

WHAT'S NEW IN OBSTETRIC ANESTHESIA FROM 2015?

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(* I have no conflicts to disclose. *)

GOALS & OBJECTIVES

Participants will be able to:

1. Discuss how recent research is changing clinical practice in obstetric anesthesia via new guidelines and policies
2. Cite maternal and fetal effects of analgesic and anesthetic techniques and best practices.
3. Optimize and expedite management of obstetric and anesthetic complications.

GUIDELINES AND POLICIES

PRACTICE GUIDELINES

Updated *ASA Practice Guidelines for Obstetric Anesthesia* were published online 11/15. Recommendations are similar but references and survey responses are updated.

Anesthesiology 2016; 124: 270

See page 281 for Appendix 1 with the summary of recommendations.

EATING IN LABOR

Abstract from Canada reviewed the literature on aspiration during labor and found very few cases.

- ASA Press Release 10/24: "Most healthy women would benefit from light meal during labor."
- Health Day: "...new Canadian research suggests that a light meal during labor could be a good idea for most healthy women."
- ASA Press Release 11/06: "...on October 28, the Practice Guidelines were passed. On page 12 of the guidelines is the language: solid foods should be avoided in laboring patients."

LEVELS OF MATERNAL CARE

Classification system for levels of maternal care (versus long-standing levels of neonatal care) developed by ACOG and SMFM.

- Unfortunately presented to ASA and SOAP leadership *after* already developed, so listed as "supportive" rather than "endorsed by"
- Goal: regionalize high risk maternal care in facilities with specialized resources.

LEVELS OF MATERNAL CARE

1. Birth Center: no anesthesiology needs except after transfer for unexpected events
2. Level I (Basic): OB and anesthesia services "available" for analgesia or cesarean, capability for massive transfusion - could include twins, VBAC, preeclampsia (not severe)
3. Level II (Specialty): OB and anesthesia services available at all times, MFM and Board-certified anesthesiologist available for consultation

LEVELS OF MATERNAL CARE

- Level III (Subspecialty Care): BC anesthesiologist in charge of anesthesia services, full complement of subspecialists, ICU accepts pregnant women
- Level IV (Regional Perinatal Health Care Centers): same + on-site ICU care for the most complex conditions
- "These are guidelines, not mandates, and geographic and local issues will affect systems of implementation for regionalized perinatal care."

LEVELS OF MATERNAL CARE

- Major goal is to collect accurate QI data at all sites because "Although specific supporting data are not currently available in maternal health, it is believed that concentrating the care of women with the most complex pregnancies at designated regional perinatal health care centers willachieve optimal outcomes."

Obstet Gynecol 2015; 125: 502

Am J Obstet Gynecol 2015; 122: 259

ASA Newsletter 2015; 79: 42

HOME BIRTHS - CANADA

Comparison of home vs. hospital births in Ontario, Canada (11,493 in each group):

- No difference in stillbirth, neonatal death or serious neonatal morbidity
- No difference for nulliparous vs. multips
- All intrapartum interventions were lower among planned home births.

CMAJ 2015; DOI:10.1505/cmaj.150564

HOME BIRTHS - OREGON

Cohort study of births in Oregon 2012-3:

- ↑ perinatal death rate for planned out-of-hospital births (3.9 vs. 1.8 deaths per 1000 deliveries, $p=0.003$) vs. hospital births
- ↑ odds for neonatal seizures out-of-hospital
- ↓ NICU admission, ↑ unassisted vaginal delivery (94% vs. 72%) and ↓ odds of OB procedures in out-of-hospital births

N Engl J Med 2015; 373:2642

HOME BIRTHS - U.S.

ACOG and AAP have requirements for planned home births. Are they followed?

- CDC data was used to compare midwife-attended home births to hospital deliveries by certified nurse midwives.
- 30% of home births were not low risk: 28% > 41 weeks, breech, twins, 4% TOLAC
- 66% were attended by non-certified midwives

Am J Obstet Gynecol 2015; 212: 350

HOME BIRTHS - RISKS

What is the risk of medical complications or use of resources beyond routine among U.S. deliveries expected to be low risk?

- 4 million were low risk, 29% had at least 1 complication: 15% cesarean, 5% meconium, 4% assisted vaginal delivery, chorio
- With ≥ 1 risk factor, 57% had at least 1 unexpected complication.

Am J Obstet Gynecol 2015; 212: 809

CESAREAN RATES

What is the optimal cesarean delivery rate? WHO states no more than 10-15%.

- Comparison of cesarean data in 194 WHO member states 2005-12 vs. health outcomes.
- Cesarean rates of 19% were associated with optimal levels of maternal / neonatal mortality.
- No one-size-fits-all rate for every country or institution; perform when *appropriate*.

JAMA 2015; 314: 2263, 2238

DECREASING CESAREANS

What is the effect of having collaborative OB laborist and midwifery services on L&D?

- Community hospital changed from a private practice (clinic + L&D) to 24-hour coverage with a laborist-midwifery model.
- Primary cesarean rate \downarrow 32% to 25%
- VBAC rate \uparrow 13.3% to 22.4% (OR 2.03)

Obstet Gynecol 2015; 126: 716

DECREASING CESAREANS

Community hospital with 2 distinct practice models: private practice or laborist-midwife.

- Cesarean rates were higher in the private practice model: 32% vs. 17% (OR 2.11)
- C/S rates also higher with a prior cesarean delivery: 71% vs. 42% (OR 3.2)
- Lowest risk G1, term, vertex singleton rates were 30% in private practice vs. 16%

Am J Obstet Gynecol 2015; 212: 491

DECREASING CESAREANS

Are there safe strategies that can reduce cesarean delivery rates?

- 32 hospitals in Quebec, randomized trial of 1.5 years of audits of indications for CS, feedback to obstetricians, and use of "best practices"
- Reduction in CS in low risk pregnancies but not high risk, \downarrow rate of major neonatal morbidity, no difference in maternal morbidity.

N Engl J Med 2015; 372: 1710

CESAREAN & INDUCTION

What are the risk factors for cesarean delivery after induction of labor?

- Retrospective cohort study of 785 G1, term, vertex, inductions
- 29.4% had cesarean delivery, nomogram created
- Risk factors: older age, shorter height, \uparrow BMI, \uparrow weight gain in pregnancy, HTN, DM, \uparrow gestational age, cervix < 3 cm initially.

Obstet Gynecol 2015; 126: 1059

CESAREAN & INDUCTION

Systematic review and meta-analysis of induction vs. expectant management of uncomplicated, term, singleton pregnancies.

- No difference in cesarean rates, operative vaginal delivery, chorioamnionitis
- Induction → less blood loss, less meconium stained amniotic fluid, lower birth weight

Am J Obstet Gynecol 2015; 212: 629

CESAREAN & CHILD HEALTH

Is there a relationship between planned cesarean delivery (vs. unplanned cesarean or vaginal delivery) and childhood health problems or death? Scottish registry data.

- No difference between planned/unplanned.
- Planned vs. vaginal delivery had ↑ risk of asthma requiring hospitalization, salbutamol prescription, and all-cause death by 21 years.

JAMA 2015; 12/3

DRUG LABELING

- Currently there is inadequate information for physicians and patients to make informed decisions about medications in pregnancy (e.g., ketorolac, propofol, bupivacaine).
- FDA final rule on pregnancy labeling for prescription medications requires removal of categories A-D, X
- New labeling will describe what is actually known and recommendations.

Am J Obstet Gynecol 2015; 212: 24

MARIJUANA

ACOG Committee Opinion: *Marijuana Use During Pregnancy and Lactation*

- Ask about use and discourage it.
- Because of concerns regarding impaired neurodevelopment (in animal studies), as well as maternal and fetal exposure to the adverse effects of smoking, women who are pregnant or contemplating pregnancy should be encouraged to discontinue use.

Obstet Gynecol 2015; 126: 234

FAMILY PLANNING

Costs of pregnancy and childbirth under ACA.

JAMA 2015; 313: 245

Saving lives with contraceptive coverage.

Am J Obstet Gynecol 2015; 212: 602

Planned Parenthood at risk.

N Engl J Med 2015; 373: 890, 963

ACLU sues Catholic hospitals over abortions.

Medscape Nov. 12, 2015

UK CEMD, 2009-2012

- 68% of women died from medical and mental health problems; only 32% from direct complications of pregnancy
 - Almost ¼ died of sepsis → early diagnosis (MEOWS), rapid antibiotics, escalate care
 - 1/11 died of flu → vaccinate
 - Need multi-disciplinary review of all deaths
- UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity, 2009-12

ANALGESIA FOR LABOR

PHYSIOLOGY OF LABOR

Pro-inflammatory cytokines ↑ at term and are associated with cervical ripening. Do they influence the pain of labor?

- Maternal inflammatory markers measured
- Pain scores recorded during labor
- Highest levels of IL-1 β presented at greatest cervical dilation and had the fastest labors with less pain.

Anesth Analg 2015; 121: 748

PHYSIOLOGY OF PREGNANCY

MRI exams of term unanesthetized parturients:

- IVC volume was much lower when supine.
- 15 degree tilt did not relieve compression, but 30 degree tilt significantly ↑ IVC volume.
- Aortic volume was never affected by position.
- Supine sleeping associated with ↑ risk for term stillbirth, esp. in compromised fetus with IUGR.

Anesthesiology 2015; 122: 286

Obstet Gynecol 2015; 125: 347

PHYSIOLOGY OF OXYGEN

Is oxygen in labor helpful or harmful to the fetus?

- Con oxygen: millions of babies are exposed, it's uncomfortable and anxiety-provoking to the mother, no studies support its benefit, it could cause harm by ↑ free radical activity; why have routine exposure to an unproved intervention?
- Pro oxygen: may return fetal oxygen to normal if hypoxic and correct late decelerations

Am J Obstet Gynecol 2015; 212: 459

NITROUS OXIDE FOR LABOR

- Few side effects for mother/ fetus, rapidly reversible unlike opioids
- Can be used if an alternative to neuraxial is needed (e.g., version, perineal repair)
- No relevant occupational exposure for nursing
- Satisfaction scores are similar for neuraxial, N₂O, or transition from N₂O to an epidural
- Meets CMS guidelines for conscious sedation

SOAP Newsletter Summer 2015, page 22

An example of a mobile N₂O delivery system with oxygen and scavenging connections.



INHALED N₂O

	UCSF	UColorado
% using N ₂ O	14%	20%
N ₂ O→epidural	42%	60%
Epidural only	76%	75%
Adverse events	0	0

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

SAFETY OF NITROUS

Pediatric patients exposed to nitrous for 8 hours during spine surgery did not show megaloblastic anemia (B12 inactivation).

Anesth Analg 2015; 120: 1325

ENIGMA-II Trial found no ↑ in adverse cardiac events 1 year after noncardiac surgery in at-risk patients exposed to 70% nitrous.

Anesthesiology 2015; 123: 1267

REMIFENTANIL PCA

Can the efficacy of a remifentanyl PCA be improved by coordinating peak R levels with maximum contraction strength? No.

- Average duration of pain was 45 seconds
- Time between was highly variable
- No model improved matching remifentanyl effect-site concentration with contraction peak
- Safe use requires continuous monitoring

Br J Anaesth 2015; 114: 281

INTRA-NASAL FENTANYL

Hand-held fixed-dose spray of 50 µg fentanyl was compared to IM meperidine for labor pain.

- Pain scores were similar with small reductions of 1-2/10.
- Women receiving fentanyl were more satisfied and had less sedation and nausea.
- Neonates exposed to fentanyl had fewer nursery admissions and better breast-feeding.
- No IV or painful injections needed.

BJOG 2015; 122: 983

PATIENT PREFERENCES

What factors are associated with 1) women avoiding epidural for labor, and 2) what factors are associated with a change in their plans?

1. Prefer no epidural: high parity, unfavorable social conditions, delivery in a public hospital; 52% delivered without an epidural
2. Change to epidural: nulliparity, oxytocin augmentation, presence of anesthesiologist, high midwife workload

Anesth Analg 2015; 121: 759

PATIENT PREFERENCES

Survey of women who had an epidural for labor and vaginal delivery:

- Best: effective pain relief
- Adverse: difficult placement, less effective than expected, physical effects (numbness, itching, shivering, ↓ BP)
- Challenges: waiting in pain, received too late or wore off too soon, inadequate info

Anesth Analg 2015; 121: 974

EPIDURAL ANATOMY

Cadaver study of 50 epidural catheters:

- 3 catheters curled in a circle, 2 entered intervertebral foramen, 5 caused venous damage
- Meningo-vertebral ligaments space connect to the venous plexus and the bony canal wall
- May result in epidural compartments and uneven distribution of anesthetic

BMC Anesthesiol 2015; 15: 94

EPIDURAL MAINTENANCE

Does a background infusion confer any benefit? A systematic review and meta-analysis found:

- No conclusions regarding risk/benefit.
- There was no difference in maternal or neonatal adverse events.
- Risk of instrumental delivery and length of 2nd stage were ↑ with infusion, but fewer patients required physician-administered boluses.

Anesth Analg 2015; 121: 149

2ND STAGE MAINTENANCE

Does changing the infusion to fentanyl-only while pushing improve outcome?

- Women at 8-10 cm dilated, with a functional epidural, were randomized to continue their infusion or change to epidural fentanyl 100µg/hr
- No difference in duration of 2nd stage, degree of motor block, or instrumental delivery
- For similar analgesia, received 5x dose fentanyl

Anesthesiology 2015; 122: 172

SCOLIOSIS & EPIDURALS

How successful is epidural labor analgesia in women with previous spinal instrumentation surgery for scoliosis?

- No difference in bupivacaine consumption per hour, number of boluses, or failure between post-surgery patients and controls
- ↑ time for placement in the surgery group, more re-directions and change in interspace, more need for an experienced provider to take over.

Anesth Analg 2015; 121: 981

CSE AND DECELERATIONS

Would prophylactic IV ephedrine 10 mg prevent post-CSE fetal bradycardia?

- No difference in decelerations: 2.7% in the ephedrine group vs. 4.7% in controls
- Also no difference in urgent cesarean delivery, uterine hypertonus or tachysystole, and abnormal FHR patterns

Can J Anesth 2015; 62: 1201

CONTINUOUS SPINAL

- If a “wet tap” occurs, consider conversion to a continuous spinal (CSA) technique.
- Failure of the catheter is easier to diagnose because you can't aspirate CSF if it dislodges – epidural catheters require dosing, then waiting to see an effect.
- The risk of PDPH is less in morbidly obese parturients versus non-obese.

Anesth Analg 2015; 121: 451

CONTINUOUS SPINAL

Test of a 23 gauge spinal catheter (Wiley Spinal®) used for labor analgesia:

- 2.6% incidence PDPH, managed with EBP
- 23% had paresthesias, 9% had kinking that prevented aspiration or injection
- 36% required dose adjustments for breakthrough pain or weakness
- Steep learning curve for providers

Anesth Analg 2015; 121: 1290

INTRATHECAL OXYTOCIN

Intrathecal oxytocin seems to prevent hypersensitivity after surgery, has treated cancer pain, and has receptors in the dorsal horn of the spinal cord.

- 5 healthy volunteers received 5-150 µg intrathecal oxytocin
- No adverse events or complications but no analgesic effects were apparent.

Anesthesiology 2015; 122: 407

LABOR EPIDURAL BILLING

The ASA's Anesthesia Quality Institute database was used to determine distribution of the mean durations of labor analgesia among US hospitals.

- Overall mean duration was 6 hours.
- 10% were below and 12% above the mean.
- The *number* of labor epidurals is not a valid measure to quantify productivity or payment to U.S. anesthesia groups. Base + time better.

Anesth Analg 2015; 121: 1283

USE OF FORCEPS / VACUUM

- 3.3% of all deliveries with a low risk of complications
- Forceps more effective but more likely to result in a 3rd or 4th degree tear.
- Adequate anesthesia is necessary.

ACOG Practice Bulletin #154:

Operative Vaginal Delivery

Obstet Gynecol 2015; 126: e56

AWHONN GUIDELINES

2015 Revision: After labor epidural placement and stabilization the labor RN may:

- Replace empty infusion syringes or bags
- Remove the catheter if ordered
- Stop the pump for safety concerns or after delivery.

The labor RN may not bolus the catheter, change pump settings, or obtain procedural consent.

JOGNN 2015; 44:151

PATIENT EDUCATION

U.S. academic medical center websites were searched for English and Spanish language patient education materials on epidural analgesia.

- Readability was 9th-12th grade versus the 6th grade level recommended.
- All discussed benefits, only 14% discussed complications (PDPH and hypotension most common) or contraindications.

Anesth Analg 2015; 121: 1295

TRAINEE EDUCATION

How many obstetric epidural placements are required to produce competence?

- Trainees new to L&D at a large public hospital in the UK were tracked.
- Used CUSUM (cumulative sum) analysis
- About 50 attempts required to achieve competence

Br J Anesth 2015; 114: 951

CASE REPORTS

Woman with an unstable cervical spine fracture in halo required induction for preeclampsia and passive 2nd stage.

A&A Case Reports 2015; 4: 145

Woman with Harlequin Ichthyosis required cesarean for failure to progress → failed epidural → general anesthesia.

A&A Case Reports 2015; 4: 19

ANESTHESIA FOR CESAREAN DELIVERY

GASTRIC ULTRASOUND

Pregnant women had gastric ultrasound after overnight fasting prior to their elective cesarean to determine “normal”.

- 53/103 had no antral fluid, 49/103 had fluid seen in RLD position only, 1/103 had fluid in supine and RLD positions
- Antral cross-sectional area = 95% CI, 8.6-10.3 in RLQ position = estimated gastric volume \leq 117 ml.

Anesth Analg 2015; 121: 752

GASTRIC EMPTYING

Gastric emptying was compared among 5-500 ml beverages of increasing caloric content: water, OJ, milk, gum syrup.

- Healthy fasted volunteers (non-OB)
- Emptying depended mainly on caloric content rather than composition.
- Pulp-free OJ and milk no different.

Br J anaesth 2015; 114: 77

ASPIRATION PROPHYLAXIS

Which interventions given prior to cesarean section reduce the risk of aspiration pneumonitis? Poor quality evidence, but.....

- ↓ risk of intragastric pH <2.5 with antacids (RR 0.17 versus placebo), H₂-receptor antagonists (RR 0.09), and PPI (RR 0.26)
 - Most effective: antacids + H₂-antagonists but no study had adverse outcomes to compare
- Cochrane Database Syst Rev 2014: CD004943

CEFAZOLIN DOSE IN OBESITY

Does 3 gm cefazolin produce better adipose tissue concentrations in obese women BMI > 30 than 2 gm for pre-cesarean prophylaxis?

- Tissue harvested before fascial incision and after closing fascia
- 3 gm cefazolin did not increase adipose tissue concentrations, so 2 gm is adequate
Obstet Gynecol 2015; 125: 1205

SKIN PREPARATION

Comparison of chlorhexidine with alcohol, povidone-iodine with alcohol, and both sequentially before cesarean to prevent surgical site infections:

- Overall rate of SSI: 4.3%
- No difference between the groups: PI-A 4.6%, C-A 4.5% and both 3.9%
Obstet Gynecol 2015; 126:1251

UTERINE EXTERIORIZATION

Systematic review and meta-analysis comparing uterine exteriorization at cesarean versus repair in situ:

- 16 studies, almost 20,000 patients
- No difference in EBL, intraoperative nausea and vomiting, or pain
- Faster return of bowel function by 3 hours with in situ repair
Can J Anesth 2015; 62: 1209

MUSIC THERAPY

A study of women having surgery for breast cancer compared preop patient-selected music and intraop therapist-selected music to usual preop care with ear plugs intraop.

- No difference in amount of propofol sedation, satisfaction, or recovery time
- Music group had lower preop anxiety scores
J Clin Oncol 2015; 33: 3162

“GENTLE” CESAREAN

- Featured on NPR, Today.com, many non-medical publications
- Elements: placing ECG leads on the back or sides, BP cuff and pulse ox on one arm to leave one free, immediate skin-to-skin contact if appropriate, lowering the curtain to a clear drape at delivery
- Not advocating for more cesareans
OB/Gyn news.com, 4/23/15

“GENTLE” CESAREAN



The opaque drape can be lowered to a clear plastic drape at delivery if desired.

“GENTLE” CESAREAN



Early skin-to-skin contact is typically encouraged as part of a gentle cesarean.

RSI AND OBESITY

What is the accuracy of finding the cricoid membrane by palpation versus ultrasound in obese vs. non-obese women?

- Digital exam was accurate in 71% of normal weight vs. only 39% of obese
- ↑ neck circumference → ↓ accuracy on palpation; consider pre-procedural US
Anaesthesia 2015; 70: 1230

BIS DURING CESAREAN

Reasons why BIS may not be accurate:

- Using adequately high doses of induction agent should address the problem of awareness after RSI
- Lag time in speed of onset of BIS monitoring during and immediately after induction may not address real-time awareness
- May be useful during PPH when volatile agents are reduced or removed.

Br J Anaesth 2015; 115: 530

DIFFICULT AIRWAY

The Obstetric Anaesthetists' Association and Difficult Airway Guidelines

Anaesthesia 2015; 70: 1286

These are the first national obstetric guidelines for safe management of difficult and failed tracheal intubation.

DIFFICULT AIRWAY

SOAP Patient Safety Committee Expert Opinion: Airway equipment and training

- Compared 4 institutions' on what equipment they have on L&D and what training they do, eg. Simulations
- No real consistency

SOAP Newsletter 2015; Summer: 17

GETA AND PREMATUREITY

What is the incidence and risk factors for use of GETA during preterm cesarean?

- 11,539 women 24-36 weeks gestation
- 82% neuraxial, 18% general
- For every 1 week decrease in GA, odds of GETA increased by 13%
- Other risk factors: emergencies, hypertensive disease, non-Caucasian race

Br J Anaesth 2015; 115: 267

RATE OF GETA

What is the appropriate rate of general anesthesia for cesarean? Should it be a quality indicator for anesthesiologists?

- In current practice, general has the same or fewer complications than regional
- Regional has other benefits that should be taken advantage of – bonding, pain control, less blood loss, ↓ thrombotic complications

Anesth Analg 2015; 120: 1175

REGIONAL vs GETA

Both techniques have advantages and disadvantages; which is more efficacious?

- Patients receiving neuraxial for cesarean had ↓ EBL and ↑ postop Hgb.
- Higher satisfaction with general; more women said they would have the same technique after GETA – RR 0.8.
- No difference in neonatal outcomes.

Cochrane Database Syst Rev CD 004350

EMERGENCY CESAREAN

Patient transfer for emergency cesarean delivery can lead to medication errors, venous access complications per reports to SOAP.

- Inadvertent magnesium and oxytocin boluses
- Lack of an IV at patient request, infiltration of the IV, lack of IV tubing ports or pump tubing that prevents flow are common
- Systems design, team training are key

APSF Newsletter October 2015; 23

NITROUS OXIDE

- The ENIGMA trials compared 70% nitrous oxide versus no nitrous on outcomes for patients at risk of cardiac events having non-cardiac surgery.
- The ENIGMA-II trial found no difference in the primary outcome of death or cardiovascular events in either short-term or long-term (1 year) follow-up.

Anesthesiology 2015; 123: 1267

BP MEASUREMENT

Shivering is common during cesarean. Would wrist BP trend accurately with upper arm BP measurements?

- Wrist BP overestimates by 13 mmHg
- The measurements trend together
- Wrist BP is probably not accurate enough to use versus upper arm BP

Anesth Analg 2015; 121: 767

PREVENTING HYPOTENSION

- No fluid loading regimen reliably prevents ↓BP, probably because ↓SVR is an important component – not just ↓preload.
- Phenylephrine rapidly corrects ↓SVR, is faster than ephedrine and less likely to cross the placenta to cause fetal acidosis.
- Maternal response to SAB is ↑HR and ↑CO so giving a β-agonist isn't physiologic.
- Phenylephrine infusion at 50µg/min is optimal.

Br J Anaesth 2015; 114: 183

NOREPINEPHRINE?!

Would norepinephrine be a better pressor after spinal anesthesia than phenylephrine?

- Randomized, double-blind comparison: N 5 $\mu\text{g}/\text{min}$ versus P 100 $\mu\text{g}/\text{min}$
- N \rightarrow same BP control, less bradycardia, less decrease in cardiac output
- β -agonist activity may be preferable than α -agonist activity alone

Anesthesiology 2015; 122: 728, 736

BUPIVACAINE BARICITY

Systematic review of hyperbaric versus isobaric bupivacaine for spinal anesthesia for cesarean:

- Remarkably few studies and fewer outcomes
- No clear evidence to favor one over the other
- No data to determine which is more likely to fail \rightarrow conversion to general anesthesia

Anesth Analg 2015; 120: 132

INTRAOP WARMING

Does active warming improve outcomes after neuraxial block for elective cesarean delivery?

- Meta-analysis of 13 studies, 789 patients who had forced air warming within 30 min
- Active warming \rightarrow less shivering, better thermal comfort, less hypothermia, higher umbilical artery pH

Br J Anaesth 2015; 115: 500

OXYTOCIN DOSE

Comparison of women having elective cesarean to intrapartum laboring women exposed to exogenous oxytocin:

- ED_{90} was higher in the exposed group, 44 versus 16 U/hour
- More laboring women required additional oxytocics (34 vs 8%) and thus had more side effects (69 vs 34%)

Anesth Analg 2015; 121: 159

OXYTOCIC COMBINATIONS

Would combining oxytocics be better than using oxytocin alone?

- Myometrial samples were exposed to saline, oxytocin, ergonovine, and/or carboprost
- If no pre-exposure to oxytocin (i.e. no labor), oxytocin works the best of all drugs
- If pre-exposed, oxytocin combined with ergonovine or carboprost is superior

Anesth Analg 2015; 120: 1074

GABAPENTIN

Would a perioperative course of gabapentin improve postop analgesia? No.

- Randomized, double-blind comparison of placebo with 600 mg preop gabapentin followed by 600 mg/day
- No clinically significant difference in pain but more sedation in G group

Anesthesiology 2015; 123: 320

TAP BLOCKS

Surgical site infiltration was superior to TAP blocks after TAH with a Pfannenstiel incision.

Anesth Analg 2015; 121: 1383

Meta-analysis of efficacy of ultrasound-guided TAP blocks for abdominal surgery found marginal postoperative analgesic efficacy, and no additional effect if IT morphine is used.

Anesth Analg 2015; 121: 1640

PRURITUS

Would methylnaltrexone 12 mg SQ prevent side effects after intrathecal morphine for cesarean delivery? No.

- 80% in M and placebo groups had itching
- Intraop vomiting was more common with M; no difference in postop vomiting
- M only acts peripherally so it wouldn't block any central opioid mechanisms.

Br J Anaesth 2015; 114: 469

PRURITUS

Would ondansetron prevent pruritus by blocking 5-HT3 receptors if given before IT morphine for cesarean? Yes.

- 4 mg ondansetron or placebo were given 30 minutes before spinal anesthesia
- Pruritus was less after O: 16% versus 88%
- PONV was less after O: 8% versus 56%

BMC Anesthesiol 2015; 15: 18

ANESTHETIC COMPLICATIONS

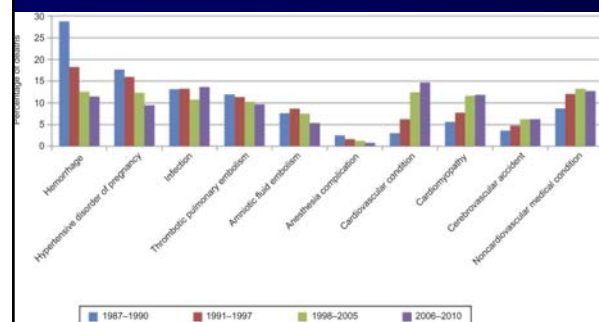
U.S. NATIONAL DATA - CDC

Top 10 causes of maternal mortality after live birth:

1. **Cardiomyopathy** 15%
2. **Cardiovascular conditions** 14%
3. Infection 13%
4. Preclampsia / 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

U.S. NATIONAL DATA - CDC



UK TRIENNIAL REVIEW

“Lessons for Anaesthesia”:

- Subdural hemorrhage, cerebral venous sinus thrombosis should be in the PDPH differential
- Practice airway drills including bronchospasm
- Maintain postoperative standards in PACU
- Be ready to deal with LAST or high blocks
- Prompt action and good communication between teams during unexpected catastrophes

UK TRIENNIAL REVIEW

- Ambulance services must relieve aortocaval compression and document how achieved.
- Monitor all women; early warning systems should be followed and audited for actions.
- All investigations of serious untoward incidents must include an anaesthetist.
- Fewer direct deaths, more multi-factorial issues

UK Saving Lives, Improving Mothers' Care
Confidential Enquiries 2009-12

This is no longer the typical L&D patient who requires our care.



STATE MMC REVIEW

California 2002-2005 had 207 pregnancy-related maternal deaths. Findings?

- 41% of deaths were deemed preventable.
- 70% of hemorrhage deaths and 60% of preeclampsia deaths were preventable.
- Other causes: cardiovascular #1, venous thromboembolism #4 and AFE #5.

Obstet Gynecol 2015; 125: 938

STATE MMC REVIEW

Cesarean deliveries in New York, 2003-12:

- Anesthesia-related complications ↓ 25%
- Similar ↓ for regional and general anesthesia
- Serious non-anesthetic complications ↑ 47%, including MI, stroke, sepsis, coagulopathy, thromboembolism, renal & respiratory failure
- Anesthesiologists should be in a multi-disciplinary team as peripartum physicians.

Anesthesiology 2015; 123: 1013

PDPH AND NIGHT FLOAT

Does a night-float call system influence unintentional dural puncture on L&D?

- Rate increased from 0.73% - 1.49%
- CA-1 residents' rate increased from 5% of the wet taps to 28% - less supervision at night?
- Not all residents were on an OB rotation.

Anesth Analg 2015; 120: 1095

PDPH AND OBESITY

After wet tap, do obese parturients have a lower incidence of PDPH?

- Retrospective cohort study compared incidence of PDPH in low BMI <31.5 versus high >31.5
- OR 0.72 for PDPH in high BMI versus low
- OR 2.4 for PDPH if she pushed during labor
- No difference \pm intrathecal catheter placement

Anesth Analg 2015; 121: 451

DURAL PUNCTURE AND CRANIAL NERVE PALSY

Hearing loss is improved with epidural blood patch, even without headache.

Canadian Anesthesiologists' Society

Abstract #86119

When CN VI symptoms of diplopia occur, early blood patch may decrease morbidity of prevent progression of symptoms.

Anesth Analg 2015; 120: 644

PROPHYLACTIC EBP

Why does waiting 24 hours to perform a blood patch seem to give better results?

- Serial hemodilution of whole blood with CSF \rightarrow TEG
- Dilution \rightarrow \downarrow R time, k time, alpha angle, MA
- Larger amounts of CSF near the EBP may lead to clot destabilization and failure

Anaesthesia 2015; 70: 135

MENINGITIS AFTER EBP

G1 in active labor, GBS +, requested epidural analgesia. Full ASRA/ASA sterile precautions used. First attempt \rightarrow wet tap, repeated at another interspace. Postural headache \rightarrow EBP on day #1 \rightarrow relief and discharge. PDPH recurred on day #4 and EBP repeated \rightarrow relief. Day #5 returned with fever, \uparrow WBC, neurologic symptoms with blood culture + for GBS, CSF culture and imaging negative. Related??

A&A Case Reports 2015; 4: 163

RESPIRATORY DEPRESSION

ASA Closed Claims database: 92/357 acute pain claims involved opioid-related resp. depression.

- 88% occurred in the first 24 hours
- 97% were judged preventable
- 42% had had a nursing check within 2 hours and 33% were on pulse oximetry
- 39% neuraxial: 47% morphine, 53% fentanyl
- 1/3 had more than one physician prescribing

Anesthesiology 2015; 122: 659

DIAGNOSING OSA

Can the usual OSA screening tools identify pregnant women with OSA?

- 248 patients had 6 screens + sleep monitoring
- 12% had OSA diagnosis: \uparrow BMI, \uparrow neck circumference; more HTN, DM, asthma, PEC
- None of the screening tools accurately detected OSA in the 3rd trimester – new tool?

Obstet Gynecol 2015; 126: 93

CARDIAC ARREST

Using cardiac MRI, is there upward displacement of the heart during pregnancy?

- CPR guidelines recommend hand placement higher in pregnancy
- 38 healthy women had MRI during 3rd trimester and again > 3 months postpartum
- There was no difference and thus no need to alter hand placement during CPR.

Am J Obstet Gynecol 2015; 213: 401

CARDIAC ARREST

Shift in thinking from peri-mortem cesarean delivery (feto-centric) to resuscitative hysterotomy (maternal-centric) as soon as acute maternal cardio-pulmonary arrest is recognized.

- Don't wait 4-5 minutes to deliver after arrest.
- Don't delay to find fetal heart rate, locate optimal equipment, or transport to the OR

Am J Obstet Gynecol 2015; 213: 653

CARDIAC ARREST

Is lipid emulsion's rescue of bupivacaine cardiotoxicity (LAST) mediated through opioid receptors?

- Rat model of bupivacaine-induced asystole
- Prior administration of naloxone or highly selective opioid receptor antagonists
- Peripheral δ , κ opioid receptors are involved

Anesth Analg 2015; 121: 340

CARDIAC ARREST

Case report: Perimortem cesarean in patient with goiter, preeclampsia and morbid obesity after arrest due to airway obstruction.

A&A Case Reports 2015; 4: 41

Case report: Parturient with left ventricular non-compaction complicated by acute pulmonary hypertension after methylergonovine for PPH.

A&A Case Reports 2015; 4: 166

EPIDURAL HEMATOMA

Non-obstetric retrospective analysis of 11,600 epidural catheters; 2.4% placed with abnormal coagulation and 3% removed.

- 2 epidural hematomas occurred: vascular procedures, abnormal postop coagulation parameters when catheters removed.
- Estimated 1:315 occurrence when coagulation status is abnormal – not 100%.

Br J Anaesth 2015; 114: 808

NEUROPATHIES

Review of anatomy and etiology of postpartum thoraco-lumbar spinal cord, lumbar nerve roots, plexus and lower extremity peripheral nerve injuries. Cases used to illustrate diagnosis, management, and treatment.

Anesth Analg 2015; 120: 141

ASRA GUIDELINES

Interventional Spine and Pain Procedures in Patients on Antiplatelet and Anticoagulant Medications

- New, separate guidelines from regional
- Similar, but more conservative
- Regional update in 2016?

Reg Anesth Pain Med 2015; 40: 182

NEURAXIAL DRUG ERRORS

Review of 29 published cases:

- 4 maternal deaths from intrathecal TXA
- Most common complication: block failure
- Human factors: drug storage, similar drug appearance → read labels carefully, label all syringes, check label with a 2nd person or bar code reader, use non-Luer lock connectors

Anesth Analg 2015; 121: 1570

SURGERY IN PREGNANCY

Mayo Clinic review of 121 surgeries performed at ≥ 23 weeks gestation (viable):

- 73% general anesthesia, 12% used fetal monitoring, 1 fetal loss was unmonitored
- 41% delivered preterm (mean GA 37 weeks), but only 10% within a week of the surgery
- Risk of complications intra- or immediately postop were low – reassuring for patients.

Am J Obstet Gynecol 2015; 212: 232

SURGERY IN PREGNANCY

Using the NSQIP database, compared 2539 pregnant women who had surgery, and propensity matched them for complications.

- More emergencies in pregnancy (50 vs 12%)
- No difference in mortality rates (0.4 vs 0.3%)
- No difference in morbidity rates (6.6 vs 7.4%)

JAMA Surgery 2015; 150: 637

BENZODIAZEPINES

Expert review of the literature on use of hypnotics and sedatives during pregnancy and association with adverse outcomes. Specific to use of benzodiazepines:

- No increased risk of congenital anomalies
- Possible association with preterm delivery, low birth weight or SGA babies

Am J Obstet Gynecol 2015; 212: 428

SURGERY CASE REPORTS

Awake craniotomy at 20 weeks.

Anesth Analg 2015; 120: 1099

Prone discectomy at 24 weeks.

Int J Obstet Anesth 2016; 25: 95

Catheter ablation of SVT with 22 week twins.

Obstet Gynecol 2015; 125: 1338

NEUROTOXICITY

Update from the FDA and Smart Tots: There is consensus that “surgical procedures performed under anesthesia be avoided in children under 3 years of age unless the situation is urgent or potentially harmful if not attended to”.

- Animal studies are consistent that all GABA agonists and NMDA antagonists have neurotoxic effects. Dexmedetomidine??

N Engl J Med 2015; 372: 796

NEUROTOXICITY

Infants having inguinal herniorrhaphy were randomized to general or spinal anesthesia.

- 238 awake/regional, 294 general anesthesia
- Development was assessed at 2 years of age
- No difference in neurodevelopmental outcome between group.
- Primary outcome is testing at 5 years of age.

Lancet 2016; 387: 239

NEUROTOXICITY IN ANIMAL STUDIES

↑ anxiety behaviors in monkeys exposed to multiple anesthetics as neonates.

Anesthesiology 2015; 123: 1084

Neurotoxic exposure in rodents can be tracked using neuronal metabolites and magnetic resonance spectroscopy.

Anesthesiology 2015; 123: 557

CESAREAN & AUTISM

Autism has been associated with cesarean birth. Study used data from a large Swedish registry:

- In the conventional cohort analysis, children born by elective CS were 21% more likely to be diagnosed as having ASD after controlling for known confounders.
- However, in the sibling control analysis, no association was found.
- Association is not causal and therefore is due to unknown genetic or environmental factors.

JAMA Psychiatry 2015; 72: 935

SUBOXONE-DEPENDENCY

Buprenorphine is an alternative to methadone to treat dependence. Partial mu opioid antagonist.

- ↓ risk of overdose, fewer drug interactions, less severe neonatal abstinence syndrome
- ↑ pain med requirements after cesarean
- Need a multi-modal analgesic regimen: neuraxial, ketamine, TAP blocks, wound infiltration, acetaminophen, ketorolac

SOAP Newsletter 2013; Summer: 13

UNUSUAL CASES

Loeys-Dietz Syndrome (autosomal dominant connective tissue syndrome) and cesarean delivery.

A&A Case Reports 2015; 4: 47

Vaginal delivery with hyperekplexia – syndrome with exaggerated startle response.

A&A Case Reports 2015; 4:103

**Doctors can't make you immortal.....
But with good luck they can prolong your suffering indefinitely.**

OBSTETRIC & MEDICAL COMPLICATIONS

UK TRIENNIAL REVIEW

- There has been an overall reduction in maternal mortality in the UK to 10 per 100K *maternities*
- All of that reduction has come from “direct” causes, e.g. preeclampsia, genital tract sepsis→ #1 direct cause is venous thromboembolism
- No change in death rates from “indirect” causes, e.g. cardiac, epilepsy
- Recommendations support better training in obstetric medicine (an ABIM fellowship area)
Obstetric Medicine 2015; 8:3

STATE MMC REVIEW

Review of deaths in Illinois 2001-12 to describe potential preventability:

- #1 vascular causes (stroke), #2 cardiac causes, #3 hemorrhagic causes
- 1/3 of deaths related to pregnancy were deemed preventable including most hemorrhage and psychiatric causes
- Patient, provider and systems factors
Am J Obstet Gynecol 2014; 211: 698

MANAGEMENT PROTOCOLS

- Use of comprehensive maternal protocols in a large health care system (> 60K annual births) reduced blood product use by 26% and hysterectomy by 15%.
Am J Obstet Gynecol 2015; 212: 272
- A standardized multi-disciplinary approach to placenta accreta spectrum resulted in ↓ EBL, ↓ transfusions and fewer emergency deliveries.
Am J Obstet Gynecol 2015; 212: 218

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

National Partnership for Maternal Safety: Consensus Bundle on Obstetric Hemorrhage

Anesth Analg 2015; 121: 142

JW ALGORITHM

Comprehensive care of the Jehovah's Witness parturient, including ethical/legal concerns and an algorithm for peripartum management.

Anesth Analg 2015; 121: 1564

POSTPARTUM HEMORRHAGE

Comprehensive management protocol including transfusion and testing.

Blood 2015; 125: 2759

Comparison of 4 national guidelines for management of PPH found substantial variation – US, UK, Canada, and Australia/ New Zealand.

Am J Obstet Gynecol 2015; 213: 76

OXYTOCIN

Do parturients exposed to oxytocin during labor require more oxytocin after delivery to achieve satisfactory tone? **YES.**

- Oxytocin ED₉₀ was 44 IU/hr after oxytocin in labor versus only 16 IU/hr without prior labor.
- 34% of laboring women but only 8% of non-laboring required other uterotonic agents.

Anesth Analg 2015; 121: 159

2ND LINE UTEROTONICS

Is methylergonovine (Methergine®) or carboprost (Hemabate®) preferable when a 2nd line uterotonic is necessary?

- 1335 women who required transfusion or operative intervention for PPH were reviewed
- 65% had Methergine®; 35% had Hemabate®
- Methergine was more effective and had less hemorrhage-related morbidity

Am J Obstet Gynecol 2015; 212: 642

ACCRETA / PERCRETA

Accreta Spectrum comprehensive management:

- Antenatal diagnosis by ultrasound
- Scheduled cesarean hysterectomy
- Multi-disciplinary preop care conference
- May need surgeons with experience in bowel or urological surgery for percreta

Obstet Gynecol 2015; 126: 654

Features of a center of excellence for accreta spectrum

Am J Obstet Gynecol 2015; 212: 561

ACCRETA / PERCRETA

Randomized trial of pre-cesarean balloon catheters for suspected placenta accreta:

- 13 in the intervention group, 14 controls
- 50% had cesarean hysterectomy in each group
- No difference in EBL, transfusion, EBL > 2500 ml, duration of surgery, peripartum complications, length of stay
- 15% had balloon-related complications

Obstet Gynecol 2015; 126: 1022

ACCRETA / PERCRETA

Review of conservative management:

- Procedures: leaving placenta in-situ, hysteroscopic resection, en bloc excision and repair, addition of arterial occlusion and methotrexate
- Risk of delayed hysterectomy for bleeding or infection, recurrence of accreta in subsequent pregnancy – cost analysis vs. immediate cesarean hysterectomy?

Am J Obstet Gynecol 2015; 213: 755

DIC SYNDROMES

- Associated with abruption, AFE, sepsis, acute fatty liver, preeclampsia / HELLP, and massive hemorrhage
- Initiated by tissue factor from trophoblastic or fetal tissue
- Treat the underlying disorder and provide blood and component therapy.

Obstet Gynecol 2015; 126: 999

RETAINED PLACENTA

Evaluation of risk factors in > 91,000 deliveries \geq 24 weeks gestation:

- Occurred in 1.1%
- Stillbirth OR 5.7, age > 30 years, delivery < 34 weeks, \uparrow labor duration
- Protective: non-Hispanic black race
- No association with BMI

Am J Obstet Gynecol 2015; 213: 864

TRANEXAMIC ACID

- Small studies have shown promising results but inadequate studies to recommend yet
- 10 RCT for cesarean \rightarrow significant reduction in EBL, no adverse events (1 gm in 5-10 min)
- Concern for neonatal exposure if given prophylactically, maternal thrombosis PP
- WOMAN trial in Africa and Europe is recruiting 15,000 women; results pending

Br J Anaesth 2015; 114: 576

FIBRINOGEN

Does low plasma fibrinogen at admission to L&D predict severe postpartum hemorrhage?

- 1951 healthy women, average fibrinogen concentration = 530
- No correlation with median EBL at delivery or with EBL > 1000 ml
- Risk of hemorrhage \uparrow with oxytocin during labor, cesarean delivery, uterine exploration

Br J Anaesth 2015; 115: 99

FIBRINOGEN

In early PPH, does pre-emptive treatment with fibrinogen reduce need for RBC transfusion?

- In early, severe PPH received 2 gm fibrinogen or saline regardless of labs
- No effect on transfusion; 20% with fibrinogen vs 22% received blood
- No thromboembolic events

Br J Anaesth 2015; 114: 623

CELL SALVAGE IN OBSTETRICS

- Change to a separate suction device after delivery.
- Use a leukocyte depletion filter to remove particulate and bacterial contaminants, reduce fetal cells, and remove AF-derived tissue factor.
- Consider cell salvage when patient will not consent to transfusion, cross-matched blood is unobtainable, or EBL is expected to be > 1 liter.
- **“...no single serious complication leading to poor maternal outcome has been directly attributed to use of cell salvage”**
- Supported by national bodies in U.S. and Britain.
Anesth Analg 2015; 121: 465

CELL SALVAGE IN OB

Which patients will lose enough blood during PPH to receive their cell salvage blood?

- Routine cesarean only 13%; 21% overall
- Cesarean hysterectomy 73%
- 69% with bleeding after cesarean
- 53% with bleeding after vaginal delivery

Obstet Gynecol 2015; 125: 919

PREECLAMPSIA: ETIOLOGY

Preeclampsia is a syndrome that:

1. Only occurs in pregnancy
2. Is characterized by maternal inflammation
3. Is associated with presence of a placenta

Does DNA shed from the placenta into the maternal circulation initiate the inflammatory response? *Expert Review* discusses evidence.

Am J Obstet Gynecol 2015; 213: 268

PREECLAMPSIA: ETIOLOGY

Expert Review: Why is placentation abnormal in preeclampsia? Recent evidence suggests that isolation and culture of cytotrophoblasts from the placentas of pregnancies complicated by preeclampsia enables normalization of their gene expression – some aspects may be reversible.

Am J Obstet Gynecol 2015; 213: S115

PREECLAMPSIA - DX

Survey of 140 pregnant women presenting to the ER with acute headache.

- 65% had primary HA diagnosis; 91% migraine
- Secondary HA due to another diagnosis in 35%
- Preeclampsia most common 2^o diagnosis in 51%
- Don't miss other diagnoses: look for ↑ BP, seizures, fever, abnormal neuro exam.

Neurology 2015; 85: 1

EARLY VS LATE ONSET PREECLAMPSIA

Overall incidence of preeclampsia was 3%.

	Death per 100K	Morbidity (%)
Early-onset < 34 weeks	42	12 (renal, CV, respiratory, CNS)
Late-onset	11	5.5
No PEC	4	3

Obstet Gynecol 2014; 124: 771

EARLY vs. LATE ONSET PREECLAMPSIA

Data on 2 million infants in Quebec, 1989 – 2012

Overall CHD	Non-Critical CHD	Critical CHD
PEC vs None P.R. = 1.57 PR=prevalence ratio	Early vs Late Onset PEC: P.R. = 5.55	Early vs Late Onset PEC: P.R. = 2.78

CHD congenital heart disease, PEC=preeclampsia
JAMA 2015; 314: 1588

#514: Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period.

“Acute-onset, persistent (>15 min) severe systolic (≥ 160 mmHg) or diastolic (≥ 110 mmHg) hypertension in the pregnant or postpartum patient with PEC/EC constitutes a **hypertensive emergency**. Severe systolic HTN may be the most important predictor of cerebral injury and infarction, and if not treated expeditiously can result in death...”

ACOG COMMITTEE OPINION

“...IV labetalol (20→40→80 mg), PO nifedipine (10→20→20 mg), and IV hydralazine (5→10 mg) are all considered first line drugs. In the rare circumstance that they fail to relieve acute severe HTN...emergent consultation with an **anesthesiologist**, maternal-fetal medicine subspecialist, or critical care subspecialist is recommended to discuss second-line intervention.”

Obstet Gynecol 2015; 125: 521

PREECLAMPSIA & STROKE

CVA in hypertensive disorders of pregnancy may be associated with impaired cerebral auto-regulation. Auto-regulatory index calculated:

- Normal in gestational hypertension (6.7)
- Reduced in preeclampsia and chronic hypertension (similar values of 5.5 and 5.6)
- Lowest in chronic HTN with superimposed preeclampsia (3.9)

Am J Obstet Gynecol 2015; 212: 513

PREECLAMPSIA & STROKE

Are complications higher in stroke during pregnancy when associated with HTN disorders?

- Women with HTN were 5.2 times more likely to have a stroke; especially with other risk factors such as atrial fib, congenital heart disease, sickle cell, thrombophilia
- Complications were more common with HTN.
- Stroke rates have ↑ since the 1990s.

Obstet Gynecol 2015; 125: 124

PREECLAMPSIA - RX

How tight should BP be controlled when treating chronic hypertension during pregnancy?

- Randomized trial of tight (diastolic target 85 mmHg) versus less-tight (diastolic 100 mmHg)
- No apparent benefit to the fetus (probably not powered to find differences in fetal death)
- Only moderate maternal benefit to tight control → less progression to severe hypertension, 28% versus 41%.

N Engl J Med 2015; 372: 407

PREECLAMPSIA

Are health care providers aware that preeclampsia ↑ later risk of cardiovascular disease?

- Gynecologists more likely to ask about pregnancy history
- Internists more likely to get appropriate testing for CV disease
- Both groups need additional education.

Obstet Gynecol 2015; 125: 1287

PREECLAMPSIA

HTN in pregnancy is associated with ↑ later risk of CV death before age 60.

- 2-3x risk after preeclampsia
- 6x risk after chronic HTN + preeclampsia
- 7x risk after chronic HTN + preterm delivery
- 5x risk after chronic HTN + low birthweight
- 5x risk after preeclampsia + preterm delivery

Circulation on-line 2015; 9/21/15

OBESITY

CDC reports that among women who delivered a full-term, singleton infant:

- 32% gained an appropriate amount
- 20% gained too little
- 48% gained too much, leading to ↑ risk of macrosomia, postpartum weight retention, and child obesity

MMWR 2015; 64: 1215

OBESITY PROTOCOLS

Assess the patient *early* and discuss the plan:

- Be frank about problems that might be encountered
- Perform an airway assessment
- Ensure reliable IV access – PICC?
- Consider an arterial line
- Use supplemental oxygen intrapartum
- Use continuous pulse oximetry
- Administer aspiration prophylaxis throughout labor

Am J Obstet Gynecol 2015; 213: 318

OBESITY GUIDELINES (1)

ACOG Practice Bulletin #156:

- Calculate BMI at 1st prenatal visit to begin diet & exercise counseling
- Pre-conception and inter-pregnancy weight loss improve outcomes during pregnancy
- **Consult Anesthesiology**; obese women with OSA are at ↑ risk of hypoxia, ↑ CO₂ and death
- Ultrasound diagnosis of anomalies may be limited
- Screen early for diabetes

OBESITY GUIDELINES (2)

- Allow longer 1st stage of labor before C/S for labor arrest
- Use mechanical & weight-based pharmacologic thromboprophylaxis
- Subcutaneous drains ↑ post-cesarean cx and should not be routine
- Stillbirth rates are ↑ but role of antepartum surveillance is unclear.

Obstet Gynecol 2015; 126: e112

BARIATRIC SURGERY

Pregnant women who had bariatric surgery were matched with pregnant controls of *similar* BMI.

- Gestational diabetes was less: 2 vs. 7%
- There were fewer LGA infants: 9 vs. 22%
- Higher risk of SGA infants: 16 vs. 8%
- Results not significant, but higher risk of stillbirth or neonatal death: 1.7 vs. 0.7%
- Bariatric surgery has strong benefits, but also risks.

N Engl J Med 2015; 372: 814

CEFAZOLIN DOSE & OBESITY

Does 3 gm cefazolin produce better adipose tissue concentrations in obese women BMI > 30 than 2 gm for pre-cesarean prophylaxis?

- Tissue harvested before fascial incision and after closing fascia
- 3 gm cefazolin did not increase adipose tissue concentrations, so 2 gm is adequate

Obstet Gynecol 2015; 125: 1205

ENOXAPARIN DOSE & OBESITY

This study compared the adequacy of thromboprophylaxis based on anti-Xa concentrations when enoxaparin was dosed by weight or BMI-stratification.

- Anti-Xa levels were higher with weight-based dosing (0.5 mg/kg enoxaparin every 12 hours)
- Only 26% were therapeutic using BMI

Obstet Gynecol 2015; 125: 1371

SEPSIS

A review of maternal sepsis deaths in Michigan 1999-2006 found:

- 15% of all pregnancy-related deaths
- Review of hospital records found 73% had a delay in receiving antibiotics, 53% had delay in escalation of care
- Of the 22 deaths, 20 developed sepsis at home (before or after delivery), 2 while hospitalized

Obstet Gynecol 2015; 126: 747

SEPSIS

Modified Obstetric Early Warning Scoring systems (MEOWS) are adapted for the physiologic changes of pregnancy. Attempt to validate 6 published MEOWS.

- Retrospective study of 364 women with chorio, 5 developed severe sepsis
- Multiple MEOWS with varying sensitivity and specificity but all poor & over-diagnosed
- None performed as well as standard MEWS

Am J Obstet Gynecol 2015; 212: 536

Tdap VACCINATION

Tdap vaccination is recommended during each pregnancy regardless of prior immunization status. Is this safe in close intervals?

- Women receiving Tdap in current pregnancy stratified by time since last Tdap; < 2 years, 2-5 years, and > 5 years
- No ↑ risk of acute adverse events or adverse birth outcomes for intervals <2 or < 5 years.

JAMA 2015; 314: 1581

HIV TRANSMISSION

ACOG Committee Opinion #635 recommends prenatal HIV screening for all women to:

1. prevent perinatal transmission,
2. get the mother the benefits of early therapy,
3. decrease the risk of transmission for HIV-uninfected sexual partners.

They recommend screening high-risk mothers again in 3rd trimester. On L&D, untested mothers should get rapid screens and antiretroviral prophylaxis started immediately if positive.

Obstet Gynecol 2015; 125: 1544

HIV TRANSMISSION

Multicenter cohort study of 8075 HIV-infected women on combination anti-retroviral therapy.

- Overall transmission rate only 0.7%.
- If started pre-conception and viral load was < 50, there was no transmission.
- If started in 3rd trimester, 2.2%
- Elimination of perinatal transmission may be possible!

Clin Infect Dis 2015; online

UNUSUAL INFECTIONS

Embolitic strokes caused by parasitic infection and eosinophilic syndrome.

N Engl J Med 2015; 373:1154

Fever and headache caused by tick-borne infection with *Borrelia*.

N Engl J Med 2015; 373: 468

CARDIOVASCULAR DZ

Describe the incidence and type of CV disease as a cause of maternal mortality in California, 2002-2006:

- 25% of deaths were from CV causes
- African-American race, illicit substance use and obesity were all risk factors
- Chronic disease prevention and treatment are needed to reduce maternal mortality

Am J Obstet Gynecol 2015; 213: 379

CARDIOMYOPATHY

Review on diagnosis and management of peripartum cardiomyopathy:

- Diagnosis of exclusion when EF \leq 45
- Symptoms of heart failure; can be difficult to differentiate from normal pregnancy symptoms
- Stabilize before delivery with oxygenation, diuretics, vasodilators \pm inotropes, then β -blockers; transplantation if no improvement

Anesth Analg 2015; 120: 638

CORONARY DISEASE

Review of subsequent pregnancy risks in women with pre-existing CAD or after acute coronary symptoms:

- CAD contributes to 20% of maternal cardiac deaths during pregnancy
- Requires specialist care with cardiology
- Treat modifiable risk factors (e.g., smoking)
- Complications \uparrow and outcomes are worse.

Heart 2015; 101: 502, 505

CARDIAC VALVULAR DZ

Review of 212 women with mechanical heart valves during pregnancy:

- Only 58% had an uncomplicated pregnancy
- 4.7% had valve thrombosis; half occurred in the first trimester when taken off warfarin
- Warfarin use ↑ miscarriage and late fetal death
- 23% had hemorrhagic complications vs 5% with a tissue valve

Circulation 2015; 132: 132

THROMBOSIS

Clinical management of DVT during pregnancy:

- Leading cause of maternal morbidity/mortality
- Gestational DVT is usually left leg and proximal → increased risk of embolism
- Ultrasound for DVT, V-Q for PE initially
- LMWH preferred treatment, continuing until 6 weeks postpartum; Coumadin contraindicated during pregnancy but safe for breastfeeding.

N Engl J Med 2015; 373: 540

THROMBOSIS

Case report: G1 at 33 weeks presented with chest and shoulder pain, right leg edema, and upper thigh pain. US → femoral DVT. CT angiogram → large central saddle embolus. Worsening symptoms and RV dysfunction on TTE led to successful catheter-directed TPA thrombolysis under GETA in a hybrid OR with cardiac surgeons and bypass on standby. Induction for preeclampsia on POD11 with vaginal delivery.

A&A Case Reports 2015; 4: 91

RISKS FOR PP DEPRESSION

Women who strongly prefer vaginal delivery but require a cesarean.

Am J Obstet Gynecol 2015; 212: 229

Self-reported poor sleep during pregnancy and the postpartum period ↑ risk of PP depression. Sleep interventions should be studied.

J Affect Disord 2015; 176: 65

FETAL LOSS

A national survey on U.S. perceptions of miscarriages found many misconceptions.

- 55% believed miscarriage was rare (< 5%).
- Believed to be caused by a stressful event (76%), heavy lifting (64%), previous IUD use (28%) or oral contraceptive use (22%).
- Those who had a miscarriage felt guilty (47%), that they had done something wrong (41%), ashamed (28%) and isolated.

Obstet Gynecol 2015; 125: 1313

FETAL LOSS

This review of stillbirth or late termination for fatal fetal anomalies discusses:

- Psychological and emotional effects
- Obstetric management
- Ethical challenges
- Medical complications

Anesth Analg 2015; 121: 457

BREECH DELIVERY

What is the neonatal morbidity by mode of delivery for breech presentation at term?

- Canadian multi-center data from 2003-11
- Planned cesarean = 86%, lowest morbidity
- Vaginal delivery = 4%, OR 3.6 for composite neonatal morbidity or mortality
- Cesarean during labor = 10%, OR 2.8
- Outcomes worse when ≥ 40 weeks gestation.

Obstet Gynecol 2015; 125: 1153

BREECH DELIVERY

Study of the association between intended mode of delivery and morbidity/mortality among preterm, breech fetuses.

- Netherlands registry, 26-37 weeks gestation
- Overall no difference in mortality, but morbidity was \downarrow by cesarean: 8.7% vs 10.4%, OR 0.77
- For 28-32 weeks gestation CD \downarrow mortality (1.7% vs 4.1%) and morbidity (6% vs 10%), OR 0.37

Obstet Gynecol 2015; 126: 1223

ANESTHESIA FOR VERSION

Comparison of the success rate of ECV using spinal anesthesia or IV remifentanyl:

- Spinal=hyperbaric bupivacaine 9 mg+fentanyl
- IV remifentanyl at 0.1 $\mu\text{g}/\text{kg}/\text{min}$
- Spinal \uparrow success rate: 83% vs 64% on first attempt and on second attempt for those versions that failed: 78% vs 0%
- No difference in fetal bradycardia requiring cesarean delivery (1.6% vs 3.2%)

Br J Anaesth 2015; 114: 944

INDUCTION FOR TOLAC

Does induction of labor vs expectant management change outcomes in women attempting VBAC?

- ≥ 37 weeks, one prior cesarean, 6033 women
- Induction \uparrow risk of failed TOLAC from 37-39 weeks but not at 40 weeks
- Induction \uparrow maternal morbidity, OR 1.87
- No difference in neonatal morbidity

Obstet Gynecol 2015; 126: 115

CHOLESTASIS

What are the pregnancy outcomes with severe intrahepatic cholestasis of pregnancy?

- Umbilical cord bile acid levels correlated with maternal bile levels
- \uparrow risk of spontaneous preterm delivery, meconium-staining, postpartum hemorrhage and perinatal death
- IUFD 9.5% when bile acids $\geq 100 \mu\text{mol}/\text{L}$ \rightarrow move to delivery

Am J Obstet Gynecol 2015; 212: 100

THE FETUS AND NEONATE



PREVENTING MISCARRIAGES

For women with a history of recurrent miscarriages, does progesterone during the first trimester increase the rate of live births?

- 836 women received progesterone or placebo
- 66% live births in the progesterone group vs. 63% in the placebo group (CI 0.94-1.15)
- No difference in live births or adverse events

N Engl J Med 2015; 373: 2141

CELL-FREE DNA TESTING

Can cell-free DNA testing perform as well in first trimester trisomy screening as the usual ultrasound and biochemical tests?

- 16,000 women tested at 12.5 weeks
- Cell-free DNA detected 100% of Trisomy 21 versus only 79% using usual testing.
- Cost?

N Engl J Med 2015; 372: 1589

FETAL MMC REPAIR

CHOP reported fetal MMC repair outcomes for 100 cases following the MOMS trial:

- Average gestational age at surgery = 23 weeks
- Membrane separation 23%, PPROM 32%, PTL 38%, 2 IUFD, 4 neonatal deaths
- Average 34 weeks at delivery but over 50% delivered \geq 35 weeks, 3.4% transfused
- 2 \rightarrow VP shunts, 71% no hind-brain herniation, 55% had better than expected functional level

Fetal Diagn Ther 2015; DOI:10.1159/000365353

ANTENATAL MAGNESIUM

Antenatal magnesium may be used for preeclampsia, preterm labor, or fetal neuro-protection. Does it increase neonatal respiratory complications?

- 1500 infants < 29 weeks gestational age
- No \uparrow in cardio-respiratory events in the Mg group and hypotension treatment and invasive ventilation occurred less often.

Am J Obstet Gynecol 2015; 212: 94

ANTENATAL INDOMETHACIN

What are the effects of tocolysis with indomethacin on neonatal outcome?

- Meta-analysis included 8454 infants
- No difference in RDS, PDA, mortality, sepsis, or bronchopulmonary dysplasia.
- Antenatal exposure was associated with risk for severe intraventricular hemorrhage (RR 1.29), necrotizing enterocolitis (RR 1.36) and periventricular leukomalacia (RR 1.59)

Am J Obstet Gynecol 2015; 212: 505

PRETERM LABOR

Maternal microbiome may influence the risk of preterm labor.

- 40 women had their body-wide microbiota DNA sequenced weekly during pregnancy and for a year after they delivered.
 - *Lactobacillus*-poor vaginal microbiota was inversely correlated with GA at delivery.
 - Probiotic therapy? Environmental exposure?
- Proc Natl Acad Sci USA 2015; 112: 11060

FETAL MONITORING

Would use of fetal ECG ST-segment analysis assist in interpretation of conventional FHR monitoring and improve neonatal outcomes?

- 11,108 singleton fetuses > 36 weeks in labor
- Routine monitoring or addition of ST analysis
- No difference in cesarean rate, operative delivery, or any adverse neonatal outcome.

N Engl J Med 2015; 373: 632

FETAL MONITORING

Can OB experts agree on interpretation of abnormal FHR tracings and appropriateness of obstetric management? No.

- “Experts” reviewed abnormal FHR tracings for court cases while either knowing neonatal outcomes or while blinded to outcome
- Both intra- and inter-observer agreement was poor → lack of objectivity of expertise

Am J Obstet Gynecol 2015; 213: 856

DELAYED CORD CLAMPING

Delayed cord clamping by 1 minute prevents iron deficiency at 6 months of age. Are there neurodevelopmental effects at 4 years of age?

- Follow-up of 69% of children in a prior RCT
- Delayed cord clamping group had improved scores in fine-motor and social domains, especially in boys.

JAMA Pediatrics online 5/26/2015

MODE OF DELIVERY

Does planned cesarean delivery lead to health problems in childhood?

- Scottish database using 321,287 term births
- Planned cesarean versus vaginal delivery had ↑ risk of asthma requiring admission and inhaler prescription, and all-cause death by 21.
- No differences in obesity, inflammatory bowel disease, type 1 diabetes, or cancer.

JAMA 2015; 314: 2271

THE APGAR SCORE

ACOG Committee Opinion #644:

- Does not predict mortality or neurologic outcome and does not diagnosis asphyxia
- Apgar < 7 at 5 minutes → get cord gases
- Scores assigned during resuscitation are not equivalent to a score assigned to a spontaneously breathing infant.

Obstet Gynecol 2015; 126: 914

CORD BLOOD GASES

Does base deficit add any further predictive value over pH < 7.0?

- Adverse outcomes (encephalopathy, death, NICU admission) increased as pH fell, but base deficit did not add predictive value
- Cord lactate level > 3.9 may be more sensitive / specific for neonatal morbidity

Am J Obstet Gynecol 2015; 213: 373

NEWBORN RESUSCITATION

A literature review on evolving strategies.

Maternal Health, Neonatology, and
Perinatology 2015; 1: 4

Multi-center safety audit to improve delivery room resuscitation management by including checklists, videotaping and debriefings.

Maternal Health, Neonatology, and
Perinatology 2015; 1: 2

HYPER-BILIRUBINEMIA

Does the combination of antenatal phenobarbital and postnatal phototherapy decrease the need for blood exchange transfusions in newborns with hemolytic disease and hyperbilirubinemia?

- Yes – the differences in bilirubin levels and the need for transfusion were significantly reduced with combination therapy
- Phenobarbital ↑ hepatic enzymes and conjugation of bilirubin.

Clin Med Insights: Pediatrics 2015; 9: 67

RISK OF CEREBRAL PALSY

Review of CP occurring in term infants.

- 80-90% of CP is due to prenatal causes; birth asphyxia has a minor role in < 10%.
- IUGR and major birth defects (especially involving the brain) occur more often with CP.
- Other associations include abnormal placentas, thrombotic states and genetic factors.

N Engl J Med 2015; 373: 946

EXTREME PREMATURETY

Review of 20-year trends in outcomes for 35,000 babies born at 22-28 weeks gestation and 400-1500 grams from 1993-2012.

- Survival and survival without major morbidity improved, especially 23-24 weeks gestation.
- More steroids, more cesareans, more CPAP and less intubation, less sepsis over time

JAMA 2015; 314: 1039

EXTREME PREMATURETY

U.S. vital statistics were used to evaluate trends in mortality for infants born at 22-28 weeks gestation during 1990, 2000, and 2010.

- Infant mortality dropped by 50% from 1990-2000 with use of surfactant and steroids
- No change from 2000-2010 with changes in nutrition and ventilation strategy.
- Trend to ↑ effort to resuscitate at 22-24 weeks

J Perinatology 2015; 35: 885

EXTREME PREMATURETY

NICHD Network examined in-hospital differences in outcomes for infants < 27 weeks without anomalies.

- Main difference was in local approach to active treatment of infants born at 22-24 wks
- There was large variation in initiating potentially life-saving treatment after birth
- After 24 weeks there was no difference.

N Engl J Med 2015; 372: 1801

EXTREME PREMATURETY

What are the ethical aspects of a prenatal consultation with neonatology when delivery is considered imminent? Less than ideal setting...

- Limits on accuracy of morbidity/mortality data
- Very emotional time for decision-making
- Variable amount of trust between parents and physicians in emergent setting
- Consider a trial of resuscitation with various decision-making points occurring over treatment in the NICU

J Clin Ethics 2015; 26: 241

EXTREME PREMATURETY

Should preterm babies born < 29 weeks have screening for patent ductus?

- Ultrasound screening before day 3 of life was associated with ↓ mortality and pulmonary hemorrhage
- No difference in necrotizing enterocolitis, severe BPD or severe cerebral lesions

JAMA 2015; 313: 2441

PREMATURETY

Should preterm babies have delayed cord-clamping vs. concerns about IVH and delay in resuscitation?

- Infants born ≤ 32 weeks
- Delay of 45 seconds to cord clamp was associated with ↓ intubation in the delivery room, *less* IVH and ↓ RBC transfusion
- No difference in death or major morbidity

Am J Obstet Gynecol 2015; 213: 676

PREMATURETY

Premature newborns randomized to “kangaroo care” or skin-to-skin contact had a 36% lower death rate than those under standard care only.

- 50% lower risk of sepsis
- 78% lower risk of hypothermia
- 88% lower risk of hypoglycemia

Pediatrics online: 12/22/15

ANTI-DEPRESSANTS

What is the fetal risk of exposure to anti-depressants during pregnancy?

- Large Canadian register cohort study
- Sertraline: 34% increased risk of ASD and VSD, twice the risk of craniosynostosis
- Non-Sertraline SSRIs: ↑ risk of craniosynostosis and musculoskeletal defects

Am J Obstet Gynecol 2015; 212: 795

ANTI-DEPRESSANTS

What (if any) is the relationship between use of anti-depressants in pregnancy and autism spectrum disorder in the child?

- Large pregnancy database in Quebec
- 1054 children with autism disorder and mean follow-up of 3 years
- Using any anti-depressant during 2nd and 3rd trimester (but not 1st) was associated: hazard ratio 1.87; SSRI use in 2nd / 3rd trimester = 2.17

JAMA Pediatr; online 12/14/15

ABSTINENCE SYNDROME

Recent studies have compared infants of opioid-addicted mothers who were treated with methadone or buprenorphine and naloxone.

- B-N exposed infants had fewer symptoms and shorter hospitalizations.
- But...mothers were less compliant with B-N
- Cost of infant treatment if abstinence syndrome occurred: \$159K - 238K > a healthy neonate.

Obstet Gynecol 2015; 125: 363

MARIJUANA

Is marijuana use independently associated with poor neonatal outcomes? No.

- 8.4% usage rate (at Wash U in St. Louis)
- ↑ if younger, AA race, inadequate prenatal care, used alcohol, tobacco and other drugs
- After risk adjusting, marijuana use did not increase markers of poor neonatal outcome (low birthweight, NICU, Apgar<7, acidosis)

Am J Obstet Gynecol 2015; 213: 422

REVIEWS

Marijuana use in pregnancy and lactation: a review of the literature.

Am J Obstet Gynecol 2015; 213: 761

Fetal alcohol spectrum disorders.

Pediatrics 2015; 136: 3113

MATERNAL CANCER

Case-control study of mothers diagnosed with cancer during pregnancy.

- 129 children assessed at 18 months, 3 years
- 74% exposed to chemo, 8.5% to radiation, 10% to surgery alone, 10% to no treatment
- No differences in cognitive function, cardiac findings, or general development vs. controls

N Engl J Med 2015; 373: 1824

MATERNAL CANCER

Does in-utero chemotherapy affect child outcome and development?

- Comparison of children whose mothers were diagnosed during pregnancy and did or did not have chemotherapy while pregnant
- Developmental testing at ≥ 18 months
- No differences in cognitive ability, school performance, or behavioral competence.

Am J Obstet Gynecol 2015; 212: 658

MATERNAL CANCER

What is the long-term outcome of children who are exposed to maternal cancer, with or without treatment, during pregnancy?

- 129 children evaluated at 18 and 36 months
- 74% were exposed to chemotherapy, 8.5% to radiation, 10% to surgery, 11% no treatment
- No difference in birthweight, cognitive development or cardiology eval at 3 years

N Engl J Med 2015; 373:1824

