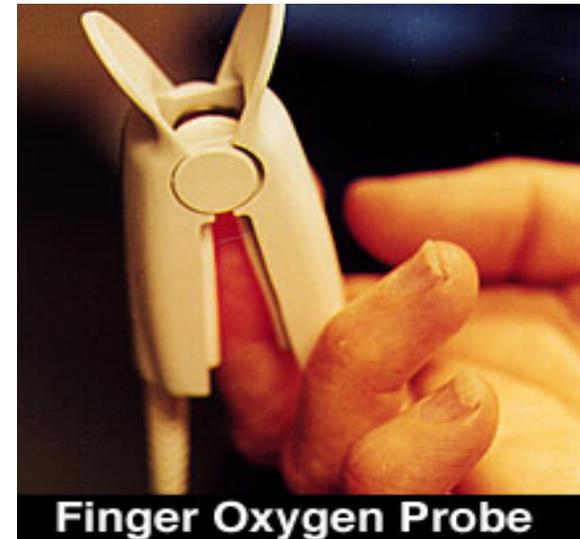
SABs fail for many reasons

Undiagnosed intrathecal catheters are rare – false positive TDs are not

LA TD for intrathecal catheters not been extensively studied

# Cardinal Rules – Neuraxial Anesthesia

- ❖ Assess for gravity dependent flow of CSF
- ❖ Gentle aspiration with 5 ml glass or 3ml plastic
- ❖ Appropriate test dose – intravascular marker
- ❖ Incremental dosing – never > 5 ml
- ❖ **Stay with the patient and observe – 30 min**
- ❖ Lipids and resuscitation equipment available



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# Treatment of total spinal

- Airway, ventilation and cardiovascular support
  - Consider undiagnosed medical problems:
    - cardiomyopathy
    - anaphylactic shock
    - eclampsia
    - ***amniotic fluid embolus***
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# **CME** The Society for Obstetric Anesthesia and Perinatology Consensus Statement on the Management of Cardiac Arrest in Pregnancy

Steven Lipman, MD,\* Sheila Cohen, MB, ChB, FRCA,\* Sharon Einav, MD,†  
Farida Jeejeebhoy, MD, FRCPC, FACC,‡ Jill M. Mhyre, MD,§ Laurie J. Morrison, MD, MSc, FRCPC,||  
Vern Katz, MD,¶ Lawrence C. Tsen, MD,# Kay Daniels, MD,\*\* Louis P. Halamek, MD, FAAR,††  
Maya S. Suresh, MD,‡‡ Julie Arafteh, RN, MSN,§§ Dodi Gauthier, M.Ed, RNC-OB, C-EFM,|||  
Jose C. A. Carvalho, MD, PhD, FANZCA, FRCPC,¶¶ Maurice Druzin, MB, BCh,\*\*  
and Brendan Carvalho, MBBCh, FRCA\*

**Table 1. Checklist of Key Tasks During the First Minutes of In-House Maternal Cardiac Arrest**

Call for help	<input type="checkbox"/> Call "OB Code"
Start CPR	<input type="checkbox"/> Call neonatal team <input type="checkbox"/> AED/defibrillator <input type="checkbox"/> IMMEDIATE BLS <input type="checkbox"/> Adult code cart <input type="checkbox"/> Adult airway equipment <input type="checkbox"/> Backboard <input type="checkbox"/> Scalpel/Cesarean pack <input type="checkbox"/> Assign timer/documenter
C Circulation	<input type="checkbox"/> Left uterine displacement (manual)
Chest compressions	<input type="checkbox"/> Hands mid-sternum <input type="checkbox"/> 100 compressions/min <input type="checkbox"/> PUSH HARD! PUSH FAST! <input type="checkbox"/> Change compressors every 2 min <input type="checkbox"/> Obtain IV access above diaphragm
A Airway	<input type="checkbox"/> Chin lift/jaw thrust <input type="checkbox"/> 100% O <sub>2</sub> at 10–15 L/min <input type="checkbox"/> Use self-inflating bag mask <input type="checkbox"/> Oral airway or <input type="checkbox"/> Experienced personnel: Intubation with 6–7.0 ETT or <input type="checkbox"/> Supraglottic airway (e.g., LMA) <input type="checkbox"/> Do not interrupt chest compressions!
B Breathing	<input type="checkbox"/> If not intubated: 30 compressions to 2 breaths <input type="checkbox"/> If intubated: 10 breaths per min (500–700 mL per breath)
D Defibrillate	<input type="checkbox"/> Administer each breath over 1 s <input type="checkbox"/> Pads front and back <input type="checkbox"/> Use AED or Analyze/defibrillate every 2 min <input type="checkbox"/> Immediately resume CPR for 2 min <input type="checkbox"/> Prepare for delivery
E Extract FETUS	<input type="checkbox"/> Aim for incision by 4 min <input type="checkbox"/> Aim for fetal delivery by 5 min

**Table 2. Checklist of Potential Contributing Factors to Maternal Cardiac Arrest**

- A Anesthetic complications (high neuraxial block, loss of airway, aspiration, respiratory depression, hypotension, local anesthetic systemic toxicity)
- B Bleeding\* (coagulopathy, uterine atony, placenta accreta, placental abruption, placenta previa, uterine rupture, trauma, surgical, transfusion reaction)
- C Cardiovascular causes (cardiomyopathy, myocardial infarction, aortic dissection, arrhythmias)
- D Drugs (anaphylaxis; illicit; drug error; magnesium, opioid, insulin, or oxytocin overdose)
- E Embolic (pulmonary embolus, amniotic fluid [AFE], air)
- F Fever\* (infection, sepsis)
- G General nonobstetric causes of cardiac arrest (H's and T's)†
- H Hypertension\* (preeclampsia/eclampsia/HELLP, intracranial bleed)

# Cardiac arrest – What's the Difference?

- Compressions – *hand position slightly higher*
- *Manual LUD (if uterus is visible)*
- Intubate – ventilate 100% oxygen
- ACLS Drugs per guidelines – *none contraindicated*
- If on  $\text{MgSO}_4$  at time of arrest – consider CaCl
- *PMCD* – promptly (*within 5 min*) to restore maternal circulation/oxygenate fetus

# Maternal Cardiac Arrest

## First Responder

- Activate maternal cardiac arrest team
- Document time of onset of maternal cardiac arrest
- Place the patient supine
- Start chest compressions as per BLS algorithm; place hands slightly higher on sternum than usual

## Subsequent Responders

### Maternal Interventions

#### Treat per BLS and ACLS Algorithms

- Do not delay defibrillation
- Give typical ACLS drugs and doses
- Ventilate with 100% oxygen
- Monitor waveform capnography and CPR quality
- Provide post-cardiac arrest care as appropriate

#### Maternal Modifications

- Start IV above the diaphragm
- Assess for hypovolemia and give fluid bolus when required
- Anticipate difficult airway; experienced provider preferred for advanced airway placement
- If patient receiving IV/IO magnesium prearrest, stop magnesium and give IV/IO calcium chloride 10 mL in 10% solution, or calcium gluconate 30 mL in 10% solution
- Continue all maternal resuscitative interventions (CPR, positioning, defibrillation, drugs, and fluids) during and after cesarean section

### Obstetric Interventions for Patient With an Obviously Gravid Uterus\*

- Perform manual left uterine displacement (LUD)—displace uterus to the patient's left to relieve aortocaval compression
- Remove both internal and external fetal monitors if present

#### *Obstetric and neonatal teams should immediately prepare for possible emergency cesarean section*

- If no ROSC by 4 minutes of resuscitative efforts, consider performing immediate emergency cesarean section
- Aim for delivery within 5 minutes of onset of resuscitative efforts

\*An obviously gravid uterus is a uterus that is deemed clinically to be sufficiently large to cause aortocaval compression

### Search for and Treat Possible Contributing Factors (BEAU-CHOPS)

- B**leeding/DIC
- E**mbolism: coronary/pulmonary/amniotic fluid embolism
- A**nesthetic complications
- U**terine atony
- C**ardiac disease (MI/ischemia/aortic dissection/cardiomyopathy)
- H**ypertension/preeclampsia/eclampsia
- O**ther: differential diagnosis of standard ACLS guidelines
- P**lacenta abruptio/previa
- S**epsis

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# Labor Room Setting Compared With the Operating Room for Simulated Perimortem Cesarean Delivery

*A Randomized Controlled Trial*

*Steve Lipman, MD, Kay Daniels, MD, Sheila E. Cohen, MChB, FRCA, and Brendan Carvalho, MBBCh, FRCA*

1090 VOL. 118, NO. 5, NOVEMBER 2011

OBSTETRICS & GYNECOLOGY

## **15 multi-disciplinary teams**

- Simulated AFE with maternal cardiac arrest
- Randomization: Delivery in OR vs. LDR

**Time to incision 4.25 LDR v 7.53 min OR**

# Transport Decreases the Quality of Cardiopulmonary Resuscitation During Simulated Maternal Cardiac Arrest

Steven S. Lipman, MD, Jocelyn Y. Wong, BA, Julie Arafeh, RN, MSN, Sheila E. Cohen, MBChB, FRCA, and Brendan Carvalho, MBBCh, FRCA

162 [www.anesthesia-analgesia.org](http://www.anesthesia-analgesia.org)

January 2013 • Volume 116 • Number 1

26 two-provider multi-disciplinary teams

Randomized to CPR during transport or while stationary

- Stationary group – 92% correct
- Transport group - 7% correct

# Obstetrical Predictors of Failed Neuraxial Labor Analgesia

- Nulliparity,  $\uparrow$  fetal wt,  $\downarrow$  cervical dil at placement
- Pain within 30 min of insertion
- Abnormal fetal presentation
- More than one episode of breakthrough pain



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# Breakthrough pain – *During Labor*

- Use adjuvants – Fentanyl/Epinephrine
- Attempt to Rx with ↑ ***volume***
- Replace/Resite

*Do not waste time convincing yourself a block exists when it is inadequate!*

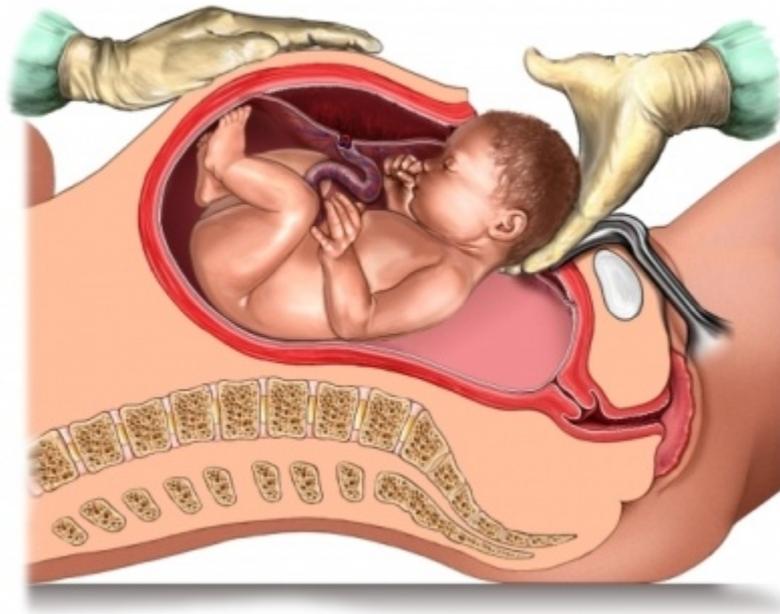
*Communicate with LDRN and OB!*

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# EPI Volume Matters (*a lot*)

<b>Bup 20 mg</b>	<b>4 ml 0.5% n=19</b>	<b>10 ml 0.2% n=19</b>	<b>20 ml 0.1% n=20</b>
Pain (VAS)	4.37	0.88	0.25
Mean duration	43 min	100 min	120 min
Motor block	+	+++	+++
Complete relief	5.26%	57.8%	75%

# Converting labor EPI to C/S EPI



# Converting a labor EPI to a C/S EPI

- Lido 2% 1:200,000 epinephrine
- +/- Bicarb 1 meq/10 ml
- In the presence of a well functioning epidural-  
10-15ml – *in divided doses*



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# Factors Thought to be Associated with Epidural Conversion Failure

- Duration of labor analgesia
- Tall v short stature
- CSE v EPI only
- OB specialist v non-specialist
- Number of boluses for breakthrough pain
- Urgency of CS

# Failure to Extend Epidural Labor Analgesia for Cesarean Delivery Anesthesia: A Focused Review

Suzanne K. W. Mankowitz, MD,\* Antonio Gonzalez Fiol, MD,† and Richard Smiley, MD, PhD\*

**Reported as high as 21%**

## ***Why not GETA?***

- Higher incidence of maternal mortality
- Pulmonary aspiration
- Difficult intubation
- Neonatal depression
- Intraoperative awareness
- Uterine relaxation – volatile agents
- Postop pain, sedation

# EPI Conversion Failure – Now What?

## EPI catheter replacement

- Takes time – titrate correctly
- Total LA dose? – LAST

## Single-shot spinal

- Increased risk of high/total spinal
- UK - 50% of high spinals followed failed EPI
- Reduce spinal dose
- Wait 30 min

# Inadequate EPI level for C/S = CSE

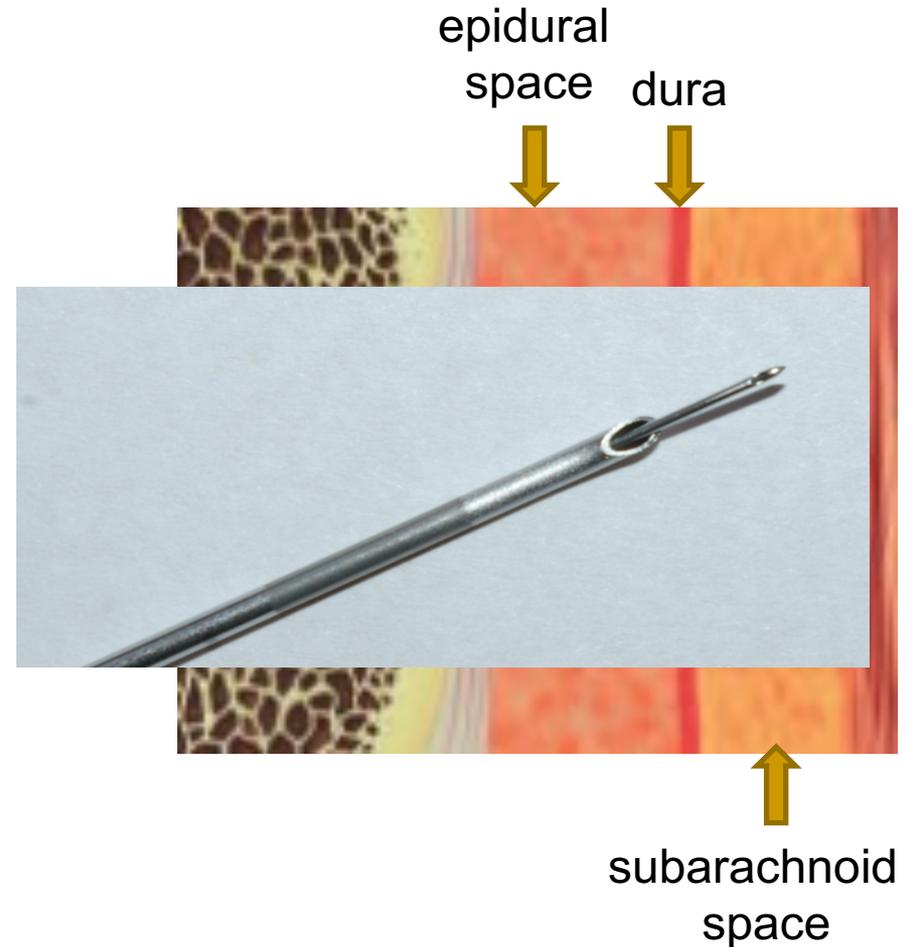
- In failed top-up for C/S
  - Repeat using a CSE
  - Reduce spinal dose
  - Augment block using the (new) EPI cath

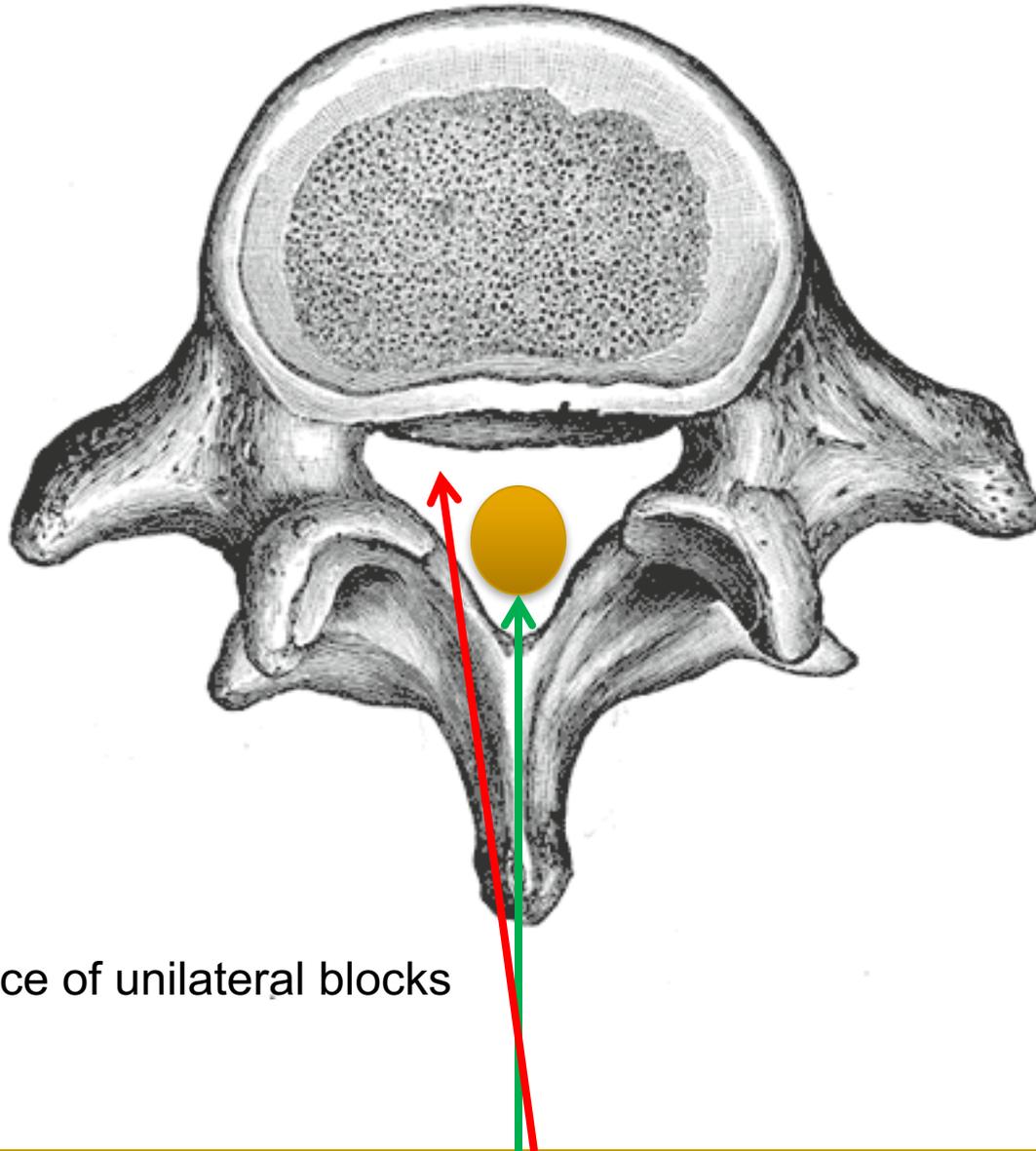
*Minimizing the chance for a high/total spinal*

# Combined spinal-epidural (CSE)

## Advantages of a CSE:

- Speed of onset
- Augment prn using EPI cath
- Confirms placement of EPI needle





Decreased incidence of unilateral blocks

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# Dural Puncture Epidural (DPE)

- Similar to CSE – dura is punctured with a small spinal needle
- **No** drug is administered via the spinal needle
- EPI is then dosed
- Improves sacral spread, onset, and bilateral pain relief without altering cephalad spread of LA administered in the EPI space with 25g (not 27g)

AA 2008;107:1646

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AA 2017;124-560-9

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# GETA for Cesarean Delivery

## ***Sometimes the best choice***

- Intra-op awareness remains high – 0.26%
- USE a GA – 0.7 MAC (or more)
  - Uterine relaxation
  - Neonatal depression
- Fetal compromise?  $FiO_2 = 1.0$ 
  - Otherwise N<sub>2</sub>O is OK
- Propofol is OK

A scenic sunset over a lake. The sky is filled with vibrant colors of orange, red, and purple. The sun is low on the horizon, casting a golden glow across the water. In the foreground, a wooden dock extends into the water. A boat is moored at the dock. The background shows a line of trees and a building on the shore.

Questions?

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