WHAT'S NEW IN OBSTETRIC ANESTHESIA FROM 2023?

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I have no conflicts of interest to disclose

CRASH – Colorado Review of Anesthesia for Surgicenters And Hospitals – Guiding the future of patient care

Anesthesiology, University of Colorado Anschutz Medical Campus

GOALS & OBJECTIVES

Discuss how literature from the past year may:

1. Change clinical practice in obstetric anesthesia via new guidelines and policies.
2. Produce best practices for analgesic and anesthetic techniques during labor and delivery.
3. Optimize and expedite management of anesthetic and obstetric complications.
4. Alter practices affecting the fetus and newborn.

NATIONAL GUIDELINES AND POLICIES

"It's a baby. Federal regulations prohibit our mentioning its race, age, or gender."

PAIN DURING CESAREAN

An estimated 15% of patients experience pain during cesarean → medicolegal consequences per Closed Claims. The ASA COBA published a "*Statement on Pain During Cesarean Delivery*" with practical advice & best practices:

- Preoperative assessment: risk factors and consent
- Minimizing risk of inadequate block: techniques, drugs, doses
- Supplementing inadequate neuraxial: variety of options
- Conversion to GETA and conduct of the anesthetic
- Follow-up, referral and QI metrics: communicate & acknowledge!

https://www.asahq.org/standards-and-practice-parameters/statement-on-pain-during-cesarean-delivery

NEURAXIAL DRUG SHORTAGES

Drug shortages are likely to continue. The ASA COBA created a "*Statement on Neuraxial Drug Shortages*" with guidance on substitutions and dose ranges + references for their use.

- They note that many neuraxial meds may not have specific FDA approval, e.g. fentanyl, isobaric bupivacaine.
- Includes suggested options for labor analgesia and surgical cases, both spinal and epidural concentrations and doses.
- Local anesthetics, e.g. 2-CP for labor, spinal ropivacaine for CS
- Opioids, e.g. meperidine and sufentanil
- Adjuvants, e.g. clonidine and dexmedetomidine

https://www.asahq.org/standards-and-practice-parameters

ANESTHETIC NEUROLOGIC COMPLICATIONS

Peripartum neurologic complications significantly impact a new mother and her family, and anesthesiologists are often consulted early - even though most nerve injuries are related to factors <u>other than</u> neuraxial procedures.

- ASA COBA published "*Statement on Neurologic Complications of Neuraxial Analgesia/Anesthesia in Obstetrics*" including assessment, imaging, consultation with Neurology/Neurosurg, & mgt.
- Focus on compressive lesions: epidural hematoma or abscess.

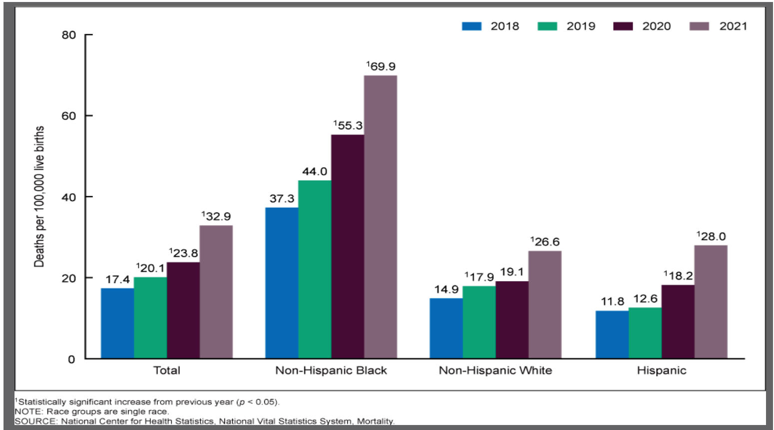
https://www.asahq.org/standards-and-practice-parameters/statement-on-neurologic-complications-of-neuraxial-analgesia-anesthesia-in-obstetrics

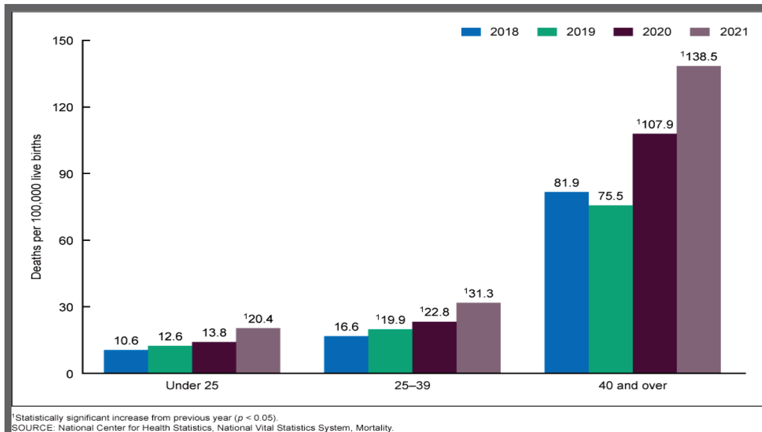
MATERNAL MORTALITY UPDATE

CDC Update on National Health Statistics, 2021:

- Maternal mortality rate rose to 33 per 100K live births from 24/100K in 2020 and 20/100K in 2019.
- 30% of maternal deaths were in Black mothers, and their mortality is 2.6 times higher than White mothers.
- Deaths were more common in older mothers > 40.
- Leading <u>pregnancy-related</u> causes were pulmonary embolism, hemorrhage and HTN (i.e. stroke).
- COVID added ↑ severity as well as disruptions to OB care.

NCHS Health E-Stats, March 2023





IN-HOSPITAL MATERNAL MORTALITY

What are the trends and risk factors associated with maternal mortality and severe morbidity *<u>during delivery</u>*?

- 11.6 million discharges from a healthcare database, 2008-21
- Mortality ↓ from 10.6 to 4.6 per 100K discharges.
- Risk of mortality ↑ for age > 35 (aOR 1.49), cesarean delivery (aOR 2.28), co-morbidities, and COVID-19 diagnosis.
- Severe morbidity ↑ from 147/100K to 180/100K.
- Risk of morbidity ↑ for ages < 24 or > 35, ethnic or racial minority, cesarean delivery, Medicaid, $\geq$ 1 co-morbidities.

JAMA Network Open 2023;6:e2317641

WHAT CAN WE DO TO ↓ MATERNAL DEATHS?

- CV conditions are the leading cause of death in <u>Black</u> mothers; 70% are congenital and valvular disease, but cardiomyopathy and pulmonary HTN have the highest in-hospital mortality.
- Mental health conditions lead in <u>White</u> mothers, with substance abuse disorders, depression/anxiety, and domestic violence risk factors for suicide and overdose.
- 65% of deaths occur PP ⟶ expand Medicaid to 1 year PP.

JAMA 2023;330:911 (editorial)

ContemporaryOBGyn.net, March 2023

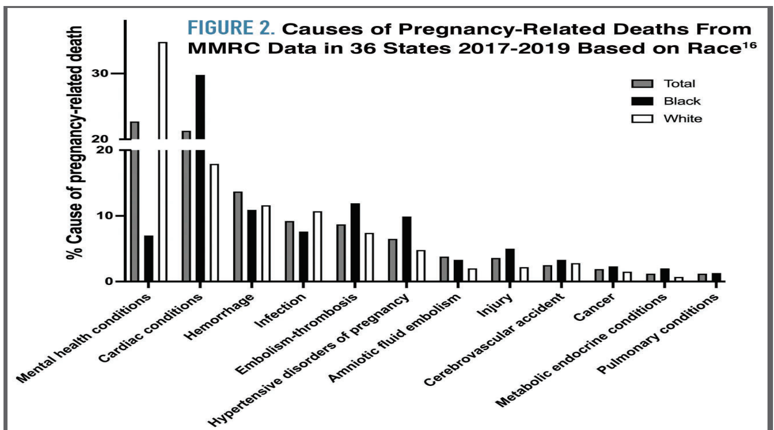


TABLE 2. Recommendations for Action and Strategies for Prevention[14,32,33]

National level
Expand Medicaid coverage to include 1 year of postpartum care
Expand economic and social support programs
Advance MMRC data collection, standardization, and research
State level
Establish maternal levels of care designations to properly triage patients
Improve public transportation services
Improve access to perinatal addiction services
Expand perinatal behavioral health support
Establish a maternal mortality task force
Community level
Engage communities of color
Establish mobile health units
Implement telemedicine use
Perform community health care needs assessments
Health care facility level
Train providers on implicit bias
Recruit a diverse workforce
Implement obstetric emergency simulation training
Implement interdisciplinary huddles
Implement evidence-based safety bundles
Develop sepsis, hemorrhage, and massive transfusion protocols
Establish an MMRC

THINGS TO DO TO PREVENT THESE DEATHS:

- **Help create or join your state's MMRC.**
- **Utilize safety bundles for hemorrhage, HTN, cardiac arrest, etc. on your L&D.**
- **Implement team simulations to practice.**
- **Have daily inter-disciplinary huddles.**
- **Work to ↑ access to care for a year after pregnancy, including mental health.**
- **Address disparities in your hospital community; see the ASA's practical recommendations on "Reducing Maternal Peripartum Disparities"**

OTHER WAYS TO IMPROVE OUTCOMES

Promote healthy lifestyles before and during pregnancy; e.g. normal BMI, exercise, healthy eating, ↓ alcohol, multi-vitamins.

Obstet Gynecol 2023;142:1278

Promote seat belt use and proper positioning.

JAMA Network Open 2023;6:e2334272

Involve pediatricians to screen mothers during well-child or infant sick visits. Women will attend pediatric visits for their baby while missing postpartum visits for themselves.

JAMA 2023;329:1819

HEALTH INSURANCE AND NEURAXIAL USE

Was implementation of the 2010 Dependent Coverage Provision of the Patient Protection and Affordable Care Act requiring private health insurers to allow young adults to remain on their parent's plan until age 26 associated with ↑ labor neuraxial use?

- 4.5 million birth certificates analyzed; 69% epidural use
- There was a 1.0% (95% CI, 0.8 to 1.2) absolute ↑ in labor neuraxial utilization among women aged 21-25 vs age 27-31.
- Statistically significant ↑ for White and Hispanic, but not Black or other races. But is 1% clinically significant?

Anesthesiology 2023;139:274

DISPARITIES IN OB ANESTHESIA CARE

Maternity care is free in the UK by the NHS. Are there still disparities in anesthetic care vs the US? YES.

- Maternity data for England from 2011-2021.
- GA for CS was 58% more common in Caribbean Black women and 35% more common in African Blacks vs White.
- British White women were more likely to receive neuraxial analgesia for labor than Bangladeshi (aOR 0.76), Pakistani (aOR 0.85) and Caribbean Black (aOR 0.92) women.

Anaesthesia 2023;78:820

HOW TO ADDRESS ETHNIC DISPARITIES

Although the US and UK systems are different, both have systemic disparities in anesthesia care. What to do?

- Enhance cultural competencies toward professional practice and interpersonal interactions.
- Train in trauma-informed care for vulnerable populations.
- Measure responsiveness for those with low health literacy.
- Provide community outreach with culturally sensitive educational material – both written and videos – as well as interpreter services on admission to L&D.

Anaesthesia 2023;78:799 (editorial)

DISPARITIES ON L&D:WHAT DON'T WE KNOW?

- A review of studies in the literature about disparities in obstetric anesthesia service and outcomes found that we need more comparisons on use of neuraxial for labor, timing of their placement, mode of anesthesia for cesarean, postpartum pain management and management of complications (e.g. PDPH.
- An editorial proposes areas for future research in obstetric anesthesia to assure changes are made where inequality exists, e.g. epidural use is less among Hispanic and Black parturients. How can we promote ↑ neuraxial use?

Can J Anesth 2023;70: 936, 1035

RACE & DRUG TESTING ON L&D

What is the association between race, drug testing, and a positive test among parturients?

- EMR review 2018-2021 from a health care system in PA.
- 11% gave a history of substance abuse: opioid use more common in White and cannabis more common in Black.
- Regardless of history, the probability of a drug test being ordered was highest among Black patients. BUT Black women did *not* have a higher probability of a + test result.

JAMA Health Forum 2023;4:e230441

WAYS TO REDUCE HEALTH CARE DISPARITIES

Is Black representation within the PCP workforce associated with improved health outcomes in Black individuals? YES.

- Cohort study of 1618 US counties
- Black PCPs worked in < half of counties in 2009, 2014, 2019.
- Black PCP representation levels were associated with ↓ all-cause mortality rates among Black individuals & with ↓ mortality rate disparities between Black and White patients.

JAMA Network Open 2023;6:e236687

ON-LINE PRENATAL EDUCATION

Could an online childbirth education course improve outcomes in high-risk pregnancies?

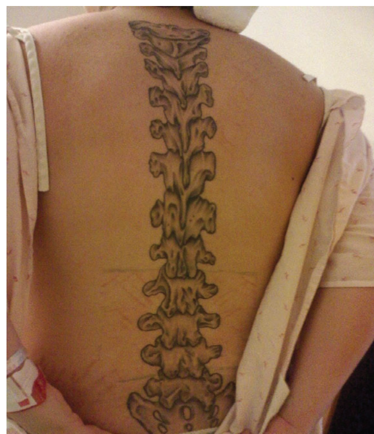
- RCT comparison of an online interactive program (Birthly) with usual prenatal education.
- Nulliparous, English-speaking patients with Internet access who had high-risk medical or mental health conditions were enrolled. Most were Black and publicly insured.
- The intervention group had lower anxiety scores, fewer emergency visits, higher satisfaction with their childbirth education, but there was no difference in delivery outcomes.

Am J Obstet Gynecol 2023;229:67

FOLLOW-UP ON THE DOBBS DECISION

- Exacerbating U.S. health inequity for low-income women.
  N Engl J Med 2023;388:1444
- Obstacles to care mount the year after Dobbs decision.
  JAMA 2023;330:119
- Texas banned abortion in early pregnancy and live births ↑ despite ↑ abortions provided to Texans out of state and ↑ requests for medication abortion pills, i.e. not all had access.
  JAMA 2023 (Bell)
- Navigating legal risks when providing essential reproductive care post-Roe is complex. JAMA 2023;330:1523

LABOR ANALGESIA



NITROUS OXIDE - EFFICACY

- AWHONN recommendation: Nitrous oxide should be a vital component in the provision of quality maternity care, and the bedside nurse is the ideal candidate to initiate N_2O use.
  JOGNN 2018;47:239
- A comparison of IV meperidine and N_2O for laboring multi-parous patients found comparable pain control and adverse effects. N_20 is a suitable alternative to limit opioid use.
  Obstet Gynecol 2023;141:1 (editorial),12
- N_2O provides negligible analgesia but provides anxiolysis and high satisfaction scores. Does not influence progress of labor.
  Am J Obstet Gynecol 2023 (5);S1246 (Review)

N_2O: ENVIRONMENTAL CONCERNS

- Using the 50:50 mix approved by the FDA with its high 5L flows, 4 hours of labor has a carbon footprint equivalent to driving a car 1500 km. *ASA Monitor June 2023:34*
- Cracking technology converts nitrous oxide into nitrogen and oxygen using catalytic cracking. Use the device near the hospital scavenging system exhaust. *Anaesthesia 2023;78:288, 292, 653*
- Primum non nocere: N20 may cause occupational exposure to colleagues, adverse effects on patients **(?)** and harm to the environment – an ethical debate vs patient satisfaction.

Anesth Analg 2023;2023;136:613

BENEFITS OF NEURAXIAL ANALGESIA

Nulliparous patients at term were divided into two groups: epidural placed at 1 cm dilation (N=198) vs placement at >1 cm (N=809). Effects on labor and outcomes? NONE.

- No difference in length of latent phase of labor, active phase, 2nd and 3rd stages of labor or cesarean delivery rates.
- No difference in maternal or neonatal outcomes.

J Obstet Gynaecol Res 2023 (Chen)

Labor epidural analgesia facilitates gastric emptying in parturients after a light meal vs no epidural analgesia.

Anesthesiology 2022;136:542

BENEFITS OF NEURAXIAL ANALGESIA

A propensity score matched analysis of 51K deliveries in China where there is a 17.3% neuraxial analgesia utilization found:

- Being nulliparous, previous cesarean, hypertensive disorders and labor augmentation ↑ use of neuraxial.
- Neuraxial was associated with ↓ risk of: intrapartum cesarean (aOR 0.68), especially for maternal request (aOR 0.48), 3rd or 4th degree lacerations (aOR 0.36) and 5-minute Apgar score ≤3 (aOR 0.15).

Anesth Analg 2023;137:1047

BENEFITS OF NEURAXIAL ANALGESIA

Neuraxial analgesia for labor has been shown to ↓ risk of PPH. Does it also ↓ risk of transfusion? YES

- National Vital Statistics data from 2015-2018 (12.5 million births) using neuraxial analgesia as the exposure.
- The overall maternal transfusion incidence was 30.5/10K for patients with<u>out</u> NA vs 20.2/10K <u>with</u> NA.
- For intrapartum cesarean after labor analgesia, there was a 45% reduction in transfusion and a 7% reduction for VD.

Anesthesiology 2023;139:734

UNCLEAR BENEFIT OF NEURAXIAL ANALGESIA

Studies evaluating risk of postpartum depression with vs without neuraxial analgesia for labor have shown conflicting results overall as well as differences between countries.

- Prospective observational study in Saudi Arabia
- 91 parturients enrolled, 48.4% received epidural analgesia.
- 42% had depressive symptoms (by the Edinburgh Postnatal Depression Scale) within 2 days PP, and 38.5% at 6 weeks.
- There was no correlation with epidural analgesia use.

PLOS ONE 2023;18 (Ahmad) / Can J Anesth 2023;70:1909

REVIEW: LABOR EPIDURAL OUTCOMES

- Clinically negligible prolongation of labor; 30 minutes for first stage and 15 minutes for second stage of labor.
- No increased risk of assisted vaginal or cesarean delivery.
- Transient hypotension on initiation is not associated with adverse outcomes if treated with fluids and/or pressors.
- Infants have a better acid-base status at delivery compared with systemic opioid analgesia.
- There is ↑ incidence of non-infectious fever that has <u>not</u> been shown to affect neonates; its cause is unknown.

Am J Obstet Gynecol 2023;S1260 (Callahan)

NEURAXIAL PLACEMENT – MISC.

- Routine lab tests (i.e. platelet count) and continuous fetal monitoring are not required for the placement of neuraxial analgesia in an otherwise uncomplicated laboring patient.

  Anesthesiology 2016;124:270 (ASA Practice Guidelines)
- An AI automated guidance program for ultrasound ID of neuraxial landmarks in obese parturients performed well.

  Eur J Anaesthesiol 2023;40:707
- Epiduroscopy showed that deep breathing during epidural catheter insertion expands the potential cavity of the epidural space. Can J Anaesth 1999;46:850

DURAL PUNCTURE EPIDURAL (DPE)

What are the differences in outcomes between DPE and conventional placement of epidural analgesia for labor?

- Catheter failure rates and need for replacement were lower with DPE: RR 0.61
- Time to 1st epidural bolus was later with DPE: 450m vs 367m
- But there was no difference in rate of conversion to GA for cesarean, need for supplemental boluses, rate of PDPH or need for epidural blood patch.

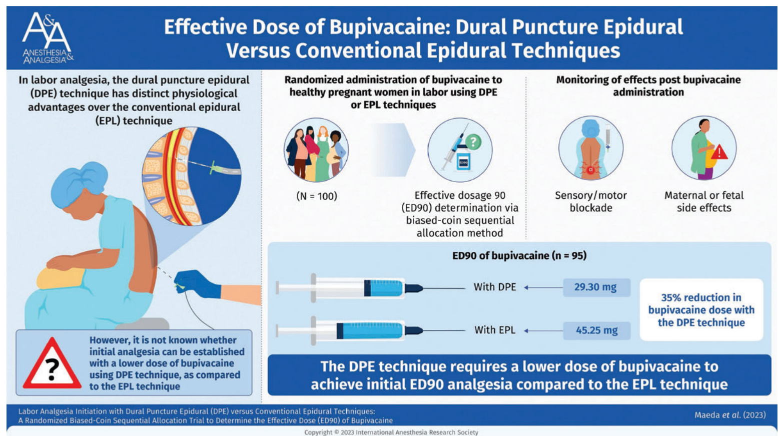
Int J Obstet Anesth 2022;52:103590

DURAL PUNCTURE EPIDURAL (DPE)

DPE has faster onset, better bilateral coverage and better sacral spread than conventional epidural. Does DPE require less epidural bupivacaine to achieve initial analgesia? YES

- A biased coin sequential allocation method was used, requiring a pain score < 3 at 30 minutes.
- ED 90 for bupivacaine dose after DPE was 29.3 mg vs 45.3 mg after conventional epidural placement.

Anesth Analg 2023 (Maeda)



SINGLE-SHOT SPINAL ANALGESIA?

Is SSS of any utility in early labor or for primiparous patients?

- 88 primips, 161 multips in early labor, and 316 multips at ≥ 6cm received 2.5 mg spinal bupivacaine + 5 mcg sufentanil.
- The odds ratio for insufficient duration of analgesia was 1.94 for primips & 2.08 for multips in early labor vs control.
- They were also 2.20 and 2.61 times more likely to require additional types of analgesia than the multips in later labor.
- But perhaps a reasonable option in low-resource settings?

Acta Anaesthesiol Scand 2023;67:1079

PIEB FOR MAINTENANCE

After DPE and an epidural bolus (15 ml 0.1% ropivacaine + sufentanil), what is the optimal time interval and bolus volume of programmed intermittent epidural bolus (PIEB) for labor analgesia?

- Interval between boluses: ED50 = 52.5 minutes, ED90 = 37.
- Optimal volume /bolus: ED50 = 7.1 ml, ED90 = 11.3 ml.
- Higher volumes and longer intervals seem to be optimal.

Anesth Analg 2023; 137:534, 1233

PIEB vs PCEA FOR MAINTENANCE

If an epidural pump cannot provide PIEB settings, would a high volume PCEA bolus without background infusion provide comparable analgesia? YES

- RCT of 360 women who received either PCEA with 10 ml bolus & 30 minute lockout or PIEB with 10 ml bolus every 30 minutes, i.e. the patient gave the bolus or the pump did.
- Breakthrough pain was similar; 11.2% PCEA vs 10.8% PIEB
- Total ropivacaine consumption was lower in PCEA group.
- Motor block, satisfaction, maternal & neonatal outcomes were similar between groups.

Anaesthesia 2023;78:1129

CLINICAL TRIALS vs "REAL WORLD"

The ARRIVE Trial in 2018 showed that elective induction at 39 weeks (versus expectant management) ↓ cesarean rates by 16% and hypertensive disorders by 39%. 2 follow-up studies:

- Hypertensive disorders were ↓ in women having IOL at 39 weeks vs all nulliparous individuals delivering at 39 or later in a large nationwide sample, i.e. supports ARRIVE.
- A collaborative of 13 hospitals found an ↑ in elective IOL but no changes in cesarean rates or hypertensive disorders, i.e. does not support ARRIVE.

Obstet Gynecol 2023;142:236, 239, and 242

ADDITIONAL ARRIVE TRIAL FOLLOW-UP

Meta-analysis: Elective IOL at 39 weeks resulted in reduced perineal injury, macrosomia and low 5-min Apgar scores.

JAMA Network Open 2023;6:e2313162

Elective IOL at term resulted in lower cesarean rates and lower maternal and neonatal adverse outcomes. Benefits did not vary by hospital location, delivery size, or teaching status.

JAMA Network Open 2023;6:e239167

The ARRIVE Trial led to practice changes: ↑39-week IOL and↓ cesarean rates for low-risk nulliparous patients.

JAMA Network Open 2023;6:e2328274

WHAT DOES TIKTOK SAY ABOUT LABOR?

TikTok videos searched for #Pitocin and 100 evaluated.

- Patients or support partners created 53% of videos; 37% were created by doctors, nurses or doulas.
- 35% encouraged patients to decline oxytocin, 28% encouraged them to reduce the oxytocin infusion rate.
- 38% engendered patient distrust of healthcare professionals. Does this include anesthesiologists?
- Inaccurate and negative information was common.

Am J Obstet Gynecol MFM 2023;5:101138

WHAT DOES TIKTOK SAY ABOUT EPIDURALS?

POPSUGAR 7/17/23: What exactly is an epidural?

TikTok recently went viral for a post in which she expresses her shock at learning what's actually involved in an epidural. 'Finding out that the epidural isn't a shot, it's a tube that stays in your back for your entire labor' she wrote over video of her mouth hanging open. 'I have no words'….

"They really don't tell us anything on purpose" one person wrote. "Wait, I thought it was a pill" someone else said.

CHAT GPT AND EPIDURALS

Is ChatGPT accurate answering questions about neuraxial labor analgesia? +/- but pretty much!

- Investigators created a consensus list of 10 commonly asked questions about labor epidurals that were given to Chat GPT v3.5. 20 division chiefs of OB Anesthesia at U.S. academic centers reviewed the responses as experts.
- Over half of experts somewhat → strongly agreed with the medical accuracy, but there was strong disagreement with the answer to 1 question "Do epidurals prolong labor?"
- Problem: ChatGPT answers were at a college reading level.

Anesth Analg 2024;PAP (Mootz)

TRIAL OF LABOR AFTER CESAREAN (TOLAC)

What is the current rate of TOLAC and the success rate of vaginal birth after 1 or 2 prior cesarean deliveries?

- National data comparing 2010 rates with 2020 rates.
- Attempted TOLAC ↑ from 15.3% to 21.7%.
- Successful TOLAC ↑ from 69.8% to 74.7%.
- So overall, the vaginal birth after cesarean (VBAC) rate ↑ to 16.2% in the United States.

Obstet Gynecol 2023;141:173

UPDATES ON VERSION FOR BREECH

The individual physician performing the version impacts success rate and should be studied. Of 20 MDs included, success rates varied from 12-70% (average overall 45.2%).

Am J Obstet Gynecol 2023;Sept:348

Neuraxial anesthesia is associated with a higher rate of successful ECV compared with IV or inhalational analgesia. Remifentanil ↑ ECV success vs placebo by 43%, with lower pain scores and less fetal bradycardia.

Anesth Analg 2020;131:1800

Int J Obstet Anesth 2023:103649

ANESTHESIA FOR 2ND TRIMESTER ABORTIONS

About 1% of abortions take place outside an office after the 1st trimester. Anesthesiologists may be involved in these cases.

- Cases may ↑ as barriers to care post-Dobbs cause delays.
- Multi-day cervical preparation often occurs first, leading to a time-sensitive, non-elective procedure.
- Deep sedation without intubation appears safe and may be preferable through 24 weeks gestation.
- Consider: preop pain from cervical dilators, intraop mgt of uterine atony in a uterus prior to mature oxytocin receptors, possibility of substance use disorders.

Anesth Analg 2023;137:345

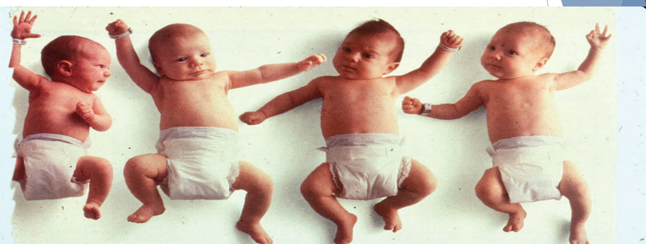
OPPORTUNISTIC SALPINGECTOMY

After vaginal delivery, is salpingectomy during PPTL cost effective for ovarian cancer risk reduction? YES

- Cost effectiveness analytic decision model
- In 10K patients desiring PPTL, adding opportunistic salpingectomy would result in 25 fewer ovarian cancer cases, 19 fewer ovarian cancer deaths, and 116 fewer unintended pregnancies than TL alone.
- Salpingectomy is more cost effective than TL at $26,150 per quality-adjusted life-year.

Obstet Gynecol 2023;141:819

CESAREAN DELIVERY



SALPINGECTOMY DURING CESAREAN

- Bilateral salpingectomy at the time of CD reduces risk of later ovarian cancer by 80% and is a safe, feasible, and cost-effective strategy across the population.

JAMA Surgery 2023;158:1204

- Permanent contraception in the postpartum period should include complete salpingectomy as an option, with the benefit of ovarian cancer prevention. *Obstet Gynecol 2023;142:1347*
- BRCA 1,2 gene carriers can be offered bilateral salpingo-oophorectomy at the time of indicated cesarean delivery.

Obstet Gynecol 2023;142:1500

SURGEON GENDER & CESAREAN MORBIDITY

Is there an association between surgeon gender and maternal morbidity after cesarean delivery?

- A Canadian study found surgery performed by female surgeons had lower mortality rates than male surgeons.
- Prospective cohort study of 4244 cesarean deliveries
- No difference in maternal morbidity (aRR 0.92) or postpartum hemorrhage (aRR 0.98) between genders.

JAMA Surgery 2023;158:273

AIRWAY MANAGEMENT FOR GETA

A QI project tracked 3 steps that can optimize airway management in obstetrics:

1. Use of video-laryngoscopy for all obstetric general anesthetics led to 94% first-pass success; 100% overall.
2. Use of low-flow nasal oxygen during apnea and laryngoscopy to maintain saturations ↑ from 48% prior to 90% afterward.
3. Positioning in a ramped 20-30 degree head-up position improves FRC and the view at laryngoscopy.
4. Use of a checklist and team training is supportive.

Eur J Anaesthesiol 2023;40:826

ROLE OF THE LMA IN OBSTETRICS

Review of the literature on LMAs during cesarean delivery:

- Aspiration is a rare complication, especially with NPO protocols, pharmacologic prophylaxis, and RSI.
- 2nd generation LMAs are recommended as rescue devices during failed intubation for protection from aspiration.
- A few studies have shown LMAs to be a safe primary airway for cesarean in carefully selected patients, but robust evidence is still lacking.

Curr Opin Anesthesiol 2023;36:276

GETA IN HYPERTENSIVE DISORDERS

Thrombocytopenia should be ruled out before neuraxial anesthesia in parturients with hypertensive disorders. How often is GETA used because of confirmed ↓ platelets or unavailable lab results?

- Multicenter observational study of 591 patients
- 8% had confirmed thrombocytopenia < 75K
- 9% had GETA due to *unavailability* of a platelet count, although 89% ultimately had platelets adequate for neuraxial.
- Clinician judgement is critical and spinal may be appropriate.

Anesth Analg 2023;136:992

NOREPINEPHRINE DURING CD

Are there adverse effects of administering NE through a peripheral IV (versus central line)?

- 1004 patients having surgery (non-obstetric) received perioperative peripheral NE; site was inspected regularly.
- Extravasation occurred in 2.3% but no cases of tissue necrosis; all adverse events ended without rx within 48 hrs.
- 0.9% incidence of bradycardia; no severe hypertension.

Anesth Analg 2024;PAP (Jens)

NEURAXIAL MORPHINE AFTER 2-CP

Why is pain control less when epidural morphine is given after epidural 2-CP local anesthetic for cesarean?

- Parturients were randomized to epidural 2-CP or lidocaine with epi and bicarb for cesarean delivery.
- All received 3 mg epidural morphine after delivery.
- No difference in time to first opioid or total 24-hour opioids.
- Use additional local anesthetic to cover the “window” between 2-CP wearing off and onset of morphine analgesia.

Anesth Analg 2023;136:86

MULTI-MODAL ANALGESIA

Multi-modal regimens are underused and should be standard.

- Spinal or epidural morphine whenever neuraxial is used.
- Scheduled NSAIDs and acetaminophen given together.
- Intravenous dexamethasone 8-10 mg is opioid-sparing.
- Truncal blocks or local infiltration if neuraxial is not used.
- Avoid gabapentin; limited analgesia and excess side effects.

Anaesthesia 2023;78:1170 (PROSPECT guidelines)

Curr Opin Anesthesiol 2023;38:288 / Anesth Analg 2023;136:1122

POSTOPERATIVE LIDOCAINE PATCH

Is a lidocaine patch beneficial for postoperative multimodal analgesia? YES

- Meta-analysis of 16 RCT and 918 surgical patients
- Pain scores were significantly lower at 12, 24, and 48 hours in the lidocaine patch groups.
- Opioid requirements were less but satisfaction was similar.
- Consider using for breakthrough pain or opioid tolerance.

Clinical Journal of Pain 2023;PAP (Wu)

TENS DEVICE FOR POST-CESAREAN PAIN

Does treatment with TENS in addition to standard post-cesarean analgesia regimen ↓ opioid consumption? YES

- Blinded comparison of a functional or sham TENS device
- Each group received 3 treatments (real or sham) at the incision site over the first 24 hours postop
- Those with the functional TENS used 47% less opioid while inpatient and were prescribed less at discharge.

JAMA Network Open 2023;6:e2338188

TRUNCAL BLOCKS: QL vs ERECTOR SPINAE

Is the quadratus lumborum block (QLB II) or erector spinae block preferable after cesarean under spinal anesthesia?

- Randomized trial using US-guided 0.25% bupivacaine blocks
- There was no difference in opioid consumption, pain scores, complications or QOL measures on POD 1,2, and discharge.
- The 2 blocks have similar analgesic efficacy and quality of recovery after cesarean delivery.

Int J Obstet Anesth 2023;53:103614

PREVENTING & TREATING PRURITUS

Meta analysis of ondansetron for *prevention* of pruritus found significant reduction: RR 0.81.

Anesth Analg 2024;138:70

Meta analysis found 5 options for *treating* pruritus that were superior to placebo: sub-hypnotic doses of propofol, neuraxial and systemic opioid agonist-antagonists (e.g. nalbuphine), opioid antagonists (e.g. naloxone), and serotonin antagonists (e.g. ondansetron).

Br J Anaesth 2023;131:556

ERAS AND FEEDING AFTER CESAREAN

Is immediate feeding appropriate after cesarean during labor?

- RCT of 501 parturients randomized in PACU to immediate full feeding or on-demand full feeding.
- Immediate feeding did not change rates of vomiting or maternal satisfaction, but 10% chose to eat nothing vs 3% in the on-demand group.
- Intervals to return of bowel function were shorter in the immediate food group.

Am J Obstet Gynecol MFM 2023;5:101031

PERSISTENT OPIOID USE

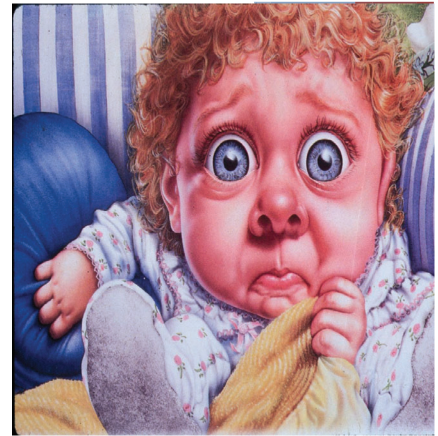
2 studies reviewed the incidence of persistent opioid use 1 year after cesarean delivery and associations.

- Database review from Ontario Canada found rates were higher after vaginal (1.6%) than cesarean (0.98%) delivery and that benzodiazepine use was associated (aOR 2.69).
- Systematic review found wide variation in prior studies from 0.12% to 2.2%, highest in private insurance claims.
- Definition of persistent opioid use varied widely.

Obstet Gynecol 2023;142:1440

Int J Obstet Anesth 2023;54:103644

ANESTHETIC PROBLEMS & MORBIDITY



POSTDURAL PUNCTURE HEADACHE (PDPH)

Consensus guidelines on PDPH from a multi-society, int'l working group generated these recommendations.

- Prevention: no prophylactic EBP, no bed rest, no IT or epidural meds, no systemic meds, ± IT catheter placement
- Conservative Rx: scheduled multi-modal therapy, short-term opioids but not long term, caffeine but < 300 mg/day if breast-feeding, no other meds (steroids, theophylline, triptans, ACTH, neostigmine, methergine or gabapentin), no bed rest, usual oral hydration rather than IV, and no abdominal binders or aromatherapy.

PDPH GUIDELINES cont.

- Procedural interventions: no or minimal evidence for acupuncture, SPG blocks, greater occipital nerve blocks (except PDPH after small spinal needle?), spinal /epidural morphine, epidural dextran, gelatin, HES or fibrin glue.
- When conservative measure fail and PDPH interferes with activities of daily living, consider blood patch.
- When to get imaging? If there are focal neurological deficits, visual changes, alterations in consciousness or seizures, if onset is > 5 days post-neuraxial, or if the headache is not orthostatic.

JAMA Network Open 2023;6:e2325387

Advances in Anesthesia 2023;41:71

PDPH & INTRATHECAL CATHETER

- Retrospective study of re-siting the epidural vs. IT catheter placement after wet tap; 92,651 epidurals, 550 wet taps.
- No difference in incidence of PDPH but ↓ need for epidural blood patch (aOR 0.82) after IT catheter placement.
- No benefit in leaving the IT catheter in for 24 hours.
- Added benefit of injecting IT saline to ↓ PDPH (aOR 0.85) and need for EBP (aOR 0.75).
- Guidance on safe management of IT catheter is included.

Anaesthesia 2023;78:1256, 1195 (editorial)

PDPH: RISK FOR RECURRENCE AFTER EBP

Retrospective review of 212 OB patients who required EBP.

- 26% had failed EBP (lack of relief or need for further rx)
- Failure ↑ when depth of the epidural space was > 5.5 cm (OR 3.08) and when PDPH occurred in < 24 hours.
- Failure was less when the interval between initial dural puncture and EBP was > 48 hours (OR 0.20).

Int J Obstet Anesth 2023;56:103925

PDPH & COSYNTROPIN (ACTH)

- A retrospective cohort review of cosyntropin 1 mg for prevention of PDPH in postpartum women found no benefit for ↓ing PDPH or EBP. Cosyntropin for rx of PDPH also had no benefit and an ↑ need for EBP (56% vs 28%).

  Int J Obstet Anesth 2023;56:103917
- A retrospective review of 115 postpartum women with wet tap; 56% received 1 mg cosyntropin at delivery. There was no difference in PDPH or need for EBP.

  Int J Obstet Anesth 2023;56:103922

CARDIAC ARREST

How often does cardiac arrest occur during delivery and what are the risk factors?

- Retrospective cohort study using National Inpatient Sample
- Incidence was 1:9000 deliveries with 70% surviving to hospital discharge. Survival lowest with associated DIC.
- More common in older, Black mothers on Medicaid or Medicare who had underlying medical conditions.
- Associations: ARDS, mechanical ventilation, AFE.

Ann Int Med 2023;176:472

CARDIAC ARREST - BRITAIN

7TH National Audit Project by the Royal College of Anaesthetists: Cardiac arrest in obstetric patients receiving anesthesia.

- Incidence 1:12,700 *anesthetic* encounters; 1:17,000 with regional and 1:1220 with general anesthesia.
- Hemorrhage, high neuraxial and brady-arrhythmias after spinal accounted for 68% of arrests. Black race was over-represented.
- At least half of all obstetric cases occur from MN-8am. Does staffing reflect this distribution of clinical activity?

Royal College of Anaesthetists 2023;ISBN 978-1-900936-35-4

SIMULATION EDUCATION ON L&D

The Obstetric Life Support resuscitation curriculum combines self-guided work + simulation for health care professionals.

- 77 participants completed the 8 sessions of training
- At baseline, < half passed the cognitive assessment
- After the course, cognitive assessment score was 82.4% and megacode pass rate was 96%.
- 93% of participants felt the course met its objectives.

Obstet Gynecol 2023;142:1189

MED ERROR: TRANEXAMIC ACID

Inadvertent intrathecal administration leads to rapid-onset convulsions and 50% mortality. Steps to prevent errors:

- Inform anesthesia providers of the dangers of IT TXA
- Store separately from anesthetic drugs and away from the anesthesia cart. Read labels carefully for look-alike meds.
- Audit implementation regularly.
- Educate staff when TXA is introduced to L&D.

Am J Obstet Gynecol, January 2023 (Moran)

MED ERROR: TRANEXAMIC ACID

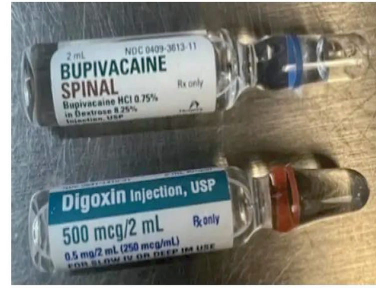
A review of 22 cases of drug swaps and intrathecal TXA:

- Orthopedic and obstetric cases were most common.
- Fatality rate was 36% with survivors having severe neurologic impairment.
- Presented as seizures (mistaken for eclampsia), hemodynamic instability, VT/VF and acute pain.
- The only treatment is supportive.

Eur J Anaesthesiol 2023;40:334

LOOK-ALIKE AMPULES: SPINAL LA & TXA

FIGURE 1. Examples of Ampules of Bupivacaine Spinal by Hospira (NDC 0409-3613-11) (top) and Digoxin by Hikma Pharmaceuticals (NDC 0641-1410-31) (bottom)



A healthy patient had a planned elective CD with spinal anesthesia. Med error when digoxin was taken from the auto-dispenser instead of bupivacaine. She was declared brain dead and died soon after.

Pharmacy Times 2024;90:34

OTHER MEDICATION ISSUES

Closed Claims Case Review: LAST

ASA Monitor, August 2023:33

Perioperative anaphylaxis: Clinical Focus Review

Anesthesiology 2023;138:100

EPIDURAL-RELATED FEVER: REVIEW

- 20% of OB patients who receive neuraxial analgesia will have fever regardless of the LA or maintenance chosen.
- Etiology is unknown but it is non-infectious. No prophylaxis has worked (e.g. antibiotics, steroids, acetaminophen) and no treatment is necessary except passive cooling.
- It may be caused by sterile inflammation involving reduced activation of caspase-1. Thermoregulatory mechanisms due to neuraxial local anesthetic may contribute.

Am J Obstet Gynecol May 2023;S1283

PRE-PROCEDURE PREGNANCY TESTING

Ethical principles do not support mandatory preanesthesia pregnancy screening tests: a narrative review

- Mandatory routine non-consented preop pregnancy testing does not respect patient autonomy.
- It can be coercive, e.g. if canceling surgery is the option.
- It can cause harm socially, medically (by delaying needed treatments), and financially (insurance implications).
- Not performing a test does not have medicolegal issues.
- There is no evidence that anesthetics harm the fetus, so what is the benefit to the patient? And how is this an anesthesia issue?

Anesth Analg 2023;PAP (Jackson)

MANAGING CHOLECYSTITIS IN PREGNANCY

What are the adverse outcomes in pregnant patients with acute cholecystitis (AC) who do/do not have cholecystectomy?

- Retrospective cohort study using an insurance database
- 34.5% underwent surgery during pregnancy; 42% during 1st trimester, 40% 2nd trimester and 12% 3rd trimester.
- Having AC during pregnancy led to ↑ adverse outcomes (vs not).
- Having *surgery* for AC resulted in **fewer** adverse outcomes in all trimesters than medical management: OR 0.81, 0.71 and 0.45 in 1st, 2nd and 3rd trimesters.

JAMA Surgery 2023 (Hantouli)

ADNEXAL MASSES DURING PREGNANCY

What is optimal diagnosis, management and prognosis?

- More are diagnosed in pregnancy because of frequent ultrasounds ~0.2-2% of patients; ~2% are malignant.
- Surgery may be done for symptoms, torsion or malignancy.
- Laparoscopy is preferred to open, using LUD, port placement for uterine size, insufflation pressure < 12-15 mmHg, maternal capnography, pre/post FHR and contraction monitoring, and mechanical ± chemical thromboprophylaxis.

Am J Obstet Gynecol June 2023:601

THE PREGNANT TRAUMA PATIENT

Trauma is the leading non-obstetric cause of maternal death, most commonly MVA, domestic violence, and falls.

- Often fetal care is prioritized over maternal, e.g. fetal ultrasound and monitoring are done, while maternal vitals are not documented and FAST exam is not done.
- The fetus should not distract from conventional ATLS, including any indicated imaging studies.
- Notify obstetric & peds personnel from L&D early to assist with fetal assessment and neonatal care if delivered.

Anesth Analg 2023;136:830

Trauma Management in the Pregnant Patient

Nathan, Naveen

Anesthesia & Analgesia136(5): 829, May 2023.

SUGAMMADEX REVERSAL IN PREGNANCY

A retrospective review of 124 pregnant women having non-OB surgery found those who received sugammadex had no ↑ risk of preterm delivery or miscarriage than those who did not.

Int J Obstet Anesth 2023;53:103620

Although Merck and SOAP advise against sugammadex use in pregnancy and the FDA has not approved it (based on theoretical binding to progesterone), several case series have found no harm. Sugammadex is a safe and superior agent for reversal – should that outweigh theoretical harms?

Anesth Analg 2023;136:1217

BREASTFEEDING AND ANESTHETICS

- Opioid analgesics are compatible with breast-feeding <u>except</u> the FDA has a warning against codeine in lactating women. A CYP2D6 mutation could lead to high concentrations of morphine in breast milk due to ultra-metabolism.
- It is safe to resume breast feeding immediately after GA, as soon as she is awake enough to hold her child or pump.
- Pain meds such as oxycodone can and should be given in PACU as needed and should not delay breast-feeding.

ASA Committee on Obstetric Anesthesia

Statement on resuming breastfeeding after anesthesia

ANESTHETIC NEUROTOXICITY

Children having complex cardiac surgeries have ↑ cumulative doses of sedatives and anesthetics. Does it correlate with ↓ neurodevelopmental scores (Bayley Scale) at 18 months? NO

- No association was found between total cumulative volatile anesthetic exposure, opioids, benzodiazepines, or dexmedetomidine and abnormal scores at 18 months.
- Higher ketamine doses were associated with ↓ motor performance at 18 months.
- Editorial: reassuring to parents & providers – with caveats.

Anesthesiology 2023;139:393

Debunking Developmental Delay

Assessing Associations between Anesthesia in Infancy & Neurodevelopmental Outcomes

Prior studies demonstrate negligible to no difference in neurodevelopment following single, *brief* anesthetic exposures in *healthy* children.[1]

In this issue of Anesthesiology, Simpao *et al.* evaluated associations between cumulative anesthesia doses and neurodevelopmental scores at age 18 months in 110 infants undergoing congenital cardiac surgery.[2]

Confounders:*
Genetic anomaly
Sex
Race
Maternal education
Cardiac diagnosis class
ECMO
Both weight Z score
Hospital length of stay

Medication Class	Bayley III** Motor	Bayley III Language	Bayley III Cognitive
Volatile anesthetic (MAC-h)	No association $\beta = -0.54$ (−1.41, 0.32)	No association $\beta = 0.22$ (−1.18, 1.61)	No association $\beta = -0.20$ (−1.24, 0.84)
Opioids (mg/kg MME)	No association $\beta = 0.06$ (−0.03, 0.15)	No association $\beta = 0.005$ (−0.14, 0.15)	No association $\beta = 0.02$ (−0.08, 0.13)
Benzodiazepines (mg/kg)	No association $\beta = -0.02$ (−0.08, 0.04)	No association $\beta = -0.02$ (−0.11, 0.07)	No association $\beta = 0.01$ (−0.06, 0.08)
Dexmedetomidine (µg/kg)	No association $\beta = -0.17$ (−1.04, 1.15)	No association $\beta = -0.27$ (−0.57, 0.03)	No association $\beta = -0.15$ (−0.37, 0.08)
Ketamine (mg/kg)	NEGATIVE association $\beta = -0.34$ (−0.64, −0.05)	No association $\beta = -0.07$ (−0.56, 0.42)	No association $\beta = -0.18$ (−0.54, 0.19)

Conclusion: In this small, retrospective analysis, cumulative doses of volatile anesthetics and other sedative medications were not associated with neurodevelopmental impairment at age 18 months following congenital cardiac repair. However, higher ketamine doses were associated with lower motor scores.

Infographics In Anesthesiology
October 2023

Debunking Developmental Delay: Assessing Associations between Anesthesia in Infancy and Neurodevelopmental Outcomes

Holly Ende; James Rathmell; Jonathan P. Wanderer

ANESTHETIC NEUROTOXICITY IN PREGNANCY

A cohort study of children who had received prenatal anesthesia during maternal surgery (N=129) vs unexposed.

- 90% had a single exposure lasting 91 minutes
- No difference in the global executive composite of the behavior rating inventory of executive function score.
- No difference in problems from the child behavior checklist, psychiatric diagnoses or learning disorders.

Anaesthesia 2023;78:159

EPIDURALS & AUTISM: YES

Is labor epidural analgesia and/or oxytocin associated with autism spectrum disorder (ASD)?

- Kaiser CA database using 205,994 singleton vaginal births.
- 75% were exposed to epidural; 57% to oxytocin.
- 2.5% of children had ASD diagnosed during follow-up.
- ASD risk with epidural was OR 1.28 independent of oxytocin
- ASD risk was OR 1.30 for epidural and oxytocin together.
- ASD risk with oxytocin alone was not significant.

JAMA Network Open 2023;6:e2324630

EPIDURAL & AUTISM, ADHD: NO

With sufficient power in the study, is labor epidural analgesia associated with ASD and/or ADHD?

- 4.5 million singleton pregnancies in a Scandinavian registry.
- 24% were exposed to epidural analgesia during labor, 1.2% were diagnosed with ASD and 4% with ADHD.
- On a population level there was a significant association with epidural, but when controlling for maternal anxiety or depression & using siblings not exposed to epidural as the control group, there was no significant association.

Am J Obstet Gynecol 2023;228:233

OBSTETRIC & MEDICAL COMPLICATIONS

"I'm going to give it to you straight, Mrs Watson, for a 27 year old you're in pretty bad shape."

PREDICTING PP HEMORRHAGE

ACOG and AWHONN recommend stratifying all patients on admission and at delivery for hemorrhage risk. Does it help?

- 4516 singleton births at a Level 4 maternity center
- 41% were categorized as low-risk, 27% medium, 32% high
- 20% of low-risk had PPH and there was no difference between medium or high-risk in PPH or morbidities.
- Conclusions: a better predictive model is needed for PPH.

Am J Obstet Gynecol 2023;S322:abstract #487

PREVENTING PPH SEQUELAE

- Since anemia can be diagnosed well in advance of delivery and there is time for optimization, screen early.
- Treat iron deficiency even if not anemic. Oral iron QOD in the first trimester, IV iron infusions 2nd and 3rd trimesters.

Curr Opin Anesthesiol 2023;36:255

- In a medically underserved population, providing rather than prescribing iron supplements was associated with ↑ Hct, ↓ anemia throughout pregnancy and postpartum.

JAMA Network Open 2023;6:e2332100

- The Anesthesiology PreProcedure clinic can provide IV iron.

PPH TRENDS AND OUTCOMES IN THE US

- 2000-2019: 77 million delivery hospitalizations from the NIS
- Overall 3% had PPH but it ↑ from 2.7% to 4.3% over time.
- Transfusion ↑ from 2000-11, then ↓ from 17% to 13% in 2019.
- Peripartum hysterectomy ↓ from 1.4% to 0.9% over time.
- Risk factors for PPH, transfusion and hyst were placenta previa, placenta accreta, and placental abruption.
- Overall, PPH has ↑ but transfusion and hysterectomy have ↓.

Obstet Gynecol 2023;141:152

REVIEWS RELATED TO HEMORRHAGE

- Placenta Accreta Spectrum: Obstet Gynecol 2023;142:31

"Coordination with an anesthesiologist accustomed to PAS care or managing massive obstetric hemorrhage, rapid large-volume transfusion, and invasive hemodynamic monitoring is crucially important…The optimal approach to anesthesia for PAS surgery is unknown. Although GETA is often chosen, many referral centers use neuraxial for either all of the case of part of the case until after the time of delivery."

- Von Willebrand Disease, Hemophilia, and other Inherited Bleeding Disorders in Pregnancy: Obstet Gynecol 2023;141:493

PPH: ANESTHESIA NOTIFICATION

The anesthesia team should be alerted for PPH after vaginal delivery to assist with resuscitation. How to prevent delays?

- QI initiative after near-misses from delayed notification
- Practice changes based on EBL or vital sign changes failed.
- Automated process was initiated in Epic; when a 2nd-line uterotonic was administered ⟶ text sent to L&D anesthesia.
- Since introducing the system, no failures to alert for PPH.
- At UCH, anesthesia team is required to be present for TXA administration which occurs at QBL > 1000 ml.

A&A Practice 2023;17:e01687

MECHANICAL ADJUNCTS TO TREATING PPH

- REBOA device used in 31-week pregnancy with ruptured splenic aneurysm and shock after other measures failed.

Acta Anaesthesiol Scand 2023;67:230

- JADA device post-market review of 800 cases, 94% uterine atony. Success rate 93% after vaginal birth and 84% after cesarean delivery. No perforations or deaths.

Obstet Gynecol 2023;142:1006

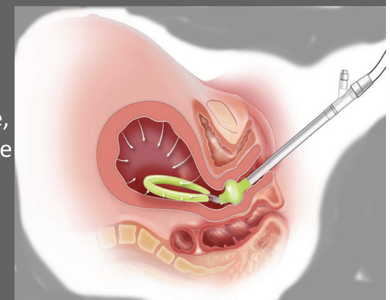
- Intrauterine balloon tamponade (e.g. Bakri) was 87% effective in a recent meta-analysis, 6.5% complication rate.

Obstet Gynecol 2023;142:1000, 998 (editorial)

INTRAUTERINE VACUUM DEVICE (JADA)

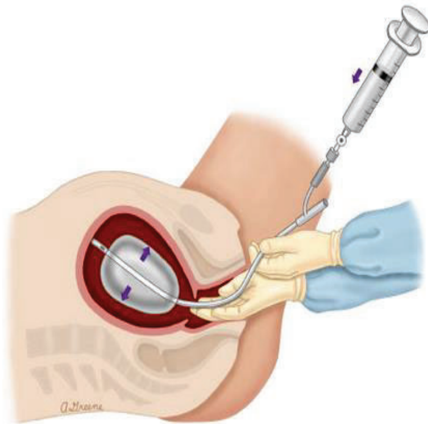
Intrauterine vacuum-induced hemorrhage control may provide a new rapid and effective treatment option for postpartum hemorrhage, with the potential to prevent severe maternal morbidity and mortality. Control of PPH occurred in 3 minutes; 98% found it easy to use.

Obstet Gynecol 2021;136:882



Uterine balloon tamponade has a success rate of 86% in treating PPH, especially due to atony or placenta previa, and has a low complication rate of < 6.5%.

Am J Obstet Gynecol 2020; 222: 293



TRANEXAMIC ACID FOR CESAREAN

Should TXA be used prophylactically for cesarean deliveries?

- RCT of 11K parturients having scheduled cesarean delivery
- Transfusion ⟶ 3.6% in TXA group vs 4.3% in placebo
- EBL > 1L ⟶ 7.3% of TXA group vs 8% of placebo
- No difference in Hgb change or thromboembolic events.

N Engl J Med 2023;388:1365

If given to all CD it is cost-effective in reducing complications, but the effect size is small and probably not clinically relevant.

Obstetric Anaesthesia 2023;131:893

BLOOD PRODUCT RESUSCITATION: REVIEWS

- Coagulation management and transfusion in massive postpartum hemorrhage *Curr Opin Anesthesiol 2023;36:281*
- Perioperative considerations in management of the severely bleeding coagulopathic patient (see section on postpartum hemorrhage) *Anesthesiology 2023;138:535*
- What's in your transfusion? A bedside guide to blood products and their preparation. *Anesthesiology 2024;140:144*

Transfusion types	Volume and composition	Shelf life	Typical increase	Compatibility
Whole blood	Total volume: 400-550 mL Composition: Red blood cells (RBCs), plasma, and platelets	With citrate-phosphate-dextrose (CPD): 21 d With citrate-phosphate-dextrose-adenine (CPDA-1): 35 d	Equivalent to transfusion of 1 unit of RBCs plus 1 unit of plasma	Use group O with low titers of anti-A and anti-B antibodies
Plasma	Total volume: 200-250 mL Coagulation factors vary based on ABO group, storage conditions, processing, and product	Frozen: 1 y Plasma outdates 24 h after thawing, but may be relabeled as thawed plasma with 5 d of additional storage at 1-6 °C	10-20 mL/kg Increases factor levels by ≈30% Expected international normalized ratio change: −0.07 per unit	ABO compatibility required Rh compatibility not required
Cryoprecipitate	Total volume: 10-15 mL/unit (5 units usually pooled together) Factor VIII: 80-120 units Fibrinogen: 250-400 mg (1.3-2.0 g per 5-unit pool)	Frozen: 1 y Thawed/pooled in an open (nonsterile) system: 4 h Thawed/pooled in a closed (sterile) system: 6 h	Fibrinogen increase: ≈7 mg/dL/unit Expected fibrinogen increments 5-Unit pool: 40-50 mg/dL 10-Unit pool: 80-100 mg/dL	ABO and Rh compatibility not required
Platelets	Total volume: 200-300 mL per whole blood-derived platelet component or 200-400 mL per apheresis unit Composition: Platelets suspended in plasma or platelet additive solution	Room temperature: 5 or 7 d depending on bacterial mitigation measures taken Pooled in an open (nonsterile) system: 4 h Cold-stored platelets: 14 d	24 000-45 000/μL After 1 platelet dose (1 apheresis unit or 4-6 whole blood-derived platelet concentrates) Expected increment decreases ≤33% with pathogen-reduced platelets	ABO and Rh compatibility not required
Red blood cells	Total volume: 300-350 mL RBCs: 200 mL Plasma: 30-40 mL Anticoagulant/additive solution: 100-110 mL	With CPD: 21 d With CPDA-1: 35 d With additive solution: 42 d	Increase after transfusion of 1 unit Hemoglobin: ≈1 g/dL Hematocrit: ≈3%	ABO and Rh compatibility required

55% of blood volume; <1%; 45%

Blood and its Components JAMA 2023;330:1903

OTHER BLOOD PRODUCTS FOR PPH

An RCT in cardiac surgery patients found fibrinogen concentrate (4 g) was cost-effective vs cryoprecipitate (10 U).

JAMA Surgery 2023;158:245

A case series of 5 obstetric patients who received O+ whole blood during pre-hospital transport found risk of Rh alloimmunization was low. Benefits of whole blood: balanced resuscitation, ↓ donor exposure, and better patient outcomes.

Obstet Gynecol 2023;142:1248

NEW AHA STATEMENT: ANESTHETIC CARE OF THE PREGNANT PATIENT WITH CV DISEASE

- Cardiovascular disease is the leading cause of maternal mortality in the US, accounting for >25% of maternal deaths, highest in Black patients.
- Cardio-obstetrics = multi-disciplinary care of pregnant patients with congenital or acquired heart disease.
- Anesthesiologists can prevent or promptly recognize CV decompensation, monitor and treat: inotrope and vasopressor support, TTE, delivery location, ICU and mechanical support, as well as anesthetic management.

CARDIAC DISEASE: PLANNING

HIGHEST RISK CARDIAC LESIONS (CLASS IV)

Pulmonary arterial hypertension of any cause

Severe left ventricular dysfunction (EF<30%, NYHA FC III or IV)

Severe mitral stenosis

Severe symptomatic aortic stenosis

Systemic RV with severely ↓ LV function

Severe aortic dilation (e.g. >45 mm with Marfan syndrome)

Vascular Ehlers-Danlos Syndrome

Fontan circulation with any complication

Circulation 2023;147:e657

REVIEWS OF CARE OF OBSTETRIC PATIENTS WITH CARDIAC DISEASE

- Care for the Obstetric Patient with Complex Cardiac Disease *Advances in Anesthesia 2023;41:53*
- Consensus Bundle on Cardiac Conditions in Obstetric Care *Obstet Gynecol 2023;141:253*
- Anesthetic Management of Patients with Peripartum Cardiomyopathy *Curr Opin Anesthesiol2023;36:269*

MONITORING CARDIAC DISEASE PATIENTS

- Can trainees with limited echo experience get usable images from TTE during cesarean? Yes, useful images were obtained in 95% of patients, LV function could be assessed in 98% and RV function in 78%. *Anesth Analg 2023;PAP (Ortner)*
- Healthy pregnant and postpartum women, free of preexisting cardiovascular disease, do not have elevated high-sensitivity troponin. *JAMA Cardiology 2023;8:890*

PULMONARY HTN: MODE OF DELIVERY

What is the preferred mode of delivery for patients with pulmonary HTN: trial of labor or planned cesarean?

- Retrospective cohort review of 727 deliveries
- There was no difference in morbidity between groups.
- However if the trial of labor resulted in cesarean rather than vaginal delivery, 1/3 had a morbidity event such as transfusion or re-admission (similar to healthy patients).
- Either mode of delivery may be considered.

Anesth Analg 2023;PAP (Meng)

PULMONARY HTN: OUTCOMES

What are the pregnancy outcomes in women with congenital heart disease (CHD), with and without pulmonary HTN?

- 2220 women with CHD; 729 had pulmonary HTN
- Women with no or mild pulmonary HTN had fewer complications than those with moderate-severe: maternal mortality = 0 vs 6%, heart failure = 8 vs 40%, other cardiac complications = 9 vs 32%, OB complications = 5 vs 16%
- BNP > 100 (OR 1.9) and NYHA Class III to IV (OR 2.9) were associated with ↑ adverse maternal cardiac events
- Follow-up with a multi-disciplinary team (OR 0.4) and strict antenatal supervision (OR 0.5) were protective.

Circulation 2023;147:549

AHA STATEMENT: PULMONARY HTN MANAGEMENT IN NON-CARDIAC SURGERY

Specific comments related to *anesthetic management* & to OB:

- Assure appropriate monitoring, prompt mitigation of anesthesia-induced hemodynamic effects, pain control and expertise in management of PH and right heart failure.
- Avoid hypercarbia, Trendelenberg position, hypo- or hyper-volemia, hypoxia, bradycardia and N_2O (↑ PVR).
- Consider pre-induction placement of sheaths for VA ECMO.
- If neuraxial is used, plan slow titration of CSA or epidural and pressor support with norepinephrine or vasopressin.

Circulation 2023;47 (Rajagopal)

SOTATERCEPT FOR PULMONARY HTN

Sotatercept is a new agent for management of pulmonary HTN.

- Mechanism: first-in-class activin signaling inhibitor biologic.
- Results from a Phase 3 RCT of 163 patients with WHO functional class II-III pulmonary HTN on stable therapy:
- At 6 months the sotatercept group had ↑ exercise capacity ⟶ 6-min walk distance ↑ by 34 meters vs 1 m with placebo.
- The treatment group had improved functional class, BNP, PVR and QOL. Adverse effects were less than placebo.

N Engl J Med 2023;388:1478, 1524 (editorial)

CARDIAC DISEASE: LONGTERM FOLLOW-UP

- Only 60% received cardiovascular health counseling at their postpartum visit. *JAMA 2023;330:359*
- The first year postpartum, assess and promote CV health, including diet, physical activity, smoking cessation, sleep health, BMI, BP, blood sugar and lipid screening and management. *JAMA 2023;330 (Khan)*
- Subsequent pregnancies in women who had peripartum cardiomyopathy remain high risk due to ↓ LVEF, relapse, and ↑ all-cause mortality out to 5 years. *JACC 2023;82:16*

ASPIRIN TO PREVENT PREECLAMPSIA

Summary on use of aspirin during pregnancy:

- Low-dose aspirin is safe for mother and fetus.
- Reduces risk of preeclampsia by 10-20% if risk factors present.
- Daily dose is $\geq$ 100 mg taken at bedtime.
- No neuraxial concerns per ASRA.
- Not currently recommended for prevention of preterm birth or for fetal growth restriction unless at risk for preeclampsia.

Obstet Gynecol 2023;142:1333

BLOOD TEST TO PREDICT PREECLAMPSIA

A new blood test predicts development of PEC, whether severe features will develop in the next 2 weeks, and can rule out preeclampsia when suspected but doesn't meet criteria.

- Ratio of sFlt1 (anti-angiogenic) to placental growth factor (PlGF = pro-angiogenic) $\leq$ 38 rules out PEC.
- Ratio > 38 was predictive of PEC with severe features requiring delivery within 2 weeks.
- Thermo Fisher's test was approved by the FDA in May 2023.

Am J Obstet Gynecol 2023;228:573

PRES vs ECLAMPSIA: REVIEW

- Posterior reversible encephalopathy syndrome occurs in patients with acute severe HTN and leads to seizures, visual disturbances and confusion (mild to coma).
- DDX with eclampsia, dural venous sinus thrombosis.
- MRI → edema in regions supplied by the posterior circulation; resolution in 70% in weeks to months.
- Management: treat HTN (e.g. labetalol, nicardipine), manage seizures (magnesium), ICU for supportive care.
- Good outcomes with appropriate care.

N Engl J Med 2023;388:2171

PULMONARY EDEMA

Interstitial alveolar syndrome is a precursor to pulmonary edema. Incidence in PEC with severe features?

- 70 patients with PEC with severe features had lung POCUS.
- Lung ultrasound detected edema in 64% of patients before overt symptoms.
- Presence of B-lines correlated with LV diastolic dysfunction.
- Lung POCUS gives valuable info in preeclamptic patients.

Anesth Analg 2023;137:1158

CHRONIC HTN AND OSA CORRELATION

Controlling for BMI, is OSA more prevalent among pregnant patients with chronic HTN?

- 100 patients, 10-20 weeks gestation with and without chronic HTN were BMI matched and underwent a home sleep test.
- Among patients with chronic HTN, OSA was more prevalent (64% with and 38% without) and more severe.
- ↑ odds of OSA if age > 25 years with chronic HTN (OR 2.6).

Anesth Analg 2023;136:205

POSTPARTUM RISKS AFTER PREECLAMPSIA

- Preeclampsia is associated with ↑ risk of thromboembolism during and after delivery. US sample of 523K primiparas.

JAMA Network Open 2023;6:e2343804

- 43% of pregnancy-associated stroke had associated HTN. Stroke associated with HTN had ↑ adverse outcomes: seizure, mechanical ventilation, prolonged hospital stay.

Obstet Gynecol 2023;142:393

POSTPARTUM CV RISKS AFTER PEC/HTN

- The risk of readmission for postpartum CV complications was 4x higher over 1 year in patients with chronic HTN.

Obstet Gynecol 2023;142:1431

- PEC is associated with adverse cardiac events during delivery (aOR 4.74) and within 90 days postpartum (aOR 2.32).

Anesth Analg 2023;136:728

- Patients with history of PEC or gestational HTN were 2.4 times more likely to develop chronic HTN at 10 years.

J Am Coll Cardiol 2022 (Chou)

CANNABIS USE DURING PREGNANCY

Why do so many pregnant women use cannabis?

- Focus groups with pregnant women who reported use.
- 70% reported daily use, 25% weekly use and 6% monthly.
- Preferred over other medications for sleep, nausea, pain or mood and thought it was safer.
- Many believed cannabis use was safe in pregnancy or perceived a lack of scientific evidence, but wanted more information from their obstetrician.

Obstet Gynecol 2023;142:1153

CANNABIS USE IN PREGNANCY

Some states that have legalized cannabis mandate warning signs including information on harms during pregnancy. Do they impact use? NO

- If people used cannabis, living in a warning signs state was associated with beliefs that it was safe in pregnancy and that those who used cannabis should not be punished.
- Among people who did not use before or during pregnancy, living in a warning signs state was associated with beliefs that use was not safe and use should be punished.

JAMA Network Open 2023;6:e2317138

CANNABIS USE AND PLACENTAL FUNCTION

Is maternal cannabis use associated with ↑ adverse pregnancy outcomes related to placental dysfunction? YES

- Cannabis exposure was documented by urine drug assay.
- SGA, medically indicated preterm birth, stillbirth and hypertensive disorders of pregnancy were ↑(aRR 1.27).
- Risk was not increased by 1st trimester use only, but was higher if used beyond the 1st trimester (aRR 1.32).

JAMA 2023;330:2191

Effects of cannabis use on:

	Placenta	Fetus	Offspring
Paternal cannabis use		• Spontaneous abortion • Low birth weight	• Small for gestational age • Sudden infant death syndrome
Maternal cannabis use	• Altered placental epigenome and transcriptome	• Preterm birth • Low birth weight • Altered fetal epigenome	• Small for gestational age • NICU admission • Autism spectrum disorder • Attention-deficit/hyperactivity disorder • Psychoticlike experiences

Cannabis use and perinatal health research ***JAMA 2023;330:913***

ASRA-PM GUIDELINES ON PERIOP CANNABIS

Nine key questions were developed to address safe management of surgical patients using cannabinoids. Question #4 addresses parturients for labor or cesarean.

- Fetal effects: cannabis readily crosses the placenta; ↓ birth weights, adverse neurodevelopmental changes
- Maternal effects: ↑ N&V, altered temp regulation
- Breastfeeding: half-life of THC in breast milk up to 17 days
- Chronic use may lead to opioid tolerance; acute intoxication may reduce need for opioids.

Reg Anesth Pain Med 2023;48:97

PAIN MANAGEMENT STRATEGIES WITH OUD

1. Continue her MAT opioid maintenance throughout her hospital stay to prevent withdrawal.
2. There is no cross-tolerance to local anesthetic, so use neuraxial techniques, wound infiltration, lidocaine patch, etc.
3. Refer for an obstetric anesthesia consult antepartum.
4. Develop a consistent multi-modal pain pathway, e.g. acetaminophen, NSAIDs, lidocaine patch, etc.
5. Address her fears and any prior bad experiences. Recognize nerves are sensitized with high-dose opioids.

ASA Monitor December 2023:30

URINE TOXICOLOGY STUDIES

A positive urine fentanyl test has major consequences. Does fentanyl in labor epidural infusions lead to a + test? YES

- Prospective cohort study used urine samples before and after initiation of neuraxial analgesia plus at intervals during labor and up to 4 times postpartum + a neonatal urine sample.
- No specimens were + before neuraxial. Intrapartum 77% had + mass spec and 40% had + immunoassay.
- Postpartum 91% had + mass spec and 62% had + immunoassay. Neonatal samples were + in 77%.

Am J Obstet Gynecol 2023;228:741

PERIPARTUM OPIOID OVERDOSE DEATHS

- Peripartum drug overdose mortality ↑ 3-fold since 2018. OD deaths occurred in younger with less education who were un-married and died outside health care settings compared to other OB mortalities. *JAMA Psychiatry 2023 (Han)*
- Patients with OUD were 24x more likely to die in the year PP from opioid overdose, and 6x from other causes. Stillbirth, severe maternal morbidity and preterm birth ↑ risk of OD death. MAT lowered the odds of death by 60%.

Obstet Gynecol 2023;141:656

MEDICATION-ASSISTED TREATMENT

Buprenorphine is associated with ↓ risks of adverse neonatal outcomes than methadone. However comparison studies need to use appropriate methadone dosing in divided doses to avoid the intoxication/withdrawal cycle seen with single daily doses.

N Engl J Med 2023;388:957

When pregnant women are engaged in OUD treatment, their infants also receive the appropriate levels of care. Infants are more likely to receive the recommended number of well-child visits and have ↓ likelihood of readmissions.

JAMA Pediatrics 2023 (Ali)

MENTAL HEALTH

- Perinatal depression affects 1/7 mothers: 27% before pregnancy, 33% during, and 40% postpartum.
- 2/3 have other psychiatric conditions: 83% anxiety, 14% panic disorders, 11% OCD.
- ACOG recommends screening at intake, later in pregnancy and at postpartum visits, but 75% who screen + receive no treatment. APA recommends screening at well-child visits.
- Treatments include psychotherapy, SSRIs or SNRIs, and a new oral medication Zuranolone.

JAMA 2023 (Simas)

ZURANOLONE FOR POSTPARTUM DEPRESSION

FDA approved the first pill for treating PP depression 8/2023.

- Take 50 mg once daily at night for 14 days.
- Significant improvement in depressive symptoms was seen compared to placebo by 15 days through 45 days.
- It's a neuroactive steroid modulating GABA-A receptors.
- Concerns: cost (est. $16K out of pocket for 14 days of rx), FDA warning – should not drive within 12 hours of taking.

JAMA 2023;330:902

SCREENING FATHERS FOR DEPRESSION

A pilot program screened fathers involved in an inter-generational postpartum primary care clinic. There are no current guidelines for paternal depression screening.

- 87% identified with a racial or ethnic minority group.
- They self-reported low rates of stress or pre-existing mental health conditions, but 30% screened + for depression.
- Gaps in care were identified: 26% were uninsured and 54% has no primary care provider.

BMC Pregnancy & Childbirth 2023;23:675

MATERNAL SEPSIS

The multi-disciplinary Alliance for Innovation on Maternal Health (AIM) published their *Consensus Bundle on Sepsis in Obstetric Care.* Lead author is an Anesthesiologist!

- Sepsis is the 2nd leading cause of maternal mortality in the US, proportion unchanged since 1987, and 73% are preventable,
- Care delayed because vital sign changes and symptoms overlap with physiologic changes of pregnancy.
- Use a pregnancy-adjusted screening tool, although false + remains high. Consider sepsis in any person with deteriorating status.

Obstet Gynecol 2023;142:481

INFECTION PREVENTION DURING CESAREAN DELIVERY (Box 2)

1. Use of electric clippers rather than a razor for hair removal
2. Avoid perioperative hyperglycemia
3. Advise patients to shower with soap or an antiseptic agent the night before
4. Preoperative surgical site skin preparation with an alcohol-based agent
5. Vaginal cleansing with povidone-iodine or chlorhexidine for labor or ruptured membranes
6. Closure of subcutaneous tissue 2 cm or greater
7. Use of subcuticular suture
8. Cesarean delivery: cefazolin administered within 60 min before incision (weight-adjusted dosing to cefazolin 3 g can be considered for patients with weight more than 120 kg)
9. Redose after 1,500 mL estimated blood loss or lengthy procedures
10. For patients in labor or with ruptured membranes, add azithromycin to antibiotic prophylaxis for cesarean delivery
11. Follow indwelling urinary catheter protocol postoperatively

RESPIRATORY DISORDERS

- 5.7% of maternal deaths are due to pulmonary embolism in the US. While PE deaths ↓ in the general population from 2003-20, maternal deaths from PE did not.

  Am J Obstet Gynecol MFM 2003;5:100754

- Review on *Asthma in Pregnancy*: symptoms worsen in 40% and 5.8% will be hospitalized. Risk factors = medication non-adherence (do not discontinue medications and use steroids as needed), obesity, AA race and viral infections.

  JAMA 2023;329:1981

OSA IN PREGNANCY

Anesthesiology consensus guidelines by SASM and SOAP:

- Screen those with HTN, diabetes and obesity but not ↑ age, preferably in 1st or 2nd trimester.
- Most screening tools are poor predictors in pregnancy, e.g. STOP-BANG, Berlin, Epworth, and ASA checklist.
- Other screening tools are suggested with caveats.
- Home sleep testing should be used; pulse ox not reliable.
- CPAP is recommended to ↓ symptoms although effects on maternal markers and neonatal outcomes is unknown.

Obstet Gynecol 2023;142:403

PREGNANCY AFTER BARIATRIC SURGERY

- Perinatal outcomes are good: ↓ risks of preeclampsia, gestational diabetes and large or small for GA infants.
- Avoid NSAIDs after delivery, any pill size should be < 10mm
- Pregnancy weight gain will be lower, especially when surgery-to-conception interval is shorter.
- Surgical complications can occur, especially in the 1st year: anastomotic leaks, bowel obstruction or ischemia, slippage of gastric bands – be aware of differential with pain or N/V.
- GLP-1 receptor agonists are not teratogenic in 1st trimester.

Obstet Gynecol 2023;141:583 JAMA Network Open 2023;6:e2346228
JAMA 2023;329:758 JAMA 2023;26112 (Harris)

PREGNANCY AFTER BREAST CANCER

Can women safely interrupt endocrine therapy to attempt pregnancy after breast cancer? YES

- 516 women $\leq$ 42 years, treated with endocrine therapy for 18-30 months who desired pregnancy.
- Median time since diagnosis was 29 months, 93% Stage I or II.
- The 3-year incidence of breast cancer events was 8.9% in the treatment-interruption group and 9.2% in the controls.

N Engl J Med 2023;388:1645

MISC REVIEWS OF OTHER CO-MORBIDITIES

- Management of patients with solid organ transplants.

  SMFM Consult Series #66, August 2023

- Management of primary ITP in pregnancy.

  N Engl J Med 2023;389:540

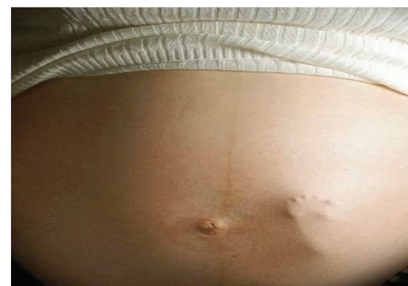
- National guidelines on management of twin pregnancies.

  Am J Obstet Gynecol 2023;December:577

- Outcomes for women with epilepsy and their children.

  JAMA Neurology 2023 (Mazzone) & 2024 (Cohen)

THE FETUS AND NEONATE



TERATOGENS DURING PREGNANCY

How often and when are pregnancies exposed to teratogenic meds?

- Health insurance database of ~ 640K pregnancies + 137 teratogenic meds + initiation of prenatal care.
- 5.8% of all live births were exposed to teratogens.
- Most common exposures: fluconazole, valproate, lisinopril, and immunomodulators.
- 25% occurred before 6 weeks gestation and 49% by 15 weeks → before prenatal care and risk-benefit discussions occur and after the option of termination for teratogenic effects.

JAMA Network Open 2024;e2354298

VACCINE HESITANCY

- CDC reports that pregnant women “very hesitant” to receive flu vaccine ↑ 17%→25% and Tdap ↑ 15%→20% from 2021-23.
- RSV is a major cause of morbidity & mortality in infants. New maternal vaccine ↓ rate of severe RSV in infants up to 6 mos.
- When pregnant women received the COVID vaccine, risks of severe neonatal morbidity, death, and admission to NICU were significantly lower. No adverse pregnancy or fetal or newborn effects were seen.

MMWR 10/23; N Engl J Med 2023 (Kampmann);
JAMA Pediatrics 2023 (Jorgensen + Healy editorial)

MATERNAL VACCINATIONS

In addition to being safe for mother and baby to receive during pregnancy, by vaccinating the mother, infants receive immunity for 6 months or more from:

- Influenza *JAMA Pediatr* 2023 (Sahni)
- COVID *JAMA Pediatr* 2023;177:1314
- RSV *N Engl J Med* 2023;388:1451

Prevents infant disease and ↓ hospitalization and death from severe disease while infants cannot be vaccinated.

SMOKING AND CAFFEINE

Pregnant women are encouraged to cease smoking and reduce caffeine. What is the actual risk of adverse outcomes?

- >900 women in the smoking analysis; >900 in caffeine group
- Analyzed maternal serum metabolomics in samples at 12, 20, 28, and 36 weeks gestation (cotinine and paraxanthine)
- Smoking was associated with preterm birth (aOR 2.58) and fetal growth restriction (aOR 4.07).
- High levels of caffeine exposure had <u>no</u> associations.

Int J Epidemiol 2023;52:1756

PRETERM BIRTH: PREVENTION & MGT

TOPS Trial: Does cervical pessary placement ↑ the risk of PTB among individuals with a short cervix? No, but fetal/ neonatal death was ↑ in the pessary group.

JAMA 2023;330:340

IV magnesium administered to parturients before birth at < 30 weeks gestation ↓ risk of death and cerebral palsy in their children. Does it also reduce risk if given 30-34 weeks? NO.

JAMA 2023;330:603

MATERNAL OXYGEN DELIVERY

Does maternal oxygen during labor affect cord gases at delivery? NO

- 5 RCTs have shown that acute short-term oxygen delivery to the mother does not improve fetal acid-base status or other neonatal outcomes. Would long-duration, high concentration delivery improve umbilical cord gas oxygen? NO
- 140 healthy women with Cat I FHR tracings in labor received 10L oxygen by tight face mask for ~5.5 hours vs. receiving room air.
- There were no differences in umbilical cord partial pressure of oxygen or the proportion with Cat II FHR tracings.
- <u>*However*</u>, the cord arterial pH was <u>lower</u> in the oxygen group.

Am J Obstet Gynecol 2022;227:629

DELAYED CORD CLAMPING

Is delayed cord clamping beneficial for preterm babies?

- Meta analysis of 6367 neonates < 37 weeks gestation
- Delayed cord clamping for > 30 seconds (vs immediate) ↓ death before discharge (OR 0.68). 120s had most benefit.
- About 75% of blood available for placenta-to-fetus transfusion is transfused in the first minute of life.
- Delay does ↑ risk of hypothermia in newborns < 32 weeks.

Lancet 2023 (Seidler)

U.S. INFANT MORTALITY

- Infant mortality rate was 5.6 deaths per 1000 live births in 2022, 3% higher than in 2021.
- Rates ↑ significantly among infants of American Indian and Alaska Native (9.06/1000) and white (4.52/1000) women.
- Rates also ↑ for preterm infants, males, and in 4 states: Georgia, Iowa, Missouri and Texas.
- Beneficial policies: Medicaid extension to 1 year, paid family & medical leave, maternal/ fetal/ neonatal mortality reviews to assess causes and prevention, quality collaboratives, & doulas.

CDC/NCHS Report #33, November 2023

March of Dimes Report Card, November 2023

MANAGEMENT OF PDA

In very preterm infants (< 28 weeks), is early ibuprofen or expectant management preferable for patent ductus?

- 273 infants randomized, mean GA 26 weeks & weight 845g
- Expectant management had same or better outcomes for the primary outcome events: necrotizing enterocolitis, broncho pulmonary dysplasia, and death.

N Engl J Med 2023;388:980

PREVENTING NEURAL TUBE DEFECTS

The U.S. Preventive Services Task Force reaffirmed their recommendation that "all persons planning to or who could become pregnant take a daily supplement containing 0.4-0.8 mg of folic acid" (Grade A recommendation).

- 12 new studies were used for the update. Benefits were ↓ risk of neural tube defects (aRR 0.49). No harms were identified (e.g. autism, maternal cancer).

JAMA 2023;330: 454, 460 and 480

REVIEW: FETAL SURGICAL REPAIR OF OPEN NTD

- Spinal bifida has a prevalence of 2-4 per 10K live births
- Prenatal screening allows patients to consider management options during pregnancy.
- Prenatal repair has been shown to improve outcomes for the child (MOMS trial) including ↓ need for VP shunting, better lower extremity function.
- Prenatal repair ↑ risk for the mother, the pregnancy and future pregnancies. New minimally invasive options show similar benefits for the child but improved outcomes for the mother.

Obstet Gynecol 2023;141:505

FETAL SURGICAL REPAIR OF SPINA BIFIDA

Complications for the mother are reduced by using hybrid fetoscopic repair, i.e. open maternal laparotomy + fetoscopic in utero repair of the NTD versus an entirely open repair.

- Surgery was longer in the hybrid group but only half required later cesarean for delivery, gestational age at delivery was later (38.1 vs 35.8 weeks) and preterm birth was less (4.2% vs 15.9%).

Am J Obstet Gynecol 2023;229:53

MATERNAL OPIOID-USE DISORDER

What is the risk of post-neonatal mortality among infants with withdrawal syndrome or whose mothers had OUD?

- Tennessee Medicaid database 2007-2018
- Risk of death in the first year was elevated for infants whose mothers had OUD or if the infant had withdrawal syndrome when compared to unexposed infants (aOR 1.54-1.64).

JAMA Pediatr 2023 (Grossarth)

NEONATAL OPIOID WITHDRAWAL

Which is best method to assess the severity of neonatal opioid withdrawal – usual care using a scoring system (Finnegan) or a new functional system (Eat, Sleep, Console)?

- RCT at 26 U.S. hospitals; 1305 infants born > 36 weeks
- Days from birth until readiness for discharge was shorter using the functional system: 8.2 vs 14.9 (RR 0.55)
- Incidence of adverse outcomes was similar.

N Engl J Med 2023;388:2326