3/8/24

Disclaimer: These guidelines are provided as a general reference and are not meant as a substitute for clinical judgement. Decisions about patient care should be individualized. Any questions regarding a particular patient should be directed to the attending anesthesiologist.

OB Anesthesia Guidelines

1) **Preanesthetic Evaluation**
   a) History and Physical Examination
      i) A basic preanesthetic H&P should be obtained on all patients on the L&D floor or those presenting for a procedure
         (1) Careful attention should be paid to the following:
            (a) History of coagulopathy or use of anticoagulants
            (b) History of spine disease and/or surgery
            (c) History of CNS disease suggesting increased ICP (e.g., headaches, papilledema)
            (d) Pre-existing neurological deficits should be documented clearly in the preanesthetic evaluation
            (e) Focused examination of the back and airway
            (f) Any positive findings from above should be discussed with the anesthesiologist
   b) NPO Guidelines
      i) In general, OB patients should follow standard ASA NPO guidelines
         (1) Solids- 6-8hrs depending on contents of last po intake
         (2) Clear liquids- 2hrs
            (a) For uncomplicated labors (e.g., ASA 2, not TOLAC, no fetal issues), patients may continue clear liquid intake during labor; if feasible, patients who will require a procedure should be made NPO at least 2hrs prior
         (3) Patients in active labor should be considered a full stomach regardless of NPO status
   c) Aspiration Prophylaxis
      i) ASA Practice Guidelines for Obstetric Anesthesia recommend routine administration of pharmacologic aspiration prophylaxis: Non-particulate antacid, H2-receptor Antagonist, and/or Metoclopramide
         (1) Ideally, all three agents will be administered prior to any planned obstetric procedure (e.g., CS, D&C)
            (a) Timing:
               (i) Non-particulate antacid (e.g., BiCitra): within 30 minutes of planned procedure
               (ii) H2-receptor antagonist and metoclopramide: greater than 30 minutes prior to planned procedure
            (b) For emergency procedures, the non-particulate antacid is the most important and should be administered
               (i) If greater than 30 minutes have elapsed since administration, consider repeating the dose as duration of effect is highly variable and can be as short as 20-30 minutes
   d) Lab work
      i) Platelet count
         (1) Per ASA guidelines, a platelet count is not necessary prior to initiation of neuraxial anesthesia in a healthy, uncomplicated patient
            (a) However, if time permits the platelet count should be reviewed prior to placement of neuraxial anesthesia
            (b) Any patient with a history of coagulopathy or preeclampsia should have a platelet count prior to neuraxial anesthesia
      ii) Type and Screen
         (1) Should be performed on all patients presenting for obstetric procedure
      iii) Type and Crossmatch
         (1) Decision to order a crossmatch should be individualized and discussed with the anesthesiologist, in addition to the obstetric care team
      iv) Coagulation Studies
         (1) PT, PTT, INR
            (a) Routine ordering of coagulation studies is not recommended, unless the patient has been on an anticoagulant
         (2) TEG
            (a) Validation of the use of thromboelastography for parturients is lacking, therefore, ordering and interpretation should be done in consultation with the anesthesiologist

2) **Labor Analgesia**
   a) Epidural Analgesia
      i) Remains one of the safest and most effective methods for laboring parturients
         (1) Informed consent discussion after preanesthetic evaluation

(a) Risks
(i) Common-nausea, hypotension, shivering, PDPH
(ii) Uncommon-intravascular or intrathecal injection, high/total spinal, neurological deficits
(b) Benefits-analgesia and use for anesthetic if CS required
(c) Alternatives-nothing, parenteral (e.g., remifentanil gtt), OB pudendal/paracervical block
(2) Indications
(a) Maternal request is sufficient indication for epidural analgesia
(i) Delay for cervical dilation should be avoided
(ii) Although epidural analgesia has been shown to increase labor time and rate of operative delivery (CS and IVD), this likely has little if any clinical effect
1. More important are maternal factors (e.g., primigravida) and obstetric management
(3) Contraindications
(a) Absolute: refusal, inability to cooperate, increase ICP from mass lesion, infection overlying site, coagulopathy or recent anticoagulation, uncorrected hypovolemia/hemodynamic instability
(b) Relative: systemic infection, pre-existing neurologic disease, severe stenotic heart lesions
(4) Anticoagulation
(a) See Appendix A
(i) These guidelines were developed specifically for anticoagulated obstetric patients
(5) Technique
(a) For an excellent review of neuraxial techniques: https://www.nysora.com/techniques/neuraxial-and-perineuraxial-techniques/
(b) Most patients will benefit from a traditional lumbar epidural technique
(i) Patients with a history of failed epidural, inadequate analgesia, and/or difficult placement, consider a dural puncture epidural
1. Theoretically, this will place the patient a greater risk for PDPH (approx. 1:100)
(ii) Patients presenting in advanced labor may benefit from a CSE technique
(6) Dosing
(a) Although systemic absorption and placental transfer is minimized via epidural administration of local anesthetics, total cumulative dose and maximum dosage should always be considered, especially when giving bolus doses
(i) There is no difference in the treatment of LAST for obstetric patients
(b) Dilute anesthetic solutions with narcotic (i.e., fentanyl) are preferred for labor analgesia
(i) If feasible, patients should be given a PCEA and titration should focus on maximizing analgesia and minimizing motor blockade
1. In general, most patients can be started with the infusion at 10-12cc/hr w/ 5cc bolus q15-30min
2. A dermatomal level of T10 (umbilicus) is desirable for the first stage of labor
a. Remember, if using a caloric method for testing dermatomes (e.g., ice, alcohol prep pad), this will typically be 1-2 levels higher than your actual proprioception block
3. To achieve a higher dermatome, consider giving 5cc of 0.125% or 0.25% bupivacaine and increasing your basal infusion rate by 2cc until desired dermatome is achieved
(ii) Patients with an allergy or intolerance to fentanyl may require higher infusion rates to achieve adequate analgesia
(c) For sacral sparing, which is typically encountered close to the onset of the 2nd stage of labor, consider fentanyl 50-100mcg or precedex (see separate guidelines regarding dosing of precedex
(i) Fentanyl dosing may be repeated every 2-3 hours if needed
(d) For instrumental vaginal delivery, 10cc of 1% lidocaine and 100mcg of fentanyl at least 5-10 minutes prior to application of forceps
(e) If after bolus dosing twice does not achieve desired effect and patient is still early in labor, consider replacement and performing a DPE

b) Parenteral labor analgesia
i) Remifentanil infusions are a viable alternative for patients who otherwise are unable to receive neuraxial analgesia
(1) Remifentanil can be quickly titrated given its short half-life
(a) Because it is given IV, some placental transfer does occur
(i) However, studies of umbilical artery and vein sampling of neonates born to mothers who receive remifentanil during labor and CS show rapid redistribution and/or metabolism of the drug making any lingering adverse effects on the neonate unlikely

3) Anesthesia for Cesarean Delivery

a) Choice of anesthesia

i) Most obstetric patients will benefit from a neuraxial technique compared to general anesthesia for CS
   (1) Changes in the maternal airway, pulmonary mechanics, and gastrointestinal system, make spinal or epidural anesthesia better choices for anesthetizing the parturient
      (a) For a relatively concise review of physiologic changes in the mother and how it relates to anesthesia: https://www.nysora.com/foundations-of-regional-anesthesia/sub-specialties/obstetric/obstetric-regional-anesthesia/
   (2) Regardless of the type of anesthesia, when an obstetric patient is recumbent, they should avoid lying flat on their back to prevent aortocaval compression (i.e., supine hypotension syndrome)
      (a) This is typically accomplished by tilting the bed to the left at 15-30°
         (i) Manual left uterine displacement is essential in cases of maternal cardiac arrest

b) Spinal Anesthesia
   i) Preparation
      (1) Fluid co-loading, except in patients with preeclampsia
      (2) Availability of pressors*
         (a) Prophylactic administration of a phenylephrine infusion may lead to less lability in BP
         (b) Recommendations are to not let BP, specifically MAP fall more than 10% of preoperative baseline
            (i) Placental bed perfusion is passive due to lack of autoregulation in the spiral arteries; therefore, BP must be tightly controlled to prevent uteroplacental insufficiency
         (c) Phenylephrine is the ideal vasopressor for spinal induced hypotension
            (i) Ephedrine may be given, consider avoidance in mothers who have a fetus in distress due to potential for worsening fetal acidosis
      (3) Positioning
   ii) Technique
      (1) See above under epidural for technique
   iii) Dosing
      (1) Bupivacaine has a long history and established safety profile in obstetric anesthesia
         (a) Depending on the patient's height, a dose of 10-12.5mg (cc's will depend on concentration) of bupivacaine can be used, either hyperbaric or isobaric
         (b) If no contraindication, use a short acting (lipophilic) and long acting (hydrophilic) narcotic to the anesthetic solution for intrathecal administration
            (i) Fentanyl- provides rapid onset analgesia and works synergistically with the bupivacaine, especially helpful for the visceral manipulation component of the CS
               1. Pruritus is the most common side effect
            (ii) Morphine- onset time is much slower (>1 hour) but provides excellent postoperative analgesia up to 24hrs
               1. May cause delayed respiratory depression, nausea, pruritus
      (2) A blockade at T6 or above is necessary for adequate anesthesia during a CS

c) Epidural Anesthesia
   i) Dosing
      (1) Lidocaine 2% w/ 1:200,000 epinephrine is the typical choice for epidural anesthesia for CS, given in 5cc aliquots every 3-5minutes up to 20-25cc depending on the patient's height
         (a) For faster onset, mix the lidocaine solution with sodium bicarb in a 9:1 ratio
      (2) 100mcg of fentanyl epidural should also be given early to improve the quality of the block
      (3) 3-5mg of PF morphine should be given after delivery of the neonate via the epidural

d) General Anesthesia
   i) Although neuraxial anesthesia is preferred, general anesthesia is a safe alternative for obstetric patients undergoing CS
   ii) General Flow
      (1) Patient is prepped and draped, avoid anxiolytics if possible, adequate preoxygenation
      (2) OBs waiting for okay to start
      (3) Propofol, succinylcholine (rocuronium okay if concerns about succinylcholine)
         (a) Narcotics and anxiolytic after delivery
      (4) RSI w/ cricoid, rescue equipment nearby (Glidescope, LMA, bougie)
      (5) Confirmed endotracheal intubation, give OBs okay to proceed
      (6) Keep volatile at 1 MAC until delivery of placenta, then cut to half and turn on nitrous
         (a) Because volatile anesthetics are potent smooth muscle relaxants, uterine tone is expected to be boggy with general anesthesia
            (i) Reassure the OB that their tone will improve after the volatile agent starts to decrease
      (7) Give Pitocin and other uterotonics if needed
      (8) Unless there is a compelling reason, obstetric patients should never be deep extubated d/t increased risk of aspiration

(9) Consider PCA and/or TAP block for general anesthesia patients since they did not receive long acting neuraxial narcotic

4) **Miscellaneous**

a) PPH

i) Definition: Vaginal Delivery >500cc EBL, CS >1000cc EBL, or any degree of maternal blood loss with accompanying hemodynamic instability

ii) Risk factors: h/o PPH, h/o uterine surgery, abnormal placentation, multiple gestation, fetal macrosomia, polyhydramnios, chorioamnionitis, multiparity, anemia, prolonged and/or augmented labor

iii) Etiology: trauma, uterine atony, coagulopathy (usually exacerbating another etiology), retained products of conception

iv) Management: consider crossmatch for patients w/ 2 or more of above risk factors, large bore IV access, rapid correction of hypovolemia, arterial line if hemodynamic instability, surgical control of bleeding, consider targeted resuscitation if coagulopathic with ordering of TEG

b) PDPH

i) Incidence: Spinal needle 1-10% (depending on type, lower for pencil point), approximately 50% incidence for dural puncture w/ an epidural needle

(1) Represents a significant number of the obstetric claims in the ASA's Closed Claims Project database

ii) Presentation: within 5 days of dural puncture, typically somewhere in the 24-48hr mark, most often with associated nausea, vomiting, and neck stiffness; photophobia and tinnitus are less common

(1) A hallmark of PDPH is drastic worsening of headache w/ sitting or standing up and improvement with recumbency

(a) Headache location frontal vs occipital is not consistent, but it is typically bilateral

(2) Rarely, patients may present with a CN palsy (CN III palsy is most common)

iii) Treatment

(1) Conservative

(a) Traditional conservative therapy involves hydration, caffeine, bedrest, and/or abdominal binder

(i) Robust evidence is lacking regarding the efficacy of traditional conservative therapies

(ii) May be warranted in cases where the diagnosis of PDPH is questionable, epidural blood patch may be technically difficult or contraindicated, and/or mild cases

(2) Interventional

(a) An epidural blood patch is the gold standard for treatment of PDPH

(i) In a case of known dural puncture and classical presentation of PDPH, consider proceeding with epidural blood patch at 24hrs after delivery

1. The rate of first-time success and decreased need for additional blood patch is decreased if patient able to make it to 24hr mark
2. An epidural blood patch should be performed under strict sterile conditions
3. Review of the topic and technique: https://www.nysora.com/foundations-of-regional-anesthesia/complications/postdural-puncture-headache/

(b) Several pharmacologic therapies have been proposed, each with varying degrees of evidence for their use. Discussion of each is beyond the scope of this document.

(i) Typically, their use is reserved for patients who fail conservative therapy, cannot have an epidural blood patch, and/or refuse epidural blood patch

(c) A sphenopalatine block can be used as a temporizing measure, though use should be discussed in consultation with the attending anesthesiologist

c) Preeclampsia

i) Overview

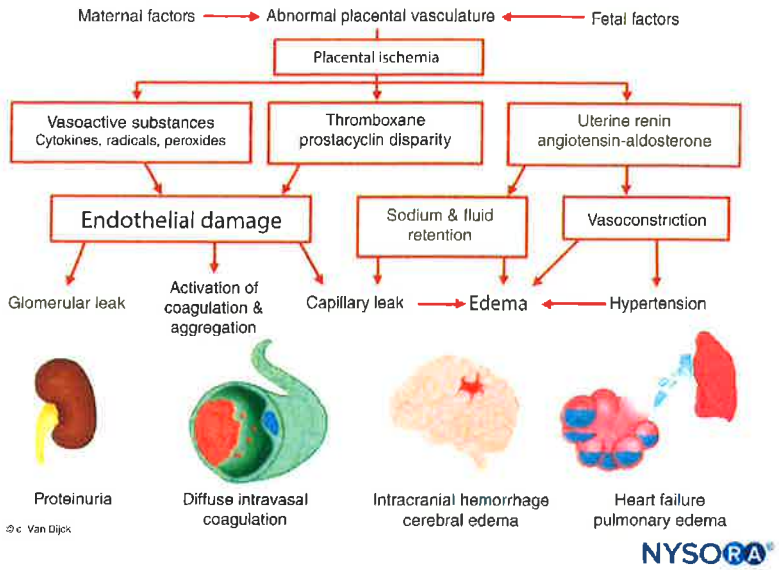
(1) Although the exact etiology of preeclampsia is not known, it is thought to be triggered by placental ischemia resulting in a "proteinaceous increase in blood pressure"

(2) Cardiovascular disease, including hypertensive disorders of pregnancy (e.g., preeclampsia), are the leading cause of maternal mortality in the United States

(a) Hemorrhage remains the leading cause of maternal death worldwide

(3) Preeclampsia exists along a spectrum, with the most severe manifestations of the disease being HELLP syndrome and eclampsia
   (a) HELLP- hemolysis, elevated liver enzymes, low platelets
   (b) Eclampsia- progression to seizures

(4) Preeclampsia can affect almost every major organ system (see diagram)



(5) Preeclampsia is defined as severe if it has any of the following features
   (a) Systolic blood pressure consistently more than 15% above baseline
   (b) Diastolic blood pressure consistently more than 15% above baseline
   (c) Proteinuria of 5 g/24 h
   (d) Oliguria of 400 mL/24 h
   (e) Visual disturbances
   (f) Pulmonary edema or cyanosis
   (g) Epigastric pain
   (h) Intrauterine growth retardation

(6) Goals of therapy
   (a) Prevent/control convulsions
      (i) Mainstay of therapy in United States is magnesium sulfate
      (ii) Decreased DTRs and somnolence are common
   (b) Improve organ perfusion and control BP
      (i) Leading cause of death is cerebral hemorrhage
   (c) Correct clotting abnormalities
      (i) Mild thrombocytopenia is common
   (d) Definitive treatment is delivery for progressive or severe cases

ii) Anesthetic Management

(1) Considerations
   (a) Although preeclampsia causes an overall increase in total body water, most of that fluid is in the interstitial space and most of these patients are intravascularly depleted
      (i) Unfortunately, due to the pathophysiology of the disease, IV hydration must be done judiciously to prevent severe edema, specifically pulmonary edema
   (b) Low platelets are common in pregnant patients (i.e., gestational thrombocytopenia) and even more common in preeclamptic patients
      (i) Current guidelines use a cutoff of 70k or greater
      (ii) If a patient has a diagnosis of HELLP, strong consideration should be given to avoiding epidural placement regardless of platelet count d/t likely progression of coagulopathy
         1. Consideration of spinal anesthesia should be individualized based on discussion with patient, anesthesiologist, and OB
   (c) Preeclamptic patients tend to be more sensitive to the sympathectomy associated with neuraxial analgesia/anesthesia and paradoxically more sensitive to the effects of pressors
      (i) Careful titration of both is necessary
   (d) Finally, most fetuses of preeclamptic mothers experience at least some degree of IUGR d/t placental ischemia
      (i) Maintaining placental perfusion pressure by maintaining the MAP is critical as these fetuses tend to be acutely sensitive to any degree of uteroplacental insufficiency

(2) Labor analgesia
   (a) Epidurals are thought to be beneficial in preeclamptic patients d/t the vasodilatory effects
   (b) Adequate hydration and LUD are essential to prevent severe hypotension, especially in women who have been on antihypertensives
   (c) Platelet count

(i) Preeclampsia- within 12 hours
(ii) Preeclampsia with severe features- within 6 hours and no significant worsening of symptoms
(iii) HELLP- discuss with attending

(3) Cesarean delivery
(a) Some advocate for epidural anesthesia in patients with preeclampsia d/t the ability to slowly titrate the dose
(i) Spinal anesthesia can be safely used in patients with preeclampsia with adequate preparation
1. Pressors are preferred over IV fluid bolus for reasons discussed above
2. Aggressive IV hydration combined with the autotransfusion from uterine tetany after delivery could lead to flash pulmonary edema

5) Anesthesia for Non-obstetric Surgery

a) ASA and ACOG are firm in their position that medically necessary care should not be delayed for pregnant women
i) Despite this, apprehension still exists regarding anesthetizing pregnant patients for non-obstetric surgeries
ii) No anesthetic agents, at the usual doses and length of administration, have been definitively shown to be teratogenic
iii) Based on available evidence, it seems the maternal disease state is more relevant to both maternal and fetal outcomes

b) General principles
i) Timing
(1) Retrospective analyses have demonstrated that the optimal timing for non-emergent procedures needed during pregnancy should occur during the 2nd trimester to minimize the risk of teratogenicity, pregnancy loss, or preterm labor

ii) Changes in maternal anatomy and physiology (see above) necessitate careful preparation
(1) Preop- gestational age should be determined, obstetric clearance if time permits, pharmacologic aspiration prophylaxis, discussion with surgeon, OB, and anesthesia team if intraoperative fetal monitoring is necessary/feasible
(2) Intraop- if possible, d/t established safety profile in pregnant women, neuraxial technique preferred, if general anesthesia is required, recommend ETT at 20 weeks gestational age
(a) Regardless of the presence of intraoperative fetal monitoring, strict avoidance of hypoxia, hypotension, hyperventilation, and acidosis is critical to both maternal and fetal health
(3) Pharmacology
(a) Again, no anesthetic agents are proven teratogens. However, because of the availability of alternatives and persistent concern over certain medications, consider avoidance of midazolam and nitrous oxide
(b) Reversal should be performed with neostigmine and atropine
(i) Glycopyrrolate does not cross the placenta, whereas neostigmine does. Thus, reversal with this combination could cause severe fetal bradycardia
(ii) Sugammadex has a theoretical potential to bind steroid hormones and could affect pregnancy maintenance. The Society for Obstetric Anesthesia and Perinatology recommends avoidance of sugammadex in pregnant patients currently

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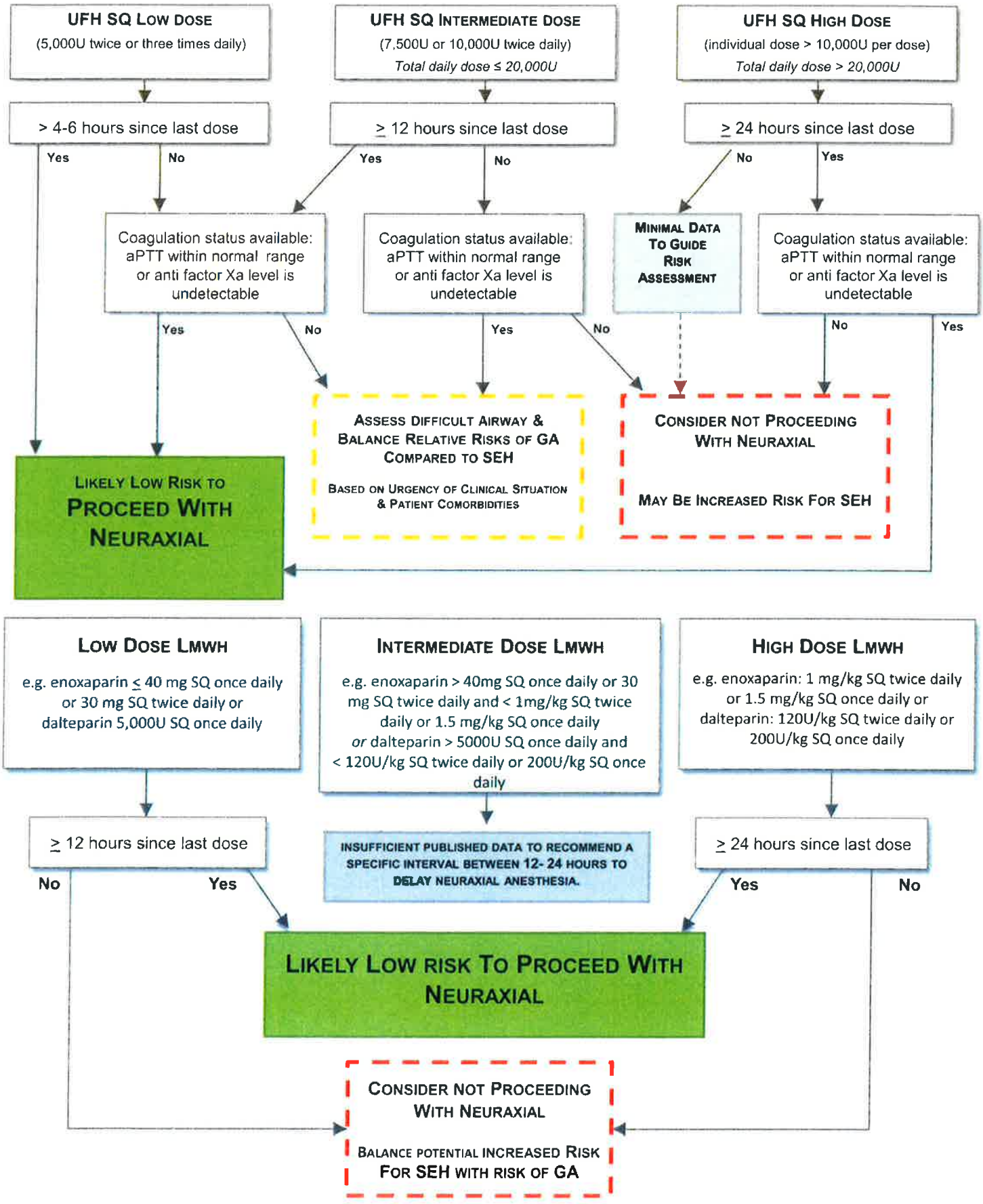
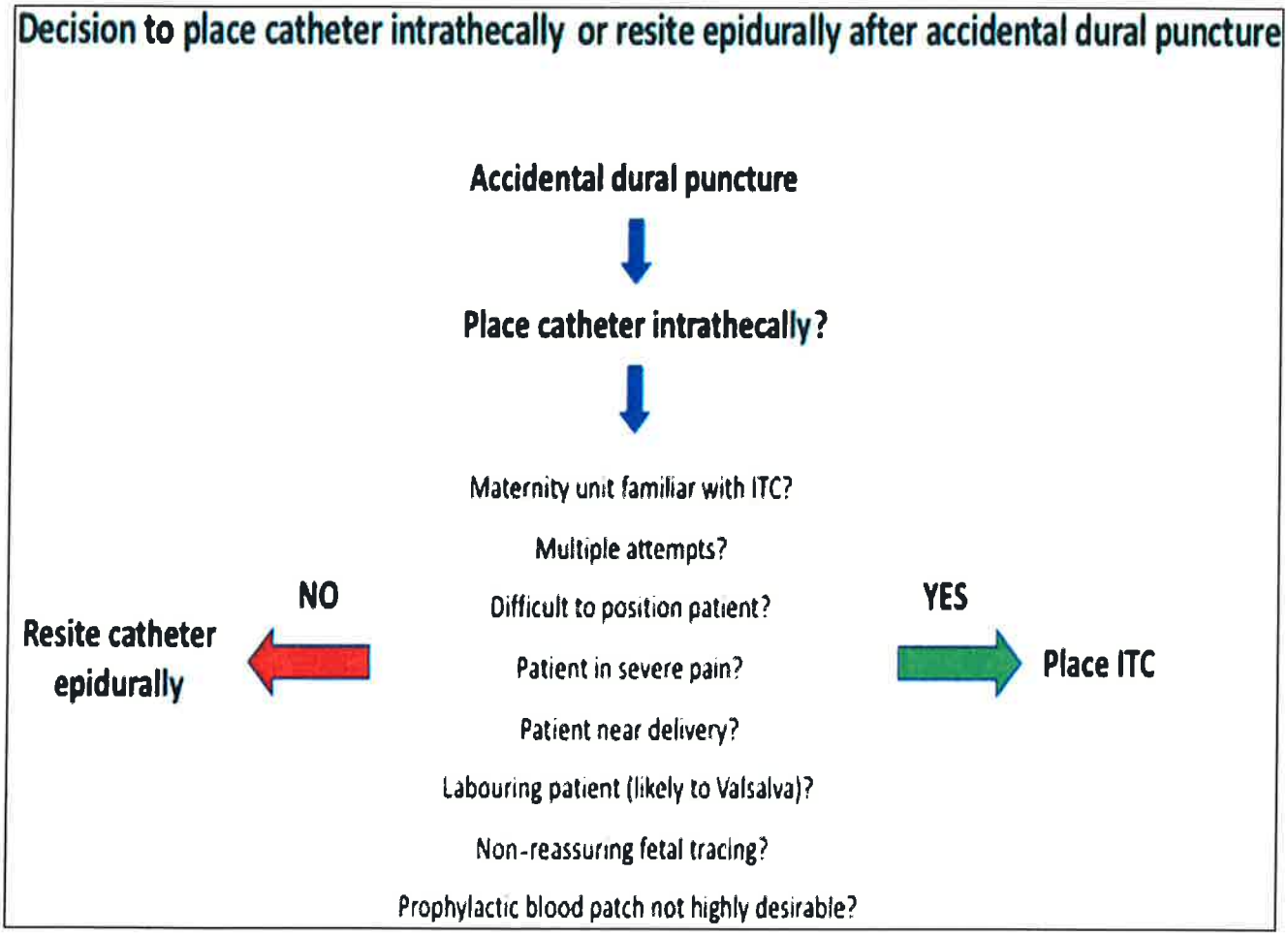
Appendix A


UFH SQ Low Dose
(5,000U twice or three times daily)
UFH SQ Intermediate Dose
(7,500U or 10,000U twice daily)
Total daily dose ≤ 20,000U
UFH SQ High Dose
(individual dose > 10,000U per dose)
Total daily dose > 20,000U
> 4-6 hours since last dose
≥ 12 hours since last dose
≥ 24 hours since last dose
Yes
No
Yes
No
No
Yes
Coagulation status available: aPTT within normal range or anti factor Xa level is undetectable
Coagulation status available: aPTT within normal range or anti factor Xa level is undetectable
Minimal Data To Guide Risk Assessment
Coagulation status available: aPTT within normal range or anti factor Xa level is undetectable
Yes
No
Yes
No
No
Yes
Likely Low Risk to Proceed With Neuraxial
Assess Difficult Airway & Balance Relative Risks of GA Compared to SEH
Based on Urgency of Clinical Situation & Patient Comorbidities
Consider Not Proceeding With Neuraxial
May Be Increased Risk For SEH
Low Dose LMWH
e.g. enoxaparin ≤ 40 mg SQ once daily or 30 mg SQ twice daily or dalteparin 5,000U SQ once daily
Intermediate Dose LMWH
e.g. enoxaparin > 40mg SQ once daily or 30 mg SQ twice daily and < 1mg/kg SQ twice daily or 1.5 mg/kg SQ once daily or dalteparin > 5000U SQ once daily and < 120U/kg SQ twice daily or 200U/kg SQ once daily
High Dose LMWH
e.g. enoxaparin: 1 mg/kg SQ twice daily or 1.5 mg/kg SQ once daily or dalteparin: 120U/kg SQ twice daily or 200U/kg SQ once daily
≥ 12 hours since last dose
Insufficient published data to recommend a specific interval between 12- 24 hours to delay neuraxial anesthesia.
≥ 24 hours since last dose
No
Yes
Yes
No
Likely Low Risk To Proceed With Neuraxial
Consider Not Proceeding With Neuraxial
Balance Potential Increased Risk For SEH with Risk of GA

Guidelines for Intrathecal Catheters in OB Patients

- Background
  - Intrathecal catheters (ITC) are a reliable and effective method for providing labor analgesia and surgical anesthesia
- Advantages and Disadvantages
  - Advantages- potential headache prevention, avoiding repeat attempts and further dural punctures, reliable block for labor analgesia and surgical anesthesia, faster onset
  - Disadvantages- theoretical risk of infection (no infections from ITC have been reported in OB literature), medications errors (e.g. overdosing→ high/total spinal), unfamiliarity with ITC
  - See below for decision chart regarding placement
- Safety
  - Identification- includes sign on door and HOB, clear labeling of catheter alerting all caregivers to presence of ITC
  - Infection prevention- using filters when drawing up medications and dosing through catheter, avoiding frequent disconnections of the catheter (top-ups may be given via the pump), using sterile technique if catheter disconnected for dosing and removal if concern for contamination
  - Education- educating nursing staff and obstetrician of presence of ITC



Moaveni D. Management of intrathecal catheters in the obstetric patient. BJA Educ. 2020;20(7):216-219.

Table 1 **Intrathecal catheter dosing for labour analgesia and surgical anaesthesia. Dilute local anaesthetic+opioid infusions commonly used for labour epidural analgesia may be used for intrathecal labour analgesia at reduced doses. Surgical anaesthesia is provided using typical bupivacaine concentrations with doses titrated to a T4 level.[1,9,10] Account for filter dead space (0.6–1 ml) and catheter dead space (0.2 ml) when bolusing medications.**

Labour analgesia	
Dosing technique	Medication
Initial	Bupivacaine 0.25% 0.5–1 ml (1.25–2.5 mg) + fentanyl 10–20 μg
Infusion only	Bupivacaine 0.05–0.125% + fentanyl 2–5 μg ml^{-1} Basal: 0.5–3 ml h^{-1} or Sufentanil 2.5–5 μg h^{-1}
Patient-controlled intrathecal analgesia	Bupivacaine 0.125% + fentanyl 2 μg ml^{-1} Basal: 1–2 ml h^{-1} Bolus: 1 ml Lockout: 20–30 min
Top ups	Bupivacaine 0.25% 0.5–2 ml (1.25–2.5 mg) with or without fentanyl 15–20 μg or Sufentanil 5 μg
Surgical anaesthesia	
Dosing	Medication
Initial	Fentanyl 15–20 μg Morphine 0.05–0.3 mg Bupivacaine plain 0.5%, 1 ml (5 mg) initial dose, and then titrate to desired level with additional 0.5 ml (2.5 mg) boluses or Bupivacaine hyperbaric 0.75%, 0.5 ml (3.75 mg) initial dose, and then titrate to desired level with additional 0.3 ml boluses
Subsequent intraoperative dosing	Bolus bupivacaine to maintain desired anaesthetic level and patient comfort