JULY 1, 2025

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# AORA4U NEWSLETTER


Obstetric Anaesthesia - II

## Obstetric Point of Care Ultrasound (O-POCUS)

Written By : Dr Azam Danish

## Analgesia for Caesarean delivery and postoperative pain management: A Multimodal approach

Written By : Dr Prit A Singh

## LAST: Let’s put it in past! (Infographic)

Prepared By : Dr Sushmita Madireddy (AORA Fellow)

## PDPH: Guidelines for Prevention and management (Inforgraphics)

Prepared By : Dr Amrita Rath

## Regional Anesthesia in patients on anti-thrombotic/ thrombolytic therapy (Infographic)

Prepared By : Dr Meghna VS (AORA Fellow)

AORA Quiz Answers

# Message by the President

Greetings!
Obstetric anaesthesia has long been a subspecialty that challenges anaesthesiologists with a dynamic spectrum of clinical scenarios and, at times, intense emotions. As our field continues to evolve, scientific advancements have underscored the pivotal role of the anaesthesiologist in obstetric care, ensuring maternal and fetal safety during labour, caesarean sections, and high-risk pregnancies. We provide labour analgesia, regional and general anaesthesia, hemodynamic management, and emergency interventions. Our expertise in pain relief, airway management, and resuscitation remains vital for optimizing maternal and neonatal outcomes.
The integration of ultrasound-guided regional anaesthesia and point-of-care ultrasound (POCUS) has significantly enhanced our ability to manage complex cases, offering greater precision and improving patient safety. However, beyond technical advancements, it is imperative that we continuously assess and refine the quality, efficiency, and consistency of the care we provide.
We are privileged to feature contributions from leading national experts in this edition of the newsletter. The editorial team and contributors have dedicated significant time and effort to compiling this issue, and we hope you find it both informative and valuable in your clinical practice.

*Yours truly,*
*Dr Amjad Maniar*
*President, AORA India*

# Message by the Secretary

Dear AORA members, colleagues and Obstetric Anaesthesia practitioners,
Greetings from the desk of Team AORA. In our pledge and endeavour to encourage Anaesthesiologists to upgrade their skills, practices and patient care AORA through this newsletter intends to throw some light on upscaling the practice in Obstetric Anaesthesia.

As we all are aware, irrespective of the zone across the country or Asian subcontinent Obstetric Anaesthesia forms the majority of the work for most of the Anaesthesiologist. In spite of the advances in the Obstetric anaesthesia practices in recent years the challenges faced by the Obstetric Anaesthesiologists still continue to affect the delivery of high-quality health care to the parturient. Challenges faced during the Obstetric Anaesthesia aren't just restricted to the mother but extended to the neonate too. They aren't limited to the obstetric medical condition or emergencies but also to the dynamic physiologic changes in the parturient and the neonate.

This second Newsletter of AORA under our Academic Director Dr Hetal Vadera brings to your door, the experiences thoughts knowledge and skills of the Doyens in Obstetric practice not just nationally but internationally. Dr Sunil Pandya has nicely enlightened how one can deliver and audit one's own services to international standards. Dr Preet Anand Singh has stressed upon extending our focus from just Obstetric Anaesthesia to Perioperative Analgesia. Dr Danish Azam has ably guided us to use POCUS in Obstetrics and how it can help us troubleshoot and get us out of most pertinent practice dilemmas. The immense experience and knowledge shared by Dr Anju Grewal and Dr Manokanth in form of real case scenarios will definitely make each one of us nostalgic of our own cases. Dr GL Ravindra and team have shared their insights with us to help us establish a Labour Analgesia clinic in our area.

Dr Neha and Dr Amrita will tease our brains with their quizzing abilities which I am sure you will enjoy. The inspirational interviews of AORA fellowship Gold medallists by Dr Manshad will definitely inspire many RA enthusiasts in coming years to follow.

Overall, I would say this edition will definitely be a game changer in creating a difference in practice for each one of us. On your behalf and from every one of us at AORA, I congratulate Dr Hetal Vadera for his Endeavour to extend our knowledge of Regional Anaesthesia to field of Obstetric Anaesthesia.

"We only know what we know when we need to know it"
Sukhada Pathanam

*Yours truly,*
*Dr Ujjwalraj Dudhedia*
*Secretary, AORA India*

## Editorial Team

### From the desk of editor:

# Advancing Excellence in Obstetric Anaesthesia

Dear Readers,
Obstetric anaesthesia stands at the crossroads of maternal and foetal well-being, demanding a seamless blend of precision, preparedness, and compassionate care. With evolving clinical practices, technological advancements, and increasing patient expectations, our role as anaesthesiologists in obstetric care has never been more crucial.

This edition of AORA4U delves into critical aspects of obstetric anaesthesia, bringing together expert insights on enhancing maternal care through quality improvement initiatives, tackling challenges in labour analgesia, and addressing dilemmas in obstetric anaesthesia with a case-based approach. The integration of point-of-care ultrasound (POCUS) in obstetric emergencies is transforming our decision-making capabilities, while procedure-specific analgesia in LSCS is optimizing peri-operative comfort for mothers.

Beyond clinical excellence, we also celebrate the dedication and aspirations of young anaesthesiologists. The AORA fellowship Gold Medalist interview highlights the journey of a rising star in regional anaesthesia, inspiring us all to strive for innovation and mastery in our field.

As we navigate the complexities of modern obstetric anaesthesia, let us continue to learn, collaborate, and elevate our standards of care. Together, we can ensure safer outcomes and a more fulfilling childbirth experience for every mother and baby.

Happy reading!

Warm regards,

*Yours truly,*
*Dr Hetal kumar Vadera*
*Scientific Chairperson, AORA*
*Editor, AORA Newsletter*

# Obstetric Point of Care Ultrasound (O-POCUS)

Written By : Dr Azam Danish

### *Introduction*

Point-of-care ultrasound (POCUS) has revolutionized perioperative and critical care management across various specialties, including obstetric anaesthesia.

POCUS is an invaluable bedside tool for anaesthesiologists and intensivists, aiding in the rapid assessment of obstetric patients with haemodynamic instability, respiratory distress, or perioperative complications.
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The I-AIM (Indication, Acquisition, Interpretation and Medical Decision-Making) framework is a succinct and intuitive model for all POCUS examinations and we recommend its use as a standardized approach to POCUS to minimize error.


**Indications for POCUS in Obstetric Patients**

POCUS is increasingly recognised as a critical tool in obstetric anaesthesia.

The key indications include:

**1. Difficult Airway Management [1]**

Pre-intubation airway assessment (thyrohyoid distance, tongue thickness)
Detection of esophageal vs. tracheal intubation
Cricoid cartilage-to-vocal cord distance assessment for predicting difficult intubation

**2. Hemodynamic Assessment and Shock Management**

Hypovolemic shock (e.g., postpartum haemorrhage, severe dehydration)
Cardiogenic shock (e.g., peripartum cardiomyopathy, amniotic fluid embolism, myocardial infarction)
Obstructive shock (e.g., pulmonary embolism, cardiac tamponade)
Septic shock (e.g., chorioamnionitis, septic abortion)

**3. Cardiac Dysfunction in Pregnancy**

Peripartum cardiomyopathy
Valvular heart disease assessment
Right ventricular strain in pulmonary hypertension

**4. Respiratory Distress & Hypoxia**

Pulmonary embolism
Acute pulmonary edema (e.g., preeclampsia-related cardiac dysfunction)
Pneumothorax
Aspiration pneumonitis or pneumonia

**5. Volume Status & Fluid Responsiveness**

Inferior vena cava (IVC) assessment
Passive leg raise (PLR) with stroke volume measurement
End-diastolic left ventricular size on echocardiography

**6. Neuraxial Ultrasound for Regional Anaesthesia**

Identifying lumbar intervertebral spaces for epidural or spinal anaesthesia
Assessment of neuraxial anatomy in obese or difficult cases

**7. Gastric Ultrasound in Obstetric Patients**

Identification of patients at risk for pulmonary aspiration during general anesthesia.
Helps guide the timing of anaesthesia induction, especially in emergency obstetric procedures.
Useful for tailoring airway management strategies.

**8. Obstetric Haemorrhage & Uterine Pathology**

Postpartum haemorrhage with uterine atony vs. retained products
Placental abruption or previa assessment (limited scope but adjunctive)

**9. Intracranial Pressure (ICP) Assessment in Pregnant Patients**

Preeclampsia with suspected cerebral edema
Postpartum headache evaluation
Head trauma or suspected intracranial haemorrhage in pregnancy

### *Difficult Airway Management [1-2]*

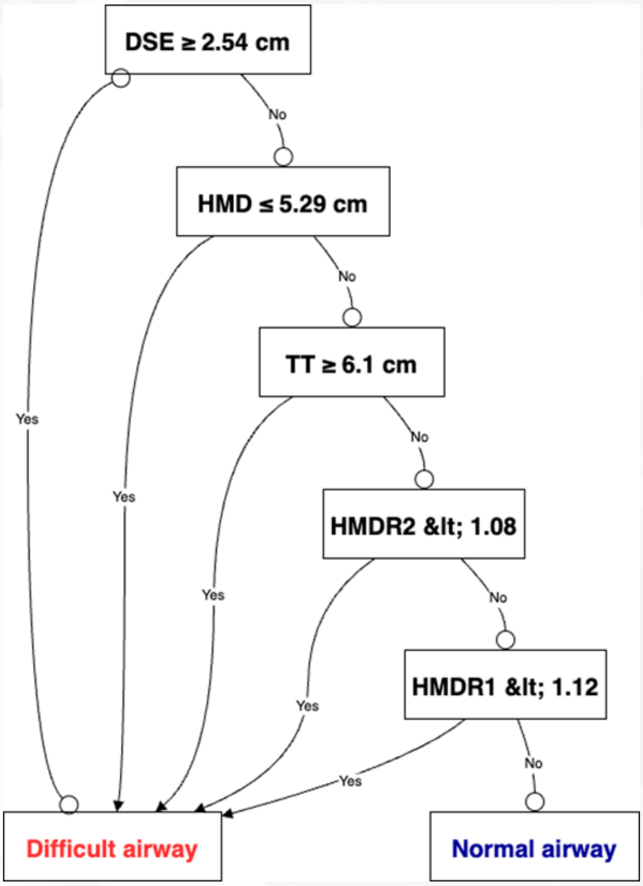
Up to 90% of difficult airways are unanticipated

**Anaesthetic implications of Airway changes in Pregnancy:**

· Mucosal oedema in the upper airway
· Greater resistance to flow
· Bag-valve-mask ventilation becomes more difficult
· Greater risk of airway obstruction with sedation
· OSA: Recurrent Nocturnal Desaturation

**1.Pre-intubation airway assessment** (thyrohyoid distance, tongue thickness):

**Flowchart – 1: Difficult Airway Evaluation with Sonography (DARES) algorithm.**
DSE, distance from the skin to the epiglottis;
HMD, hyomental distance;
TT, tongue thickness;
HMDR2, ratio of the HMD measured with the head in maximal extension and the head in neutral position;
HMDR1, ratio of the HMD measured with the head in a ramped position and the head in neutral position.
Adapted from Lin et al.




2. **Non-pregnant:**
o Thyrohyoid distance: 2.5–3.0 cm (adequate airway space)
o Tongue thickness: 4.5–5.0 cm

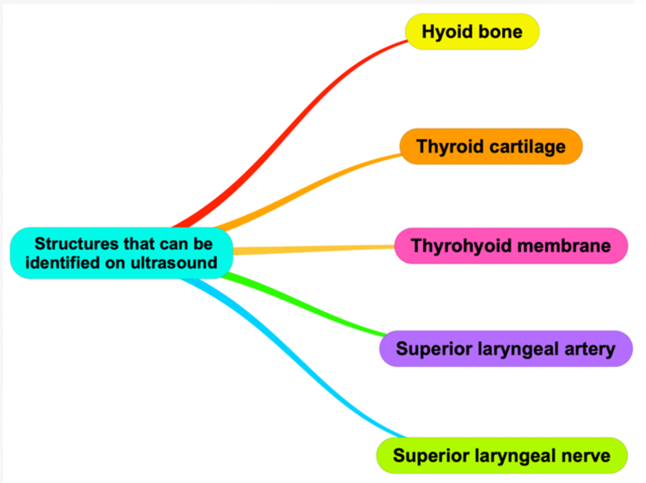
3. **Pregnant:**
o Thyrohyoid distance: <2.2 cm (reduced due to soft tissue edema, increased airway resistance)
o Tongue thickness: ≥6.0 cm (increased due to hormonal and fluid changes, contributing to difficult laryngoscopy)
Clinical Implications:
o A thyrohyoid distance <2.2 cm is associated with increased difficulty in visualizing the vocal cords during direct laryngoscopy.
o An increased tongue thickness (>6.0 cm) is linked to higher Mallampati scores and difficult intubation scenarios.

o Detection of oesophageal vs. tracheal intubation
o Cricoid cartilage-to-vocal cord distance assessment for predicting difficult intubation

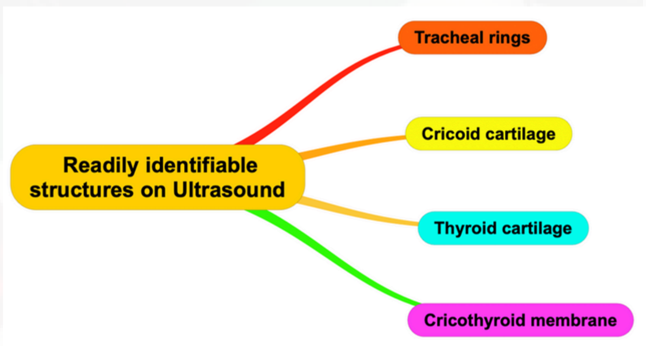
**2. Ultrasonography Procedure**
o Equipment: Mindray M7 Super portable ultrasound machine.
o Transducer: 6-13 MHz high-frequency curvilinear probe.
o Patient Positioning: Supine with head in a neutral position.
o Scanning Method:
Transverse axis and craniocaudal sagittal scan.
Submental region of the neck.

**5. Measurements taken at five levels in both normal and extended neck positions:**
o Hyoid bone: Distance from skin to hyoid bone.
o Epiglottis: Distance from skin to epiglottis (thyrohyoid membrane level).
o Cricothyroid membrane: Distance from skin to anterior commissure.
o Thyroid isthmus: Distance from skin to thyroid isthmus.
o Suprasternal notch: Distance from skin to trachea at this level.

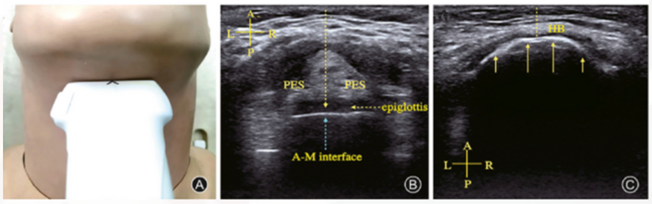
***Structures that can be identified on ultrasound:***




***Readily identifiable structures on Ultrasound:***



Distance from the skin to epiglottis midway and the distance from the skin to the hyoid bone[3]:




(A) A high-frequency line array ultrasound probe placed in a median horizontal position on the patient's neck.
(B) Median sagittal ultrasound image. The epiglottis appears hypoechoic. The yellow dotted line denotes the distance from the skin to epiglottis midway.
(C) The median sagittal ultrasound image. The yellow dotted line denotes the minimum distance from the skin to the hyoid bone.
PES: pre-epiglottic space; A-M interface: air-mucosal interface; HB: hyoid bone; A: anterior, P: posterior; L: left; R: right.

***Normal Sonoanatomy:***

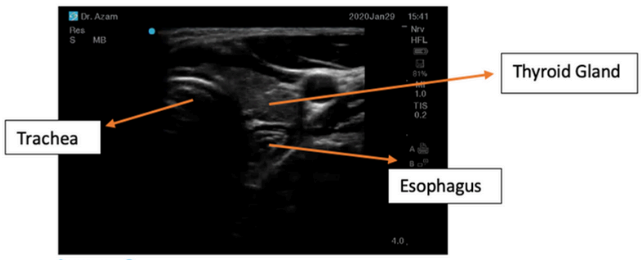
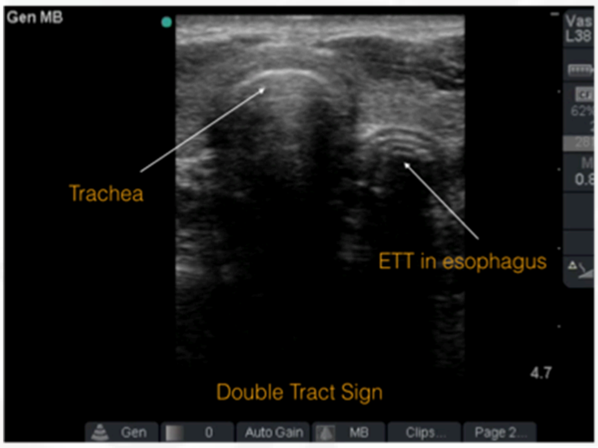



Image – 2

**Double Trachea Sign:**




**Identifying and marking of the CTM (cricothyroid membrane):**

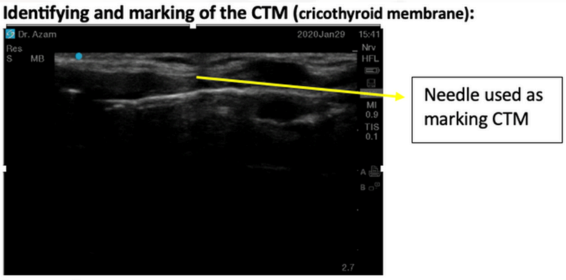
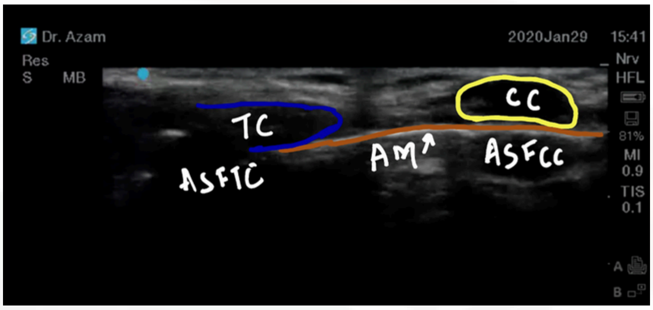



Image – 4




***Labelled Structures:***

✦TC (Thyroid Cartilage) [Blue Outline]
• The thyroid cartilage (TC) is a large, hyperechoic (brighter) structure in the anterior neck.
·It is an important landmark for identifying the cricothyroid membrane (CTM).

✦CC (Cricoid Cartilage) [Yellow Outline]
·The cricoid cartilage (CC) appears below the thyroid cartilage.
·It is a complete ring structure and serves as a key anatomical landmark for airway management.

✦ASFIC (Anterior Soft Tissue over Thyroid Cartilage)
·This represents the soft tissue covering the thyroid cartilage.

✦ASFCC (Anterior Soft Tissue over Cricoid Cartilage)
·This represents the soft tissue overlying the cricoid cartilage.

✦AM (Air Mucosal Interface) [Orange Line]
·Likely represents the cricothyroid membrane (CTM) or midline acoustic interface.
·The CTM is an important site for emergency cricothyrotomy and surgical airway access.

***Clinical Relevance:***

Ultrasound-Guided Cricothyrotomy:
o Identifying the CTM is critical for emergency airway interventions, such as cricothyrotomy.
o The thyroid cartilage (TC) and cricoid cartilage (CC) serve as key sonographic landmarks.
o This scan can help assess neck anatomy in difficult airway cases and guide procedures.

***Airway Edema Assessment on Ultrasound [1 & 4]:***

**Technique:**
o Use a high-frequency linear probe placed transversely on the anterior neck.
o Measure anterior soft tissue thickness at the level of the vocal cords and supraglottic area.

**Findings Suggestive of Airway Edema:**
o Increased anterior neck soft tissue thickness (>3 mm increase compared to non-pregnant baseline)
o Hypoechoic swelling around the vocal cords
o Reduced visibility of air-mucosal interface
o Widening of the epiglottic-aryepiglottic fold complex

**Clinical Implications:**
o May predict difficult airway management in pregnant patients, especially those with preeclampsia.
o Helps in early decision-making regarding awake Fiberoptic intubation or alternative airway strategies.

***Hemodynamic Assessment and Shock Management [5]:***
o Hypovolemic shock (e.g., postpartum haemorrhage, severe dehydration)
o Cardiogenic shock (e.g., peripartum cardiomyopathy, amniotic fluid embolism, myocardial infarction)
o Obstructive shock (e.g., pulmonary embolism, cardiac tamponade)
o Septic shock (e.g., chorioamnionitis, septic abortion)

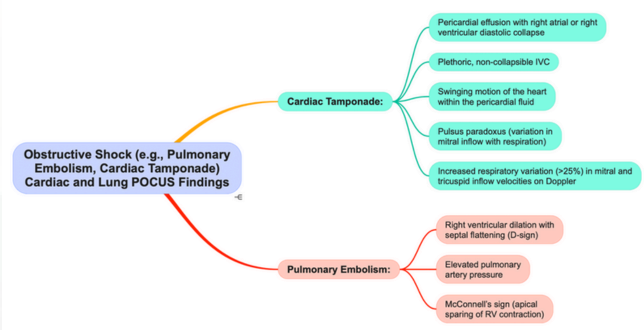
**Hypovolemic Shock** (e.g., Postpartum Haemorrhage, Severe Dehydration)
***Cardiac POCUS Findings:***
o Hyperdynamic left ventricle with small end-diastolic volume
o Increased left ventricular outflow tract velocity time integral (LVOT VTI)
o Collapsed inferior vena cava (IVC) with >50% inspiratory variation
***Management Implications:***
o Rapid fluid resuscitation and blood product administration
o Early identification of ongoing hemorrhage and need for surgical intervention

**Cardiogenic Shock** (e.g., Peripartum Cardiomyopathy, Amniotic Fluid Embolism, Myocardial Infarction)
***Cardiac POCUS Findings:***
o Global or segmental left ventricular hypokinesia (peripartum cardiomyopathy, MI)
o Right ventricular dilation and dysfunction (amniotic fluid embolism)
o Low ejection fraction (<40%) with poor contractility
***Management Implications:***
o Differentiating cardiogenic from other types of shock
o Early initiation of inotropes and advanced cardiac support
o Consideration for mechanical circulatory support in severe cases

**Obstructive Shock** (e.g., Pulmonary Embolism, Cardiac Tamponade)
***Cardiac and Lung POCUS Findings:***
o Pulmonary Embolism:
§ Right ventricular dilation with septal flattening (D-sign)
§ Elevated pulmonary artery pressure
§ McConnell's sign (apical sparing of RV contraction)

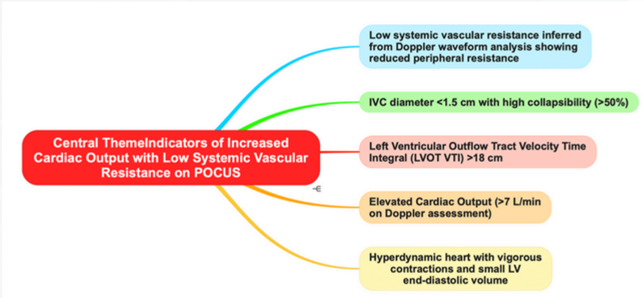
o Cardiac Tamponade:
§ Pericardial effusion with right atrial or right ventricular diastolic collapse
§ Plethoric, non-collapsible IVC

***Management Implications:***
o Early anticoagulation or thrombolysis for PE
o Pericardiocentesis for tamponade relief

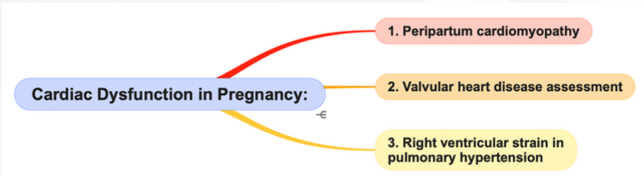



**Septic Shock** (e.g., Chorioamnionitis, Septic Abortion)
***Cardiac and Vascular POCUS Findings:***
o Hyperdynamic left ventricle with reduced afterload
o Small or normal IVC with high variability
o Increased cardiac output with low systemic vascular resistance

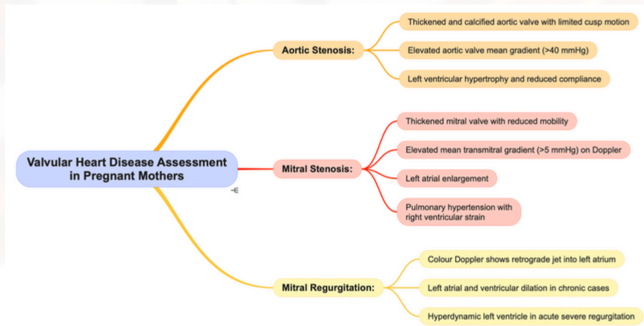
***Indicators of Increased Cardiac Output with Low Systemic Vascular Resistance on POCUS:***
· Left Ventricular Outflow Tract Velocity Time Integral (LVOT VTI) >18 cm
· Elevated Cardiac Output (>7 L/min on Doppler assessment)
· Hyperdynamic heart with vigorous contractions and small LV end-diastolic volume
· IVC diameter <1.5 cm with high collapsibility (>50%)
· Low systemic vascular resistance inferred from Doppler waveform analysis showing reduced peripheral resistance



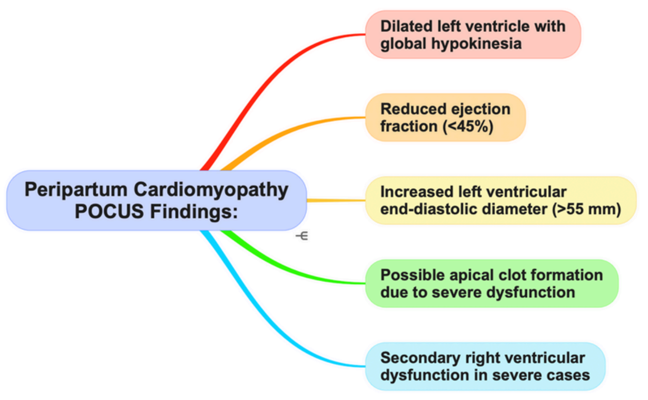

***Cardiac Dysfunction in Pregnancy & Echocardiography (Focused Cardiac Ultrasound - FoCUS)***



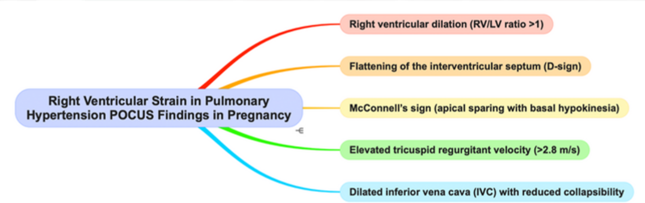

***Valvular Heart Disease Assessment in Pregnant Mothers:***



***Peripartum Cardiomyopathy POCUS Findings:***



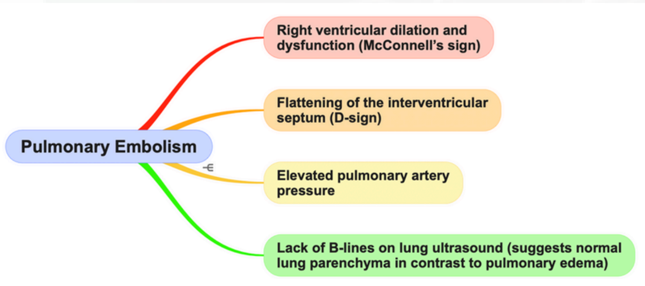

***Right Ventricular Strain in Pulmonary Hypertension in Pregnancy:***




### *Respiratory Distress & Hypoxia*

- Pulmonary embolism
- Acute pulmonary edema (e.g., preeclampsia-related cardiac dysfunction)
- Pneumothorax
- Aspiration pneumonitis or pneumonia

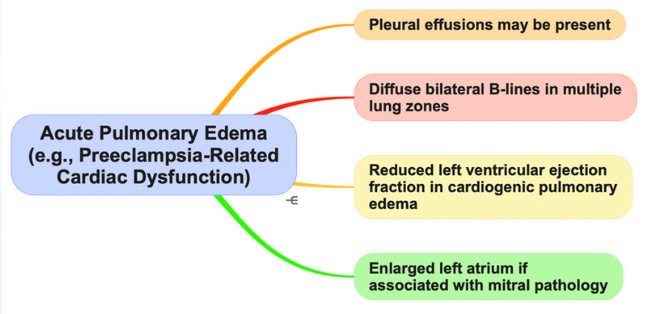
***Pulmonary embolism [6] – POCUS***



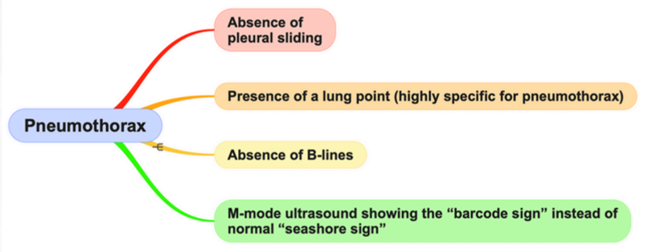

***McConnell's sign*** [6]

- McConnell's sign is a distinct echocardiographic feature of acute massive pulmonary embolism.
- It is defined as a regional pattern of right ventricular dysfunction, with akinesia of the mid-free wall and hypercontractility of the apical wall.
- In the case of acute pulmonary embolism, we should try to elicit this echocardiographic sign and if it is seen, then thrombolytic therapy should be started.

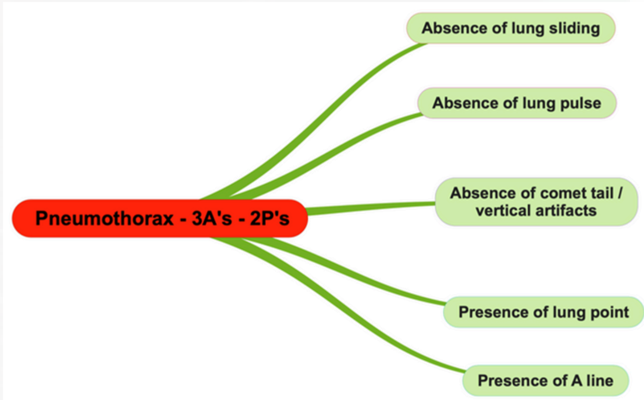
***Acute pulmonary edema (e.g., preeclampsia-related cardiac dysfunction) – POCUS***



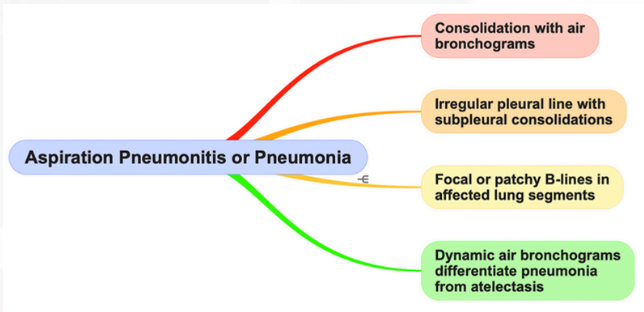

***Pneumothorax – POCUS***




***POCUS – Findings in Pneumothorax:***




***POCUS in Aspiration pneumonitis or pneumonia***



*Pleural Effusion:*

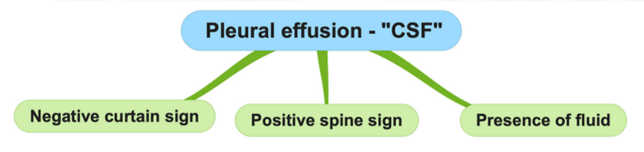



**Image Showing Pleural Effusion & Ascites:**

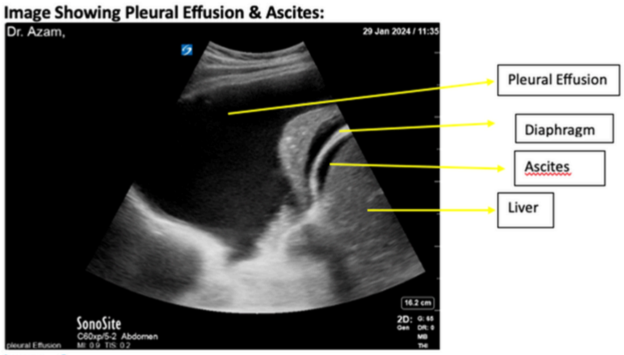



Image – 6

**Positive Spine Sign:**

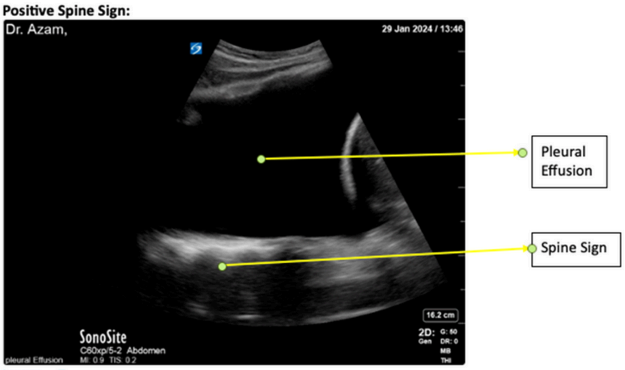


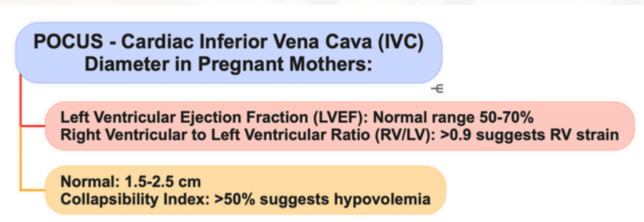

Image – 7

***Volume Status & Fluid Responsiveness in Pregnant Mothers:***

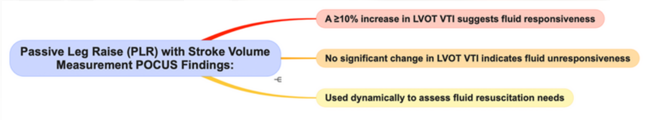
oInferior Vena Cava (IVC) Assessment
oPassive Leg Raise (PLR) with Stroke Volume Measurement
oEnd-Diastolic Left Ventricular Size on Echocardiography

*Views Used:*

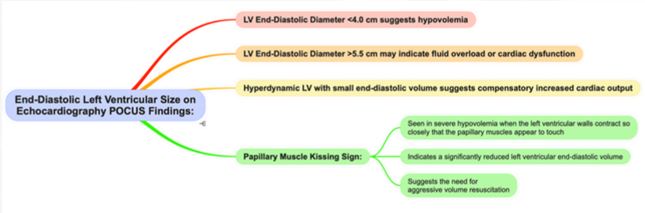
✦Parasternal long axis (PLAX), parasternal short axis (PSAX), apical four-chamber (A4C), subcostal four-chamber (SC4C)
✦Subxiphoid view with IVC in long-axis:
o IVC collapsibility index (<50% suggests fluid overload; >50% suggests hypovolemia)
o Respiratory variability in mechanically ventilated patients




***Passive Leg Raise (PLR) with Stroke Volume Measurement:***

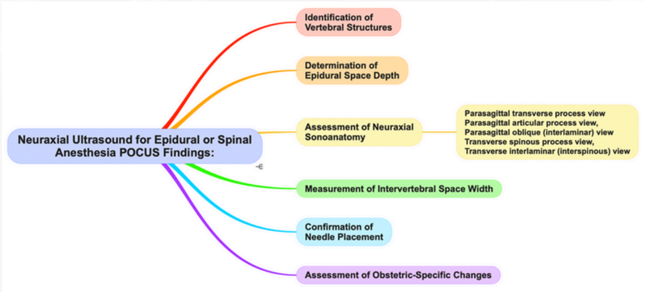



***End-Diastolic Left Ventricular Size on Echocardiography POCUS Findings:***




***Neuraxial Ultrasound for Regional Anaesthesia [7, 8, 9]:***

**Neuraxial Ultrasound for Epidural or Spinal Anaesthesia POCUS Findings:**




**Parasagittal transverse process view of the lumbar spine:**

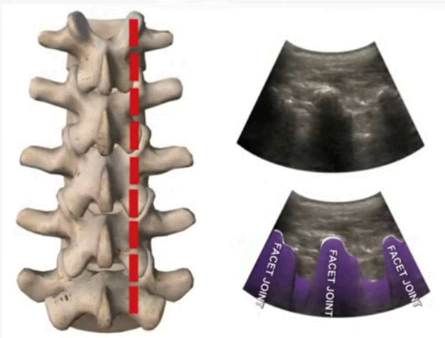



**Image – 8 -** Parasagittal transverse process view of the lumbar spine – Trident Sign

**Parasagittal articular process view of the lumbar spine:**

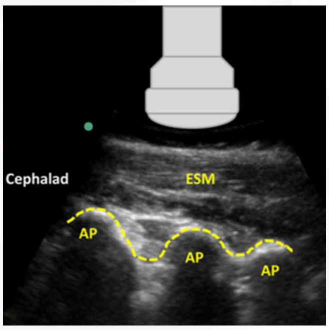



**Image – 9** - Parasagittal articular process view of the lumbar spine ESM, erector spinae muscle; AP, articular process Yellow Dotted lines highlight the contour of the articular processes, resembling a series of camel humps ('camel hump sign').

***Parasagittal oblique view of the lumbar spine:***

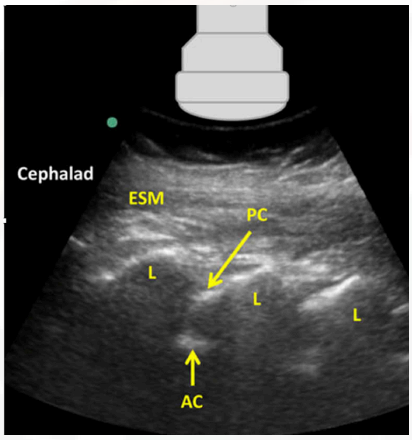



**Image – 10** - Parasagittal oblique view of the lumbar spine L, lamina; PC, posterior complex; AC, anterior complex

***Transverse spinous process view of the lumbar spine***

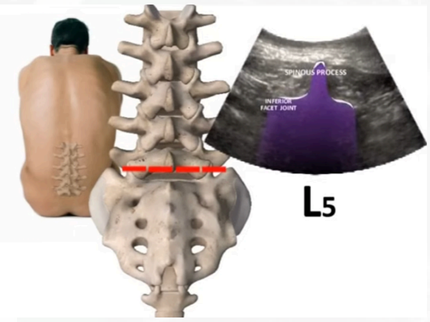



**Image – 11** - Transverse spinous process view of the lumbar spine

***Transverse interlaminar view of the lumbar spine:***

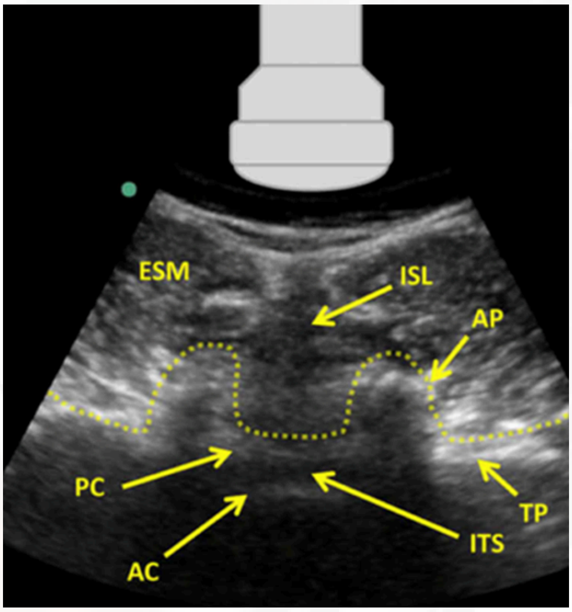
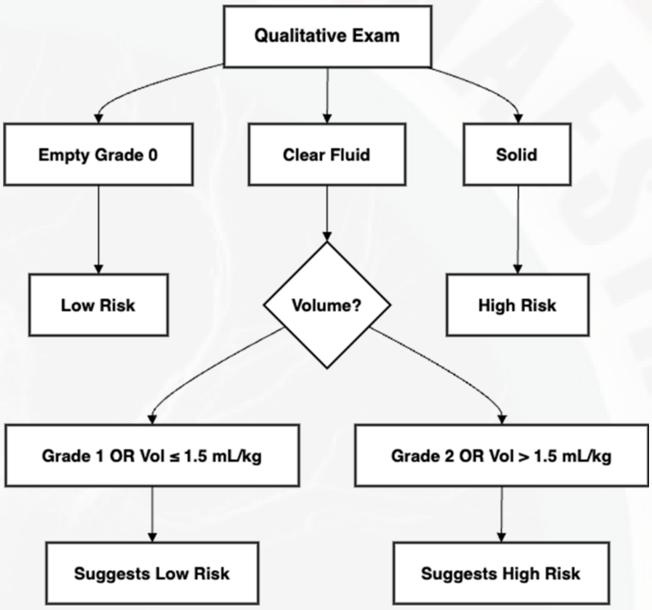



**Image – 12** - Transverse interlaminar view of the lumbar spine ESM, erector spinae muscle; PC, posterior complex; AC, anterior complex; ITS, intrathecal space; ISL, interspinous ligament; AP, articular process; TP, transverse process. The Yellow Dotted line in outlines the contour of the ultrasonographic structures giving rise to the 'bat's wing sign'.

### *Gastric Ultrasound in Pregnant Patients [10 - 11]:*

·The presence of residual gastric contents at the time of induction of anaesthesia is an important risk factor of aspiration pneumonia in pregnant mothers.

Flow chart of the analysis of the findings and medical decision-making based on the gastric point-of-care ultrasound:




Source : gastricultrasound.org/en/interpretation/#interpretation

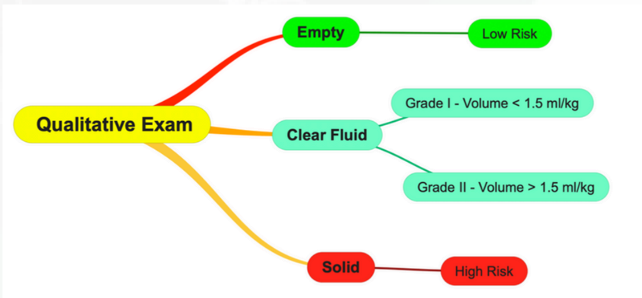
**Qualitative Examination:**

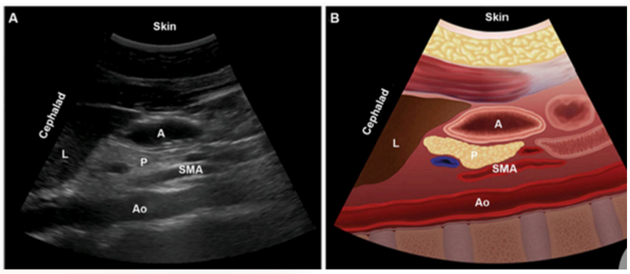
· Empty stomach: Collapsed gastric antrum with no visible content.

· Fluid-filled stomach: Anechoic or hypoechoic fluid content.

· Solid food in the stomach: Hyperechoic content with non-homogeneous pattern.

· Gastric distension: Overfilled antrum seen in cases of delayed gastric emptying or high aspiration risk.



***Sonographic image of the antrum in an empty stomach: " Bull's Eye " Appearance***

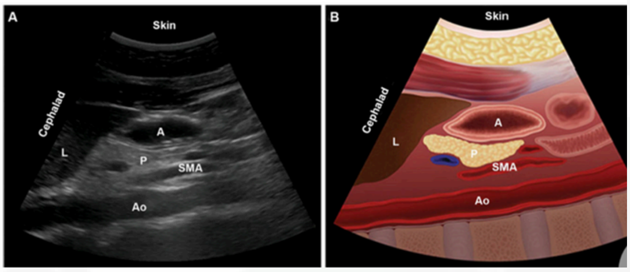
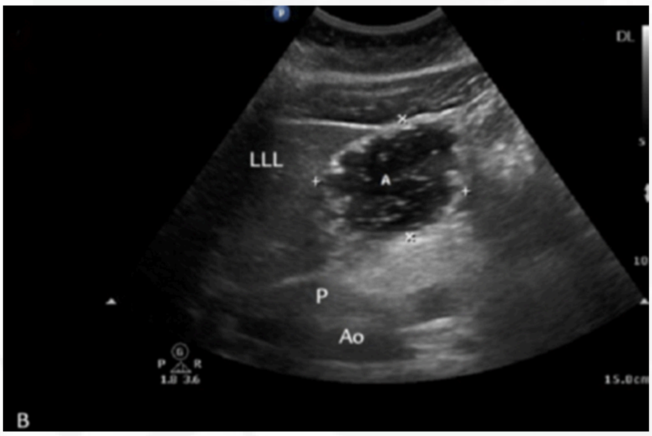



**Image – 13** A. Sagittal sonography of the gastric antrum. A = antrum; L = liver; P = pancreas; SMA = superior mesenteric artery; Ao = aorta.
B. Sagittal picture of the gastric antrum.

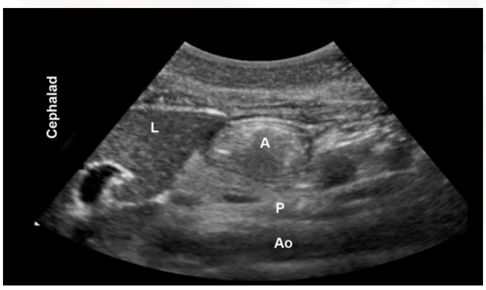

The antrum appears empty in the right lateral decubitus position (grade 0 antrum). Ao = aorta, L = liver, P = pancreas, and S = spine. Yellow arrows signal the antrum.

***Ultrasonography image of the gastric antrum after ingestion of a clear fluid:***




Ultrasonography image of the gastric antrum after ingestion of a clear fluid. Note that the antrum appears distended with hypoechoic or anechoic content. Small gas bubbles giving the appearance of a " starry night. "

***Ultrasonography image filled with solid content:***




"The antrum with mixed echo contents appeared to expand when filled with solid content, giving the film a 'frosted glass' appearance

***Obstetric Haemorrhage Assessment***

Role of POCUS in Obstetric Haemorrhage

· Rapid bedside assessment for the cause and severity of bleeding.
· Helps differentiate between retained products of conception, uterine atony, and concealed haemorrhage.
· Guides decision-making for surgical or interventional procedures.
· Assess placental position and maturity

**Transabdominal Ultrasound (TAUS) & Transvaginal Ultrasound (TVUS) Findings**:

·Intrauterine Clot or Retained Placenta:
o Heterogeneous echogenic material within the uterine cavity.
o Absent or reduced vascular flow on Doppler suggests a clot; increased vascularity suggests a retained placenta.
o A thickened endometrial stripe (>10–12 mm) may indicate retained products.

· Free Fluid in the Peritoneal Cavity (Suggesting Concealed Hemorrhage):
o Anechoic or hypoechoic free fluid in Morrison's pouch, pouch of Douglas, or perisplenic/perihepatic spaces.
o Echogenic clot within the peritoneal cavity may indicate ongoing or past haemorrhage.

· Uterine Atony vs. Hypercontractility:
o Uterine Atony:
§ Large, flaccid uterus with minimal myometrial contraction.
§ No significant thickening or focal contraction seen on ultrasound.
§ Increased vascularity and turbulent blood flow on Doppler.

o Hypercontractility (e.g., Placental Abruption):
§ Thickened, heterogeneous myometrium with areas of focal contraction.
§ Retroplacental haematoma appearing as hypoechoic or mixed echogenicity mass.
§ Increased resistance on Doppler studies.

***Optic Nerve Sheath Diameter (ONSD) Assessment in Pregnant Patients [12]:***

· Role of ONSD in POCUS
o Non-invasive assessment of intracranial pressure (ICP) in critically ill obstetric patients.
o Used in cases of preeclampsia, eclampsia, intracranial haemorrhage, and head trauma.
o Helps guide neuroprotective strategies and intervention decisions.

**Normal and Diagnostic Values**

· Normal ONSD Values in Pregnant Patients:
o Non-pregnant adults: <5 mm
o Pregnant patients: 4.8–5.4 mm (slight physiological increase due to fluid retention)
Diagnostic Cutoff for Raised ICP:
o ONSD >5.7 mm: Suggestive of increased intracranial pressure (>20 mmHg)
o ONSD >6.0 mm: High likelihood of critical ICP elevation (>25 mmHg)

**POCUS Technique for ONSD Measurement**

Transorbital Approach:

o High-frequency linear probe placed gently over the closed eyelid.

o Adjust depth to visualise the optic nerve posterior to the globe.

o Measure 3 mm behind the retina, perpendicular to the optic nerve.

**Interpretation:**

o Normal optic nerve sheath appears as a hypoechoic tubular structure posterior to the globe.

o Enlargement beyond 5.7 mm suggests increased ICP.

### *Conclusion on Obstetric POCUS in Pregnancy*

✦Obstetric Point-of-Care Ultrasound (O-POCUS) is a rapid, non-invasive, and essential bedside tool for assessing maternal and fetal well-being.

✦It aids in diagnosing early pregnancy complications, fetal viability, placental abnormalities, labour progress, and postpartum conditions.

✦By providing real-time imaging, it enhances clinical decision-making, improves patient outcomes, and guides obstetric interventions.

✦While highly beneficial, its effectiveness depends on operator skill and proper integration into obstetric practice.

✦Further Studies are required to validate ONSD – However, USG for ONSD measurement has presented itself as an exciting option for the measurement of increased ICPin preeclampsia patients and offers the advantages of being a simple, non-invasive and readily available diagnostic modality.

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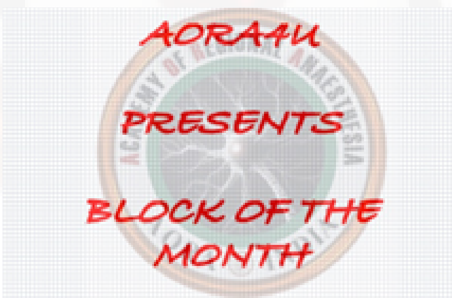


# Analgesia for Caesarean delivery and postoperative pain management: A Multimodal approach

Written By : Dr Prit A Singh


### *Abstract*
Pain during and postoperatively after Caesarean Delivery (CD) presents unique challenges. Unlike analgesia for other surgeries, the pain management plan must facilitate maternal-infant bonding and safe breastfeeding while controlling both somatic and visceral pain components. The increasing awareness of opioid-related risks necessitates opioid-sparing strategies without compromising analgesic efficacy. This review aims to provide an overview of current options and techniques for perioperative analgesia for CD, emphasizing a multimodal approach tailored to individual patient needs.


### *Introduction*
Caesarean delivery (CD) is a frequently performed inpatient procedure worldwide. (1,2) Effective pain management is crucial, influencing maternal comfort, early ambulation, and the ability to bond with and care for the neonate. (2) Suboptimal analgesia can lead to delayed mobilization, increased risk of thromboembolism, prolonged hospital stays, and the potential for chronic pain development, with associated risks of long-term opioid use.(3) Therefore, a comprehensive, multimodal approach to analgesia is essential, balancing effective pain relief with minimisation of adverse effects and support for breastfeeding.

### *Options Available: A Multimodal Analgesic Strategy*
The foundation of CD analgesia is a multimodal strategy, targeting different pain pathways to achieve synergistic effects and reduce reliance on any single agent, particularly opioids. (4) This approach typically includes the following components:

1. **Neuraxial Opioids**: Long-acting hydrophilic opioids, such as morphine, administered via intrathecal or epidural routes, provide extended analgesia.(5) Fentanyl or sufentanil which are lipophilic opioids, are often added to neuraxial local anaesthetics to improve intra-operative analgesia.
2. **Non-Opioid Analgesics**: Scheduled administration of Paracetamol and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) forms a crucial component of the multimodal regimen.(6) These agents reduce pain and opioid consumption, with paracetamol preferred for its favorable side-effect profile.
3. **Regional Anesthesia Techniques**: Interfascial plane blocks, such as Transversus Abdominis Plane (TAP) blocks and Quadratus Lumborum (QL) blocks, provide analgesia by blocking abdominal wall nerves.(7) Wound infiltration with local anesthetics can also provide modest pain relief.
4. **Systemic Analgesics**: Oral opioids (e.g., oxycodone, morphine) are used as needed for breakthrough pain. Intravenous patient-controlled analgesia (PCA) with morphine may be used in the immediate postoperative period, especially after general anesthesia.

### *Applied Anatomy for Caesarean Delivery*
The abdominal and pelvic anatomy underpinning obstetric analgesia and anaesthesia involves intricate neural pathways, musculoskeletal structures, and haemodynamic considerations.

The anterolateral abdominal wall is innervated by thoracic spinal nerves (T6–L1), which traverse the transversus abdominis plane (TAP). Surgical incisions during caesarean sections activate both somatic (abdominal wall) and visceral (uterine) pain pathways.

During the first stage of labor, uterine contractions and cervical dilation activate visceral afferents traveling with sympathetic fibers (T10-L1), while the second stage engages somatic pain from perineal stretching, conveyed by the pudendal nerve (S2-S4). [1, 2]

Innervation of the pelvic viscera involves the superior & inferior hypogastric plexus, integrating sympathetic (T10-L2) and parasympathetic (S2-S4) fibers.

Regional techniques must account for this convergence, particularly during cesarean deliveries requiring extensive visceral manipulation.

Effective neuraxial analgesia requires blockade of all these segments, typically achieved through epidural or combined spinal-epidural techniques. If using General Anesthesia (GA) for CD, regional techniques should be accordingly used, however, the anatomical coverage may be inferior to neuraxial blocks.

Critical vascular considerations during CD [3, 4] include the gravid uterus compressing the aortocaval axis, and exacerbating hypotension during neuraxial anaesthesia. Autonomic blockade further perturbs haemodynamics, necessitating pre-load optimisation and left uterine displacement. The epidural space's venous engorgement in pregnancy increases the risk of systemic absorption, demanding meticulous technique to avoid intravascular injection.

### *Regional anaesthesia for CD(technique Details/ images) [5,6]*
The following is a description of common Ultrasound guided regional anesthesia techniques. Neuraxial techniques will not be described in detail as they are widely known.

### *Ultrasound-guided regional anaesthesia techniques*
**Transversus Abdominis Plane (TAP) Block**

The TAP block involves depositing local anesthetic between the internal oblique and transversus abdominis muscles, targeting the thoracolumbar nerves, under ultrasound guidance. A high-frequency linear probe is placed transversely between the costal margin and iliac crest. The needle is advanced in-plane from medial to lateral side until [7] the tip reaches the TAP, confirmed by hydro dissection of the fascial layers . A volume of 15–20 mL per side of dilute long-acting local anesthetic like 0.2% ropivacaine or 0.1-0.2% bupivacaine is injected, spreading cephalad and caudad to cover T10–L1 dermatomes.[8, 9]

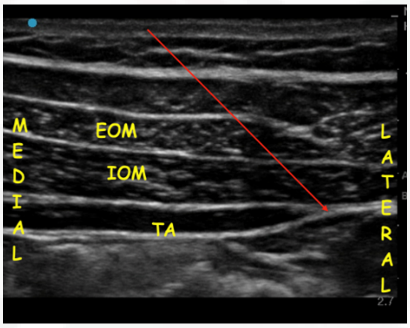



**Fig 1.** Transversus Abdominis Plane (TAP) block. EOM- External Oblique muscle, IOM- Internal Oblique Muscle, TA- Transversus Abdominis Muscle. Arrow- direction of needle

### *Quadratus Lumborum (QL) Block*

The QL block targets the thoracolumbar fascia near the quadratus lumborum muscle, providing broader sensory blockade. With the patient in lateral decubitus, an ultrasound probe is placed transversely at the posterior axillary line. The needle traverses posteriorly from latissimus dorsi and external oblique muscles, delivering 20–25 mL of dilute long-acting local anesthetic [10, 11] like 0.2% ropivacaine or 0.1- 0.2% bupivacaine posterior to the QL muscle. This approach facilitates cephalad spread to T7–L1, potentially blocking visceral afferents.

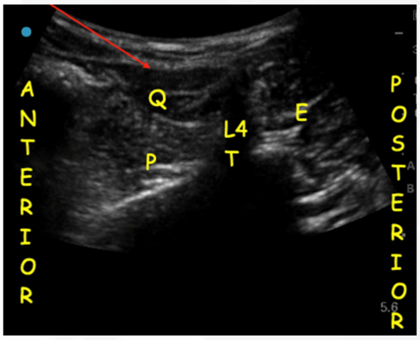
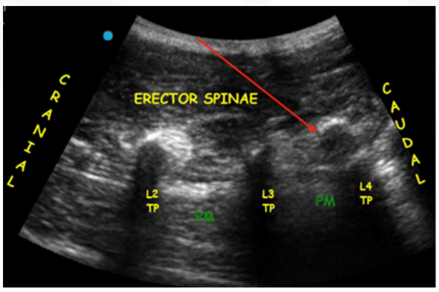



**Fig 2.** Quadratus Lumborum (QL) block. QL- Quadratus Lumborum muscle, PM- Psoas Major muscle. ES- Erector Spinae muscle. L4TP- Fourth Lumbar vertebra transverse process. Arrow- direction of needle.

### *Erector Spinae Plane (ESP) Block*

The ESP block involves injecting local anaesthetic deep to the erector spinae muscle preferably at the T9 vertebral level. Using ultrasound, a curvilinear probe identifies the transverse process, and a needle is advanced until it makes [12, 13] contact with bone. After negative aspiration, 20 mL of dilute long-acting local [14, 15] anesthetic like 0.2% ropivacaine or 0.1-0.2% bupivacaine is injected, diffusing anteriorly to the paravertebral space.

**Fig 3.** Erector Spinae plane (ESP) block. PM- Psoas Major muscle. L2TP, L3TP,L4TP- Second, Third, Fourth Lumbar vertebrae transverse processes respectively. Arrow- direction of needle.

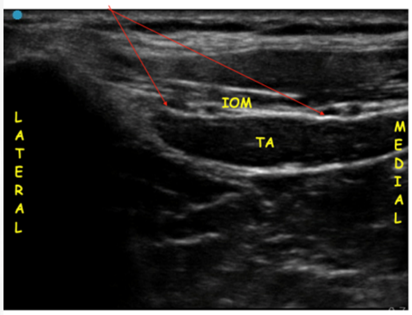



### *Ilioinguinal Iliohypogastric nerve blocks*

The ilioinguinal (II) and iliohypogastric (IH) nerves arise from L1, emerging near the psoas major, crossing the quadratus lumborum, and lying between the transversus abdominis and internal oblique near the Anterior Superior Iliac Spine (ASIS).

A linear ultrasound probe is placed 2-3 cm medial and inferior to the ASIS to identify the muscle layers. The nerves are located in the fascial plane between Internal oblique and Transversus abdominis muscle. 10-20 mL of dilute long-acting local [16, 17] anesthetic like 0.2% ropivacaine or 0.1-0.2% bupivacaine is injected.

**Fig 4.** IlioInguinal Iliohypogastric nerve (II-IH) block. IOM- Internal Oblique Muscle (IOM), Transversus Abdominis Muscle (TA) Arrow- direction of needle.




### *Detailed Comparison of Analgesic Techniques*

**Neuraxial Opioids vs. Systemic Opioids:** Neuraxial opioids offer superior analgesia compared to systemic opioids, with lower pain scores, increased time to first analgesic request, and reduced opioid exposure to the breastfeeding neonate.(5) However, they are associated with a higher incidence of pruritus and nausea. Intrathecal morphine provides faster onset and lower systemic opioid levels compared to epidural administration.

**TAP vs. QL Blocks:** Both TAP and QL blocks provide superior analgesia compared to controls in patients who do not receive intrathecal morphine. (7) QL blocks may offer better visceral analgesia but can be technically more challenging and carry a risk of lower extremity weakness.

**Wound Infiltration:** Wound infiltration with local anesthetics can decrease opioid consumption, but the benefits are lost in patients receiving intrathecal morphine. (8) Subfascial catheter placement is more efficacious than subcutaneous techniques

**Ilioinguinal Iliohypogastric nerve & Erector Spinae plane blocks:** There has been recent evidence supporting these blocks for elective CD.[9, 18, 19] .

The **2021 PROSPECT guidelines** for elective caesarean section recommended intrathecal opioids as the gold standard for such cases. However, if the opioids were not administered, it suggested use of multimodal analgesia including systemic medications andultrasound-guided regional techniques—TAP, QL blocks, single dose/ continuous local anaesthetic infiltration for postoperative analgesia as per the systematic review evidence generated till 2020. (10) It did say that TAP blocks remained the most studied, but the evidence from QL blocks seemed to offer enhanced visceral coverage and duration.

In its **2023 update**, it added ESP and II-IH blocks as well to the armamentarium of the interfascial plane blocks, however with moderate evidence. (9)

**Adjuvant Analgesics:** Gabapentin may be considered as a rescue analgesic for severe pain, but routine use is not recommended due to the risk of sedation. RA adjuvants like Dexamethasone and Dexmedetomidine may increase time to first rescue analgesia and modestly lower pain scores, but evidence is limited.(9)

Summing up the current evidence supports individualized selection based on surgical extent, pain mechanisms, and institutional expertise.

***Failed neuraxial block - what do I do ?[20]***

When neuraxial anesthesia fails during cesarean delivery, immediate intervention requires a structured approach balancing surgical urgency with patient safety.

**Key priorities include** (depending on when the failure is detected)

1) Halting surgical progression upon pain reporting.
2) Implementing positional/drug salvage techniques.
3) Executing repeat neuraxial procedures with adjusted dosing.
4) Timely conversion to general anesthesia (GA) if indicated.

***Complete failure:*** If the patient has no evidence of block, and it is an elective/ semi urgent procedure- think about repeating procedure, with lower volume of Local anaesthetic. Opioids are not recommended to be re-dosed. Combined Spinal Epidural (CSE) technique can be utilised.

If it is a Category -1 Cesarean section, technically difficult neuraxial procedure with previous multiple attempts/comorbidities- a delivery under General Anesthesia with multimodal analgesia is recommended.

***Partial failure:***

***Before skin incision***

***Spinal anesthesia***

- Positional Rescue- Trendelenburg 15° + left uterine tilt enhances hyperbaric local anesthetic spread.
- Limited hip flexion
- Valsalva manoeuver, coughing

***Epidural anesthesia***- there are a few options as detailed below

- Epidural Volume Extension (EVE): Inject 10 mL saline via epidural catheter to raise block by 2–3 dermatomes. Confirm catheter placement first with 3 mL lidocaine 2% + epinephrine test dose.

-Epidural Bolus: 15–20 ml lidocaine 2% + epinephrine 5 μg/mL; monitor for Local Anesthetic Systemic Toxicity (LAST)

-Fast-Acting Adjuvants- Alkalinized Lidocaine: Mix 15 mL lidocaine 2% + 1 mL $NaHCO_3$8.4% epidurally (onset 4–6 min).

***After skin incision***

- Systemic analgesia can be utilised and the following drugs can be used-

-IV Ketamine 0.3 mg/kg + midazolam 1 mg reduce pain perception without neonatal depression.

- Fentanyl 50–100 μg IV bridges analgesia gaps while preparing definitive solutions.

-Local anaesthetic infiltration, by the surgeon may help alleviate the pain.

- General anaesthesia- this should be done appropriately and utilized as below.

Foetal extraction required <8 minutes (Category 1 cesarean section).

***Total neuraxial failure with ongoing dissection:***

***Reassurance and communication***

It is important to communicate with the parturient, their family member and the team. As a first step, halt surgery instantly upon patient reporting pain, using closed-loop communication. It's important to coordinate with the team for the next steps as detailed above and document all the events. After the procedure, a debrief maybe required (details in next section). Document all the events meticulously, including the decision making to help with the explanation and for posterity.

***Exception***: If foetal head is exteriorised, complete delivery first. Validate pain using a 0–10 scale, distinguishing pressure (T10 level) from sharp pain (T6 required for peritoneal coverage).

***Complication Mitigation***

- **High Spinal Block Prevention**

Limit cumulative bupivacaine to 20 mg/4 hours.

Start pressor infusions (e.g. Phenylephrine) prophylactically.

- **LAST management**

Recognize Triad: Circumoral numbness → seizures → cardiovascular collapse.

Specific treatment alongside ACLS protocol includes the usage of Lipid emulsion 20%.

***Post-Crisis Actions***

Debrief Patient and team

Explain events to the patient and the family with the obstetrician around. This could be done post-GA emergence (for some patients).

Offer postpartum anaesthesia consult to address psychological concerns.

Simulation Training: Rehearse block salvage monthly; include multidisciplinary team ( Obstetrician/ Nursing & Midwifery staff, Operation Theatre staff)

Discussion: Tailoring Analgesia and Minimising Risks

The choice of analgesic technique should be individualised based on patient factors, including type of anaesthesia, risk factors for severe pain, and breastfeeding status.

**Patients Receiving Neuraxial Anesthesia**: Long-acting neuraxial opioids, combined with scheduled paracetamol and NSAIDs, are the preferred approach. Oral opioids can be used as needed for breakthrough pain.

**Patients Receiving General Anesthesia:** Regularly scheduled paracetamol and NSAIDs, combined with bilateral interfascial plane blocks, are recommended. IV PCA with morphine may be used for 24 hours, while transitioning to oral opioids.

### *Managing Side Effects:*

**Pruritus and nausea**: They are common side effects of neuraxial opioids. Pruritus is treated with opioid antagonists like Naloxone. Combination therapy (e.g., ondansetron plus dexamethasone) can be used for PONV prophylaxis.

**Respiratory Depression**: While rare, delayed respiratory depression is a potential complication of neuraxial opioids. Monitoring protocols should be in place, with frequency based on opioid dose and patient risk factors.(11)

**Breastfeeding Considerations**: The lowest effective dose of opioids should be used to minimize transfer to breast milk. Highly protein-bound medications like NSAIDs and local anesthetics transfer less readily. Codeine and tramadol routinely should be avoided due to the risk of neonatal overdose and respiratory depression.(11)

### *Conclusion and Practical Tips*

Effective CD analgesia requires a multimodal, opioid-sparing approach tailored to individual patient needs. By carefully considering the options available, understanding their risks and benefits, and engaging patients in shared decision-making, anesthesiologists can optimize pain management and promote positive maternal and neonatal outcomes.

### *Practical Tips:*

1.Implement Multimodal Analgesia:Combine neuraxial opioids, NSAIDs, paracetamol, and regional blocks for synergistic pain relief.

2.Optimise Neuraxial Opioid Dosing: Use the lowest effective dose of intrathecal morphine (75-150 mcg) or epidural morphine (1.5-3 mg) to minimize side effects. In case of neuraxial block failure- have a protocol for management.

3. Consider Regional Anesthesia Blocks: Utilise interfascial plane blocks for patients not receiving neuraxial opioids or as rescue analgesia for breakthrough pain.

4.Administer Scheduled Non-Opioids: Provide regularly scheduled paracetamol and NSAIDs to reduce opioid consumption.

5. Minimize Opioid Prescriptions: Avoid routine opioid orders and implement reduced-dose guidelines for orders when opioids are necessary.

6.Monitor Respiratory Function: Establish protocols for monitoring respiratory rate and sedation in patients receiving neuraxial opioids.

7. Educate Patients: Provide preoperative education on expected pain trajectory, optimal use of non-opioid analgesics, and tapering/disposal of opioids.

8. Address Side Effects: Proactively manage pruritus, nausea, and vomiting with appropriate medications.

9.Promote Breastfeeding: Select analgesics with minimal transfer to breast milk and encourage breastfeeding prior to opioid administration.

10. Individualise Analgesic Plans: Tailor analgesic regimens based on patient-specific factors, including pain thresholds, anxiety levels, and previous experiences.

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"10"

# PDPH

## Guidelines for Prevention and Management

Prepared By : Dr Amrita Rath

**01. Risk Factors**

Younger age
Female sex
(Grade A, High Certainty)

**02. Risk Factors**

H/O headache
(Grade B, Mod Certainty)
Pushing during labor after large-gauge dural puncture
(Grade C, Low Certainty)

**03. Prevention**

Use non-cutting spinal needles for lumbar puncture
(Grade A, High Certainty)

**04. Prevention**

If cutting needle, Small-gauge needles reduce PDPH risk
(Grade A, High Certainty)

**05. Prevention**

Bevel parallel to spine's long axis for cutting needles
(Grade B, Mod Certainty)

**06. Prevention**

Avoid routine prophylactic epidural blood patch
(Grade C, Low Certainty)

**07. Diagnosis**

Suspect PDPH if headache occurs within 5 days post-neuraxial puncture, often relieved when lying flat (Grade B, Mod. Certainty)

**08. Treatment**

Multimodal analgesia (acetaminophen, NSAIDs) should be offered to all if not C/I.
(Grade B, Mod. Certainty)

**09. Treatment**

Consider epidural blood patch for refractory PDPH impairing daily activities
(Grade B, Mod Certainty)

**10. Red Alert!!!!**

Urgent neuroimaging for worsening symptoms or new neurological deficit.
(Grade B,Mod. Certainty)

Source: Uppal V, et al. RAPM 2023; 0: 1-31.

# LAST

## LETS PUT IT IN THE PAST!!

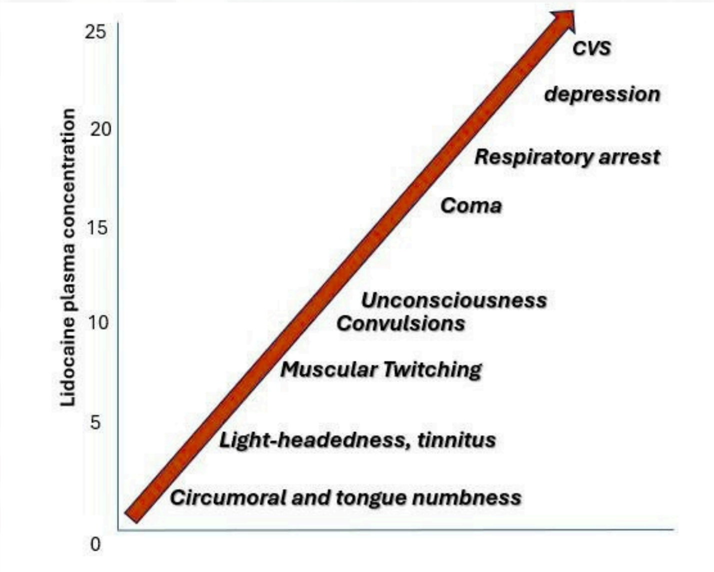
Prepared By : Dr Sushmita Madireddy (AORA Fellow)

## 1 Why?

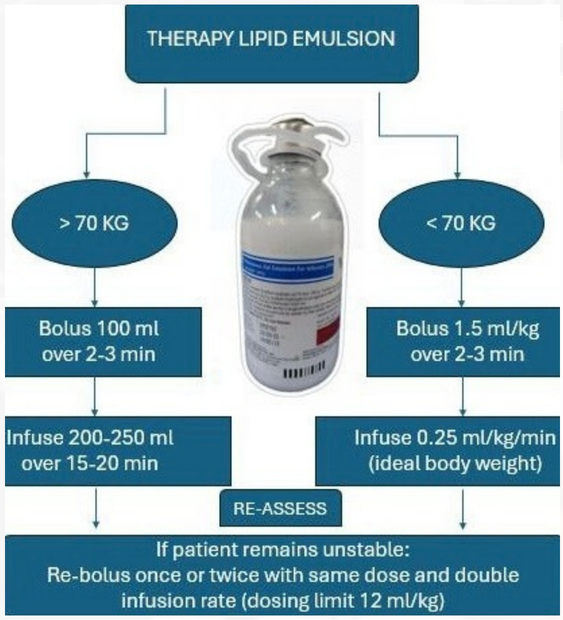
HIGH SYSTEMIC ABSORPTION

- intercostal
- caudal
- epidural
- brachial plexus
- subcutaneous

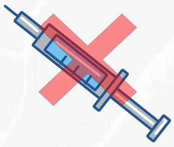
INADVERTENT IV INJECTION



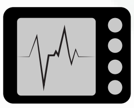

## 2 How will I know?




## 3 Now, what to do?



**CALL HELP!**



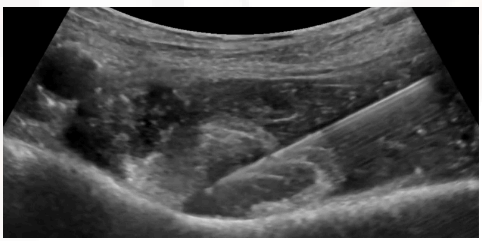

BZDs


## 4 How does lipid work?

## Prevention strategy

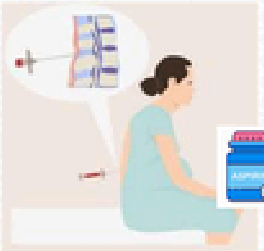
## 5

*use ultrasonography wherever possible*



In case of an event report to www.lipidrescue.org
www.lipidregistry.org

# REGIONAL ANAESTHESIA IN PATIENTS ON ANTITHROMBOTIC/ THROMBOLYTIC THERAPY

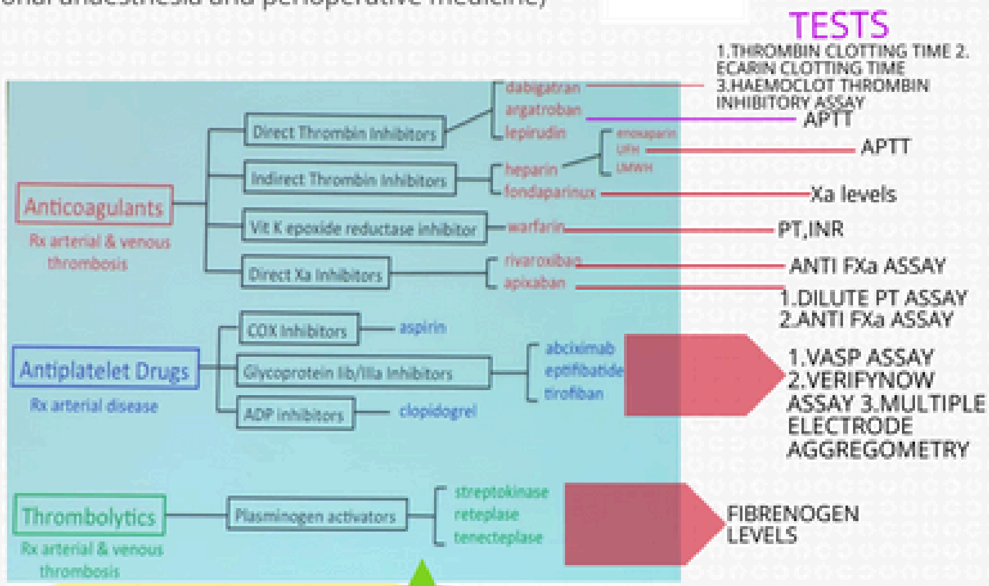



DR.MEGHANA V S

(Fellow in regional anaesthesia and perioperative medicine)


## A TIME FROM LAST DOSE

| | |
|---|---|
| 0 h | ASPIRIN ≤200mg/day |
| 4 h | UFH low dose ≤200IU kg/day/SC; ≤100IU kg/day/IV |
| 6 h | UFH high dose IV |
| 12 h | LMWH low dose<br>anti-Xa≤50 IU/kg/day;<br>enoxaparin≤40 mg/day |
| 24 h | ODF-Xa low dose rivaroxaban, edoxaban<br>LMWH high dose |
| 36 h | ODF-Xa low dose Apixaban<br>FDX low dose ≤2.5mg/day |
| 48 h | DABIGATRAN low dose 220 mg/day |
| 72 h | ASPIRIN · 200 mg/day<br>VKA Acenocoumarol<br>ODF-Xa<br>DABIGATRAN high dose 150 mg BD |
| 4 days | FDX high dose |
| 5 days | VKA Warfarin Fluindione<br>IP2Y Ticagrelor Clopidogrel |
| 7 days | VKA Phenprocoumon<br>IP2Y Prasugrel |




## INTERVENTION

## B TIME UNTIL NEXT DOSE

| | |
|---|---|
| 1 h | UFH low dose IV |
| 4 h | LMWH |
| 6 h | ASPIRIN · 200 mg/day |
| 24 h | IP2Y Ticagrelor Prasugrel<br>DABIGATRAN high dose |
| 48 h | IP2Y Clopidogrel 300 mg |

2024 guidelines

Against the use of DOAC antidotes Idarucizumab,Andexanat alfa,PCC to reverse DOAC anticoagulation activity

| DRUG | A | B |
|---|---|---|
| RIVAROXABAN | 26 h | 4-6 h |
| APIXABAN | 26 h | 4-6 h |
| EDOXABAN | 72 h | 4-6 h |

BETRIXABAN taken off market. Residual Apixaban plasma level <30ng/ml or Xa activity<0.1 IU/ml is acceptable prior to block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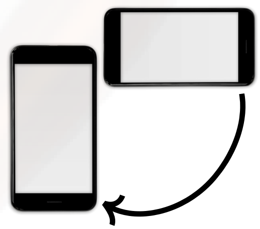

# AORA QUIZ
## RECAP

Prepared by Dr Neha Singh & Dr Amrita Rath

**1. Which of the following is the most effective regional analgesic technique for post-cesarean pain relief?**
A) Epidural morphine
B) Transversus abdominis plane (TAP) block
C) Ilioinguinal-iliohypogastric block
D) Intrathecal fentanyl

**2. Which peripheral nerve block will provide the most effective analgesia following LSCS?**
A) Ilioinguinal-iliohypogastric nerve block
B) Transversus abdominis plane (TAP) block
C) Quadratus lumborum block (QLB)
D) Wound site infiltration

**3. What is the primary disadvantage of using intrathecal fentanyl for post-cesarean analgesia?**
A) Delayed onset
B) Short duration of action
C) Increased nausea and vomiting
D) Respiratory depression

**4. Which ultrasound feature is most predictive of severe pre-eclampsia-related cardiac dysfunction?**
A) Ejection fraction <40%
B) Global longitudinal strain (GLS) impairment
C) Hyperdynamic LV function
D) Inferior vena cava (IVC) collapse

**5. Which NSAID is safest for post-cesarean pain control in breastfeeding mothers?**
A) Ibuprofen
B) Diclofenac
C) Ketorolac
D) Celecoxib

**6. Which of the following factors least influences the duration of TAP block analgesia?**
A) Type of local anesthetic used
B) Volume of injectate
C) Patient weight
D) Use of ultrasound guidance

**7. Which of the following increases the risk of respiratory depression with intrathecal morphine for LSCS?**
A) BMI >30 $kg/m^2$
B) Dose >200 mcg
C) Co-administration of fentanyl
D) Gestational age

**8. Which opioid has the lowest transfer to breast milk when used for LSCS analgesia?**
A) Morphine
B) Fentanyl
C) Oxycodone
D) Codeine

**9. In case of failed spinal anesthesia for a category 1 LSCS, the safest immediate management is:**
A) Convert to general anesthesia
B) Reattempt spinal injection at a higher level
C) Administer epidural top-up
D) Perform local infiltration at the incision site

**10. A parturient undergoing LSCS with a history of mitral stenosis requires regional anesthesia. Which of the following is the MOST crucial hemodynamic consideration during spinal anesthesia in this patient?**
A) Maintaining a high heart rate to preserve cardiac output.
B) Preventing any decrease in systemic vascular resistance.
C) Ensuring a slow, gradual onset of sympathetic blockade.
D) Aggressive fluid boluses to counteract preload reduction.

**11. In a morbidly obese patient undergoing LSCS, which of the following is the MOST significant challenge in performing a successful spinal anesthetic?**
A) Increased risk of post-dural puncture headache.
B) Difficulty in identifying the midline and intervertebral space.
C) Increased risk of hypotension due to exaggerated sympathetic blockade.
D) Prolonged onset of sensory block due to increased adipose tissue.

**12. What is the primary mechanism of action of intrathecal magnesium sulphate in enhancing postoperative analgesia after LSCS?**
A) Activation of opioid receptors.
B) Blockade of NMDA receptors.
C) Inhibition of cyclooxygenase enzymes.
D) Reduction of local anesthetic metabolism.

**13. A patient develops severe pruritus after intrathecal fentanyl for LSCS. What is the MOST appropriate treatment?**
A) Naloxone bolus.
B) Diphenhydramine.
C) Ondansetron.
D) Propofol bolus.

**14. Which of the following is the MOST accurate statement regarding the use of ultrasound guidance for spinal anesthesia in LSCS?**
A) It eliminates the risk of post-dural puncture headache.
B) It reliably predicts the depth of the subarachnoid space.
C) It primarily aids in identifying the midline and intervertebral level.
D) It eliminates the need for local anesthetic infiltration.

**15. Which of the following is the most significant determinant of epidural local anesthetic spread in labor analgesia?**
A) Volume of local anesthetic
B) Dose of local anesthetic
C) Speed of injection
D) Position of the parturient

**16. Which local anesthetic has the lowest placental transfer when used for labor epidural analgesia?**
A) Bupivacaine
B) Lidocaine
C) Ropivacaine
D) 2-Chloroprocaine

**17. Which factor contributes most to a failed epidural for labor analgesia?**
A) Unilateral block
B) Catheter migration
C) Inadequate volume of local anesthetic
D) Incorrect catheter placement in the subdural space

**18. Which dermatome level should be covered for optimal labor analgesia in 1st stage of labour?**
A) T4-T6
B) T6-T10
C) T8-T12
D) T10-L1

**19. Which block is most useful for providing perineal analgesia in the second stage of labor?**
A) Pudendal nerve block
B) Iliohypogastric block
C) Paracervical block
D) Transversus abdominis plane block

**20. Which measurement on POCUS is most useful in diagnosing peripartum cardiomyopathy?**
A) Left atrial size
B) Mitral inflow E/A ratio
C) LV global longitudinal strain
D) LV ejection fraction

# AORA QUIZ
## ANSWERS

Prepared by Dr Neha Singh & Dr Amrita Rath

**1. Answer: A) Epidural morphine**
Explanation: Epidural morphine provides long-lasting analgesia (up to 24 hours) due to its hydrophilic nature, allowing it to bind opioid receptors in the spinal cord. While TAP blocks and rectus sheath blocks provide somatic pain relief, they lack visceral analgesia.

**2. Answer: C) Quadratus lumborum block (QLB)**
Explanation: QLB provides both somatic and visceral analgesia by affecting the thoracolumbar fascia and spread to the paravertebral space, superior to TAP block. TAP provides only somatic analgesia, but not visceral. Wound site infiltration will be short acting, and can provide only visceral pain relief.

**3. Answer: B) Short duration of action**
Explanation: Intrathecal Fentanyl involves injecting fentanyl (an opioid analgesic) directly into the cerebrospinal fluid (CSF) in the spinal canal.
Post-Cesarean Analgesia: This refers to pain relief after a cesarean section.
Short Duration of Action:
Fentanyl, when administered intrathecally, provides rapid and potent pain relief. However, its duration of action is relatively short, typically lasting only a few hours. This is because fentanyl is a lipophilic opioid, meaning it's readily absorbed into the lipid-rich tissues of the spinal cord and then quickly redistributed, leading to a decrease in its concentration at the opioid receptors responsible for analgesia.
Why Other Options Are Incorrect:
A) Delayed onset: Intrathecal fentanyl has a very rapid onset of action.
C) Increased nausea and vomiting: While opioids can cause nausea and vomiting, it's not the primary disadvantage of intrathecal fentanyl specifically.
D) Respiratory depression: While a risk with all opioids, it's not the main disadvantage when used in appropriate doses for post-cesarean analgesia.

**4. Answer: B) Global longitudinal strain (GLS) impairment**
Explanation: Subclinical LV dysfunction in pre-eclampsia is best identified by GLS, which detects early myocardial impairment even before overt LV dysfunction. GLS is a sensitive and early marker of LV systolic dysfunction in PPCM. It detects subtle changes in myocardial deformation that may not be apparent with LVEF alone. While MAPSE, TRV, and RVFAC are useful, GLS provides a more comprehensive assessment of LV systolic function.

Why Global Longitudinal Strain (GLS) Impairment (Answer B)?
Mechanism: GLS is a measure of the deformation of the left ventricle (LV) during contraction. It's a sensitive marker of subtle changes in myocardial function. In pre-eclampsia, even before a decrease in ejection fraction is evident, GLS can show impairment due to the effects of the disease on the heart muscle.
Predictive Value: Studies have shown that GLS is a strong predictor of adverse cardiac events in women with pre-eclampsia. It can identify those at higher risk of developing severe cardiac dysfunction.
Why Not the Other Options?
A) Ejection Fraction <40%: While a decreased ejection fraction indicates significant cardiac dysfunction, GLS impairment can detect problems earlier, before the ejection fraction drops.
C) Hyperdynamic LV Function: Hyperdynamic LV function (increased contractility) is often seen in early pregnancy due to increased blood volume. It's not specific to pre-eclampsia-related cardiac dysfunction.
D) Inferior Vena Cava (IVC) Collapse: IVC collapse reflects volume status, but it's not a direct measure of cardiac function. While it can be affected by pre-eclampsia, it's not as specific or sensitive as GLS for predicting severe cardiac dysfunction.

**5. Answer: A) Ibuprofen**
Explanation: Ibuprofen has a well-established safety profile for lactating mothers with minimal transfer into breast milk.
Ibuprofen: This is generally considered the safest NSAID for breastfeeding mothers. It has a short half-life, meaning it's cleared from the body relatively quickly. Only very small amounts pass into breast milk, and it's considered compatible with breastfeeding by most authorities, including the American Academy of Pediatrics.
Why the other options are less preferred:
B) Diclofenac: While generally considered compatible, it's not as well-studied as ibuprofen in breastfeeding.
C) Ketorolac: This is a potent NSAID and is generally avoided in breastfeeding due to potential risks to the infant.
D) Celecoxib: There is limited data on its safety in breastfeeding, and it's generally not recommended.

**6. Answer: C) Patient weight**
Explanation: The duration of a TAP block is more dependent on local anesthetic choice, adjuncts, and technique rather than body weight. Patient Weight as a Less Influential Factor: Patient weight has the least direct influence on the duration of TAP block analgesia compared to the other options. While weight can indirectly affect the distribution and metabolism of the local anesthetic, its impact on the duration of the block is minimal.

Why other options are more influential:
A) Type of local anesthetic used: Different local anesthetics have varying durations of action. For example, bupivacaine generally provides longer analgesia than lidocaine.
B) Volume of injectate: A larger volume of local anesthetic can spread over a greater area, potentially blocking more nerves and prolonging the analgesic effect.
D) Use of ultrasound guidance: Ultrasound guidance allows for precise placement of the local anesthetic, ensuring it reaches the target nerves and improving the effectiveness and duration of the block.

**7. Answer: B) Dose >200 mcg**
Explanation: Respiratory depression is dose-dependent, occurring more commonly when intrathecal morphine exceeds 200 mcg. Opioid co-administration and BMI may contribute but are not primary determinants.
Intrathecal Morphine: This refers to administering morphine directly into the cerebrospinal fluid (CSF) in the spinal canal. It's a common technique for providing post-operative analgesia after cesarean sections (LSCS - Lower Segment Cesarean Section).
Respiratory Depression: This is a serious potential side effect of opioids like morphine. It occurs when the respiratory centers in the brain become depressed, leading to slowed and shallow breathing.
Risk Factors for Respiratory Depression with Intrathecal Morphine:
Dose: Higher doses of intrathecal morphine increase the risk of respiratory depression. A dose exceeding 200 mcg is generally considered a higher risk.
Spread of Morphine in the CSF: The cephalad (upward) spread of morphine in the CSF can reach the brainstem, where the respiratory centers are located.
Patient Factors: Factors like age, obesity, and pre-existing respiratory conditions can also increase the risk.
Concomitant Medications: Other medications that depress the central nervous system, such as sedatives or other opioids, can potentiate the respiratory depressant effects of morphine.
Why the other options are incorrect:
A) BMI >30 kg/m$^2$: While obesity can be a risk factor for respiratory complications in general, it's not a primary driver of respiratory depression specifically from intrathecal morphine.
C) Co-administration of fentanyl: Fentanyl is a potent opioid and can contribute to respiratory depression. However, it's often used in combination with intrathecal morphine to improve analgesia. The key factor is the total opioid dose and the patient's individual response.
D) Gestational age: Gestational age itself is not a direct risk factor for respiratory depression with intrathecal morphine.

**8. Answer: A) Morphine**
Explanation: Morphine has low lipid solubility and minimal transfer to breast milk, making it the preferred opioid in lactating mothers.
Why Morphine?
Pharmacokinetics: Morphine has a relatively low oral bioavailability (meaning less of it gets absorbed into the bloodstream when taken orally). This, combined with its relatively short half-life, contributes to less transfer into breast milk compared to other opioids.
Clinical Use: While all opioids transfer to some extent, morphine is often considered a safer choice for breastfeeding mothers due to its lower transfer rate.
Why Not the Other Options?
B) Fentanyl: Fentanyl is highly lipophilic (fat-soluble), which can lead to higher concentrations in breast milk.
C) Oxycodone: Like fentanyl, oxycodone is also lipophilic, resulting in more transfer into breast milk.
D) Codeine: Codeine is metabolized into morphine, which means it will eventually lead to morphine in breast milk. There's also some concern about variable metabolism in some individuals, which could lead to unpredictable levels in breast milk.

**9. Answer: A) Convert to general anesthesia**
Explanation:
Time Sensitivity: In a failed spinal for LSCS, time is of the essence. The surgery needs to proceed promptly to ensure the safety of both mother and baby.
General Anesthesia Reliability: General anesthesia provides a rapid and reliable method to achieve surgical anesthesia.
Other Options are Less Reliable or Time-Consuming:
B) Reattempt spinal injection at a higher level: This takes time and its category 1 LSCS. It also carries the risk of complications if repeated attempts are made.
C) Administer epidural top-up: If a spinal has failed, it's unlikely an epidural top-up will provide adequate surgical anesthesia quickly enough.
D) Perform local infiltration at the incision site: This would only provide very limited anesthesia and would not be sufficient for a major abdominal surgery like LSCS.
Repeating a spinal increases the risk of high spinal blockade, making general anesthesia the safest immediate option.

**10. Answer: C) Ensuring a slow, gradual onset of sympathetic blockade.**
Explanation: In mitral stenosis, cardiac output is dependent on heart rate and preload. A rapid decrease in systemic vascular resistance (SVR) due to spinal anesthesia can lead to profound hypotension because the stenotic valve limits the heart's ability to increase cardiac output. A slow, gradual onset of sympathetic blockade allows for better hemodynamic adjustment.

**11. Answer: B) Difficulty in identifying the midline and intervertebral space.**
Explanation: Obese patients often have challenging spinal anatomy, making midline identification and needle placement difficult. While other factors might be present, the main difficulty is anatomical.
Why Difficulty Identifying Midline and Intervertebral Space (Answer B)?
Anatomical Changes: In morbidly obese individuals, excess adipose tissue in the back can obscure the bony landmarks used to locate the midline and intervertebral spaces. This makes the spinal needle insertion more challenging.
Technical Difficulty: The increased tissue depth can make it harder to accurately guide the needle to the correct location in the spinal canal.
Why Not the Other Options?
A) Increased Risk of Post-Dural Puncture Headache (PDPH): While technically possible, obesity itself doesn't directly increase the risk of PDPH. The technique and needle size are more significant factors.
C) Increased Risk of Hypotension Due to Exaggerated Sympathetic Blockade: While obesity can contribute to cardiovascular challenges, the primary concern in spinal anesthesia is the technical difficulty of performing the block, not necessarily an exaggerated sympathetic blockade.
D) Prolonged Onset of Sensory Block Due to Increased Adipose Tissue: Adipose tissue doesn't significantly affect the onset of sensory block once the local anesthetic is injected into the cerebrospinal fluid. The main hurdle is getting the needle into the correct space.

**12. Answer: B) Blockade of NMDA receptors.**
Explanation: Magnesium sulphate acts as an NMDA receptor antagonist, reducing central sensitization and wind-up phenomena, thus enhancing postoperative analgesia.
Why Blockade of NMDA Receptors (Answer B)?
NMDA Receptors: N-methyl-D-aspartate receptors are involved in the transmission of pain signals in the central nervous system.
Magnesium's Role: Magnesium acts as an NMDA receptor antagonist. By blocking these receptors, it reduces the perception of pain, especially in the context of central sensitization (increased responsiveness of pain pathways after surgery).
Synergistic Effect: Magnesium can also enhance the effects of other analgesics, like opioids, when used in combination.
Why Not the Other Options?
A) Activation of Opioid Receptors: Magnesium doesn't directly activate opioid receptors. Its analgesic effect is primarily through NMDA receptor blockade.
C) Inhibition of Cyclooxygenase Enzymes: This is the mechanism of action of NSAIDs (nonsteroidal anti-inflammatory drugs), not magnesium.
D) Reduction of Local Anesthetic Metabolism: Magnesium doesn't significantly affect the metabolism of local anesthetics. Its primary mechanism is at the level of the central nervous system.

**13. Answer: A) Naloxone bolus.**
Explanation: Pruritus from intrathecal fentanyl is reversed by Naloxone. and ondansetron is for nausea.

**14. Answer: C) It primarily aids in identifying the midline and intervertebral level.**
Explanation: Ultrasound is most valuable in identifying the midline and intervertebral space, especially in patients with challenging anatomy. While it can provide an estimate of depth, it doesn't eliminate the risk of PDPH or the need for local anesthetic infiltration.

**15. Answer: A) Volume of local anesthetic**
Explanation:
The spread of local anesthetic in the epidural space is primarily determined by volume rather than dose. Increasing volume results in more extensive spread, leading to a greater dermatomal coverage. While dose (concentration × volume) affects the degree of sensory and motor blockade, volume is the dominant factor influencing spread in the parturient, especially given the reduced epidural space compliance due to pregnancy-related engorgement of the epidural venous plexus.

**16. Answer: D) 2-Chloroprocaine**
Explanation:
2-Chloroprocaine is an ester local anesthetic that undergoes rapid hydrolysis by plasma cholinesterases, resulting in minimal placental transfer.

**17. Answer: B) Catheter migration**
Explanation:
The most common cause of failed epidural analgesia is catheter migration, leading to inadequate analgesia or intravascular placement. Unilateral block and subdural placement are rarer but can still contribute to failure.
Why Catheter Migration (Answer B)?
Mechanism: The epidural catheter is a thin tube placed in the epidural space. If it moves from its optimal position, it can result in inadequate or patchy pain relief.
Types of Migration:
Out of the Epidural Space: The catheter can slip out of the epidural space altogether.
Intravascular Migration: The catheter can enter a blood vessel, leading to systemic effects rather than localized pain relief.
Subarachnoid Migration: The catheter can puncture the dura and enter the subarachnoid space (where spinal anesthesia is given), leading to a high or total spinal block.
Why Not the Other Options?
A) Unilateral Block: While a unilateral block (pain relief on only one side) is a common issue, it's not considered a complete "failure" of the epidural. It can often be corrected by repositioning the patient or adjusting the medication.
C) Inadequate Volume of Local Anesthetic: This can cause inadequate pain relief, but it's usually easily rectified by administering more medication.
D) Incorrect Catheter Placement in the Subdural Space: While this can lead to problems, it's less common than catheter migration and often results in a different clinical picture (e.g., a high block rather than a complete failure).

**18. Answer: D) T10-L1**
Explanation:
Labor pain from cervical dilation and uterine contractions is transmitted via T10-L1. As labor progresses, additional coverage of S2-S4 may be needed.

**19. Answer: A) Pudendal nerve block**
Explanation:
The pudendal nerve (S2-S4) provides sensory innervation to the perineum and is useful for perineal pain relief.

**20. Answer: C) LV global longitudinal strain**
Explanation: GLS detects early myocardial dysfunction and is more sensitive than ejection fraction in diagnosing peripartum cardiomyopathy.
Why LV Global Longitudinal Strain (Answer C)?
Mechanism: Global longitudinal strain (GLS) is a sensitive measure of left ventricular (LV) function. It assesses the deformation of the heart muscle during contraction. In PPCM, even before a decrease in ejection fraction (EF) is evident, GLS abnormalities can be detected.
Early Detection: GLS can identify subtle changes in LV function that are not apparent with traditional measures like EF. This allows for earlier diagnosis and intervention in PPCM.

Why Not the Other Options?
A) Left Atrial Size: While left atrial enlargement can occur in heart failure, it's not specific to PPCM and might not be an early finding.
B) Mitral Inflow E/A Ratio: This reflects diastolic function (how well the heart relaxes). While diastolic dysfunction can occur in PPCM, GLS is a more sensitive marker of systolic dysfunction (how well the heart contracts), which is the primary issue in PPCM.
D) LV Ejection Fraction (EF): EF measures the percentage of blood pumped out of the LV with each contraction. While EF is important, it might not show significant changes in the early stages of PPCM. GLS can detect subtle abnormalities before EF becomes significantly reduced.