



**UPDATE ON OBSTETRIC ANESTHESIA: PEARLS FROM THE 2025 LITERATURE**

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**\*I have no conflicts of interest to disclose\***



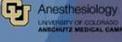
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**GOALS & OBJECTIVES**

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**.



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**NATIONAL GUIDELINES AND POLICIES**



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

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**WHY IT IS UNETHICAL NOT TO CONDUCT RANDOMIZED TRIALS IN PREGNANCY**

- Less than 10% of meds approved since 1980 have evidence to determine pregnancy safety.
- The status quo leaves pregnant women with difficult decisions about the right choice amid limited evidence.
- A med may be prescribed anyway and lead to adverse effects, or safe and beneficial meds may be avoided.
- Example: COVID 19 vaccine trials excluded pregnant women and CDC did not recommend until August 2021. 20% of COVID 19 deaths and 1% of stillbirths during that gap might have been prevented.

*JAMA 2026;PAP (Bilinski)*

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**GUIDELINES FOR GI PROCEDURES IN PREGNANCY**

*"Performing Endoscopy Safely in Pregnant Patients: Best Practices for the Gastroenterology Team"*

- Emergent conditions are done ASAP: cholangitis, bile leak, GI bleeding, gastric outlet obstruction, esophageal foreign body.
- Consider delaying non-emergent conditions (e.g. high suspicion of malignancy) to 2<sup>nd</sup> or 3<sup>rd</sup> trimester.
- Pre-procedure: involve a multidisciplinary team in planning (!).
- Procedural: positioning, ↓ fluoroscopy exposure if possible.
- Postprocedure: involve OB for FHR and contraction monitors.

*Am J Gastroenterol 2025;PAP (Lim; also includes an anesthesiologist!)*

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**GUIDELINES FOR TRAUMA IN PREGNANCY**

1:12 pregnant patients will experience trauma, primarily blunt injuries from MVC and falls. Guidelines for EMS personnel:

- Focus on pregnancy physiologic changes, e.g. LUD, vital signs may not reflect hemorrhage, airway management.
- If ROSC has not returned after addressing correctable causes, resuscitative hysterotomy is indicated.
- Resuscitation of the mother is always the priority over fetus.
- Consider the possibility of intimate partner violence.
- Promote conversations around injury prevention including correct seatbelt use (low on the abdomen.)

*Prehospital Emergency Care 2025*

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### IMPROVING OUTCOMES: DOULA SUPPORT

A meta-analysis was used to estimate the association between doula support in labor and need for cesarean delivery.

- 18 studies (RCT and observational) and 367K patients.
- Rate of cesarean delivery was 17.5% with doula support vs 23.6% with standard care, RR 0.71.
- Rates of operative vaginal delivery were also lower; RR 0.64.
- No difference in low 5-minute Apgar scores or use of neuraxial anesthesia.

*Obstet Gynecol 2025;146:73*

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### IMPROVING OUTCOMES: DOULA SUPPORT

A retrospective cohort study evaluated the association between doula care and a broad range of maternal and infant outcomes.

- Single institution, 17,831 deliveries, 486 with doula care.
- Patients with doula care were more likely to self-report Black race, be publicly insured, live in a disadvantaged neighborhood.
- Doula care was associated with ↑ vaginal birth after cesarean (VBAC), improved attendance at postpartum visits, better breastfeeding rates and fewer preterm deliveries.
- Benefits were consistent across race and insurance status.

*Am J Obstet Gynecol 2025;232:387*

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### IMPROVING OUTCOMES: GEOGRAPHY

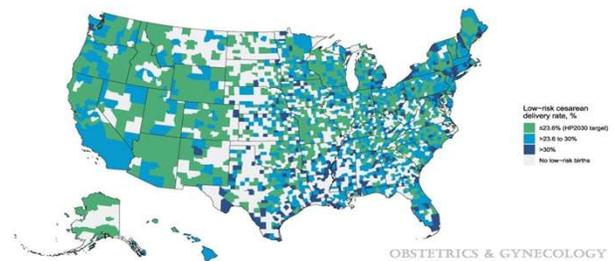
How does cesarean delivery rate vary by county of delivery?

- In 2023, the overall CD rate in the U.S. was 23.6% for NTSV births: nulliparous, term, singleton, vertex.
- Wide variation: the West had lower rates (21.6%) than the Midwest (22.9%), Northeast (25.2%) and the South (25.4%).
- The most urban of counties (vs rural) had the highest rates.
- Rates were higher across the U.S. for Asian, Black, and Native Hawaiian/Pacific Islander groups.

*Obstet Gynecol 2025;146:877*

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### IMPROVING OUTCOMES: GEOGRAPHY



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### IMPROVING OUTCOMES: INSURANCE & COSTS

In 2023 41% of U.S. births were covered by Medicaid. States were ranked by % of their births covered by Medicaid:

3 highest: Louisiana 64%, Mississippi 57%, New Mexico 55%

3 lowest: Utah 18%, New Hampshire 21%, North Dakota 23%

Colorado has 36% covered by Medicaid, or 22K total births.

The cost of giving birth in CO is \$23K for a cesarean and \$14K for a vaginal delivery.

CO is 15<sup>th</sup> most expensive for cesarean and 28<sup>th</sup> for vaginal birth. Alaska is highest: \$40K for cesarean, \$29K for vaginal.

Sources: *Becker's Hospital Review, Axios Denver*

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### NEW ASA STATEMENTS ON OB ANESTHESIA

These statements were approved by the ASA HOD in 2025:

- *Antenatal Anesthesia Consultation*: recommends when to obtain anesthesia consults for medically complex patients.
- *Anesthesia Management and Support for External Cephalic Version*: recommends neuraxial analgesia to ↑ success of ECV.
- *Anesthesia Services Staffing Labor and Delivery*: considerations for our services on L&D, including obtaining hospital support.
- All statements can be found on the ASA website: [asahq.org](http://asahq.org)
- Of note, our own Rachel Kacmar is the new Chair of COBA!

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**POST-DOBBS: MATERNAL MORBIDITY**

A single institution examined their maternal morbidity before 2021 when they offered expectant management or pre-viable termination for life-limiting fetal conditions vs after state legislation changes when only expectant mgt was offered.

- All pregnancies undergoing expectant mgt resulted in stillbirth or neonatal or infant death.
- Preeclampsia and cesarean delivery ↑ after legislation and only occurred in patients receiving expectant mgt.
- Composite maternal morbidity ↑ with expectant mgt vs termination: 72% vs 15%; P< .001.

*JAMA Network Open 2025;8:e2521883*

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**MATERNITY CARE DESERTS**

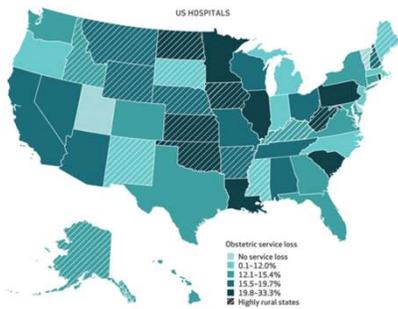
A study analyzed OB services at acute care hospitals 2010-22.

- 25% of hospitals in 7 states closed their L&D services with 60% of hospitals in 6 states having NO L&D services by 2022.
- 12 states saw 25% losses of L&D services among hospitals in rural counties. In PA and SC 46% of rural counties lost their L&D services between 2010-22.
- Another study found more than half of rural hospitals no longer offer maternity care, and about 100 rural hospitals have eliminated L&D services just since 2020.

*Health Affairs 2025;44:806 / JAMA 2025;333:2040*

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Exhibit 2 Percent of all short-term acute care US hospitals that lost hospital-based obstetric services, by state, 2010–22



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**MATERNITY CARE DESERTS**

Table 1. – Number of U.S. Hospitals Providing Obstetric Care by Annual Number of Births

Survey Year	Hospitals with Obstetric Care	Total Births
1981	4,163	3,667,316
1991	3,545	3,669,112
2001	3,160	3,973,925
2011	2,900	3,888,844
2020	2,846	3,536,150
2022*	2,075	3,661,220
2023	1,893	3,591,328

\*2022 data were used to assess postpandemic hospital closures and birth rates.

*Anesthesiology 2025;143:330*

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**MATERNITY CARE DESERTS & MATERNAL MORTALITY**

What is the association between level of maternity care access and pregnancy-related mortality?

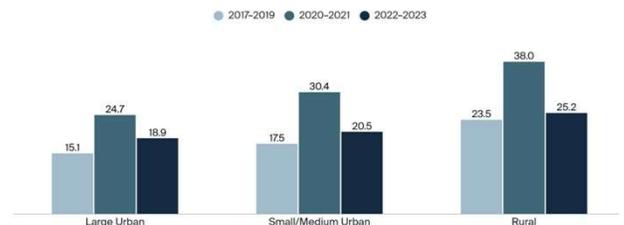
- March of Dimes info on access to maternity care by county was paired with CDC data on maternal mortality by county.
- Included almost 15 million live births. Levels of L&D access were rated as desert, low, moderate and full access.
- “Desert” counties compared with full access counties had a significantly higher maternal mortality rate: 32.3 vs 23.6 per 100K live births, RR 8.6.

*Obstet Gynecol 2025;146:181*

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Pregnancy-related mortality ratios were over 50 percent higher in rural areas than large urban areas.

Pregnancy-related deaths per 100,000 live births



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**RURAL RESIDENTS & HIGH-RISK PREGNANCIES**

What happens when rural hospitals close? A study in SC compared:

- 1) rural residents who delivered at urban hospitals, i.e. bypassed their community for a non-local delivery (6%) with
  - 2) rural residents who delivered in their community (7%) and
  - 3) urban residents delivering in urban hospitals (86%).
- Rural residents who had non-local births – about half of the rural births – had the highest risk of severe maternal morbidity.
  - Urban and local rural deliveries had the same or lower risk.
  - Targeted discharge planning & PP care coordination are necessary.

*JAMA Network Open 2025;8:e2544522*

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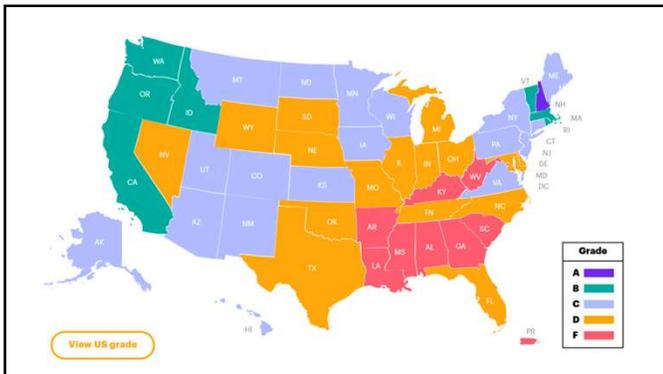
**MARCH OF DIMES REPORT CARD 2025**

The U.S. overall grade was D+, unchanged from recent years.

- Low ratings are primarily driven by preterm birth rate of 10.4%, i.e. 1:10 U.S. babies are born prematurely.
- Racial and ethnic disparities persist with worse outcomes for Black, American Indian and Alaska Native women and infants.
- Worsening access to prenatal care with 25% of pregnant patients not beginning care in the 1<sup>st</sup> trimester due to no available appointments, not knowing they were pregnant.
- 16% received inadequate prenatal care (i.e. fewer visits).

*MarchofDimes.org/report-card*

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**U.S. MATERNAL MORTALITY 2018-2022**

The CDC published its national data on pregnancy-related deaths.

- There were 6283 deaths from 2018-22 with an ↑ing rate from 25.3/100K live births in 2018 to 32.6/100K live births in 2022.
- State rates varied from 18.5 to 59.7/100K live births. If the national rate was reduced to the lowest state rate, 2679 maternal deaths could have been prevented.
- American Indian/Alaska Native women have the highest rate at 106.3/100K, followed by Black women at 76.9/100K.
- Cardiovascular disease was the leading cause of death, but cancer, psychiatric disorders & substance abuse led late deaths.

*JAMA Network Open 2025;8:e254325*

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**PREGNANCY vs ABORTION-RELATED MORTALITY**

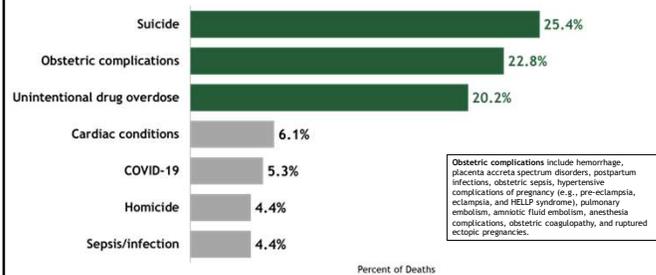
What is the difference between mortality related to pregnancy and mortality related to abortion?

- Study compared U.S. national data for deaths from 2018-2021.
- The ratio of pregnancy to abortion-related mortality was 53.
- Excluding COVID-related mortality it was 44.
- Conclusions: By taking away the option to end a pregnancy, abortion bans for pregnant people to take on substantially increased health risks associated with continued pregnancy, i.e. 53x greater risk of dying.

*JAMA Network Open 2026;9:e2554793*

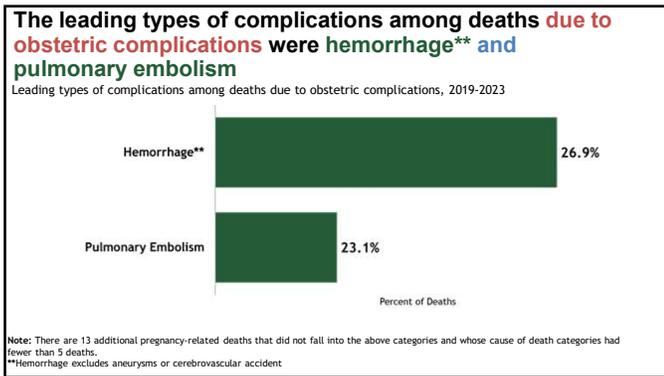
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**The leading causes of pregnancy-related deaths 2019-2023 were suicide, obstetric complications, and unintentional drug overdose**

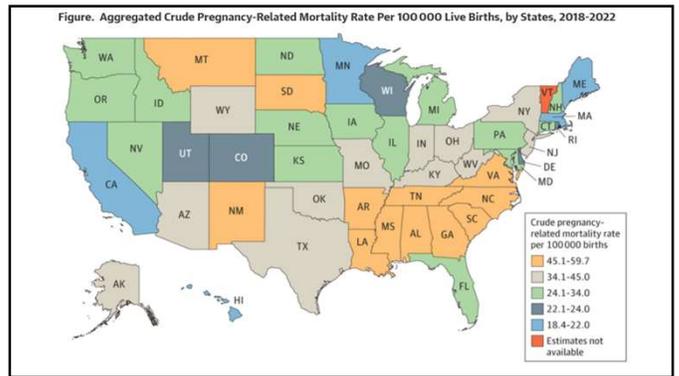


Note: There are 13 additional pregnancy-related deaths that did not fall into the above categories.

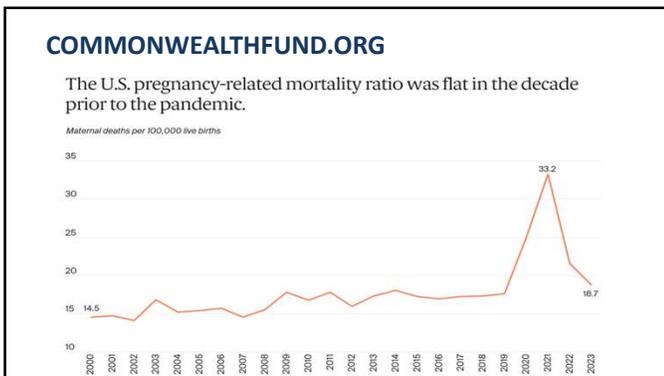
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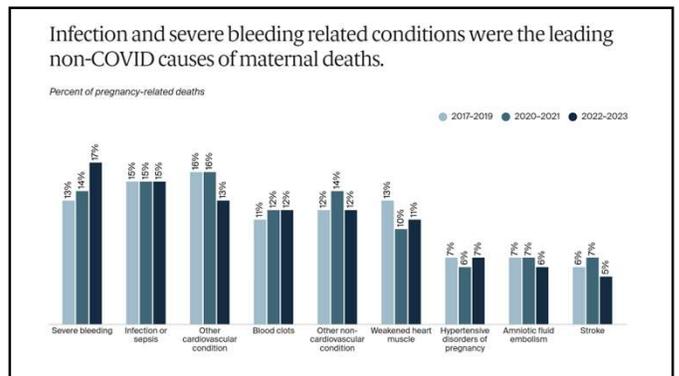
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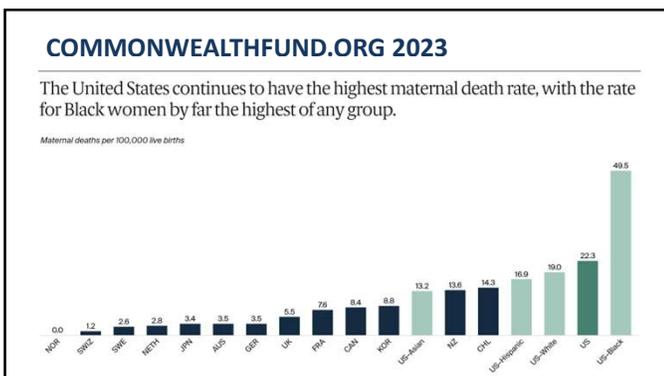
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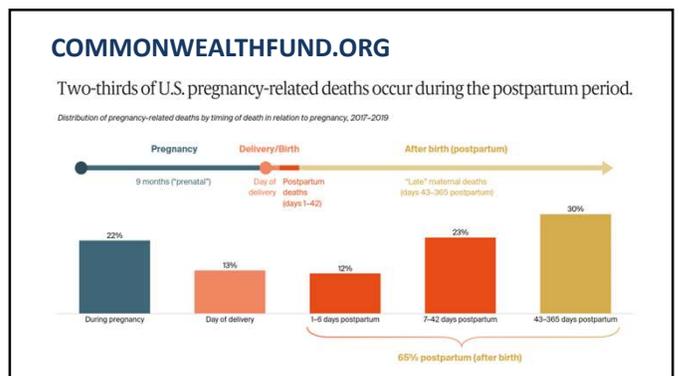
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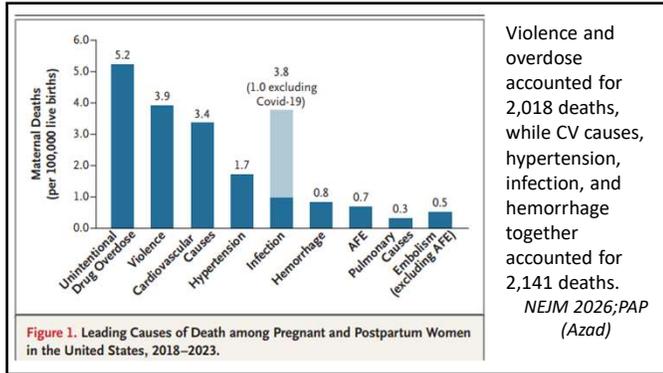
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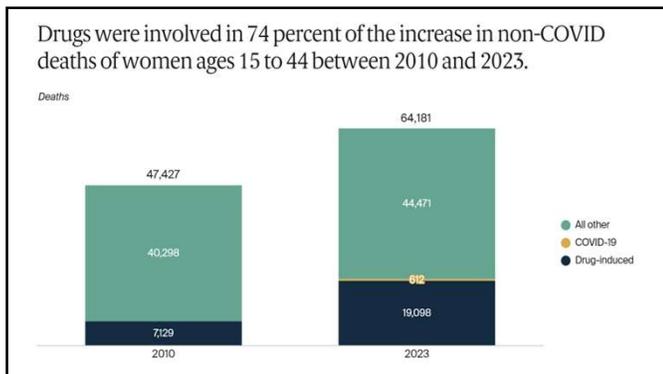
### U.S. MATERNAL MORTALITY 2018-2022

In the U.S. homicide, suicide and drug overdose are the leading causes of pregnancy-associated (not pregnancy-related) causes of death, especially intimate partner violence.

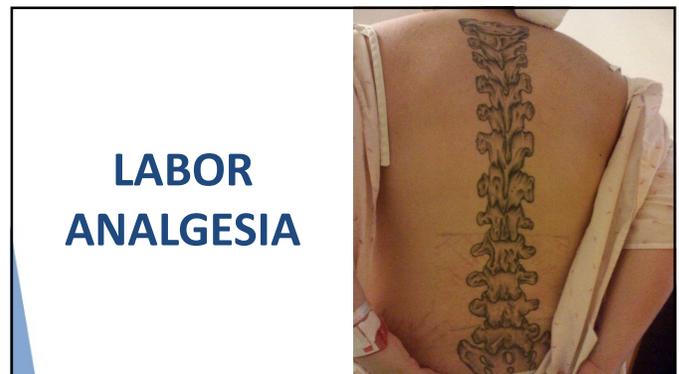
- The breakdown for this 5 years includes 837 homicides, 579 suicides, 2083 drug overdoses, and 851 deaths that involved firearms.
- Pregnant/PP women had a 37% higher firearm homicide rate than nonpregnant, directly related to state-level firearm ownership.
- Homicide mortality was highest in Mississippi.
- Suicide mortality was highest in Montana.
- Drug overdose was highest in Delaware.

JAMA Network Open 2025;8:e2459342 and e2542457

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**GREAT REVIEW FOR OUR COLLEAGUES!**

Clinical Expert Series **CME**

## Key Management Considerations in Obstetric Anesthesiology

Holly B. Ende, MD, and Brian T. Bateman, MD

Obstetricians, midwives, nurses, and anesthesiologists collaborate daily to care for patients on the labor and delivery unit. Effective communication among these team members is essential for optimal patient care. This article aims to provide context and explanation for key aspects of obstetric anesthesia management to support conversations and engagement between obstetric and anesthesia teams.

(Obstet Gynecol 2025;146:807-19)

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### ELECTIVE INDUCTION OR EXPECTANT MGT?

- The ARRIVE trial (2018) found induction at term ↓ cesarean delivery rates, ↓ development of preeclampsia, ↓ newborn respiratory complications, but eIOL ↑ L&D length of stay.
- Retrospective cohort studies since the ARRIVE trial have had mixed and inconsistent results.
- New ACOG recommendations state: consider whether the patient prefers intervention or not, L&D resources to support more inductions, and the actual outcomes at your hospital.

Obstet Gynecol 2025;145:e45

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### VAGINAL BIRTH AFTER CESAREAN CALCULATOR

The VBAC calculator is used to counsel patients on their expected success at achieving vaginal delivery after cesarean.

- A successful VBAC has ↓ hemorrhage, thromboembolism, infection and operative complications.
- The original calculator predicted lower success rates for African American and Hispanic women without biologic justification. A new calculator in 2021 removed race/ethnicity.
- This study compared TOLAC outcomes using the old and new calculators and found race/ethnicity did not contribute.

*Am J Obstet Gynecol 2025;232:323*

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### VAGINAL BIRTH AFTER CESAREAN CALCULATOR

- Basic Info: Age, height (in/cm), weight (lbs/kg) → BMI.
- History: Number of prior C-sections, reason for previous C-section (e.g., failure to progress, fetal distress).
- Pregnancy Details: Gestational age, blood pressure, and cervical dilation/effacement if in labor.
- Updated Variable: Chronic hypertension requiring treatment (Yes/No) instead of race/ethnicity.

Output → A probability score or percentage, e.g., they have a 75% chance of having a successful vaginal delivery (VBAC).

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### HOW TO MEASURE STAFFING NEEDS ON L&D?

Estimates of anesthesia activity on L&D based only on annual number of deliveries do not reflect actual staffing needs.

- Neuraxial analgesia and cesarean delivery rates vary by hospital.
- Case timing and urgency are unpredictable on L&D.
- Antepartum consultations and multi-disciplinary care coordination are part of the practice and take time.
- When the EMR was used to document concurrent activity, staffing capacity and utilization for every minutes for 1 year, the need for similar staffing nights & weekends was well-documented.

*J Clin Anesth 2026;108:112054*

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### PATIENT INFORMATION ON LABOR EPIDURALS

TikTok plays a significant role in how people get medical info.

- A review of 189 TikTok videos related to labor epidurals found 27% had been uploaded by medical professionals, but 73% by non-medical TikTokers.
- Using validated quality scales, the videos were overall poor to moderate quality but medical professionals had ↑ scores.
- Only 26% included medical information; 10% of those were inaccurate and 18% had only anecdotal information.

*Anesthesiology News 2025;September:4*

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### CONSENT FOR EPIDURAL ANALGESIA IN LABOR

Women who received an epidural during induction of labor were interviewed postpartum about the anesthesia consent process.

- They felt they received limited information about analgesia alternatives due to time constraints during labor. *Improve timing and quality of information provided to patients.*
- They felt that although risks were mentioned, there was little chance for them to voice their concerns, and that if they did it was downplayed by the anesthetist. *Invite questions/concerns.*
- The value of discussion and of written material during labor were limited by pain, fatigue and opioids, especially later in labor. At that point they didn't want to ask questions that would delay epidural administration.

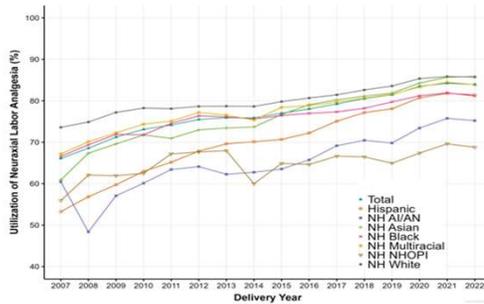
*Anaesthesia 2025;80:1174 (editorial), 1199*

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### SOAP.org: THE PAINLESS PUSH WEBSITE

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### EPIDURAL ANALGESIA UTILIZATION IN THE U.S.



Overall use of epidural analgesia ↑ across all racial & ethnic groups to 85%. Largest ↑ in Hispanic (28%) and Asian (25%). Smallest change in White (12%) and NHPI (12%).

*Anesthesiology 2025;142:409*

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### OB ANESTHESIA SURVEY: 40-YEAR UPDATE

A survey of anesthesiologists compared L&D practice in 2021 to practices in prior decades (1981, 1991, 2001, 2011):

- Despite stable birth rates over 40 years, hospitals providing OB care have ↓ by 50%, esp. since COVID = maternity care deserts.
- Epidural analgesia has ↑ in all size hospitals to 84% use overall.
- 73% use continuous infusion with PCEA; only 15% use PIEB.
- As labor epidural utilization increases, the use of general anesthesia for cesarean decreases, now at 14% overall.
- Nitrous oxide is rarely available in any size hospital.

*Anesthesiology 2025;143:330*

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### EPIDURAL vs DURAL PUNCTURE ANALGESIA

Meta analysis of 18 studies and 2144 parturients found:

- DPE has a slightly faster onset, fewer one-sided blocks, reduced motor block, improved sacral coverage, and ↑ rates of adequate analgesia.
- No difference in cesarean or operative vaginal delivery, need for top-up doses, or hypotension.
- DPE or CSE should be considered over traditional epidural analgesia due to these benefits.

*Br J Anaesth 2025;134:1402*

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### PRO-CON DEBATE: AIR vs SALINE FOR LOR

This debate concerns chronic pain management, but *may be* applicable to other epidural procedures.

- Pro air: incidence of pneumocephalus is extremely low considering the number of epidurals performed, observing no fluid return from the Tuohy provides strong assurance the needle is not intrathecal, air may offer tactile benefits.
- Pro saline: the risk of PDPH and other rare complications is less, fewer false positive LOR, and less compressible.
- Summary: neither is superior; providers' degree of familiarity with the technique is most important.

*Anesth Analg 2025;141:100 (editorial), 103*

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### FETAL DECELERATIONS AFTER EPIDURAL ANALGESIA

Why do abnormal fetal heart rate patterns sometimes develop after neuraxial analgesia (epidural, CSE, or spinal)?

- 838 term singleton fetal tracings reviewed, and prolonged decels occurred in 6.6% within 30 minutes of neuraxial.
- Uterine hyperstimulation was the strongest factor associated, especially in nulliparas with higher pain scores pre-epidural.
- No changes in systolic or diastolic BP were seen → hypotension is rarely if ever the cause of prolonged decelerations.
- Rx should be fluids, stopping oxytocin, and NTG or terbutaline.

*Am J Obstet Gynecol MFM 2025;7:101747*

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### PROGRAMMED INTERMITTENT EPIDURAL BOLUS

Is PIEB associated with fewer epidural catheter replacements than continuous epidural infusions?

- A pre & post cohort study of almost 16K patients before and after PIEB was implemented.
- There was no difference in need for replacement based on the maintenance regimen.
- Catheters placed after CSE were 1.28x less likely to need replacement than those initiated with epidural only.

*Anesth Analg 2025;PAP Morgan*

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### PROGRAMMED INTERMITTENT EPIDURAL BOLUS

What are the optimal PIEB settings (ED90) during the first stage of labor after dural puncture epidural technique?

- 40 nulliparous women, 25 gauge dural puncture, up-and-down sequential allocation study.
- ED90 for bolus = 8.8 - 9.2 ml with a fixed 40-minute interval.
- No patients experienced motor block.
- In our practice we use 10 ml q 45 minutes in active labor or 5 ml q 30 minutes in early labor, and PCEA 5 ml q 10.

*Can J Anesth 2025;72:254*

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### DOES PIEB AFFECT UMBILICAL DRUG LEVELS?

What are umbilical ropivacaine and fentanyl levels after PIEB/PCEA and does it influence neonatal outcome?

- 50 parturients received CSE and PIEB at 7 ml q 45 minutes.
- Umbilical venous concentrations of local anesthetic and fentanyl were low, even if top-up boluses were given within 1 hour of delivery.
- All neonatal outcomes were good based on Apgar score at 5 minutes and umbilical arterial pH > 7.2.

*Eur J Anaesthesiol 2025;42:96*

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### ESAIC GUIDELINES FOR MANAGEMENT OF THE FAILING EPIDURAL DURING LABOR ANALGESIA

Guidelines were developed through a systematic literature search → Delphi process → review by all ESAIC members.

- 11 clinical practice statements were made. Examples include:
- Consider CSE when replacing an epidural catheter to ↓ onset time and ↑ reliability of the new catheter.
- DPE should be considered even if an IT dose is not being used.
- Round on all parturients with an epidural q 2 hours and document their motor and sensory block & clinical status.

*Eur J Anaesthesiol 2025;42:96*

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### EPIDURAL MORPHINE AFTER VAGINAL DELIVERY?

Would a single 2mg dose of epidural morphine reduce opioid consumption and quality of recovery after vaginal delivery?

- 157 parturients were randomized to morphine 2mg or saline. All received acetaminophen and ketorolac q 6 hours.
- 4% requested opioids after morphine; 14% after saline.
- Verbal pain scores were lower at 24 hours (2 vs 3).
- Pruritus, nausea and dizziness in the morphine group counteracted the positive impact on recovery.
- Reserve for 3<sup>rd</sup>, 4<sup>th</sup> degree repairs or other perineal injuries?

*Anesth Analg 2025;140:1063*

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### USES FOR 2-CHLOROPROCAINE ON L&D

We need a short-acting spinal anesthetic option like 2-CP on L&D.

- Cervical cerclage: 50mg IT + fentanyl → earlier discharge than spinal bupivacaine.
- Pain during cesarean: intra-peritoneal administration after delivery at doses ≤ 1200 mg has safe plasma levels, no LAST.
- True allergy to amide local anesthetics: use 1.5% for labor analgesia boluses and infusion, or 15 mg for IT analgesia.
- External cephalic version: no studies on dosage; ~30 mg IT?
- Other short procedures: PPTL, D&C, cerclage removal, minimally invasive fetal surgery?

*SOAP newsletter, Spring 2025, p 7*

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### OPPORTUNISTIC SALPINGECTOMY DURING TL

- Many/most ovarian cancers are derived from the fallopian tube.
- Opportunistic salpingectomy at the time of pelvic surgery such as cesarean delivery, PPTL, and hysterectomy may ↓ the most common type of ovarian cancer by **80%** over a lifetime.
- Salpingectomy does not ↑ risk of complications, e.g. bleeding.
- Of 1877 patients with ovarian cancer, 24% had a missed opportunity to have had a salpingectomy during a prior surgery.
- ACOG supports counseling and discussion as a risk reduction opportunity in the general population.

*JAMA Surg 2025;160:1091 / Obstet Gynecol 2019;133:e279*

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### WHAT IS THE "RIGHT" CESAREAN DELIVERY RATE?

- The recommended nulliparous, term, singleton, vertex (NTSV) cesarean rate is 23.6%. [*Healthy People 2030 goal*]
- In Denver, hospital rates range from 10%-33%. Why?
- A comparison of NTSV rates in 30 million U.S. births found overall rates went down between 2012 and 2021, but rates for Black individuals went up → thus disparity increased. Why?
- Black rates 31% > Hispanic 28% > White 26.5%. Why?

*JAMA Network Open 2025;8:e2544078*

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### ELECTIVE CESAREAN ON MATERNAL REQUEST

ACOG recommends planned vaginal if there are no indications for cesarean delivery, but honors the decision on maternal request after counseling & shared decision-making.

*JAMA 2026;PAP (Alperin)*

A case vignette with options for arranging for an elective cesarean or recommending a vaginal delivery unless there are medical indications. Risks and benefits for the newborn and the mother are discussed.

*N Engl J Med 2026;394:603*

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### NPO TIMES FOR CESAREAN?

- Gastric emptying is not ↓ in 2<sup>nd</sup> and 3<sup>rd</sup> trimesters. Labor and opioids ↓ emptying but epidural analgesia improves it.
- Emptying after water, carbohydrate drinks and tea with milk are no different than fasting in gastric cross-sectional area. Solids are unpredictable during labor. Value of POCUS?
- Unlimited preoperative access to water before elective cesarean will ↓ perioperative vomiting, ↑ satisfaction, and ↓ intraoperative vasopressor doses during spinal anesthesia.

*Br J Anaesth 2025;134:124 / Am J Obstet Gynecol 2024;231:651*

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### PATIENT EDUCATION MATERIALS FROM SOAP ThePainlessPush.com



Anesthesia for your Cesarean Delivery: Your Questions Answered

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### IS GENERAL ANESTHESIA SAFE FOR NEONATES?

Neonatal outcomes influence the choice of anesthesia for cesarean, with neuraxial assumed to be safer.

- Meta analysis of 36 RCTs with 3456 neonates compared neuraxial to general anesthesia for cesarean.
- Apgar scores at 1 & 5 minutes were slightly lower with GA (mean difference at 1 min = 0.58 points and at 5 min = 0.09 points).
- There were no differences between anesthetics after the immediate newborn period and no difference in NICU admission.
- If GA is indicated due to maternal co-morbidities, fetal emergencies or patient request, it is safe for the neonate.

*Anesthesiology 2025; 144:325*

60

### HIGH-FLOW NASAL OXYGEN IN OBSTETRICS

A systematic review found HF was not superior to facemask pre-oxygenation and did not ↑ apnea time to desaturation.

*Anaesthesia 2025;80:1247*

In obese parturients, HF did not provide clinically meaningful differences compared to standard facemask oxygenation.

*Anaesthesia 2025;80:378*

Is there a role for HF nasal oxygen on L&D? Should it be available on L&D? Would we create new complications when it's infrequently used? *Anaesthesia 2025;80:349 (editorial)*

61

### VIDEO vs DIRECT LARYNGOSCOPY?

The largest comparison of video vs direct laryngoscopy for cesarean deliveries (320) performed during general anesthesia:

- VL was used in 72% vs DL in 28%, significantly higher than before COVID when DL was favored.
- No difference in first-pass success rates (99%).
- Better laryngeal view with VL.
- SOAP has a large multi-center GA study ongoing. Stay tuned!

*Anesth Analg 2025;140:1245*

62

### IS GETA ASSOCIATED WITH PP DEPRESSION?

A review of 326K cesarean deliveries followed patients for one year postpartum for readmission, clinic visit or ED visit.

- Overall, 6% received GETA compared to 94% neuraxial.
- Use of GETA was associated with a 38% ↑ risk of postpartum depression requiring hospitalization.
- GETA also had a 45% ↑ risk of suicidality.
- When GETA is used for cesarean, consider a postpartum debrief with the patient, especially if they screen + for PPD.

*Anesth Analg 2025;141:618*

63

### IS GETA ASSOCIATED WITH PP DEPRESSION?

A systematic review and meta-analysis found 7 RCT and cohort studies with 1.5 million patients.

- Cesarean under general anesthesia is significantly associated with ↑ risk of both overall (OR 1.64) and severe (OR 1.4) postpartum depression.
- Risk was highest in the 1<sup>st</sup> PP week (OR 4.68) indicating a need for early mental health screening but risk persisted through 1 year.
- Does it matter why was GA used? How to control for confounders such as unplanned emergencies, poor neonatal outcome, etc.?

*Eur J Anaesthesiol 2026;43:66*

64

### SEDATION FOR NEURAXIAL PLACEMENT?

Patients scheduled for cesarean delivery who requested anxiolysis received 1-2mg boluses of remimazolam until sedated but able to answer questions before their neuraxial procedure.

- There were no desaturation events, NRFHTs, abnormal Apgar scores or fetal blood pH. Anxiety scores ↓ from 7.5 to 3.3.
- All stated remimazolam improved their experience and would request it again. All remembered their delivery.
- Other options – fentanyl? dexmedetomidine? N<sub>2</sub>O? What about labor epidural placements?

*Anesth Analg 2025;141:660*

65

### HOW MANY SUPPORT PEOPLE IN THE OR?

If patients requests an additional support person in the OR, what are the pros and cons? Have a plan!

- Pros: enhances the patient's sense of empowerment, ↑ our transparency, improves mental health outcomes, may enable better bonding between parents and their newborn.
- Cons: maintaining sterility, preserving OR team efficiency, overcoming space constraints.
- What about family vs doula vs professional photographer?
- What about cases requiring general anesthesia?

*A&A Practice 2025;19:1 (Evans)*

66

### PHENYLEPHRINE INFUSION vs BOLUS

After spinal anesthesia for cesarean, how do prophylactic phenylephrine infusions compare to as-needed boluses to manage hypotension?

- There is no difference in neonatal outcomes between infusion and bolus, including Apgar scores and cord gases.
- Infusions ↓ the risk of hypotension and intraop nausea & vomiting, and fewer interventions are needed to maintain BP.
- Consider infusion doses of 50µg/min or 0.5µg/kg/min.

*Anesth Analg 2025;139:1144*

*Anesth Analg 2025;141:732 (editorial),736*

67

### NOREPINEPHRINE FOR SPINAL HYPOTENSION

What is the optimal NE infusion rate to prevent hypotension after spinal anesthesia for cesarean?

- Vasopressors with β-agonist activity may support maternal HR and cardiac output better than phenylephrine.
- Blinded RCT to find the ED50 of NE and phenylephrine.
- Potency ratio was ~ 1 NE : 13 P.
- Extrapolating to NE ED95 → infusion rate of 1.9-3.8 µg/min.
- Bolus dose potency ratio also ~13: 8µg NE vs 100µg P.

*Anesth Analg 2025;141:17*

68

### BEST TREATMENT FOR SHIVERING?

Shivering is common during neuraxial for cesarean. This meta-analysis compared IV treatments.

- 20 RCT with 1983 patients were included.
- Odds ratios for effective treatment of shivering:  
Dexmedetomidine, OR 38 >Tramadol, OR 34 >Nalbuphine, OR 26 >Meperidine, OR 21 >Ondansetron, OR 7 >Clonidine, OR 3.
- 4 drugs were effective and dexmedetomidine was top-ranked for all outcomes. Usual dose ~20 mcg.

*J Clin Anesth 2025;100:111680*

69

### PAIN MANAGEMENT AND OPIOID-USE DISORDER

Consensus statement from SOAP, ASRA and SMFM covers key questions, optimization and practical management strategies.

- Prenatal optimization: methadone and buprenorphine management, anesthesiology consult
- Labor analgesia: neuraxial initiation and maintenance, post-delivery pain management
- Withdrawal, toxicity/overdose and monitoring issues
- Post-cesarean analgesia and multi-modal therapies

*Anesth Analg 2025;140:1318, 1314 (editorial)*

70

### INTRATHECAL MORPHINE DOSE

Can the IT dose of morphine be reduced when multi-modal analgesia is used after cesarean delivery?

- Retrospective cohort study of 3300 cases using either 150 or 100 mcg IT morphine + multi-modal analgesia (ERAS protocol).
- Comparable analgesia → no difference between group in opioid consumption in the first 24 hours.
- Fewer side effects using 100 mcg → less use of anti-emetics (OR 0.65) and ↓ treatment for pruritus (OR 0.16).
- Remember that lower doses will ↓ the duration of analgesia.

*Int J Obstet Anesth 2025;62:104348*

71

### IT MORPHINE vs HYDROMORPHONE

How do intrathecal morphine 150 mcg or hydromorphone 75 mcg compare for post-cesarean analgesia?

- A blinded RCT found no difference between groups in 24-hour pain scores, 24-hour opioid consumption, or side effects, i.e. treatment for nausea/vomiting or pruritus.
- An editorial points out that the time to first opioid request (10 hours for morphine vs 6 hours for hydromorphone is clinically significant for patients, favoring morphine.
- Save IT hydromorphone for allergies or drug shortages.

*Anesth Analg 2026;142:19 / Sharpe (editorial)*

72

### FASCIAL PLANE BLOCKS AFTER CESAREAN

A meta-analysis of 18 trials and 1525 patients compared truncal blocks to IT morphine after cesarean delivery.

- 11 trials evaluated TAP blocks: analgesia was inferior to IT morphine, although blocks had ↓ nausea and vomiting.
- 2 trials evaluated erector spinae plane (ESP) blocks: similar pain relief to ITM but no difference in N&V.
- 5 trials evaluated QL blocks: similar pain relief to ITM and reduced odds of N&V → best alternative to IT morphine.

*Br J Anaesth 2025;134:1415*

73

### PREVENTING POSTOPERATIVE N&V

From the 5<sup>th</sup> Consensus Guidelines for Management of Postoperative Nausea & Vomiting: Executive Summary

- Cesarean delivery patients' risk factors for PONV after cesarean: female, non-smoker, younger age, laparotomy/gyn surgery, postop opioids ± history of PONV or motion sickness (~ 5 points).
- Prophylaxis with 3-4 agents in different classes is recommended.
- Metoclopramide and scopolamine patches are very effective after cesarean and for neuraxial morphine side effects. Dexamethasone at ≥ 8 mg also provides opioid-sparing.

*Anesth Analg 2025; Gan PAP*

74

## ANESTHETIC PROBLEMS & MORBIDITY



75

### ACCIDENTAL DURAL PUNCTURE AND PDPH

A retrospective analysis of a real-time documentation system for neuraxial block from 2017-2022:

- Of 40K deliveries documented, the rate of accidental dural puncture was 0.9% and of PDPH was 0.4%.
- 90% of PDPH followed accidental DP; 10% after spinal.
- 72% of PDPH received epidural blood patch with a 90% first-time success rate.
- 33% of PDPH after spinal required epidural blood patch.

*Eur J Anaesthesiol 2025;42:492*

76

### MULTISOCIETY INTERNATIONAL GUIDELINES: PDPH

Delegates from SOAP, OAA, ASRA, ESRA developed 10 questions → performed a thorough literature search → generated 50 recommendations for PDPH. Every L&D needs this document!

- PDPH ↑ risk of subdural hematoma, cerebral sinus thrombosis, meningitis and other neurologic complications.
- NO pharmacologic modalities have shown a benefit in preventing or treating PDPH.
- Epidural blood patch remains the most effective treatment and should not be delayed if severe symptoms are present.
- Discharge instructions and follow-up are mandatory!

*Reg Anesth Pain Med 2024;49:471 / Can J Anesth 2025;72:1163*

77

### OAA GUIDELINES ON INTRATHECAL CATHETERS

A literature search and Delphi approach produced guidelines on IT catheter placement following accidental dural puncture:

- Includes dosing (labor & CD), safety, complications, follow-up
- Use the usual local anesthetic infusion at 1-3 ml/hr for labor.
- Check sensory and motor function every hour.
- Top-ups for cesarean should be done in the OR.
- Label the catheter clearly; only the anesthesia team doses it.
- IT catheters should be removed after delivery ASAP (not after 24 hours) to reduce drug errors and infection risk.

*Anaesthesia 2024;79:1348 / Anaesthesia 2025;80:211*

78

### OPTIMAL VOLUME OF INJECTED BLOOD FOR PATCH

Retrospective review of 317 patients who had received an epidural blood patch (EBP) for PDPH over 10 years, injected until the patient had symptoms of back pain or pressure aiming for 30 ml.

- Median volume injected = 28 ml.
- 23% required a repeat blood patch for relief.
- A larger injected volume of blood was associated with ↓ need for a 2<sup>nd</sup> blood patch and volumes ≥ 30 ml were associated with ↑ likelihood of symptom resolution.
- Days from PDPH diagnosis to EBP was also associated with was also associated with successful treatment.

*Anesth Analg 2026;PAP (Berger)*

79

### RACIAL & ETHNIC DISPARITIES IN OB ANESTHESIA

A meta-analysis of 19 studies elucidated disparity in anesthesia:

- Asian (OR 0.72) and Black (0.80) patients had lower odds of receiving neuraxial analgesia during labor.
- Black patients were more likely to receive general anesthesia for cesarean compared with White patients (OR 1.60).
- A U.S. nationwide analysis of inpatient epidural blood patch use after PDPH found 53% of White patients received EBP.
- Hispanic (OR 0.80), Asian or Pacific Islander (0.74) and Black (0.69) patients were less likely to receive EBP.

*Anaesthesia 2025;80:757 / Anesth Analg 2024;139:1190*

80

### INTRAOPERATIVE PAIN DURING CESAREAN: 2 studies

A meta-analysis of intraop pain with neuraxial included 34 articles:

- The pooled incidence of intraop pain was 17%.
- Spinal anesthesia had the lowest incidence of intraop pain (14%), while epidural top-up had the highest (33%).

An international prospective cohort study of 3693 patients was done over 8 weeks to determine the incidence of intraoperative pain:

- The overall incidence was 7.6%; 3.7% with spinal, 9.2% with CSE, and 12.2% with epidural top-up anesthesia.
- Median pain score was 6; 10% were dissatisfied with how the anesthesia team managed their pain.

*Anesthesiology 2025;143:156 / Anesthesiology 2026:PAP (O'Carroll)*

81

*The Retrievals* is an award-winning podcast that investigates how women's pain, especially during medical procedures like fertility treatments (egg retrievals) and C-sections, is often dismissed or minimized by the medical system, using real patient experiences.



#### The Retrievals Serial

★ 4.6 (10K) · TRUE CRIME · SERIES

C-sections are the most frequently performed major surgeries in the world. So why do so many patients feel severe pain during them? Season 2 of the award-winning podcast "The Retrievals" is an ... [MORE](#)

▶ Season 2 Trailer

82

### INTRAOPERATIVE PAIN MANAGEMENT

500 patient-anesthesiologist dyads completed questionnaires in PACU on pain, anxiety, medication requests and subjective experiences after cesarean with spinal anesthesia.

- Only 41% of patients who asked for analgesics actually got them. Is this the pain vs pressure problem?
- Anesthesiologists may not accurately assess their patients' intraoperative pain, so encourage patients to self-advocate.
- Despite 10% reporting pain, only 5% received analgesics and anxiolytics were given 4 times more often.

*J Clin Anesth 2025;100:111689*

83

### INTRAOPERATIVE PAIN MANAGEMENT

A single health system analyzed the incidence of patients receiving IV adjuncts during cesarean under neuraxial at 8 of their maternity hospitals.

- Overall, 19% received at least 1 IV adjunct, but there was high practice variability from 0.7 to 69% of patients.
- Fentanyl was most frequently given at 13.5%, dexmedetomidine 6%, midazolam 5.6% and ketamine 1.5%.
- Highlights the need for better documentation of indications for medication, e.g. patient request, pain, anxiety, etc.

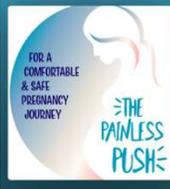
*Anesthesiology 2026; PAP (Lim)*

84

**ASA & SOAP GUIDELINES FOR INTRAOP PAIN**  
STANDARDS AND PRACTICE PARAMETERS

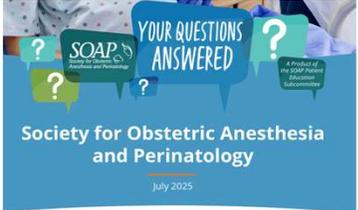
Statement on Pain During Cesarean Delivery

Developed by: Committee on Obstetric Anesthesia  
Original Approval: October 18, 2023



**Painless Push**  
Painless Push

85



**Society for Obstetric Anesthesia and Perinatology**  
July 2025

**Peripartum Pain Management Toolkit for Cesarean Delivery**

Season 2 of the hit podcast The Retrievals addresses the experience of Cesarean delivery in modern medicine.

“Cutting someone's body open and operating when they can feel it: That is not supposed to happen. That's something from history or from war.”

Significant pain during a C-section can't be something that 100,000 women experience each year. Can it? ”

86

**ANESTHESIA & CHILDBIRTH-RELATED PTSD**

Several anesthetic-related complications during delivery are risk factors for developing or exacerbating PTSD:

- Failed spinal/epidural anesthesia with pain requiring rescue medications or conversion to general anesthesia.
- Traumatic needle insertion causing pain during neuraxial procedures.
- “Wet tap” followed by severe PDPH.
- Severe postoperative nausea & vomiting.
- Accidental awareness during general anesthesia.
- We **must** practice trauma-informed care: close communication, allowing patients control when possible, and using medications if desired.

*Anesth Analg 2024;139:1156*

87

**ANESTHESIA & CHILDBIRTH-RELATED PTSD**

A study on psychological trauma after urgent/emergent cesarean delivery interviewed 36 women within 3 days of delivery:

- 5 themes relevant to all disciplines: felt unprepared for cesarean, fear of the OR, uncertain trust in their providers, loss of their expected birth experience, inconsistent patient-centered care.
- Stressors specific to anesthesia: conversion between techniques (i.e. epidural to general or spinal), repeated attempts at neuraxial, PDPH, pain during surgery or in PACU.
- Helpful aspects of care: anticipatory guidance and continuous support, preserving the birth experience as much as possible, ensuring high-quality surgical and postop pain management.

*Anesthesiology News 2025;December:4*

88

**ASRA: NEURAXIAL AND ANTI-COAGULANTS**

5<sup>th</sup> edition of the guideline reviews literature published since 2018.

- New statement: “It is not recommended to maintain neuraxial...in the setting of continuous intravenous heparin administration.”
- A section on pregnancy notes that the first 6 weeks postpartum have a higher rate of thrombosis and PE than pregnancy, which is also a hypercoagulable state. Heparin's PTT response and duration are ↓ during pregnancy, as are aXa levels and duration for LMWH.
- Thus, the incidence of neuraxial hematoma is ↓ in pregnancy compared with older, orthopedic patients. “Risk of GA may be greater than neuraxial in select high-risk parturients receiving VTE prophylaxis, and exceptions to these recommendations may be appropriate.”

*Reg Anesth Pain Med 2025;PAP (Kopp)*

89

**EPIDURAL-RELATED MATERNAL FEVER**

3 papers addressed the issue of fever during epidural analgesia.

- 1) A meta-analysis of strategies for prevention found no clear evidence to support any individual interventions.  
*Am J Obstet Gynecol 2025;233:581*
- 2) Risk of fever affects 15-25% of laboring women but there is no evidence of harm to the newborn. Etiology remains unknown.  
*Br J Anaesth 2025;135:9 (editorial)*
- 3) Review article: incidence 1.6-46.3%, no intervention prevents fever, epidural local anesthetics may trigger sterile inflammation.  
*Eur J Anaesthesiol 2025;43:45*

90

### FDA PUTS BOXED WARNING ON TXA

The FDA has identified and evaluated multiple medication errors of intrathecal injections of TXA leading to serious injury or death.



91

### DRUG ERROR: EPIDURAL INFUSION OF ACETAMINOPHEN

The IV formulation of acetaminophen is commonly used for postoperative pain, as are epidural infusions.

- 5 incidents are described; none were associated with lasting clinical side effects.
- 4 were postop surgical patients, 1 was a pregnant patient during labor with epidural analgesia.
- Beware of look-alike infusion bags, use NRFit epidural connectors, do staff education, and review all cases for QI.

*Anesth Analg 2025;140:1230*

92

### FAILED SPINAL FOR PPTL

What is the failure rate for single-shot spinal for PPTL?

- Retrospective single-center review of 243 cases.
- 11% of spinals failed, requiring conversion to GA.
- Studies from different institutions have also reported 15-20% failure rates → higher than spinals for cesarean delivery.
- Cause unknown, but studies have shown PP patients require a higher dose of IT bupivacaine due to lower progesterone levels and ↓ pressure in the epidural space.
- Plan: ↑ dose? Use CSE? Monitor your own practice?

*Can J Anesth 2025;72:1379*

93

### TUBAL LIGATION FAILURE RATES

How should patients be counselled about failure rates for PPTL?

- U.S. data from 2013-2015 was examined to determine real-world failure of tubal sterilization.
- Rates of pregnancy did not vary between PPTL after cesarean or vaginal delivery vs interval procedures.
- 2.9% of women were pregnant in 1 year; 8.4% after 10 years.
- Younger age ↑ failure rates: 4% age < 25 years vs 0% > 35 years.
- Data from CA Medicaid: 2.6% were pregnant in 1 year.
- Is salpingectomy more effective than traditional TL? Are LARCs?

*NEJM Evid 2024;3:Schwarz, Tasset (editorial)*

94

### ANESTHETIC NEUROTOXICITY

Did sevoflurane-sparing anesthesia improve neuro-developmental outcomes in an RCT of 400 patients < 2 years old?

- Randomized comparison of maintenance with sevoflurane vs dexmedetomidine + remifentanyl + minimal sevoflurane.
- No difference in IQ scores or social, emotional and behavioral functioning at 30 months eval. A 5-year follow-up is to come.
- Like the GAS trial, this RCT also suggests you shouldn't alter your anesthetic in infants to avoid neurotoxicity.

*Anesthesiology 2025;143:827, 799 (editorial)*

95

### WHAT IS OPTIMAL ET CO<sub>2</sub> FOR GA IN PREGNANCY?

A *sheep* study compared potential targets for maternal arterial pCO<sub>2</sub> during GA to optimize fetal blood gas values and avoid fetal acidosis from hypercarbia or ↓ uterine blood flow?

- 10 different maternal values from 27-50 mmHg were studied.
- At 27 mmHg (95% CI 23-30) fetal gases were optimized. This is close to the average of an awake pregnant human of 30mmHg.
- During general anesthesia in pregnancy, keep maternal arterial/end-tidal at 25-30 mmHg.

*Anesth Analg 2025;140:175*

96

### GUIDELINES: BREASTFEEDING AND ANESTHESIA

The Association of Anaesthetists produced 14 recommendations for patients who are breastfeeding and need an anesthetic.

- All patients with a child < 2 should be asked if they are breastfeeding. Encourage them to feed immediately before surgery and resume once they are alert, oriented and able to feed independently.
- Lactation consultants should be involved if needed.
- Use multi-modal opioid-sparing pain management. Avoid codeine and breastfeeding while on chemotherapy.

*Anaesthesia 2026;PAP (Mitchell)*

97

### INTERFERENCE WITH HORMONAL CONTRACEPTION

A survey assessed anesthesia providers' use of sugammadex and aprepitant, knowledge of interactions with hormonal birth control and patient counseling practices.

- Electronic survey of providers in the Mayo Clinic system's sites.
- 96% knew S could interfere, but only 47% knew about A.
- 52% knew the duration to use alternative contraception after S but only 35% knew the info for A.
- Most providers recognized the need for preop discussion on shared decision-making, but 73% never or rarely discussed contraception before surgery.

*Anesth Analg 2025;140:145*

98

### OBSTETRIC & MEDICAL COMPLICATIONS



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

99

### OBSTETRIC LIABILITY

- Wrongful *birth* lawsuits: as the plaintiff, parents claim they were denied the opportunity to avoid conception or terminate the pregnancy due to OB negligence (e.g., missed or wrong prenatal diagnosis).
- Wrongful *life* lawsuits: as the plaintiff, the child (on behalf of parents/guardians) claim they would not have been born had the OB's negligence not deprived the parents the opportunity to avoid conception or terminate the pregnancy.
- These cases are usually determined in state court based on that state's laws.

*Am J Obstet Gynecol 2024;December:611*

100

### OBSTETRIC LIABILITY FOR STILLBIRTHS

62% of OB/Gyn physicians will be sued in their career, double the overall rate of one-third of all physicians in the U.S.

- Leading allegations are a neurologically impaired infant (27%) and stillbirth or neonatal death (15%).
- Payments for stillbirth averaged \$26 million per year + the emotional toll of families and physicians.
- Payments across states varied, with IL the highest in total amount and number of payments.
- Top allegations: failure to identify and diagnose fetal distress, improper management, delay of failure to treat.

*Am J Obstet Gynecol 2025;June:e195*

101

### WHAT IS THE PREVALENCE OF PPH?

A meta-analysis of 81 studies that included 42M women estimated the prevalence of PPH depending on method of blood loss assessment and mode of delivery.

- PPH rates were substantially higher when using objective measures of blood loss, i.e. QBL rather than EBL.
- Blood loss > 1000 ml after vaginal delivery occurred in 2.3% using EBL (visual estimates) and 3.3% using objective methods.
- Blood loss > 1000 ml after cesarean delivery occurred in 3.7% using EBL and 8.5% using QBL.
- Blood loss is underestimated using EBL and ↑ for cesarean.

*Lancet Obstet Gynaecol Womens Health 2025;Yunas*

102

### ACOG COMMITTEE OPINION: QUANTITATIVE BLOOD LOSS IN OBSTETRIC HEMORRHAGE (2025)

PPH accounts for 11% of maternal deaths in the U.S. and ~80% are preventable due to delayed recognition and treatment.

- Quantitative methods are more accurate than visual. Especially when blood loss is high, EBL underestimates actual blood loss.
- Current data do not support any one method of quantifying blood loss as superior to another. Protocols should be developed by the multi-disciplinary team on L&D.
- Begin measuring QBL at delivery and continue an ongoing tally of blood loss, visible to the team, until stable postpartum.

*Obstet Gynecol 2017;130:e168 (reaffirmed 2025)*

103

### BLOOD LOSS AND INDICATION FOR CESAREAN

What are the effects of indication for cesarean delivery on QBL?

- Based on 4881 cases performed at a large academic hospital.
- Mean QBL for all cesarean deliveries was 792 ml.
- The highest blood loss occurred during CD for arrest of labor.
- QBL during intrapartum cesarean was greater than 1500 ml in 18% of primary and 13% of repeat CD (i.e. attempted VBAC).
- Lowest blood loss was in elective repeat CD or for fetal malposition (breech).

*Am J Obstet Gynecol 2025;232:478*

104

### PROPHYLACTIC ADDITIONAL UTEROTONIC?

Patients having intrapartum cesarean after laboring are at ↑ risk of PPH. Would prophylactic methylergonovine improve atony?

- 160 patients were randomized to receive routine oxytocin infusion + methylergonovine or oxytocin + saline.
- Only 20% of the methergine group required additional uterotonics vs 55% in the placebo group, RR 0.4.
- Other improved outcomes with M: good uterine tone (80% vs 41%), ↓ incidence of PPH (35% vs 59%), lower mean QBL (967 ml vs 1315 ml), and fewer blood transfusions (5% vs 23%).
- Consider prophylaxis for other high-risk indications?

*Obstet Gynecol 2022;140:181*

105

### MATERNAL MORTALITY RELATED TO HEMORRHAGE

The CA Pregnancy-Related Mortality Committee reviewed deaths in the state from 2014-2018. Their findings:

- Placenta accreta spectrum was the #1 cause → 33% of deaths.
- “Other” hemorrhage was the cause for another 20% of deaths.
- Demographics: Chinese race vs White (14% vs 4%), ≥ 35 years of age (49% vs 22%), multiparous (57% vs 29%), cesarean delivery (33% vs 12%) and delivering at a hospital with < 1200 births/year.
- 63% of deaths were highly preventable → optimize systems approaches for hemorrhage preparedness, detection and mgt.

*Obstet Gynecol 2025;145:700*

106

### TOLAC & VBAC UPDATES

- Trial of labor after cesarean (TOLAC) is offered in only 16% of U.S. counties, & is especially low in the South and Midwest.
- National data shows the risk of uterine rupture is 0.3% as of 2022, a rare event with a low absolute risk. The rate of neonatal death associated with rupture also ↓ over time.
- The MFM Network’s VBAC calculator is used to determine an individual patient’s chance of a successful vaginal delivery after TOLAC. VBAC success is lower in Hispanic (75%), Asian (71%), and Black (67%) patients than White (77%) for unclear reasons.
- Severe maternal morbidity is also ↑ in Black and Latinx patients with prior CD than in White, for repeat CD and TOLAC.

*JAMA Network Open 2025;e2526224 & e2513578 / Obstet Gynecol 2025;145:511,514*

107

### ADDRESSING MATERNAL ANEMIA

Maternal iron deficiency anemia ↑ risk for maternal PPH and transfusion + preterm birth and low birth weight.

- Women with iron deficiency anemia at 14-17 weeks were randomized to oral iron BID or single-dose IV iron therapy.
- One treatment of IV iron ↓ low birth weight (2% vs 29%) and corrected maternal anemia (RR 1.25) without requiring additional oral or IV iron.
- Clinical guidelines should include the benefit of single-dose IV iron to treat iron-deficiency anemia. Consider offering in the pre-procedure anesthesia clinic.

*Am J Obstet Gynecol 2025;233:120*

108

**ADDRESSING MATERNAL ANEMIA**

A multi-disciplinary approach was used to ↓ anemia at delivery and transfusion rates during childbirth.

- 1<sup>st</sup> trimester: check CBC, and if anemic get iron studies. If ferritin < 30, start oral iron. Repeat studies in 4 weeks.
- 2<sup>nd</sup> trimester: repeat the process. Consider IV iron if oral iron is not tolerated, if non-compliant, or if refusal of blood products.
- 3<sup>rd</sup> trimester: if Hgb < 11 with iron deficiency, begin IV iron. If Hgb < 7, consider transfusion when a high risk of hemorrhage.
- Continue iron therapy for 6 weeks PP.
- As screening and Rx ↑, Hgb improves and transfusion rates ↓.

*A&A Practice 2025;19:e02079*

109

**OPTIMIZING UTEROTONIC MEDICATIONS: 2 studies**

A meta-analysis identified the most effective uterotonic agents with fewest side effects and generated a ranking.

- All agents were more effective than placebo or no treatment.
- Methylergonovine + oxytocin and misoprostol + oxytocin were the highest ranked agents.

A double-blinded RCT compared 2<sup>nd</sup> line uterotonic agents for atony refractory to oxytocin alone.

- There was no difference between methylergonovine or carboprost in uterine tone or need for additional treatments.

*Cochrane Database Syst Rev 2025;CD011689 / Obstet Gynecol 2024;144:832*

110

**CALCIUM FOR UTERINE ATONY**

Calcium has been shown to ↓ PPH from uterine atony.

- In vitro: uterine samples with atony showed less ↑ in Ca after oxytocin than those without atony (22% vs 74%).
- In vivo: higher calcium levels correlated with clinical obstetrician assessment of better uterine tone.

What is the bioequivalence of calcium chloride vs calcium gluconate? Is the onset time the same?

- 1 gm CaCl = 3 gm Ca gluconate. Onset times were the same and both declined by half within 30 minutes.

*Anesth Analg 2025;140:491 / Anesthesiology 2025;142:121*

111

**TIMING OF TRANEXAMIC ACID ADMINISTRATION**

Fibrinolysis activates after placental delivery, and this is exaggerated in postpartum hemorrhage. Early TXA is preventive. Should TXA be administered before delivery?

- Usual protocol is to administer after cord-clamping in high-risk cases to avoid fetal exposure.
- TXA crosses the placenta and fetal blood concentrations are comparable to maternal, but there is no evidence of adverse neonatal outcomes from animal studies, case series or trials.
- Consider administration before placental separation for severe antepartum hemorrhage (e.g. previa) or known accreta.

*Anesthesiology 2025;143:1449*

112

**RESUSCITATION TOOL: BR J ANAESTH 2025;134:232**



Fig 1. Resuscitation tool to estimate the degree of circulating blood volume loss during obstetric haemorrhage. Nomogram of the proportion of blood volume depletion based on quantitative blood loss (QBL) and patient weight and body mass index (BMI; kg m<sup>-2</sup>).

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**VISCOELASTIC POINT-OF-CARE TESTING**

Two review articles on ROTEM for postpartum hemorrhage:

- ROTEM enables rapid, POC assessment of coagulation.
- Fibrinogen replacement based on FIBTEM A5 ≤ 8 mm improves hemostasis and may reduce transfusion requirement.
- TXA should be administered ASAP in PPH (based on the WOMAN trial) but is not for routine prophylactic use.
- Viscoelastic testing may also ↓ costs over time when fewer blood products are used and may ↓ health disparities from more timely access to care, especially in rural areas.

*Eur J Anaesthesiol 2026;43:53 / Int J Obstet Anesth 2025;64:Janzen*

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### CELL SALVAGE RECOMMENDATIONS

Cell salvage is recommended – not contraindicated - in OB cases with anticipated large-volume blood loss > 10% blood volume, refusal of blood products, and/or difficulty cross-matching.

- A review of perioperative red blood cell salvage (in all settings) quotes recommendations for obstetric cases from: ACOG, ASA, NIH, Australia, Italy, Great Britain and Ireland, European Society of Anesthesiology and the European Committee on Blood Transfusion.
- Use leukocyte depletion filters (5-50  $\mu$ m).
- Take precautions against Rh isoimmunization.
- Routine use is not cost-effective or recommended.

*Anesthesiology 2025;143:1357*

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### OBSTETRIC HEMORRHAGE-CONTROL DEVICES



CLINICAL PRACTICE UPDATE

OCTOBER 2025

#### Use of Nonsurgical Hemorrhage-Control Devices for Postpartum Hemorrhage Management

ACOG recommends that hospitals and other facilities that care for and transport obstetric patients have access to nonsurgical hemorrhage-control devices (ie, uterine balloon tamponade or intrauterine vacuum-induced devices) as part of a comprehensive management algorithm for PPH.

*Obstet Gynecol 2025;146:569*

116

### COMPARING TAMPONADE & VACUUM DEVICES

A prospective QI audit of 6K PPH cases found transfusion and blood loss after device placement was similar with either the Bakri® or JADA® devices. Earlier recognition of PPH refractory to oxytocics & earlier placement ↓ device failure and transfusion.

*Obstet Gynecol 2025;145:65*

A retrospective cohort study of 338 PPH cases found the balloon tamponade device and the vacuum tamponade device were similarly effective in managing refractory PPH due to atony.

*Am J Obstet Gynecol MFM 2025;7:101638*

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### REBOA FOR LIFE-THREATENING PPH

37 obstetric patients over 14 years had a REBOA device placed for life-threatening PPH in a single center in Norway.

- REBOA were placed by the on-call interventional radiologist in the OR guided by ultrasound (no fluoroscopy) occluding Zone 3.
- All placements were technically successful and achieved hemodynamic stability with an immediate ↑ in systolic BP of 36±22 mmHg.
- There was a trend toward ↓ frequency of hysterectomies and volume of blood transfusions.
- No thromboembolic complications occurred.

*Acta Obstet Gynecol Scand 2024;103:965*

118

### AORTIC BALLOON OCCLUSION DEVICE FOR PAS

A retrospective cohort study reviewed 81 patients with placenta increta or percreta, i.e. complex placenta accreta spectrum.

- Comparison of outcomes for sheath placement with or without balloon inflation, and no sheath placement.
- Operative time was ↑ with balloon inflation (319 vs 244 min).
- Aortic balloon inflation → lower blood loss (1526 vs 2686 ml) and lower number of units transfused (2 vs 3 units).
- One patient in the aortic balloon group developed a thrombus.
- In what situations should prophylactic placement occur?

*Obstet Gynecol 2025;145:732*

119

### PAS: CONSERVATIVE MGT vs HYSTERECTOMY

A single-center retrospective cohort study of conservative management of accreta (i.e. leaving the placenta in situ) found:

- 12% had bleeding requiring hysterectomy & 9% developed endometritis. No deaths or thromboembolism.
- 45% had successful uterine preservation with mean time to resolution of 17 weeks. 5 had subsequent pregnancies.
- 55% had planned interval hysterectomy; ↓ EBL than cesarean hyst (700 vs 1950 ml) and ↓ transfusion rates (31% vs 73%).
- Leaving placenta in situ may be offered if future pregnancies are desired or there is concern for life-threatening hemorrhage.

*Obstet Gynecol 2025;145:683*

120

### PAS: CONSERVATIVE MGT vs HYSTERECTOMY

A meta-analysis compared patients with PAS who underwent cesarean hysterectomy vs conservative management (leaving placenta in situ or local myometrial resection).

- 16 studies and 2300 patients.
- Conservative management: ↓ EBL (mean difference 973 ml) and ↓ transfusion (mean difference 1.5 units).
- Cesarean hysterectomy: ↑ risk of genitourinary injury (OR 3.79) and ↑ admission to ICU (OR 7.98).
- No difference in risk of GI injury or thromboembolic events.
- A consideration for patients desiring fertility preservation?

*Am J Obstet Gynecol 2025;232:433*

121

### PAS: THE PATIENT EXPERIENCE

2 manuscripts explored the patient's perspective on their experience and their care during management of PAS.

- "Mandy: a patient's story of placenta accreta spectrum disorder." Some themes developed: patient education materials are uncommon, 89% had never heard of placenta accreta, 40% experience PTSD for up to 2 years afterward.
- "Anesthesia and postpartum pain management for PAS: the patient perspective and recommendations for care." 82% wanted to be awake for the birth but didn't get the option, 40% felt their pain control postpartum was very poor.

*Obstet Gynecol 2025;145:e150 / Int J Gynecol Obstet 2024;164:992*

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### PREVENTING PREECLAMPSIA: 3 studies

If aspirin therapy is started before 16 weeks gestation and continued to term, preeclampsia ↓ by 60%, but dose is unclear.

1. A randomized trial that included a large, diverse sample size and adherence data compared 81mg vs 162mg and found no difference in preterm PEC or PEC with severe features.
2. A similarly designed Swedish study had similar findings and also found no ↑ risk of postpartum hemorrhage.
3. Higher doses do inhibit thromboxane more effectively.

*Obstet Gynecol 2025;147:87 / JAMA Network Open 2025;8:e2457828*

*Am J Obstet Gynecol 2025;232:474*

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### PREVENTING PREECLAMPSIA

A study randomized > 8K women at high risk of developing preeclampsia to planned early term birth at 37-39 weeks depending on their number of risk factors.

- Compared to usual care, incidence of PEC was ↓ by 30%.
- There were no differences between groups in emergency cesarean or neonatal ICU admissions.
- Aspirin ↓ risk of preterm PEC, but 75% of PEC cases are term.
- 99% of maternal deaths from PEC occur in low resource settings where this approach could have even ↑ benefits.

*Lancet 2025;Goadsby and Tong (editorial)*

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### MORBIDITY ASSOCIATED WITH PREECLAMPSIA, HTN

What are the risks for otherwise healthy patients with chronic HTN who do/do not develop preeclampsia?

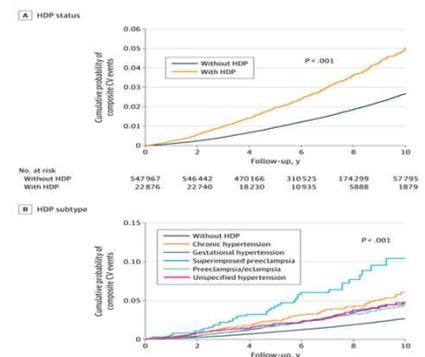
- 264K patients with HTN, but without preexisting end organ dz.
- 32% with chronic HTN developed PEC vs 5% without HTN.
- Compared to patients with no hypertensive disorders, the severe maternal morbidity risk was 5x higher for chronic HTN with superimposed PEC, 5x higher with PEC but no chronic HTN, 1.8x higher with gestational HTN, and 1.2x higher with chronic HTN alone.

*JAMA Network Open 2025;8:e2451406*

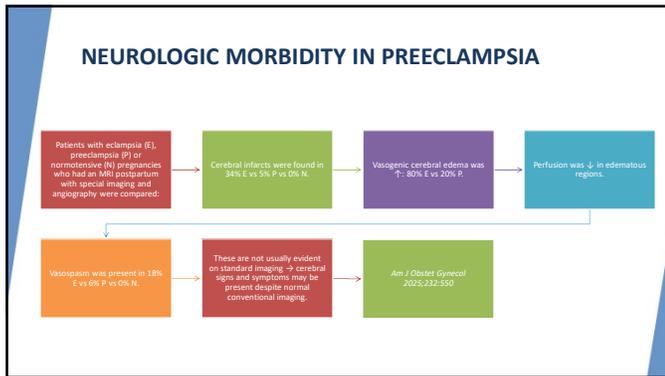
125

All the HTN disorders of pregnancy (HDP) subtypes are associated with modest ↑ in long-term cardiovascular risk, but chronic HTN with superimposed preeclampsia is associated with a **markedly** higher risk.

*JAMA Intern Med 2026;PAP (Kwak)*



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### HELLP SYNDROME vs SEVERE PREECLAMPSIA

What are the differences in maternal morbidity & mortality when a patient develops HELLP (a severe and atypical subset of PEC)?

- Case control study; national sample of > 18 M deliveries.
- 0.3% had HELLP and 2.4% had preeclampsia with severe features.
- HELLP ↑ preveable and preterm deliveries, OR 2.2-5.3.
- HELLP ↑ IUFD and stillbirth, OR 2.2.
- HELLP ↑ mortality rates and failure to rescue.
- The HELLP syndrome group were more likely to be White, have pre-pregnancy HTN, hypertensive crisis, and to undergo CD.

*Am J Obstet Gynecol 2024;e215*

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### PERIOPERATIVE MGT OF PREECLAMPSIA: REVIEW

An excellent review from the anesthesiologist's perspective on perioperative management to ↓ maternal complications.

- Focus on treatment of HTN and preserving brain, heart, liver, kidney, coagulation, and placental function.
- Strategies for fluid administration, safe neuraxial and general anesthesia, managing intraoperative bleeding and for post-cesarean analgesia.
- Discussion of postpartum thromboprophylaxis and anti-hypertensive therapy, especially in patients who breastfeed.

*Anesthesiology 2025;142:378*

129

**Table 4. Pharmacologic Agents Used to Minimize Hypertension during Tracheal Intubation and Extubation in Patients with Preeclampsia**

Drug Class	Drug	Dose	Administration	Suggested Maximal Status Dose or Infusion	Advantages	Disadvantages
Opioids	Rohipenol	10 µg/kg	IV bolus	25 µg/kg	Rapid onset, less hypotension	Fetal respiratory depression
	Fentanyl	0.5–1 µg/kg	Slow IV bolus, respiratory	2 µg/kg	Rapid onset, short duration, can be titrated as an infusion	Dose-dependent bradycardia and hypotension. Fetal respiratory depression
	Remifentanyl	2.5 µg/kg	IV bolus	3–4 µg/kg	Longer duration of analgesia	Slower onset, dose-dependent respiratory depression in the pregnant patient and neonate
β-Adrenergic antagonists	Labetalol	0.25 mg/kg	IV bolus greater than 1 mg/kg	2 mg/kg	Effectiveness at reducing blood pressure due to both β <sub>1</sub> and β <sub>2</sub> adrenergic antagonism	Bradycardia, hypotension, fetal hypoxemia, respiratory depression, fetal bradycardia
	Esmolol	1–2 mg/kg	IV bolus, may be followed by infusion	2 mg/kg	Rapid onset, short duration, can be titrated as an infusion	Bradycardia, hypotension, fetal hypoxemia, respiratory depression, fetal bradycardia
Directly acting vasodilators	Hydralazine	5–10 mg	Slow IV bolus, repeat every 20 min	10 mg/kg	Direct action on arterioles without myocardial depression	Slower onset, may cause fetal: cardiac, hypotension, headache, flushing, and nausea
	Nitroglycerin	5 µg/min	IV infusion titrate to effect	100 µg/min	Rapid onset and titratable	Tachycardia, hypotension, flushing, and nausea
Magnesium sulfate		30–40 mg/kg	IV bolus	40 mg/kg	Effective when combined with opioids (eg, alfentanil 2.5 µg/kg)	Only variably effective on its own; high chloride levels prolong neuromuscular blockade and may lead to hypotension, respiratory depression and arrhythmias
	Sulfamethoxazole	0.25 µg/kg	IV infusion titrate to effect	3 µg/kg	Extremely potent, rapid onset and titratable	Fetal cyanotic toxicity, bradycardia, hypotension, flushing, and nausea; does not suppress uterine activity; rarely used
Alpha-2 adrenergic agonists	Dexmedetomidine	0.5–1 µg/kg	IV bolus greater than 1 µg/kg	1 µg/kg	Does not decrease myocardial contractility or myocardial output; sedation, anxiolysis, analgesia, very effective at reducing oxygen requirements	Slower onset, long half-life, dose-dependent bradycardia, and hypotension; analgesic and sedative effects may delay emergence from anesthesia
	Clonidine	0.2–0.7 µg/kg	IV bolus	1.5 mg/kg	Rapid onset, effective at suppressing oxygen requirements	Decreases maternal cardiac output; blurred vision, headache, nausea, tachycardia associated with hypotension and arrhythmias
Local anesthetic agents	Lidocaine	1.0–1.5 mg/kg	Slow IV bolus	1.5 mg/kg		

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### POSTPARTUM ISSUES: BP CONTROL & BREASTFEEDING

Postpartum blood pressure can remain high and difficult to control. Could furosemide improve blood pressure management?

- RCT compared furosemide 40mg/day x 5 days vs placebo.
- ↓ mean daily blood pressure and time required for BP control.

*Am J Obstet Gynecol MFM 2025;7:101614*

Do hypertensive disorders of pregnancy affect breastfeeding?

- Nationwide data from 10M women found HDP ↑ odds of never breastfeeding and was associated with ↑ risk of stopping and fewer weeks of breastfeeding.
- Breastfeeding is cardioprotective and should be promoted.

*JAMA Network Open 2025;8:e2521902*

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### POSTPARTUM ISSUES: BP CONTROL

Hypertension during pregnancy, especially preeclampsia, is associated with stroke, dementia, and Alzheimer's disease later in life. Could better postpartum BP control change brain volumes?

- An RCT of 157 patients compared usual care to physician-optimized BP management followed by MRI scans at 9 months PP.
- The group with optimized PP blood pressures had larger total white matter volumes than those receiving usual care.
- Conclusions: the early PP period may present an opportunity to improve long-term cognitive outcomes, and the negative impact of preeclampsia on the brain may be mitigated by better PP BP control.

*JAMA Neurol 2026;Lapidaire PAP*

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**CURRENT INCIDENCE OF CV DISEASE IN PREGNANCY**

CV disease is a leading cause of maternal morbidity and mortality, but the contemporary incidence is unknown.

- A multi-institutional EHR-based pregnancy cohort with well-defined CV outcomes examined encounters from 2001-19.
- Prevalence of maternal CVD ↑ over time from 1% to 7%.
- The incidence of pregnancy-related complications (e.g. MI, stroke, heart failure, blood clots, HTN and cardiac-related maternal death) ↑ over time from 11% to 13%.
- CV complications were more frequent with co-morbidities of diabetes, HTN and pre-existing CVD.

*Circulation 2025;152:1044*

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**GUIDELINES FOR CV DISEASE IN PREGNANCY**

Extensive guidelines for cardiovascular disease in pregnancy were published by the European Society of Cardiology and endorsed by the European Society of Gynecology. *European Heart Journal 29; August 2025*

**2025 ESC Guidelines for the management of cardiovascular disease and pregnancy**

**ESC Clinical Practice Guidelines**

29 Aug 2025

The current Guidelines for the management of cardiovascular disease and pregnancy support health care professionals to manage and care for women with cardiovascular diseases before, during and after pregnancy. The 2025 guideline is developed by a multidisciplinary Task Force and is an update from the 2018 ESC Guidelines on cardiovascular disease during pregnancy. The new 2025 guideline adds important new information and evidence, update risk-scoring and new chapters on e.g. the organisation and tasks of the Pregnancy Heart Team, updated and new disease-specific chapters and a dedicated chapter on long term effects of adverse pregnancy outcomes.

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**Society for Maternal-Fetal Medicine Consult Series #73: Diagnosis and management of right and left heart failure during pregnancy and postpartum**

**Labor and delivery**

- Cesarean delivery reserved for typical obstetric indications
- Telemetry is often utilized for patients at risk for arrhythmias
- Consider arterial line in patients who may benefit from continuous blood pressure and cardiac output monitoring (e.g. critical aortic stenosis, previous peripartum cardiomyopathy with unrecovered function)
- Recommend use of neuraxial anesthesia in most patients with heart failure
- Instances in which to limit or avoid valsalva may include:
  - Severe pulmonary hypertension
  - LV outflow tract obstruction
  - Compromised venous return
  - Substantially compromised myocardial contractility
- Recommend comprehensive contraceptive counseling taking into consideration medical criteria and patient preferences

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**CARPREG II RISK SCORE FOR A PRIMARY CARDIAC EVENT: 0-1 POINTS = 5%, 2 = 10%, 3 = 15% 4 = 22% AND > 4 = 41%**

PREDICTOR	POINTS
Prior cardiac events or arrhythmias	3
Baseline NYHA III-IV or cyanosis	3
Mechanical valve	3
Ventricular systolic dysfunction <sup>a</sup>	2
High risk left-sided valve disease/left ventricular outflow tract obstruction <sup>b</sup>	2
Pulmonary hypertension	2
Coronary artery disease <sup>c</sup>	2
High risk aortopathy <sup>d</sup>	2
No prior cardiac intervention <sup>e</sup>	1
Late pregnancy assessment <sup>f</sup>	1

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WHO I	WHO II	<b>mWHO IS A PREGNANCY-SPECIFIC RISK-SCORING SYSTEM</b>
Pulmonary stenosis (small/mild) Patent ductus arteriosus (small/mild) Mitral valve prolapse (small/mild) Successfully repaired simple shunt defects (ASD, VSD, PDA, AVSD)	Unrepaired ASD or VSD Repaired tetralogy of Fallot Turner syndrome without aortic dilatation	
Mild left ventricular impairment (EF>54%) Native or tissue valve disease not considered WHO I or IV Marfan or other HTAD syndrome without aortic dilatation Aorta <45mm in bicuspid aortic valve Repaired coarctation AVSD	Left ventricular impairment (30-45%) Mechanical valve Systemic right ventricle with good or mildly impaired function Fontan (if otherwise well) Unrepaired cyanotic disease Moderate mitral stenosis Severe asymptomatic aortic stenosis Moderate aortic dilatation	
Follow-up during pregnancy: once or twice in local hospital Delivery: local hospital	Follow-up during pregnancy: every trimester in local hospital Delivery: local hospital	
WHO II-III	WHO III	Follow-up during pregnancy: Bimonthly in expert centre Delivery: Expert centre
Follow-up during pregnancy: Bimonthly in expert centre Delivery: Expert centre	Follow-up during pregnancy: Bimonthly in expert centre Delivery: Expert centre	

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**WHO IV: pregnancy not recommended**

- Pulmonary arterial hypertension
- Severe systemic ventricular dysfunction (EF<30%)
- Moderate systemic right ventricular dysfunction
- Severe mitral stenosis
- Severe symptomatic aortic stenosis
- Severe aortic dilatation
- Vascular Ehlers-Danlos
- Severe (re)coarctation
- Fontan with any complication

APVR = anomalous pulmonary venous return, ASD = atrial septal defect, AVSD = atrioventricular septal defect, EF = ejection fraction, ESC = European Society of Cardiology, HTAD = hereditary thoracic aorta disease, PDA = persistent ductus arteriosus, VSD = ventricular septal defect, WHO = World health organization

Adapted and modified for congenital heart disease, from the ESC 2018 "Cardiovascular diseases during Pregnancy (management of) Guidelines" Table 3

**mWHO is a pregnancy-specific risk classification system.**

Follow-up during pregnancy: Monthly in expert centre  
 Delivery: Expert centre

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### SMFM HEART FAILURE RECOMMENDATION (of 17 total)

- We recommend continuous fetal heart rate monitoring during anesthesia administration, labor, and delivery for pregnant patients with heart failure.
- In the case of maternal cardiovascular changes prompting inpatient assessment or treatment, we recommend continuous or intermittent fetal heart rate monitoring, taking into consideration the gestational age and any relevant maternal or fetal factors that may impact fetal viability or the maternal clinical status.
- We recommend planned vaginal delivery at term in patients with heart failure in the absence of hemodynamic compromise or obstetric indications for cesarean;
- We recommend the use of neuraxial anesthesia in most patients with heart failure to provide appropriate analgesia and to limit the effects of labor on cardiac parameters;
- We recommend considering a limited or assisted second stage for some patients after input from cardiology about each individual patient's cardiac risk.

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### RISK OF SEVERE MATERNAL M&M WITH CV DISEASE

What is the risk of severe maternal morbidity & mortality (SMM) in pregnant patients with cardiovascular disease?

- Retrospective cohort of U.S. deliveries 2010-20 from the NIS.
- Of 38M deliveries, 0.5% had CVD and their risk of SMM was 12% vs 0.7% in those without CVD, aOR 12.5.
- Risk of maternal death: 538 vs 5 per 100K deliveries, aOR 44.
- Those with chronic heart failure had the highest SMM: aOR 354.
- CV-related SMM during the delivery hospitalization was most common followed by hemorrhage, respiratory and renal SMM.

*Obstet Gynecol 2025;145:e1*

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### PERIPARTUM MATERNAL CARDIAC ARREST

The MPOG database was used to describe details of maternal cardiac arrest during delivery and up to 7 days postpartum.

- Frequency: 11.2 per 100K deliveries or 1 in 9,000.
- Most common etiologies were hemorrhage (40%), amniotic fluid embolism (31%), & anesthetic complications e.g. high spinal (12%).
- Most occurred during cesarean delivery (68%) vs vaginal delivery.
- ROSC was achieved in 77% and survival to 30 days occurred in 68%.
- Demographics: age  $\geq 40$ , BMI  $\geq 40$ , Black & Asian/Pacific Islander race.
- Clinical factors: pulmonary HTN, placenta accreta spectrum, ischemic heart disease and stillbirth.
- Deviations from societal (SOAP) cardiac arrest guidelines in 18.4%.

*Anesthesiology 2026;PAP (Furdyna)*

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### PREGNANCY WITH A PROSTHETIC HEART VALVE

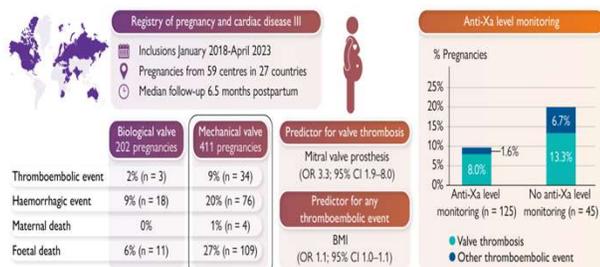
Pregnancy with a prosthetic heart valve is considered high risk due to the need for continuous, effective anti-coagulation.

- A registry of 613 pregnancies with mechanical or biological valve were reviewed for anti-coagulation and outcomes.
- Chance for an uncomplicated pregnancy with a live birth was 54% with a mechanical valve vs 79% with a biological.
- Thrombotic and hemorrhagic complications occurred more often with LMWH regimens. Thrombosis occurred in 10% with anti-Xa monitoring and 21% without. Monitor anti-Xa levels!
- Valve thrombosis occurred in 6%. Highest risk was prosthetic valve in the mitral position, OR 3.3.

*European Heart Journal 2025;van der Zande et al.*

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### Outcomes of 613 pregnancies in women with a prosthetic valve



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### MANAGING LONG QT SYNDROME IN PREGNANCY

There are  $\uparrow$  risks for ventricular arrhythmias (torsades de pointes) in the peripartum period for patients with long QT syndrome.

- ICDs should have routine device checks.
- During labor: continue beta-blocker therapy, place an early epidural to  $\downarrow$  sympathetic drive. Use cardiac telemetry intrapartum and for 48-72 hours postpartum.
- Medications to avoid: azithromycin, droperidol, ondansetron and many other anti-emetics, methadone, procainamide, propofol (?) and sevoflurane (?).
- Multi-disciplinary care is key!

*AJOG MFM 2025;7:101577*

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### PREGNANCY AFTER CERVICAL ARTERY DISSECTION

Is pregnancy associated with ↑ risk of recurrent dissection, stroke, intracerebral hemorrhage or death in women with a history of cervical artery dissection?

- > 1000 women with cervical artery dissection were followed, and 11% became pregnant in the next 5 years.
- There was no difference in adverse outcomes between those who became pregnant and those who did not.
- Prior cervical artery dissection does not justify advising against future pregnancy.

*JAMA Network Open 2025;8:e2621539*

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### SUBSTANCE USE DISORDER DURING PREGNANCY

An “Expert Review” covers nicotine, cannabis, alcohol, benzodiazepines, stimulants (cocaine/methamphetamine), and opioids during pregnancy and postpartum. For each substance:

- Maternal adverse effects
- Fetal / infant effects
- Treatment approaches
- Postpartum and lactation considerations
- SBIRT: Screening → Brief Intervention → Referral to Treatment model is recommended to link patients with treatment.

*Am J Obstet Gynecol 2025;233:337*

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### DRUG SCREENING IN L&D AND EQUITY

In a QI study, cannabis use and limited prenatal care were removed as indications for urine drug screening. What was the effect on racial parity and reporting to child protective services?

- Before the intervention, 23% of Black patients and 11% of White patients had urine drug screens. An association between Black race and CPS reporting was observed ( $P < .001$ ).
- After the intervention, 4.5% of Black and 3.6% of White patients were screened with no association between race and CPS reporting.
- There was no change in % of positive screens and no association with any adverse neonatal outcomes.

*JAMA Network Open 2025;8:e250908*

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### BUPRENORPHINE TREATMENT: 2 studies

Does buprenorphine treatment for OUD in pregnancy improve maternal and infant outcomes? Yes!

- In a cohort study of 14.5K dyads, B treatment was associated with a lower probability of severe maternal morbidity, preterm birth, and NICU admission compared to no B treatment.

What is the optimal dosing of buprenorphine in pregnancy? High!

- For 2925 pregnant patients followed from start of pregnancy to 90 days postpartum, high doses and longer duration of use led to ↑ odds of PP continuation and ↓ rates of overdose. Higher doses were not associated with NAS or low birth weight.

*JAMA Health Forum 2025;6:e251814 / Am J Obstet Gynecol 2025;233:59*

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ACOG CLINICAL CONSENSUS

NUMBER 10  
OCTOBER 2025

(REPLACES COMMITTEE OPINION NO. 722, OCTOBER 2017)

### Cannabis Use During Pregnancy and Lactation

...cannabis use has been associated with adverse outcomes such as spontaneous preterm birth, low birth weight and developmental delay. ....obstetric health care professionals should be prepared to counsel and screen all patients and use evidence-based strategies to reduce cannabis use.

*Obstet Gynecol 2025;146:600*

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### CANNABIS FOR NAUSEA IN PREGNANCY: 2 studies

- Data from 356K pregnancies found that preconception and prenatal cannabis use were associated with ↑ odds of mild and severe nausea & vomiting in the first trimester. The highest odds were in those using daily before or during early pregnancy.

In a secret shopper study, how did cannabis retailer employees counsel pregnant patients about the safety of of prenatal use?

- Among 505 retailers in CA, only 40% of employees said cannabis use was unsafe during pregnancy.
- 21% said it was safe, 19% said they weren't sure and ~17% said they couldn't give medical advice.

*Obstet Gynecol 2025;145:519 / JAMA Network Open 2025;8:e2548373*

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### POSTPARTUM DEPRESSION

Pediatricians in almost all states are now reimbursed by Medicaid to screen mothers for postpartum depression (PPD) during well-child visits. Does this method of screening work?

- Using Colorado Medicaid reimbursement records, there was a 9.6% ↑ in billed screens during the 1<sup>st</sup> year postpartum.
- Rates of PP mood or anxiety disorder diagnoses and outpatient treatment of mothers in the 1st year PP increased as well.
- Medicaid reimbursement for screenings during well-child visits may ↑ rates of detection of postpartum depression.

*JAMA Pediatr 2025;179:1009*

151

### SUICIDE AS A CAUSE OF MATERNAL MORTALITY

A review from the Netherlands of maternal deaths due to suicide during pregnancy or the first year postpartum compared 1996-2005 with 2006-2020.

- The proportion of suicides among all maternal deaths ↑ from 18→28% and is now the leading cause of maternal mortality.
- Most suicides occurred in the first year postpartum. 53% were primiparous and low educational level was a risk factor (OR 4.2).
- Underreporting to the Audit Committee Maternal Mortality & Morbidity was 78%; data collection must improve.

*BJOG 2024;131:1392*

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### MEDICATIONS TO TREAT PERINATAL DEPRESSION

Additional symptoms of perinatal depression may include inability to form an emotional attachment with the fetus or infant, doubts about parenting ability, and intrusive thoughts of harm to self or baby.

- SSRIs are 1<sup>st</sup> line and SNRI are 2<sup>nd</sup> line. There is no or a low risk of pregnancy complications and they are safe for breastfeeding.
- Pharmacokinetics/dynamics change during pregnancy and serum concentrations of many SSRIs are reduced compared to pre-pregnancy levels. Need for ↑ dose during pregnancy?
- Perinatal depression may involve neuroactive steroids, i.e. metabolites of progesterone that moderate GABA neurotransmission. The only med FDA-approved for PP depression is zuranolone (orally administered 14 days).

*JAMA 2025;334:2223*

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CLINICAL PRACTICE UPDATE

JANUARY 2025

### Zuranolone and Brexanolone for the Treatment of Postpartum Depression

ACOG recommends consideration of zuranolone in the postpartum period for severe depression (FDA-approved in 2023 specifically for postpartum depression)...The decision to use zuranolone should balance the benefits (ie, significantly improved and rapid symptom resolution compared with placebo) alongside challenges specific to initiating and managing this medication. *Obstet Gynecol 2025;146:e24*

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### TRAUMA-INFORMED CARE

Trauma occurring early in life can affect brain development and have lifelong health consequences. Traumatic birth experiences e.g. NICU admission, emergency cesarean delivery especially using GETA, and pain during cesarean can also result in PTSD.

- Trauma-informed care involves active listening, compassionate responses, and collaborative care without assumptions.
- *Examples:* ask the patient their goals and what would help them, explain the presence of any extra staff, allow their advocate in the room, make realistic promises, when possible, offer choices even if minor, offer gender and ethnic preferences if an interpreter is used.

*JAMA 2025;Gerber*

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### PERIPARTUM SEPSIS AND SEPTIC SHOCK (REVIEW)

Physiologic changes of pregnancy overlap with sepsis-induced vital sign abnormalities, interfering with early diagnosis.

- Most cases occur outside the hospital → present late in their course or die at home. Patient's often report that their symptoms were dismissed as "just" pregnancy-related.
- Causes: chorioamnionitis, endometritis, pyelonephritis.
- Need consistent patient education about warning signs: fatigue, fever/chills, severe pain, shortness of breath, fast heart rate.
- Difficult to find an optimal screen tool – qSOFA, MEWS, and SIRS perform poorly. Pregnancy-adjusted tools from UK and CA best.

*Obstet Gynecol 2025;146:207*

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### PREGNANCY-ADJUSTED SEPSIS SCREENING TOOL

Sensitivity/specificities are for antepartum, intrapartum and PP.

California Maternal Quality Care Collaborative <sup>27</sup>	Oral temperature below 36°C (96.8°F) or above 38°C (100.4°F)	57.8%/93.7% before 20 wk of gestation, 81.6%/92.5% after 20 wk of gestation <sup>14</sup>	90.6%/93.1% <sup>13</sup>	87.5%/96.1% before 3 d postpartum, 68.8%/93.2% after 3 d postpartum <sup>14</sup>	NR
	Heart rate above 110 beats per minutes				
	Respiratory rate above 24 breaths/min				
	WBC above 15,000/mm <sup>3</sup> or below 4,000/mm <sup>3</sup> or above 10% bands				
	Positive if any 2 of 4 criteria are met (sustained for 15 min)				

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### SCREENING FOR SYPHILIS DURING PREGNANCY

Between 2016-2022, maternal syphilis rates tripled, especially in mothers without access to prenatal care.

- Congenital syphilis → preterm birth, stillbirth, infant death and a wide range of infant illness and deformities.
- There is a 60% transmission rate during pregnancy and birth, but treatment (injected PCN G) is highly effective when screening is done and syphilis is detected.
- CDC and ACOG recommend universal screening in 1<sup>st</sup> and 3<sup>rd</sup> trimesters and at delivery, while USPSTF recommends only early universal screening.

*JAMA 2025;333:2006, 1962 (editorial), 2030 (patient education)*

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### MATERNAL HIV INFECTION AND TRANSMISSION

Meta-analysis to quantify vertical transmission during pregnancy by maternal HIV viral load included 147 studies with 83K mother-child pairs. Perinatal transmission varied by maternal viral load:

- 5% transmission with  $\geq 1000$  viral copies per ml (aOR 22.5)
- 1.3% with 50-999 copies per ml (aOR 6.3)
- 0.2% with  $< 50$  copies per ml (aOR baseline)
- Women receiving ART with  $< 50$  copies/ml near birth had 0% perinatal transmission, but they still had 0.1% per month risk of HIV transmission during breastfeeding. Patient counseling?

*Lancet 2025;406:349*

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### COVID VACCINATION IN PREGNANCY

ACOG continues recommending the COVID-19 vaccine in pregnant patients despite changes in CDC recommendations.

- Pregnant patients with COVID are more at risk of ICU and death.
- COVID vaccines are highly effective against moderate and severe disease and should be given as early in pregnancy as possible.
- Can be administered with other vaccines recommended in pregnancy: flu, RSV, tetanus, pertussis (DPT).
- No link to  $\uparrow$  stillbirth, miscarriage, PTB, SGA or anomalies.
- Infants  $< 6$  months are also more at risk from severe COVID but cannot be vaccinated and must rely on transplacental passage of maternal antibodies (passive immunity).

*JAMA 2025;334:1131 and 665*

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### ASTHMA IN PREGNANCY: REVIEW

Asthma affects 10% of pregnancies with risk to both mother and fetus. DO NOT discontinue or de-escalate treatments while pregnant!

- Inhaled steroids are safe, prevent exacerbations and mitigate some adverse pregnancy outcomes → should be used.
- Acute exacerbations should be treated the same: short-acting inhaled bronchodilators, systemic prednisone, admission if symptoms continue.
- Consider systemic bronchodilators: magnesium, terbutaline.
- Management of status asthmaticus: keep O<sub>2</sub> saturation  $> 95\%$  with supplementation, pCO<sub>2</sub> should be  $\sim 30$  mmHg in pregnancy ("normal" CO<sub>2</sub> is retention), intubation should be done by experienced clinicians, ECMO is an option if oxygenation/ventilation is still inadequate.
- Remember LUD and continuous fetal monitoring if viable.

*Obstet Gynecol 2025; 146:39*

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### CANCER DURING PREGNANCY

Pregnancy is complicated by cancer in 1:2000 women and increasing, in part due to older age and obesity.

- Breast, ovarian, cervical cancer, lymphoma and melanoma are the most common types and usually diagnosed in 2<sup>nd</sup> trimester.
- Surgery can be performed at any stage of pregnancy and chemo can be used after 1<sup>st</sup> trimester. Radiation and immunotherapy safety is unknown, so usually delayed until postpartum.
- Preoperatively identify and treat anemia, assess for thrombocytopenia, and address complications from chemo.

*Anaesthesia 2025;80 (Suppl 2):115*

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### CANCER DURING PREGNANCY

A study evaluated obstetric outcomes in women with early-stage gynecologic or breast cancer diagnosed in pregnancy.

- Population-based cohort of pregnancy women  $\pm$  cancer dx.
- $\uparrow$  odds of severe maternal morbidity, OR 8.03 – especially hysterectomy and sepsis.
- $\uparrow$  odds of preterm birth, OR 5.38 (iatrogenic?)
- $\uparrow$  odds of neonatal morbidity, OR 2.22 (prematurity from iatrogenic preterm birth?)

*Am J Obstet Gynecol 2025;232:466*

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### MULTIPLE SCLEROSIS AND RELAPSE RATES

Is neuraxial safe for parturients with MS?

- A systematic review of 8 studies and 1315 parturients found no difference in relapse rates whether neuraxial was used or not. Relapses are more common postpartum than during or in the year before pregnancy. *Eur J Anaesthesiol 2025;42:508*
- Discontinuation of disease-modifying therapies before or during pregnancy can lead to high risk of relapse, but many of these drugs have unknown risks to the fetus. Expert consultation is needed to avoid undertreatment & relapse during pregnancy.

*JAMA Neurol 2025;Gavoille and Krysko (editorial)*

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### ANESTHETIC MGT OF DIABETES IN PREGNANCY

Pregnancy is associated with insulin resistance and  $\uparrow$  risk of hyperglycemia. Resistance is caused by placenta-produced hormones & resolves quickly PP  $\rightarrow$   $\uparrow$  risk of hypoglycemia.

- Current recommendation from ACOG: glucose levels should be maintained between 70 and 110 mg/dl during active labor.
- Due to  $\uparrow$  risk of stillbirth at term, labor is induced at  $< 40$  wks.
- Subcutaneous insulin is typically restarted PP at  $\downarrow$  levels ( $\sim 20\%$  of prebirth levels) to  $\downarrow$  the risk of hypoglycemia.
- 5 to 10% of pregnant patients with DM have their pregnancy complicated by DKA – much higher than nonpregnant. DKA can be triggered by steroids, ie betamethasone, dexamethasone.

*Anesthesiology 2025;143:424*

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**Table 6.** Considerations for Anesthetic and Insulin Management of Patients with Diabetes Undergoing Cesarean Birth under Neuraxial or General Anesthesia

- Either neuraxial or general anesthesia is appropriate.
- Target capillary blood glucose level during labor and at the time of birth is 70–110 mg/dl.
- Check glucose levels every half hour for patients receiving general anesthesia, and every hour for patients receiving neuraxial anesthesia.
- Do not give antiemetic dexamethasone until after birth.
- Ensure adequate venous access to accommodate multiple infusions.
- Administer insulin *via* a separate, dedicated IV site.
- Stop insulin after placenta delivery for individuals with GDM.
- For patients with T1DM or T2DM on long-acting insulin, stop the insulin infusion 2 h after resumption of long-acting insulin.
- For patients transitioning to back to an ambulatory wearable insulin pump, the pump should be programed to post-natal settings, and the insulin infusion should be stopped 1 h after resumption of the ambulatory pump

GDM, gestational diabetes mellitus; IV, intravenous; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

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### DIABETES IN PREGNANCY

Continuous glucose monitors, and wearable insulin pumps, are increasingly being used in pregnancy. Anesthesiologists should have a basic understanding of their functionality, and that some patients will wish to leave their continuous glucose monitors in situ during labor and cesarean births.

- Women with Type 1 DM randomized to closed-loop insulin pumps during pregnancy until 6 weeks postpartum spent significantly more time in the pregnancy-specific glucose range than those receiving standard care (insulin pump or multiple daily insulin injections plus continuous glucose monitoring).

*JAMA 2025;334:2176 & 2165 (editorial)*

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### GLP-1 RECEPTOR AGONISTS IN PREGNANCY

Discontinuing GLP-1 drugs before or during pregnancy  $\rightarrow$  more gestational weight gain and  $\uparrow$  risk of preterm delivery, gestational diabetes and hypertensive disorders of pregnancy.

*JAMA 2025;334:2186 & 2168 (editorial)*

The Danish Medical Birth Register was used to identify postpartum mothers who had filled a prescription for GLP-1 meds through 6 months after delivery. From 2022-4 GLP-1s were increasingly used for postpartum weight loss. Most were overweight before pregnancy, but only 23% had diabetes.

*JAMA 2025;334:2227*

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## THE FETUS AND NEONATE



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### MODIFIABLE RISKS FOR BIRTH DEFECTS

What is the prevalence of risk factors for congenital heart defects, orofacial clefts, and neural tube defects among nonpregnant women in the U.S.?

- Cross-sectional data from a national health survey.
- 66.4% had at least 1 known modifiable risk factor and the % increased from 2007-2020.
- Risks include: low food security, obesity, diabetes, smoking, and low folate levels.
- Emphasizes the need for pre-conception counseling.

*Am J Prev Med 2025;107947*

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### PRENATAL CANNABIS & NEONATAL OUTCOMES

A meta-analysis of 51 studies and > 21 million participants who did or did not use cannabis during pregnancy found those who did use cannabis had:

- 52% higher risk of preterm delivery < 37 weeks.
- 75% higher risk of low birth weight < 2500 grams.
- 29% higher risk of infant death.
- Emphasizes the need to include this information in prenatal counseling and for ↑ public health awareness.

*JAMA Pediatr 2025;179:738*

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### TERATOGENICITY: ACETAMINOPHEN

A review of the literature examined the association between prenatal acetaminophen exposure and neurodevelopmental disorders in children (e.g., autism, ADHD).

- Results: 27 studies showed + association, 9 studies found no association, and 4 studies showed a protective effect.

*Environmental Health 2025;24:56*

- Based on this the FDA sent a notice to doctors stating in part: "....clinicians should consider minimizing the use of acetaminophen during pregnancy for routine low-grade fevers....balanced with the fact that acetaminophen is the safest over-the-counter alternative in pregnancy."

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### TERATOGENICITY: ACETAMINOPHEN (cont)

In contrast, 2 studies by independent groups in different countries using different data sets found that when taking genetic factors into account, there is ZERO association with autism, indicating familial confounding.

- Swedish cohort study of 2.5 million children with sibling controls (i.e. no acetaminophen in their pregnancy) found no association with autism, ADHD or intellectual disability.
- An umbrella review of 9 systematic reviews (40 studies) found only 1 review (2 articles) adjusted for familial factors and confounding through sibling-controlled analyses. That review found no association with autism (HR 1.05) or ADHD (HR 1.07).

*JAMA 2024;331:1205 / BMJ 2025;391:e088141*

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### TERATOGENICITY: ACETAMINOPHEN (cont)

Statement by the Society for Obstetric Anesthesia & Perinatology: *Acetaminophen is one of the most used medications in pregnancy, with a long history of safety when taken as recommended. Current evidence does not support a causal relationship between acetaminophen use in pregnancy and adverse neurodevelopmental outcomes. In contrast, untreated maternal fever and pain are well-documented threats to maternal and fetal health with associated adverse outcomes.....*

*In alignment with ACOG and SMFM, SOAP joins our obstetric colleagues in affirming that acetaminophen remains an appropriate and essential option for pregnant patients.*

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**TERATOGENICITY: SSRIs**

Depression occurs in ~20% of pregnant women and about 8% of pregnant women receive SSRIs. The FDA convened a panel to discuss recommendations.

- There are no randomized comparisons of pregnancy in women who do or don't take SSRIs.
- Pregnant women are excluded when SSRI trials are done.
- Observational studies can't remove confounding factors such as the mental health condition that's being treated.
- Remember there are risks to untreated depression. In CO suicide and self-harm are the #1 cause of maternal mortality.

*JAMA 2025;334:845*

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**TERATOGENICITY: SSRIs**

An editorial points out that data is hard to produce and interpret:

- RCTs cannot be done to treat or not treat severe depression, adverse birth outcomes are uncommon, adverse neurodevelopment may take years to manifest, and animal studies don't translate to human pregnancies.
- Confounding → women who continue SSRI in pregnancy may have more severe depression than those who discontinue, depression and autism share genetics, depression itself may ↑ stress hormone levels and impact nutrition.
- Current data from studies that address confounding find little or no risk for serious adverse outcomes related to SSRIs.

*N Engl J Med 2025;393:2073*

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**TERATOGENICITY: BENZODIAZEPINES**

Taiwan's National Health Insurance Research Database was used to evaluate associations between benzodiazepine use (B) during pregnancy and fetal/neonatal complications.

- 59,521 pregnancies in the B group vs 395K non-users.
- ↑ risk of preterm birth (RR 1.2), SGA (RR 1.06) and spontaneous or elective abortion (RR 1.58) but not stillbirth.
- Absolute risks were low and similar to prior studies.
- Editorial: B's play an important role in seizure disorders, tremors, alcohol withdrawal, anxiety and panic disorders, plus abrupt cessation can lead to withdrawal and seizures. Use shared decision-making with patients.

*JAMA Intern Med 2025;PAP:Li and Hung*

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**ANTENATAL STEROIDS**

Among preterm and extremely preterm infants, how quickly do antenatal steroids have a beneficial effect?

- 2 studies using U.S. or Canadian national cohorts of 7K-8K infants looked at time from steroid administration to birth and the outcomes of mortality and/or severe morbidity.
- There was ↓ mortality only 2 hours after steroids, and every additional hour was associated with a 1% ↑ in survival and survival without severe morbidity.
- The optimal interval was 12 hours to 14 days.

*JAMA Network Open 2025;8:e2511315 and 2025;8:e2461312*

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**INTRAPARTUM FETAL HEART RATE MONITORING**

Human interpretation of electronic FHR monitoring is poor, with 70% sensitivity, 44-78% specificity and 2-4% + predictive value.

- Deep learning is a branch of AI capable of recognizing complex patterns in large datasets.
- A deep learning model capable of predicting fetal acidemia was developed using 125K sample FHR tracings, ± acidemia.
- The model achieved 90% sensitivity and 48% specificity and a positive predictive value of 30% for fetal pH < 7.15.
- Could this lead to more consistent, reliable decision-making for patients on L&D?

*Am J Obstet Gynecol 2025;232:116*

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**DELAYED CORD CLAMPING**

A meta-analysis reviewed maternal and neonatal outcomes after delayed vs immediate cord clamping during cesarean delivery.

- 25 studies of neonates > 23 weeks gestation compared late (>30 seconds) cord clamping vs early.
- No differences in maternal outcomes, e.g. EBL, PPH, additional uterotonics, or surgical time.
- Delayed cord clamping improved newborn outcomes including hematocrit and bilirubin levels with no adverse effects.

*Am J Obstet Gynecol MFM 2025;7:101680*

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### DELAYED CORD CLAMPING IN PRETERM NEONATES

An ACOG Clinical Practice Update reviewed recently published data on delayed cord clamping in preterm neonates.

- Defer cord clamping for at least 60 seconds in infants < 37 weeks gestation (median 29 weeks) if they don't need immediate resuscitation. Neonatal death before discharge was reduced, OR 0.68.
- In preterm infants 28-37 weeks gestation who cannot receive delayed cord clamping, umbilical cord milking is a reasonable alternative to improve neonatal hematologic outcomes, i.e. need for transfusion. No ↑ in intraventricular hemorrhage.

*Obstet Gynecol 2025;146:442*

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### RESUSCITATION OF PRETERM INFANTS

Does resuscitation of extremely preterm infants (23-28 weeks gestation) with a higher FIO<sub>2</sub> of 60% ↓ risk of death and brain injury compared to a lower FIO<sub>2</sub> of 30%?

- 1469 infants randomized, outcome measured at 36 weeks GA.
- There was no difference in death at 36 weeks corrected gestational age, 15.4% vs 15.8%.
- No difference in brain injury at 36 weeks, 42.4% vs 43.2%.
- Higher FIO<sub>2</sub> did not improve overall outcomes. Early physiological differences, e.g. oxygen saturation > 80% did not lead to improved outcomes.

*JAMA online 12/10/25 (Oei)*

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### LIMITS OF VIABILITY

What are the trends in active treatment and survival among infants born between 22 and 25 weeks between 2014 and 2023?

- Active treatment ↑ most for 22-week infants: 29% to 79%.
- Survival ↑ the most for 22-week infants from 26% to 41%.
- Survival at 23 weeks ↑ from 47% to 55%.
- Black infants were more likely than White to receive active treatment at peri-viability.
- Factors shifting the limits of viability: new medical technology, updated clinical guidelines, publications showing differences in hospital practices for initiating active treatments and how their outcomes varied. *JAMA 2025;333:1925*

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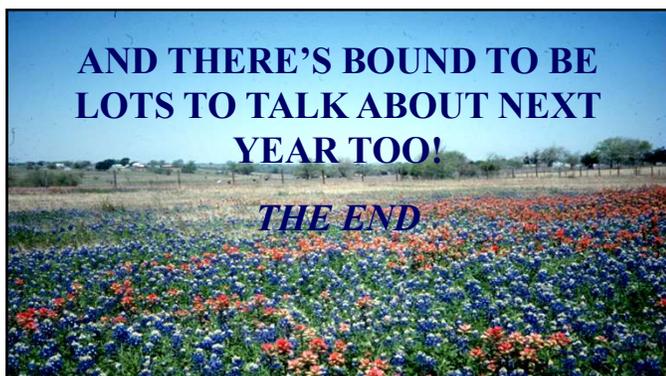
### HYPOTHERMIA FOR NEWBORN ENCEPHALOPATHY

Hypothermia induced < 6 hours after birth ↓ death and disability due to hypoxia-ischemia for infants born at ≥ 36 weeks. What about infants born < 36 weeks?

- 168 infants born at 33-35 weeks gestation with hypoxic-ischemic encephalopathy were randomized to receive normothermia vs hypothermia (unblinded) to 33.5°C for 72 hours, then rewarmed.
- Outcome: composite of death/disability at 18-22 months.
- Hypothermia did not decrease death or disability at 18-22 months corrected age. Different outcomes when ≤ 36 weeks.

*JAMA Pediatr 2025;179:396*

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