GOALS & OBJECTIVES
Upon completion of this lecture, participants should be able to:
• Discuss how recent research is changing clinical practice in obstetric anesthesia via new guidelines and policies
• Cite maternal and fetal effects of analgesic and anesthetic best-practice techniques.
• Optimize and expedite management of obstetric and anesthetic complications.

GUIDELINES AND POLICIES

MATERNAL MORTALITY
• The latest pregnancy-related mortality ratio continues to increase to 15.8 deaths per 100K live births from 2006-9. Highest in 2009 (17.8) related to the H1N1 flu pandemic.
• Racial disparity: 11.7 for white women, 35.6 for black, and 17.6 for other races.
• Reasons for ↑ mortality ratio may be better coding and identification or more co-morbidities (HTN, DM, cardiac conditions).
  www.cdc.gov 5/5/14
**MATERNAL MORTALITY**
The Global Burden of Disease Study 2013 measures maternal mortality levels and trends worldwide.
- Increases in U.S. rates are a deviation from the downward trend in developed countries.
- 2013 U.S. rate of 18.5 per 100K is double Saudi Arabia and Canada and triple the U.K.
- 55% of U.S. deaths occur > 24 hours after delivery. Better early ICU care after hemorrhage?
  Lancet 2014; 384: 980

**PREVENTING C/S**
Joint ACOG/SMFM Consensus Statement:
“…the rapid increase in the rate of cesarean births without evidence of concomitant decreases in maternal or neonatal morbidity or mortality raises significant concern that cesarean delivery is overused. Therefore, it is important for health care providers to understand… the safe and appropriate opportunities to prevent overuse of cesarean delivery, particularly primary cesarean delivery.”

**PREVENTING C/S**
- 19 recommendations are presented for first and second stages of labor, fetal heart rate monitoring, induction, fetal malpresentation and macrosomia, excessive maternal weight gain, twins, and for research going forward.
  Obstet Gynecol 2014; 123: 693

**PREVENTING C/S**
Does an obstetrician’s delivery volume affect a patient’s risk for cesarean delivery?
- Nulliparous patients with term singleton vertex-presenting fetus at a single hospital
- Median = 60 deliveries per year
- Lowest volume → 18% cesarean rate versus 9% for the highest
- Is there a role for volume in credentialing?
  Obstet Gynecol 2014; 124: 697

**PREVENTING C/S**
Meta analysis of whether the risk of cesarean is higher following induction of labor → 157 RCT
- Risk of C/S was 12% lower with induction of term and post-term gestations (not preterm)
- Risk of fetal death (RR 0.5) or admission to ICU (RR 0.86) was lower with induction
- No impact on maternal death

**PATIENT SAFETY**
ACOG: Preparing for Clinical Emergencies in Obstetrics and Gynecology:
- Tools: emergency supplies available, develop an RRT, protocols with clinical triggers, SBAR, implement emergency drills and simulations (inpatient and outpatient settings).
- Examples: shoulder dystocia, hemorrhage, anaphylactic reaction in the clinic.
  Obstet Gynecol 2014; 123: 722
PATIENT SAFETY
Yale implemented a comprehensive patient safety program in 2003. They look at liability before and after, compared to the state market.
• Median annual claims dropped: 1.31 → 0.64
• Median payments per 1000 deliveries decreased: $1,141,638 → $63,470
• Amount per case: $632,262 → $216,815
• CT market had stable claims and ↑ cost/claim.
Am J Obstet Gynecol October, 2014

30-MINUTE RULE
Meta analysis of decision-incision times and neonatal outcomes; 34 studies:
• 79% of emergent and 36% of urgent deliveries were achieved in < 30 min
• No difference by delivery time in admission to newborn ICU
• 30-minute rule not achieved in many cases; what does the guideline mean?
Obstet Gynecol 2014; 123: 536

30-MINUTE RULE
The effect of a program to shorten the D-I interval for emergent cesarean section:
• Comprehensive program to identify obstacles and debrief all emergencies
• D-I decreased by about 9 minutes
• Rate of cord pH < 7.1 and Apgar < 7 and composite neonatal outcome improved
• Maternal outcomes no different but more GA
Am J Obstet Gynecol 2014; 210: 224

WATER BIRTHS
ACOG Committee Opinion: Immersion in Water During Labor and Delivery:
“...the safety and efficacy of immersion in water during the second stage of labor have not been established...case reports of rare but serious adverse effects in the newborn...underwater delivery should be considered an experimental procedure that only should be performed within the context of an appropriately designed clinical trial with informed consent.”
Obstet Gynecol 2014; 123: 912

2014 ASA OSA GUIDELINES
• Supplemental oxygen should be administered, but may increase the duration of apneic episodes and may hinder detection of atelectasis, transient apnea, and hypoventilation by pulse oximetry.
• Patients should be kept in non-supine positions.
• Hospitalized patients at risk of obstruction from OSA should have continuous pulse oximetry after PACU.
• Intermittent pulse oximetry, or continuous bedside oximetry without continuous observation, does not provide the same level of safety. Stepdown units?
Anesthesiology 2014; 120: 268

ANALGESIA FOR LABOR
WOMEN’S PREFERENCES
40 healthy women scheduled for induction were asked their preference for ↓ pain intensity or ↓ pain duration before and after labor and delivery.
- Scores showed a preference for ↓ pain intensity, even at the cost of longer pain duration.
- This preference was even greater post-delivery.
- So even if epidurals increase length of labor…. 
Br J Anaesth 2014; 113: 468

“Listening to Women” survey → review of responses specific to labor epidural use (n=914)
- Positive: effective pain relief is appreciated
- Negative: waiting in pain to receive their epidural, receiving it too late in labor, feeling it wore off before delivery, having numb legs
- Unplanned epidurals perceived as negative; but 60% who plan un-medicated birth receive an epidural
- Better childbirth education by anesthesia providers would help with expectations and good information 
Anesth Analg 2014; PAP

PREDICTING PAIN
Can psychological tests predict the labor pain experience?
- Outcomes: pain scores during labor, epidural use, and time to epidural request
- Not very well – some correlation with anxiety scales, personality traits such as extroversion and lying, confidence, and analgesia expectations 
Anesth Analg 2014; 119:632

REduced PP DEPRESSION
Does epidural analgesia for labor decrease the risk of postpartum depression?
- 214 parturients were given the Edinburgh Depression Scale at 3 days and 6 weeks PP
- Depression occurred in 14% of women who received an epidural, vs. in 35% who did not.
- Childbirth classes and breast-feeding were also associated with ↓ depression. 
Anesth Analg 2014; 119: 383

CONSENT ISSUES
When a woman’s birth plan says to ignore her wishes for an epidural in labor, can she consent?
- No advance directive can ethically or legally override the contemporaneous expressed wishes of an informed and competent patient.
- Competent patients have the right to change their mind about treatment decisions at any time.
- A woman is not giving truly informed consent until she is actually experiencing labor. 
ASA Newsletter 2014; 78: 40

REMIFENTANIL
Favorable characteristics for labor analgesia:
- Rapid onset, short duration, and inactivated by plasma esterases → unaffected by renal or hepatic impairment
- Inferior analgesia to an epidural, but pain control is satisfactory → VAS 3.7 ± 2.8 after 30 minutes, PP satisfaction scores 8.6 ±1.4
- Monitor for desaturation, sedation and apnea 
Anesth Analg 2014; 118: 589
INHALED N₂O
Systematic review of its use for labor analgesia:
- Currently used by at least 50% of women in the UK, Australia, Finland and Canada.
- Little effect on pain scores, but most women find benefit; use as a bridge?
- No adverse effects on uterine contractility or the neonate; nausea and dizziness can occur.
- Neurotoxicity? Environmental pollution?

Anesth Analg 2014; 118: 153

INHALED N₂O
In 2012, the FDA approved equipment to deliver 50% N₂O with 50% oxygen.
- Often replaces fentanyl in early labor.
- Can be used while pushing rather than IV medications to avoid newborn effects
- After an unmedicated birth, can be used for perineal repair or removal of the placenta.
- Must collaborate on a protocol and training

OBG Management 2014; 26: 10

INHALED N₂O

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<tr>
<th></th>
<th>UCSF</th>
<th>UCOLORADO</th>
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<tbody>
<tr>
<td>% using N₂O</td>
<td>14%</td>
<td>19%</td>
</tr>
<tr>
<td>N₂O → epidural</td>
<td>42%</td>
<td>54%</td>
</tr>
<tr>
<td>Epidural only</td>
<td>76%</td>
<td>75%</td>
</tr>
<tr>
<td>Adverse events</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

UCSF found N₂O use did not affect admission to NICU, 5-minute Apgars, maternal bleeding.

EARLY EPIDURAL
Cochrane Review: Effectiveness and safety of early versus late initiation of epidural analgesia for labor using 9 RCT and > 15K women:
- Low risk of bias and high quality evidence
- No difference in cesarean: RR 1.02
- No difference in instrumental birth: RR 0.93
- No difference in length of second stage
- No difference in Apgar scores or umbilical pH

CD 007238, 2014

EPIDURAL MAINTENANCE
Meta-analysis assessed whether use of low concentration epidural infusions (≤ 0.1% B or 0.17% R) in labor ↓ the risk of assisted vaginal delivery (AVD) or other adverse outcomes:
- No difference in cesarean rates, pain scores, hypotension, NRFHT, or 5-minute Apgar < 7.
- Low concentration had ↓ AVD, ↓ motor block, ↑ ambulation, ↓ urinary retention, shorter 2nd stage, and fewer 1-minute Apgar scores < 7

Can J Anaesth 2014; 60: 840

PROGRESS OF LABOR
What is the length of the second stage of labor in modern-day practice? A review of 42,268 women with or without an epidural:
- 95th %ile duration in nulliparous women was 197 minutes without, 336 minutes with an epidural → difference of 2 hrs, 19 min.
- Multiparous women: 81 minutes without, 255 minutes with an epidural → 2 hrs, 54 min

Obstet Gynecol 2014; 123: 527
PAIN AFTER TL
Meta-analysis of 20 RCT with 1095 women found use of local anesthetic significantly ↓ postoperative pain after laparoscopic tubal ligation.
- LA was given topically on the tubes, injected into the tubes, or administered intra-peritoneally → same for PPTL?
- Simple, inexpensive and quick
Obstet Gynecol 2014; 124: 68

OTHER L&D PROCEDURES
Good review of anesthesia for non-delivery procedures on L&D:
- Cervical cerclage
- External cephalic version (ECV)
- Postpartum bilateral tubal ligation
- Dilation and evacuation (D&E)
- Fetoscopic laser photoacoagulation
Sem Perinatol 2014; 38: 378

ANESTHESIA FOR CESAREAN DELIVERY

ANTIBIOTIC PROPHYLAXIS
A database review of over 1 million women who had a cesarean delivery examined rates of perioperative antibiotic use.
- Only 59.5% received abx on the day of surgery.
- 66% who did not labor vs. 44% who labored
- Large variation by geographic region; no influence of age, race or insurance status.
Obstet Gynecol 2014; 124: 338

DELAYED CORD CLAMPING
There is safety and benefit to delayed cord clamping at delivery; it should be routine:
- Preterm neonates: stabilizes transitional circulation, ↓ need for inotropes, ↓ blood transfusions, less NEC, less IVH
- Term neonates: less iron-deficient anemia, ↑ iron stores, ? improved neuro-development
Obstet Gynecol 2014; 123: 549

SKIN-TO-SKIN
Do newborns develop hypothermia during intraop skin-to-skin bonding?
- 40 cesareans, randomized to forced-air warming or passive insulation with blankets
- 81% of blanketed infants became hypothermic
- 5% of forced-air infants had temp < 36.5º C
- Also improved maternal comfort, ↓ shivering
Anesth Analg 2014; 118: 997
SKIN CLOSURE

RCT comparing staple to suture for skin closure after cesarean:
- 8% overall had wound complications
- 11% in the staple group with 7.4% wound separation
- 5% in the suture group; mainly the result of only 1.6% wound separation
Obstet Gynecol 2014; 123: 1169

GENERAL ANESTHESIA

Findings of the 5th National Audit Program (NAP5) on accidental awareness:
- Overall incidence = 1:19,000
- Risk factors: female sex, younger adults, obesity, previous awareness, emergencies, and use of NMB agents.
- Obstetrics 10-fold over-represented, more than any other specialty; many risk factors
Br J Anaesth 2014; 113: 549

GENERAL ANESTHESIA

A review of options to prevent HTN and risk of CVA on induction in preeclampsia:
- Consider using: propofol, esmolol (1.5 mg/kg) and labetalol, NTG (2µg/kg), nicardipine, fentanyl and remifentanil
- Avoid: lidocaine (ineffective, seizures), magnesium (hypotonia), hydralazine (long onset) and nifedipine (PO only, tocolytic)
Anesth Analg 2014; 119: 1350

GENERAL ANESTHESIA

Does progesterone concentration affect anesthetic and analgesic requirement during and after cesarean?
- 90 women for elective cesarean had serum progesterone measured preop.
- Those with higher than median levels required less sevoflurane / hour and less 48-hour IV-PCA consumption postoperatively.
Anesth Analg 2014; 119: 901

GENERAL ANESTHESIA

The ENIGMA-II Trial evaluated the safety of nitrous oxide in general anesthetics in at-risk patients having non-cardiac surgery in an RCT.
- No difference in death or CV complications
- No difference in surgical site infections
- No difference in severe N&V: 15% with nitrous vs. 11% without (p<0.001) but was controlled with anti-emetic prophylaxis
- N₂O reduced volatile anesthetic use.
Lancet 2014; 384: 1446
**NEURAXIAL ANESTHESIA**

What is optimal preloading?
- Comparison of 1L LR versus 500 ml 6% HES + 500 ml LR before spinal anesthesia for elective cesarean in healthy parturients.
- HES had less hypotension → 37% vs. 55%.
- But there was no difference in pressor use, next-day Hgb, or neonatal outcomes.
- No detectable HES in cord blood samples.
  
  Br J Anaesth 2014; 113: 459

**OXYTOCIN PROTOCOLS**

What is the optimal way to dose oxytocin during cesarean delivery?
- Plasma half-life = 3-10 minutes → infusion
- ED 90 in low-risk, non-laboring women = 0.35 IU, after labor ED90 = 3 IU (9-fold ↑)
- Higher doses needed with chorio-amnionitis
- IV bolus > 5IU causes vasodilation, ↓ MAP
  
  Int Anesth Clinics 2014; 52: 48

**DELIVERY OF PRESSOR**

Is a phenylephrine infusion better than bolus dosing to maintain maternal BP during CD?
- Double-blind comparison of P infusion starting at 0.75 µg/min versus boluses to keep BP within 20% of baseline.
- Use of infusion ↓ physician interventions, ↓ hypotensive episodes, ↓ maternal N/V, and kept BP closer to baseline.
  
  Anesth Analg 2014; 118: 611

**OBESITY AND C/S**

What takes less time to initiate anesthesia in morbidly obese parturients: spinal or CSE?
- Elective C/S, 41 patients, mean BMI 49
- Compared times from inserting introducer or epidural needle to intrathecal injection
- Spinal = 210 seconds, CSE = 180 seconds (NS)
- Completed in < 10 minutes in 75% of spinals, 95% of CSE (NS)
  
  Anesth Analg 2014; 118: 168

**OBESITY AND C/S**

What is the relationship between BMI, median incision-to-delivery and median total op times?

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>Incision-Delivery</th>
<th>Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (&lt; 25)</td>
<td>9 minutes</td>
<td>43 minutes</td>
</tr>
<tr>
<td>Overweight</td>
<td>9 minutes</td>
<td>45 minutes</td>
</tr>
<tr>
<td>Obese (30-40)</td>
<td>10 minutes</td>
<td>48 minutes</td>
</tr>
<tr>
<td>Morbid obese</td>
<td>12 minutes</td>
<td>55 minutes</td>
</tr>
</tbody>
</table>
OBESITY AND C/S

The Anesthetic Approach to Operative Delivery of the Extremely Obese Parturient
Seminars in Perinatology 2014; 38: 341

NON-INVASIVE MONITORS

Is the ultrasound cardiac output monitor valid in the third-trimester of pregnancy?
• Doppler probe in the sternal notch compared to 3D-TTE > 25 weeks gestation
• % difference was ~ 32% for cardiac output and ~ 27% for stroke volume; acceptable?
• Positive bias with ultrasound may be due to the hyperdynamic pregnant state.
Br J Anaesth 2014; 113: 669

MEASURING BLOOD LOSS

Can a visual aid improve accuracy of EBL after delivery? Given a pocket card with pictures of blood on common obstetric materials; then visited 6 stations with known volumes of blood.
• The visual aid improved both objective and subjective estimation of blood loss.
• Provider type and years of experience did not correlate with accuracy before or after.
Obstet Gynecol 2014; 123: 982

NEURAXIAL MORPHINE

How does propofol ↓ pruritus after morphine?
• Rats were given intrathecal morphine, itching behavior was observed, then were randomized to control, saline, intralipid or propofol → sacrificed.
• Propofol abolished the scratching response.
• Brain histochemistry → ↑ expression of CB1 receptor in the anterior cingulate cortex.
Anesth Analg 2014; 118: 303

ANTI-EMETICS

RCT of 160 women with hyperemesis given ondansetron or metoclopramide IV for 24 hours:
• No difference in well-being, vomiting episodes, nausea or length of hospital stay
• Metoclopramide → more drowsiness, xerostomia, and persistent ketonuria BUT…
• M was significantly less expensive than O
Obstet Gynecol 2014; 123: 1272
ORAL HSV REACTIVATION
Case report of maternal neuraxial morphine during cesarean → oral HSV reactivation (cold sore) → neonatal HSV infection → mother recognized the lesions → baby received treatment and did well. Vertical transmission?
• Strong association between oral HSV reactivation after neuraxial morphine
• Should we ask in our preanesthetic evaluation?
Anesth Analg Cases 2014; 2: 103

TAP BLOCKS
Do TAP blocks with ropivacaine improve early or late (2, 24, 48 hours) analgesia when combined with neuraxial morphine?
• US-guided, bilateral, 20 ml TAP blocks
• No difference in pain at any interval, quality of recovery scores, opioid consumption, nausea, vomiting, pruritus, urinary retention.
Can J Anaesth 2014; 61: 631

NORMAL PHYSIOLOGY
168 women had thoracic impedance cardiography done 3 times from 20-40 weeks and at 24 and 48 hrs postpartum to establish “normal” for pregnancy.
• No unusual findings antepartum 20-40 weeks.
• Postpartum both VD and CD had ↑ thoracic fluid content and ↑ SVR above their baseline.
• Conclusion: Avoid excessive fluids postpartum.
• Use these values as a comparison for preeclamptic or complicated pregnancies.
Obstet Gynecol 2014; 123: 318

ANESTHETIC COMPLICATIONS
THE SOAP-SCORE PROJECT
30 institutions submitted data on 257,000 obstetric anesthetics from 2004-9 to establish the incidence of serious cx in modern practice.
• 1:3000 patients had an anesthesia-related cx
• The most common complication was high block (“total” spinal) in 1:4336 anesthetics.
• 1:533 general anesthetics resulted in failed intubation, but no hypoxemic arrests or deaths.
• No cases of aspiration were reported (0/5000).

SOAP-SCORE RESULTS
• There were 2 cardiac arrests: 1 from LAST during TAP blocks and 1 after high neuraxial block in a morbidly obese patient. No deaths.
• There were 5 cases of anaphylaxis from drugs administered by anesthesia personnel (not anesthetic drugs): ampicillin, cefazolin, latex, metoclopramide and 1 unknown medication.
• The most common causes of death were hemorrhage, cardiac disease, HTN, embolism.
Anesthesiology 2014; 120: 1505
DIFFICULT AIRWAY
Failed intubation in the surgical patient
1:2230
Failed intubation in the obstetric patient
(1985) 1:280
Modern-day incidence of failed intubation
(2014) 1:533

ASPIRATION RISK
Can bedside ultrasound reliably measure gastric contents in the 3rd trimester?
- Anesthesiologists were blinded to NPO status- fasting, clears or solid food- during bedside US in pregnant women ≥ 32 weeks
- Inter-rater reliability was 0.74
- Overall correct diagnosis was 87% → O.R. for solids was 17 versus fasting (empty)
  Br J Anaesth 2014; 113: 1018

ASPIRATION RISK
Using bedside US, what is gastric volume and emptying during labor?
- Antral cross-sectional area = volume
- 60 parturients measured at request for epidural and when fully dilated
- 50% had ↑ gastric volume (> 300 ml) in early labor versus only 13% at full dilation → gastric motility is maintained during labor.
  Br J Anaesth 2014; 112: 703

ASPIRATION RISK
For preop fasting guidelines, does milk in coffee or tea require a 6-hour delay?
- 10 healthy non-pregnant volunteers received 300 ml black tea + 50 ml whole milk → gastric US and paracetamol absorption
- Gastric emptying was 23 minutes without and 24 minutes with milk (p=NS)
- It may be acceptable to treat milk in coffee or tea same as clears for preop fasting.
  Br J Anaesth 2014; 112: 66

ANESTHESIA PSI ON L&D
AHRQ has patient safety indicators for preventable hospital complications. What is the prevalence of childbirth-related anesthesia complications (AC)?
- All childbirth admissions for 2009 in CA and complications from neuraxial and GETA
- Rate of AC for adult surgical patients = 0.13%; child-birth-specific rate = 0.31%
- Cesarean = 0.49% and vaginal delivery = 0.22%
- Hospital outliers could be identified.
  Anesth Analg 2014; 119: 911

PERIPARTUM CARDIAC ARREST
Using data from the National Inpatient Sample, 1998-2011, the incidence of peripartum maternal cardiac arrest was 1:12,000.
- Incidence is stable, outcome is improving.
- Most common etiologies: hemorrhage, heart failure, amniotic fluid embolism, and sepsis.
- 59% of women survived to hospital discharge, although neurologic status unknown.
  Anesthesiology 2014; 120: 810
**CPR IN PREGNANCY**

*The Society for Obstetric Anesthesia and Perinatology Consensus Statement on the Management of Cardiac Arrest in Pregnancy*

- Goal: to improve maternal resuscitation
- Includes POC checklists, operational strategies
- Expands on maternal and L&D aspects of the 2010 ACLS / AHA guidelines such as system errors, communication unique to L&D setting.

Anest Analg 2014; 118: 1003

**BIS AND CV COLLAPSE**

Case report: G1 at 33 weeks having emergent cesarean for twins and PTL. BIS monitor = 98 prior to induction, 35-45 in the first 15 minutes of the case. It abruptly fell to 0 followed by ↓ saturation, ↓ ET CO₂, and unobtainable NIBP. BIS recovered with resuscitation. AFE or anaphylaxis or other cause?

- BIS may provide early warning of cardiovascular collapse.

Acta Anaesthesiol Scand 2014; 58: 123

**PDPH REVIEW**

*Post-dural puncture headache: The worst common complication in obstetric anesthesia*

Sem Perinatol 2014; 38: 386

**INTRATHECAL CATHETER**

After 128 witnessed accidental dural punctures with an 18-gauge needle, 89 had intrathecal catheter placement and 39 had an epidural at another level.

- IT catheter for 24 hours → 42% PDPH
- Epidural replacement → 62% PDPH
- Odds ratio = 2.3 (CI 1.04-4.86)

Acta Anaesth Scand 2014; 58: 1233

**PDPH AND DDX**

Case series of 3 patients with persistent headache after PDPH treated by epidural blood patch who were diagnosed with cerebral venous sinus thrombosis.

- EBP resolved the postural component
- All had other neurologic symptoms
- All recovered with anti-coagulation

Can J Anesth 2014; 61: 1134
LAST: LIPID RESCUE

What is the mechanism of lipid rescue after bupivacaine cardiac arrest?
• Rat cardiac myocytes used to demonstrate lipid rescue on the single cell level
• Bupivacaine blocked the fast Na⁺ current
• Lipid emulsion ↑ the fast Na⁺ current
• Removing lipid also removed B → lipid sink

Anesthesiology 2014; 120: 724

LAST: LIPID RESCUE

Does lipid rescue work by other methods than just “lipid sink”?
• Rat model of bupivacaine toxicity
• 20% & 30% lipid, saline or control Rx
• Best model of recovery included a dose dependent lipid effect on both sequestration and inotropy

Anesthesiology 2014; 120: 915

LAST: LIPID RESCUE

An editorial reviews current understanding of the role of intralipid + epinephrine in resuscitation:
• If coronary perfusion is maintained, lipid alone has equal resuscitation outcome, ↓ arrhythmias, and better post-arrest metabolic parameters.
• With ↓ CP survival depends on epinephrine, so we should use epi + lipid in LAST.

Br J Anaesth 2014; 112: 622

ANTI-COAGULATION

If patient receives unfractionated heparin TID, should we check a PTT before neuraxial placement or catheter removal?
• In 714 non-obstetric patients, only 2.8% had PTT > 35 and none developed hematoma
• Probably not cost-effective to check PTT on everyone prior to epidural catheter removal

Anesth Analg 2014; 119: 1215

ANTI-COAGULATION

ASRA guidelines for TID use of UFH:
“The safety of neuraxial blockade in patients receiving doses greater than 10,000 U of UFH daily or more than twice-daily dosing has not been established….it is unclear whether there is an increased risk of spinal hematoma.”

Reg Anesth Pain Med 2010; 35: 73

CHOLESTASIS RISK

What is the incidence of coagulopathy in women with intra-hepatic cholestasis of pregnancy (ICP)? Should we check labs?
• Retrospective cohort review comparing use of coagulation testing versus no testing
• None tested had abnormal coagulation tests, even when LFTs were abnormal
• No difference in EBL or mode of delivery
• Routine coagulation tests are not necessary

J Clin Anesth 2014a; 26: 623
**Epidurals and Fevers**

An RCT of 400 nulliparous women having epidural analgesia randomized them to receive 2 gm cefoxitin or placebo prior to placement.

- 38% developed fever in both groups.
- About half in both groups had placental neutrophilic inflammation; abx had no effect.
- There was no difference in neonatal outcomes, no sepsis in either group, no deaths.

Anesth Analg 2014; 118: 604

Where do we stand in our understanding of epidural-associated fevers:

- Affect 10-30% of nulliparous mothers
- Placentas show non-infectious inflammation
- Not infectious but fever may ↑ work-ups
- Fever itself may ↑ neonatal encephalopathy
- Can’t prevent epidural-related fever when we don’t understand the mechanism.

Anesth Analg 2014; 118: 494

**Pregnancy Testing**

New problem – EMRs allow us to cut-and-paste.

- **Case:** A woman presented for D&C due to a history of heavy menstrual bleeding. Pre-op pregnancy test was reportedly negative. At the time of D&C, an 8 week gestation was identified – a much desired pregnancy. It was later discovered that her preoperative assessment was populated with a previous negative test result, rather than the current positive pregnancy test.

ASA Newsletter; September 2014: 42

**Breast-feeding**

What to tell a mother having surgery who wishes to breast-feed her baby in the perioperative period?

- Anesthetic drugs do transfer to breast milk but are clinically insignificant, posing little or no risk – no need to “pump and dump”.
- Minimize use of narcotics, benzodiazepines, and agents with active metabolites.
- Use regional anesthesia where possible and / or use shorter-acting agents.

Pediatric Anesthesia 2014; 24: 359

**Cancer on L&D**

Case report: labor analgesia with leukemia. Neuraxial was avoided to prevent seeding malignant cells into the CNS. Describes use of fentanyl PCA and dexmedetomidine.

A&A Case Reports 2014; 3: 104

Case report: epidural analgesia followed by STAT cesarean and general anesthesia in a woman with metastatic terminal breast cancer. Ethics of mother vs. fetus?

A&D Case Reports 2014; 2: 48

**Opioid Prescribing**

In the general population about 2% regularly use prescription opioids. What about pregnancy?

- Using a national insurance plan, 14% of pregnant women were prescribed an opioid sometime during pregnancy.
- 1 in 20 were prescribed in 1st trimester.
- Lowest in northeast, highest in south.

Anesthesiology 2014; 120; 1216
**OPIOID PRESCRIBING**

- Most prescriptions were for back and joint pain, migraine, abdominal ligament pain, fibromyalgia – none are very responsive to opioids – why not NSAIDs which are safe?
- Risk of prescribed, short-term opioid use causing congenital malformations is minimal.
- Use in 3rd trimester is a risk factor for neonatal abstinence syndrome.

Anesthesiology 2014; 120: 1063 (editorial)

**OPIOID vs. NERVE BLOCKS**

Case series of 27 nerve blocks performed in 13 pregnant women for migraine therapy.

- Blocked greater occipital, auriculotemporal, supraorbital, and supratrochlear nerves.
- Used for status migrainosus (52%) or frequent headaches (48%) after failed oral and IV medications.
- Average pain ↓ was 3-4, no adverse events.

Obstet Gynecol 2014; 124: 1169

**OPIOID DEPENDENCE**

Effects of opioid abuse and dependence during pregnancy; used NIS database 1990-2011:

- Prevalence increased by 127%
- Associated with ↑ odds of maternal death (OR 4.6), cardiac arrest, IUGR, abruption, LOS > 7 days, PTL, oligo, transfusion, stillbirth, PROM, and cesarean delivery.
- Significant OB morbidity and mortality

Anesthesiology 2014; 121: 1158

**CHRONIC PAIN POSTPARTUM**

In a rat model of nerve injury, the recovery time course was no different between males and females, but was enhanced in postpartum group.

Anesthesiology 2014; 121: 1056

Is it oxytocin-related? Spinal receptors for oxytocin exist. Animal studies do not show neurotoxicity → clinical studies possible on preventing chronic pain after nerve injury.

Anesthesiology 2014; 120: 951

**NEUROTOXICITY**

Female mouse pups exposed to sevoflurane later had impaired maternal behaviors toward their own pups.

Anesthesiology 2014; 120: 403

Neonatal rats exposed to propofol had acutely ↑ corticosterone levels. As adults they had behavioral abnormalities and exacerbated endocrine response to stress.

Anesthesiology 2014; 121: 1010

**NEUROTOXICITY**

Lab studies show definite neurotoxic effects when young animals are exposed to anesthetics.

Human observational studies are less conclusive.

- Large studies that use insensitive tests of academic achievement are usually negative.
- Studies testing individual performance in speech and language are uniformly positive.
- Insight into phenotype?

Anesthesiology 2014; 120: 1303
OBSTETRIC COMPLICATIONS

U.S. NATIONAL DATA - CDC
Top 10 causes of maternal mortality after live birth:
1. Cardiomyopathy 15%
2. Cardiovascular conditions 14%
3. Infection 13%
4. Preeclampsia / Eclampsia 11%
5. Non-cardiovascular medical 10%
6. Hemorrhage 9%
7. Thrombotic pulm. embolism 9%
8. Amniotic fluid embolism 7%
9. Cerebrovascular accident 6%
10. Anesthesia complications 0.7%
(Obstet Gynecol 2015; 125: 5)

MATERNAL MORBIDITY
- Maternal deaths are the tip of the iceberg.
- We need to identify who experienced severe maternal morbidity – the “near miss”, review their care, and recommend methods of quality improvement in obstetrics.
- Indicators: transfusion of ≥ 4 units of blood and/or admission to an intensive care unit.
(Obstet Gynecol 2014; 123: 978)

MATERNAL MORBIDITY
Current SIRS criteria for sepsis overlap with normal physiology of pregnancy.
- Meta-analysis of 87 studies that included maternal values for components of SIRS
- All SIRS criteria overlapped with normal pregnant physiology except temperature: respiratory rate, pCO₂, HR and WBC.
- Need alternate criteria to diagnosis sepsis during pregnancy.
(Obstet Gynecol 2014; 124: 535)

MATERNAL MORBIDITY
The Maternal Early Warning System (MEWS):
- Systolic BP<90, >140; diastolic BP>100 mmHg
- Heart rate < 50 or > 120
- Respiratory rate < 10 or > 30
- Oxygen saturation at sea level < 95%
- Oliguria < 35 ml/hr for ≥ 2 hours
- Agitation, confusion or unresponsiveness
- Preeclampsia with non-remitting HA or SOB
(Obstet Gynecol 2014; 124: 782)
**HOSPITAL NETWORK**

Review of maternal deaths in Hospital Corporation of American (HCA) hospitals between 2000-6:
- Leading causes of death were **preeclampsia, thromboembolism**, AFE, hemorrhage, cardiac.
- Recommendation: the best chance of reducing maternal mortality is for all women having cesarean delivery to receive thromboembolism prophylaxis.

Am J Obstet Gynecol 2008;199:36

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**HOSPITAL NETWORK QI**

Same group (HCA), 6 years later………..
- The authors instituted a policy of universal use of pneumatic stockings after CD → postop pulmonary embolism deaths dropped 7-fold.
- Another policy for automatic, rapid anti-HTN therapy for defined BPs ↓ deaths 5-fold
- Disease-specific protocols can decrease maternal mortality significantly.

Am J Obstet Gynecol 2014; 211: 32

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**SEVERE MORBIDITY**

National cohort of 115,502 women and their neonates born in 25 U.S. hospitals examined severe morbidity (MFMU Network project):
- Incidence = 2.9 / 1000 deliveries
- Most often due to postpartum hemorrhage
- Morbidity is highly associated with placenta accreta, gestational age < 37 weeks, antepartum anti-coagulant use, and any HTN

Obstet Gynecol 2014; 123: 804

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**QUALITY INDICATORS**

Do OB quality measures correlate with maternal or neonatal morbidity?
- All hospitals review elective deliveries < 39 weeks and cesareans in low-risk mothers.
- Rates vary widely among hospitals, as do rates of maternal and neonatal complications
- But there is no correlation between quality rates being measured and morbidity.

JAMA 2014: 312: 1531

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**HEMORRHAGE**

The ASA Closed Claims Project reviewed 141 claims related to hemorrhage (4% of all claims):
- OB accounted for 30% of hemorrhage claims vs. 13% of all non-hemorrhage (NH) claims.
- Mortality was high: 77% vs 27% of all claims
- Substandard care in 55% vs. 38% of all claims
- Payments were higher; $607K vs. $276K
- Themes: lack of timely diagnosis & transfusion

Anesthesiology 2014; 121: 450

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**HEMORRHAGE**

A review of medical advances in treating PPH:
- Develop an emergency hemorrhage panel with your lab that includes fibrinogen, PT, INR, platelets and Hgb for STAT turnaround. Consider TEG or ROTEM on L&D.
- Implement an obstetric hemorrhage protocol including high plasma to red cell ratios.
- Use tranexamic acid and fibrinogen.

Anesth Analg 2014; 119: 1140
**HEMORRHAGE**

A new device for tamponade of PP hemorrhage due to atony or abnormal placentation:
- Consider its use before surgical interventions
- Vaginal balloon anchors the uterine balloon
- Intra-uterine volume > 500 ml may be needed to effect hemostasis, especially during atony.

*Am J Obstet Gynecol* 2014; 210: 136

**PREECLAMPSIA**

What are contemporary risk factors for PEC?
- 2537 women enrolled < 15 weeks gestation
- 9% developed preeclampsia → risk factors:
  - Chronic HTN (OR 2.7), pre-gestation DM (OR 3.9), multiple gestation (OR 3), AA race (OR 1.9), prior preeclampsia (OR 3.6), nulliparity (OR 1.7), infertility techniques (OR 1.7), dose-response risk with ↑ BMI (> 40, OR 6)

*Obstet Gynecol* 2014; 124: 763

**PREECLAMPSIA**

Is maternal morbidity different in early-onset versus late-onset preeclampsia?
- Rates of early (0.3%) and late (2.7%) differed
- Maternal death rates per 100K deliveries → 42 with early, 11 with late, and 4 with no PEC
- Severe morbidity per 100 deliveries → 12.2 early, 5.5 late, and ~ 3 with no PEC
- Early onset disease has ↑↑ risk for cx

*Obstet Gynecol* 2014; 124: 771

**PREECLAMPSIA**

Is placental pathology different in early vs. late-onset preeclampsia?
- Early-onset disease characterized by hypoplasia, vascular lesions of insufficiency
- Late-onset disease was characterized by inflammation and placental hyperplasia.
- Early and late-onset preeclampsia appear to be different diseases.

*Am J Obstet Gynecol* 2014; 210: 66

**PREECLAMPSIA**

New guidelines from the US Preventive Services Task Force (USPSTF) state that women at increased risk of preeclampsia (e.g. PEC in a previous pregnancy) derive benefit > than harm from taking low-dose aspirin.
- 50-160 mg/day from 12-28 weeks gestation
- No ↑ abruption, PPH, IVH, perinatal mortality.
- Based on 21 RCT and 2 observational studies.

*JAMA* 2014; 311: 2055
**PREECLAMPSIA**
What is the frequency of lab abnormalities in preeclampsia? Are they related to bad outcomes?
- Abnormal labs occurred in 7.3% of women with HTN: 5% with mild, 9% with severe, and 12% with severe HTN + clinical signs of end-organ dysfunction.
- In women with mild HTN and no signs of severity, routine labs may not be beneficial or cost-effective since 95% will be normal.

*Obstet Gynecol* 2014; 124: 933

**CARDIAC DISEASE**

*The Role of the Anesthesiologist in the Care of the Parturient with Cardiac Disease.*

*Sem Perinatol* 2014; 38: 252

**CARDIAC DISEASE**

27-year old G1 at 25 weeks presents to the ER in respiratory distress. Work-up reveals pulmonary edema and TTE shows severe rheumatic mitral stenosis. Medical management fails and she undergoes balloon valvuloplasty. She then labored at term but required cesarean delivery. Physiologic changes of pregnancy may lead to acute decompensation with severe valvular disease.


**THROMBOEMBOLISM**

What is the risk of postpartum thromboembolism by number of weeks after delivery?
- Risk is highest during the first 3 weeks after delivery but present through 12th week.
- Increased risk seen after cesarean delivery, preeclampsia, hemorrhage, and postpartum infection – persisting through the 12 weeks.

*Obstet Gynecol* 2014; 123: 987

**THROMBOEMBOLISM**

How long does the risk of a postpartum thrombotic event persist?
- Includes ischemic stroke, acute MI or venous thromboembolism
- Compared to frequency of events 1 year later, highest risk in first 6 weeks: OR 11
- Still elevated 7-12 weeks postpartum: OR 2

*N Engl J Med* 2014; 370: 1307

**AMNIOTIC FLUID EMBOLISM**

*Clinical Expert Series Review:*
1. Syndrome is not amniotic fluid or embolism.
2. Timing of AFE suggests a breach between normal physiologic barrier of mother/fetus.
3. Coagulopathy likely related to trophoblastic-derived antigens – like abruption, accreta.
4. Clinical picture similar to SIRS, anaphylaxis
AFE REVIEW (cont)
5. Syndrome is final common pathway of a unique maternal immunologic response to foreign antigens originating in the fetal compartment.
6. Not linked to induced or augmented labor.
7. Diagnosis is purely clinical – no markers.
8. The only treatment is supportive.

AFE REVIEW (cont)
10. Mis-diagnosis hinders research – many cases labeled AFE are not. Must include triad of hypotension, hypoxia and coagulopathy.
11. Research is now clearly directed toward the role of antigenic response and endogenous or inflammatory mediators – not amniotic fluid per se and not embolism.
   Obstet Gynecol 2014; 123: 337

ACUTE FATTY LIVER
What is the mechanism of coagulopathy and hemorrhage in acute fatty liver of pregnancy?
• 80% have DIC that persists 4-5 days PP
• Diminished coagulant production by failing liver; median fibrinogen recovery is 4.2 days
• Hemolysis occurs and ↑ serum bilirubin
   Obstet Gynecol 2014; 124: 40

BREECH DELIVERY
Since the Term Breech Trial in 2000, ACOG and others have “banned” vaginal breech delivery.
• Unintended ↑ maternal complications, mortality
• Obstetricians worldwide have lost the skills to practice vaginal breech deliveries
• Medico-legal concerns now prevent its practice
• Version should be done for all suitable women + more use of neuraxial anesthesia to ↑ success rates.
   Lancet 2014; 384: 1183

BREECH DELIVERY
What happens after successful external cephalic version (ECV)?
• As compared with women presenting with cephalic presentation, successful ECV is still associated with higher C/S rate.
• OR 2.2 for cesarean for dystocia
• OR 2.2 for cesarean for fetal distress
• OR 1.4 for instrumental vaginal delivery
   Obstet Gynecol 2014; 123: 1327

CO-MORBIDITIES
Clinical Expert Series or Reviews:
• Diabetic Ketoacidosis in Pregnancy
   Obstet Gynecol 2014; 123: 167
• Multiple Sclerosis During Pregnancy
   Obstet Gynecol 2014; 124: 1157
• Intrahepatic Cholestasis of Pregnancy
   Obstet Gynecol 2014; 124: 120
OBESITY & IOL
If BMI > 40, does a planned cesarean provide better outcomes than induction of labor?
- One institution, 399 inductions, 262 cesareans
- No difference in maternal or neonatal morbidity associated with CD or IOL.
- Best outcomes: induction that resulted in VD
- Worst outcomes: induction resulting in CD.
  Am J Obstet Gynecol 2014; 211: 700

OBESITY & STILLBIRTH
A retrospective cohort study of singleton pregnancies without anomalies found ↑ risk of stillbirth with ↑ BMI. Overall rate = 3 per 1000.
- BMI 30-35: OR 1.7 for stillbirth
- BMI 40-45: OR 2.5
- BMI > 50: OR 3.2
- 25% of stillbirths occurred after 37 weeks; plan early delivery before 39 weeks?
  Am J Obstet Gynecol 2014; 210: 457

OBESITY & STILLBIRTH
What is the optimal BMI to prevent the increased risk of fetal death and stillbirth?
- Meta-analysis of 38 studies showed a linear increase in risk starting at BMI 20 (referent).
- For each 5-unit increase in BMI, RR ↑: fetal death = 1.21, stillbirth 1.24, perinatal death 1.16, neonatal death 1.15, infant death 1.18
  JAMA 2014; 311: 1536

PREGNANCY WEIGHT LOSS
Should the super-obese (BMI of 50 or greater) follow IOM guidelines for weight gain?
- 1034 women, 38% with weight gain below IOM recommendation of 11-20 lbs, 24% at IOM, and 38% above IOM guidelines
- Lower weight gain was not associated with preterm birth or low birth weight, but was associated with less macrosomia
- ↑ weight gain = more HTN and cesareans
  Obstet Gynecol 2014; 124: 1105

BARIATRIC SURGERY
Case series of 3 patients who conceived > 2 years after bariatric surgery and presented with abdominal pain that was mis-diagnosed.
- #1: Perforated gastric remnant: fetus died, mother had prolonged unstable ICU stay
- #2: Internal hernias and globally ischemic small bowel: preterm fetus with IVH, 21-day maternal hospital stay
- #3: Internal hernia reduced by laparoscopy
  Obstet Gynecol 2014; 124: 464

POSTOPERATIVE RISKS
Extreme obesity is associated with significant increase in post-cesarean wound complications.
- 585 women, 14.5% with BMI > 45
- More diabetes, HTN, cesarean after labor, vertical skin incision, and ↑ operative duration
- Extremely obese patients had ↑ infectious complications (OR 2.7), ↑ wound infection alone (OR 3.4) and ↑ ED visits (OR 2.2)
  Obstet Gynecol 2014; 124: 227
THE FETUS AND NEONATE

CERVICAL CERCLAGE
Current indications per ACOG:
1. Women with a current singleton pregnancy, prior spontaneous preterm birth at < 34 weeks, and short cervical length (less than 25 mm) at < 24 weeks.
2. History of 1 or more second-trimester losses related to painless cervical dilation.
3. Painless cervical dilation in 2nd trimester.
   Obstet Gynecol 2014; 123: 372

OXYTOCIN & AUTISM
• Oxytocin deficiency may be associated with autism. Does synthetic oxytocin administered for induction or augmentation after fetal oxytocin receptors, predisposing to autism?
• Prior studies have limitations in identifying confounders, knowing the drugs used for induction, diagnosing autism (DSM criteria).
• Reducing oxytocin use would ↑ cesarean rate.
   Obstet Gynecol 2014; 123: 1140

FETAL SURGERY
A review of fluid management during general anesthesia for fetal surgery for TTTS – before and after restriction:
• < 300 ml/hr, SBP > 100 with pressors
• Total fluids: 1634 ml → 485 ml
• Pulmonary edema: 5.5% → 0
• Any respiratory distress: 13% → 0
   J Clin Anesth 2014; 26: 184

CORD GASES
Is umbilical cord lactate a better predictor than pH of neonatal morbidity?
• Consecutive births, immediate cord gases and lactate before knowing neonatal outcomes.
• 1.1% morbidity rate → lactate 6.5 versus 3.3 in healthy newborns, significantly more predictive than pH using a cut-off of 3.9.
• Sensitivity / specificity higher for lactate
   Obstet Gynecol 2014; 124: 756

NEWBORN RESUSCITATION
• Maternal oxygen supplementation has not been shown to be beneficial to the fetus.
• By increasing free radical activity it may be harmful to the fetus.
• Until studied in an RCT, maternal oxygen should be reserved for maternal hypoxia and not considered an indicated intervention for non-reassuring fetal status.
   Am J Obstet Gynecol 2014; 211: 124
APGAR SCORE

Is the Apgar score relevant? What is the relationship between 5-minute score and risk of infant mortality?
• Births in Scotland, 1992-2010
• 5-minute Apgar 0-3 → OR 359 for early death, OR 31 for late neonatal death, and OR 50 for infant death
• Best association was with term births.
  Lancet 2014; 384: 1749

COOLING FOR ASPHYXIA

How much and how long should cooling be done after neonatal hypoxic ischemic encephalopathy? Usual = 33.5°C for 72 hours.
• Comparisons: 32°C versus 33.5°C and 72 hours or 120 hours (4 groups)
• No advantage to longer cooling or deeper cooling or both → did not reduce ICU deaths.
  JAMA 2014; 312: 2629

COOLING FOR ASPHYXIA

What obstetric events preceded the need for cooling for neonatal encephalopathy?
• 1.1 per 1000 live births received cooling
• Catastrophic events: cord prolapse OR 14, abruption OR 17, uterine rupture OR 130
• Associations: age < 15, BMI > 40, diabetes, preeclampsia, chorioamnionitis, length of labor, mode of delivery, epidural analgesia
  Am J Obstet Gynecol 2014; 211: 155

COOLING FOR ASPHYXIA

After head cooling at birth, what is their neurologic outcome later in childhood?
• 325 newborns with asphyxial encephalopathy were randomized to cooling or usual care
• At 6-7 years of age → 52% of treated children survived with an IQ > 85 vs. 39% of controls
• 45% survived without neurologic abnormalities vs. 28% of controls, 21% cerebral palsy vs. 36%

AND WE’LL SEE WHAT’S NEW IN 2015!

THE END