EMERGENCY MANUAL

OBSTETRIC ANESTHESIA

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MATERNAL CARDIAC ARREST

DIAGNOSIS

Pregnant + **NO Pulse**

START

CALL FOR CODE TEAM + CART  **BEGIN CPR**

IMMEDIATE

Position	⇒ Supine with back board under patient + perform manual left uterine displacement during CPR
AED	⇒ Place + assess rhythm
Airway	⇒ Place ETT + ventilate (confirm correct placement) 10 breaths/min with 100% oxygen
IV access	⇒ 2 large bore IVs, 16G (above level of diaphragm)
IO access	⇒ Humeral IO line (if no IV access)
Perimortem cesarean delivery (PMCD)	⇒ Confirm fundus is at or higher than the level of the umbilicus before proceeding ⇒ Prepare immediately at site of arrest ⇒ Alert NICU ⇒ Perform if no ROSC at 4 min from time of arrest
CPR	⇒ **100 compressions/min**; rotate compressors q2 min

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MATERNAL CARDIAC ARREST

BACK

TREATMENT

Defibrillate ⇒ **200 joules** (biphasic energy) if pulseless VT or VF

Drugs ⇒ **Epinephrine** 1 mg IV/IO q3-5 min
⇒ **Amiodarone** IV/IO 1st dose 300 mg bolus, 2nd dose 150 mg bolus

Repeat cycle until resuscitated
CPR + defibrillate (if pulseless VT/VF) q2 min + drugs

OTHER

Magnesium sulfate ⇒ If running Mg infusion, **STOP**
⇒ Administer 10% $CaCl_2$ 10 mL IV

Anesthetics ⇒ If running neuraxial/inhalation/IV medications, **STOP**

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MATERNAL CARDIAC ARREST

BACK

POTENTIAL FACTORS

Cross-check diagnosis with team

Anesthetic complications
- → High neuraxial block
- → Loss of airway
- → Aspiration
- → Respiratory depression
- → Hypotension
- → LAST

Bleeding
- → Coagulopathy
- → Uterine atony
- → Placenta accreta
- → Placental abruption
- → Placenta previa
- → Uterine rupture
- → Trauma
- → Surgical
- → Transfusion reaction

Cardiovascular causes
- → Cardiomyopathy
- → Myocardial infarction
- → Aortic dissection
- → Arrhythmia

Drugs
- → Anaphylaxis
- → Illicit drug use
- → Overdose (magnesium, opioid, insulin, or oxytocin)

Embolic
- → Pulmonary embolus
- → AFE
- → Air

Fever
- → Infection
- → Sepsis

General non-obstetric causes of cardiac arrest

Hs and Ts:
- → Hypoxia
- → Hypovolemia
- → Hypo/hyperkalemia
- → Hypo/hyperthermia
- → Hydrogen ions (acidosis)
- → Hypoglycemia
- → Tension pneumothorax
- → Tamponade
- → Toxins
- → Thromboembolism
- → Thrombosis (MI)
- → Trauma

Hypertension
- → Preeclampsia/eclampsia/HELLP
- → Intracranial bleed

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MATERNAL CARDIAC ARREST

BACK

FIND TREATABLE CAUSES

Cross-check diagnosis with team

Cardiac tamponade
Diagnosis:
→ Increased CVP, equalization of right and left-sided pressures
If suspected, consider:
→ TEE/TTE to rule out pericardial effusion
→ If present, perform peri cardiocentesis

Coronary thrombosis
If suspected, consider:
→ TEE
→ Emergent revascular ization: pharmacological or percutaneous (cath lab)
→ Intra-aortic balloon pump

Electrolyte abnormality
Rule out:
→ Hyperkalemia
→ Hypokalemia
→ Hypocalcemia
→ Acidosis
→ Hypoglycemia

Hypo/Hyperthermia
If <30C:
→ Rapid re-warming with warm IV fluids, peritoneal lavage, ECMO or CPB
If >40C:
→ Rule out malignant hyperthermia and treat if suspected

Hypovolemia
IV fluids → Rapid bolus
Hb/Hct → Evaluate
Blood → Consider transfusion

Hypoxia
If suspected, consider:
→ 100% oxygen, in OR rule out switched gas lines, use separate oxygen tank
→ Check connections, re-confirm ETT placement
→ Confirm bilateral breath sounds
→ Suction ETT
→ Rule out other causes with TEE/TTE

Pneumothorax
Diagnosis → Unilateral breath sounds, ↑ neck veins, trachea deviated from affected side (consider POCUS)
Needle decompression → Midclavicular line 2nd intercostal space, then place chest tube

Pulmonary thrombosis
If suspected, consider:
→ TEE/TTE to rule out right ventricular failure
→ Thrombolytic therapy, discuss risk/benefits with team

Toxins
Rule out:
→ Existing infusions (for neuraxial analgesia consider LAST (#13))
→ Prescriptions
→ Illicit drug use, syringe swaps or drug errors, poisoning
If suspected:
→ Contact poison control
→ Administer appropriate therapy or antidote

For a poison emergency in the US call 1-800-222-1222

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MATERNAL CARDIAC ARREST

BACK

VT/VF CONSIDERATIONS

Consider antiarrythmics ⇒ Amiodarone → 300 mg IV bolus or
⇒ Lidocaine → 100 mg IV bolus (do not administer if concern for LAST)

Hyperkalemia? ⇒ ABG → Evaluate potassium

Consider → 10% calcium chloride 10 mL IV (over 5-10 min, repeat if necessary)
Consider → Insulin 10 U IV bolus + glucose 40-60 g IV bolus
Consider → Albuterol inhaler (6-8 puffs/ETT)
pH <7.20 → Consider sodium-bicarbonate 8.4% 1-2 amps IV bolus

Hypomagnesemia or torsades? ⇒ Consider → magnesium sulfate 2 g IV (over 20 min)

TEAMWORK

Leader

Teamwork → Assign checklist reader + other roles
Open Exchange → Solicit information, ideas and input
Diagnosis/Plan → Cross check for other etiologies. Could this be anything else?
Plan & Thoughts → Share/restate aloud the treatment plan and priorities

Follower

Checklist → Obtain and read aloud
Concerns → Vocalize issues
Task → Focus on assigned task; inform leader of success/failure/issues
Communication → Confirm specific request, question for clarity and indicate completion

END

AMNIOTIC FLUID EMBOLISM

START

DIAGNOSIS

Triad
- → Hypoxia
- → Hypotension
- → Consumptive coagulopathy

Premonitory symptoms
- → Restlessness
- → Agitation

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Team leader → Identify

Airway → Clear?

Breathing → SpO_2 + RR
→ Auscultation

Circulation → HR + BP
→ Urine output

Conscious level → Adequate?

Position → Left uterine displacement

Fetal heart rate → Monitor

IV access → 2 large bore IVs, 16G

Invasive monitoring → Arterial line
→ Central line

Labs → CBC
→ Coag screen
→ Fibrinogen
→ BMP
→ ABG
→ TEG/ROTEM

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AMNIOTIC FLUID EMBOLISM

TREATMENT

Oxygen ⇨ 100% (10 L/min) via non-rebreather facemask or ETT

Hypotension ⇨ Cautious IV fluid bolus
⇨ Administer vasopressor boluses PRN
→ Phenyelphrine 100-200 mcg IV
→ Ephedrine 5-10 mg IV
→ Epinephrine 10-100 mcg IV
⇨ Consider vasopressor infusion
→ Epinephrine 0.01-0.1 mcg/kg/min IV
→ Norepinephrine 0.01-0.1 mcg/kg/min IV
→ Vasopressin 0.01-0.04 units/min IV

Coagulopathy ⇨ At risk for massive hemorrhage/DIC
→ Initiate MTP (#14) if symptoms of DIC or ongoing hemorrhage (#8) and/or atony, (#25)
→ Early administration of PRBCs, FFP, Plts, cryoprecipitate or fibrinogen concentrate (if indicated)
→ Consider tranexamic acid 1 g IV (over 10 min)

Emergent delivery ⇨ Consider

Additional treatments ⇨ Consider hydrocortisone 100 mg IV bolus
⇨ Iloprost 2.5 mcg NEB for pulmonary vasoconstriction

OTHER

1. Definitive airway: Intubate if developing hypoxia/pulmonary edema
2. Invasive monitoring: Place arterial line, consider central line
3. EKG, CXR , TEE/TTE
4. ICU consult
5. Consider ECMO or balloon pump in patients with severe left ventricular failure

DDX

1. Anaphylaxis
2. Sepsis
3. Hemorrhage
4. Embolism (PE, air)
5. Eclampsia
6. Medication reaction (LAST)
7. MI

END

ANAPHYLAXIS

START

DIAGNOSIS

- Hypoxemia
- Bronchospasm
- Tachypnea
- Angioedema
- Hypotension
- Tachycardia
- Rash

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

- **Team leader** → Identify
- **Airway** → Clear/edematous?
- **Breathing** → SpO_2 + RR
  → Auscultation
- **Circulation** → HR + BP
- **Position** → Left uterine displacement
- **IV access** → 2 large bore IVs, 14-16G
- **Labs** → Tryptase
  → CBC
  → BMP
  → ABG
  → Glucose
- **Remove potential allergens** → Latex
  → Antibiotics
  → Blood/colloids
  → Contrast
  → Muscle relaxants
  → Skin preparation solution

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ANAPHYLAXIS

TREATMENT

Oxygen ⇒ 100% (10 L/min) via non-rebreather facemask

IV fluids ⇒ Bolus 1-2 L crystalloid (rapidly infuse)

Epinephrine
- ⇒ 10-100 mcg IV bolus
- ⇒ Increase + repeat until BP + bronchoconstriction improves
- ⇒ Consider epinephrine infusion (0.01-0.1 mcg/kg/min) IV

Treat broncho-constriction
- ⇒ Albuterol MDI 2 puffs (180 mcg)
- ⇒ Diphenhydramine 50 mg IV bolus
- ⇒ Ranitidine 50 mg IV bolus
- ⇒ Hydrocortisone 100 mg IV bolus

OTHER

Continuous airway assessment ⇒ Place definitive airway if developing angioedema

Invasive monitoring ⇒ Place arterial line, consider central line

Vasopressor infusions for cardiovascular support
- ⇒ Epinephrine 0.01-0.1 mcg/kg/min IV
- ⇒ Vasopressin 0.01-0.04 units/min IV

Fetal heart rate ⇒ Monitor

Escalation of care ⇒ Consider ICU consult

END

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BRONCHOSPASM

DIAGNOSIS

Hypoxia
Cyanosis
Wheezing
Tachypnea
Dyspnea
Use of accessary muscles

START

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

- **Team leader** ⇒ Identify
- **Airway** ⇒ Clear?
- **Breathing** ⇒ SpO_2 + RR
  ⇒ Auscultation
  ⇒ ABG
- **Circulation** ⇒ HR + BP
- **Position** ⇒ Left uterine displacement
- **IV access** ⇒ 2 large bore IVs, 16G

TREATMENT

- **Oxygen** ⇒ 100% (10 L/min) via non-rebreather facemask or ETT
- **Nebulizer** ⇒ Albuterol 2.5 mg + ipratropium bromide 0.5 mg
- **Steroids** ⇒ Methylprednisolone 40-80 mg IV bolus **or**
  ⇒ Hydrocortisone 100 mg IV bolus
- **Epinephrine** ⇒ 1 mg NEB
  ⇒ 10-100 mcg IV bolus PRN
  ⇒ 0.01-0.1 mcg/kg/min IV infusion

OTHER

1. CXR
2. Magnesium sulfate 2 g IV (over 20 min)
3. Consider non-invasive ventilation
4. Consider heliox
5. If remains hypoxic, or impending respiratory failure, or in "Status Asthmaticus" proceed with invasive ventilation
6. In asthma avoid: Prostaglandins, carboprost, sulfite, aspirin, NSAIDs

DDX

1. Cardiac failure
2. AFE (#2)
3. Anaphylaxis (#3)

END

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DEPRESSED CONSCIOUS LEVEL

DIAGNOSIS

Altered mental status — **GCS <15**

START

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

- **Airway** → Clear?
- **Breathing** → SpO_2 + RR
- **Circulation** → HR + BP
- **Position** → Left uterine displacement
- **IV access** → 2 large bore IVs, 16G
- **Conscious level** → Assess GCS
  → Assess pupil size + reaction
- **Temperature** → Check
- **Check labs** → CBC
  → Glucose
  → BMP
  → Ammonia
  → Magnesium
  → ABG
- **Screen** → Urine toxicology
  → Cultures
  → Viral screen
- **Fetal heart rate** → Monitor

TREATMENT

→ If GCS ≤8 - RSI + intubate
→ Stop IV infusions of magnesium or other sedating drugs
→ If blood glucose level low - see Maternal Hypoglycemia (#10)
→ Neuro/ICU consult
→ Neuro imaging
→ Consider lumbar puncture (if no signs of ↑ ICP)
→ Consider arterial line

DDX

1. Postictal
2. Infection
3. Drug effect
4. CVA
5. Trauma
6. Electrolyte abnormality
7. Psychiatric etiology

END

DIFFICULT AIRWAY

START

DIAGNOSIS

Failure to intubate → Unable to see cords or pass the ETT into trachea

CALL FOR HELP, DIFFICULT AIRWAY CART

CP

Consider releasing cricoid pressure (CP)

→ Try to improve view with external laryngeal manipulation

OPTIONS

Sniffing position	Optimize
Airway	Mask ventilate with 100% oxygen ± CP
Laryngoscope blade	Consider changing type/ size of blade for 2nd attempt
ETT size	Consider using smaller size (6.0 mm) + use bougie/ stylet
Advanced airway device	Consider using LMA (Pro-seal or classic) or supra-glottic airway (SGA) device
Video laryngo-scope device	Consider using.
Prepare	Prepare for surgical airway (tracheostomy)

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DIFFICULT AIRWAY

If second intubation attempt fails

Insert oropharyngeal airway and perform 2-handed facemask ventilation.

If experienced provider, attempt 3rd intubation

PLACE SGA

If you cannot oxygenate the patient

→ Release CP

→ Place SGA device, such as LMA (ProSeal or classic)

→ Consider: Intubating LMA

→ Awaken patient

OTHER

If you cannot ventilate the patient

Surgical help ⇒ Call for

Alternative airway ⇒ Attempt:
- ⇒ Transtracheal jet ventilation
- ⇒ Percutaneous cricothyrotomy
- ⇒ Surgical cricothyrotomy
- ⇒ Tracheostomy

Patient ⇒ Awaken

SUCCESS

If ventilation is succesful

→ Assess maternal/fetal status and consider continuing surgery with SGA device or facemask ventilation

→ Consider other options: awaken patient, perform awake fiberoptic intubation, perform neuraxial anesthesia, delay surgery, awaken patient

→ If ventilation becomes inadequate, resume from top of page

END

DKA IN PREGNANCY

START

DIAGNOSIS

Type I Diabetes

Symptoms
- → Polyuria
- → Polydipsia
- → Nausea
- → Vomiting
- → Abdominal pain

Signs
- → Hyperventilation
- → Tachycardia
- → Hypotension
- → Altered mental status

Diagnostic Criteria

- ⟶ Glucose **>250 mg/dL**
- ⟶ pH **<7.3**
- ⟶ Bicarbonate **<18 mEq/L**
- ⟶ Ketonuria

CALL FOR HELP

IMMEDIATE

Airway	➔	Adequate?
Breathing	➔	SpO_2 + RR
Circulation	➔	HR + BP
Oxygen	➔	100% (10 L/min) via non-rebreather facemask
IV access	➔	2 IVs, 18G
Labs	➔	Glucose ➔ BMP ➔ ABG ➔ Serum ketones ➔ Lactate ➔ CBC ➔ Urinalysis
Position	➔	Left uterine displacement
Fetal heart rate	➔	Monitor
If arrhythmia	➔	12-lead EKG

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DKA IN PREGNANCY

TREATMENT

1. Fluid replacement: 1-2 L saline in 1st hour
→ Initiate 0.45% saline at 250-500 mL/hr
→ When serum glucose <250 mg/dL -> 0.45% saline with 5% dextrose 250 mL/hr

2. Initiate regular insulin infusion if potassium is >3.3 mEq/L
→ 0.1 U/kg IV bolus regular insulin over 5 min
→ Regular insulin infusion 0.1 U/kg/hr IV -> if serum glucose does not decrease by 50 mg/dL in 1st hr, double IV insulin infusion rate
→ When serum glucose <200 mg/dL, decrease insulin rate to 0.05 U/kg/hr IV

3. Consider bicarbonate replacement in severe maternal acidosis pH <7.0
→ 50 mEq sodium bicarbonate in 500 mL 0.45% saline with 20 mEq of potassium IV over 2 hours

4. Aggressive electrolyte replacement
→ Follow potassium, magnesium, phosphorous

5. Workup for precipitating factors
→ Infection
→ Hyperemesis
→ Non-compliance etc.

END

MATERNAL HEMORRHAGE

START

DIAGNOSIS

Antepartum

Intrapartum

Postpartum
→ EBL ≥1000 mL post-vaginal delivery
→ EBL ≥1000 mL post-cesarean delivery

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

- **Airway** → Adequate?
- **Breathing** → SpO_2 + RR
- **Circulation** → HR + BP
  → Capillary refill
  → Urine output
- **Conscious level** → Adequate?
- **Monitor** → Vital signs q1-2 min (until stable)
- **IV access** → 2 large bore IVs, 16G
- **IO access** → Consider humeral IO line (if no IV access)
- **Labs** → Stat CBC
  → Coag screen
  → Fibrinogen
  → ABO/T+C
  → ABG
  → Calcium
  → Lactate
  → TEG/ROTEM
  Monitor (if indicated)

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MATERNAL HEMORRHAGE

TREATMENT

Immediate (0-5 min)

→ Oxygen: 100% 10 L/min via non-rebreather facemask

→ Fluids: Bolus 1-2L IV crystalloid (see Maternal Hypotension, #8)

→ Activate MTP (see Massive Transfusion Protocol, #14)

→ Transfuse blood products (if indicated MTP or type-specific units (time-dependent))

→ Identify cause
- → Atony
- → Laceration
- → Retained placenta
- → Coagulopathy
- → Uterine inversion (see Uterine inversion, #26)

→ Treat cause
- → Fundal massage
- → Administer uterotonic(s) (see Uterine Atony, #25)
- → Tamponade: Packing, Bakri balloon
- → Surgery: B-Lynch suture, vessel ligation/ hysterectomy

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END

MATERNAL HEMORRHAGE

TREATMENT

Phase 1 (5-10 min):

→ Recap
→ Assess EBL/QBL
→ Use a rapid-infusor device
→ Consider early administration of cryoprecipitate or fibrinogen concentrate (see MTP, #14)

Phase 2 (10-20 min):

→ Consider antifibrinolytic therapy

→ Tranexamic acid 1 g IV bolus (over 10 min, repeat dose if no response) + 1 mg/kg/hr infusion

→ Early transfer to OR (if bleeding is ongoing) or IR (if bleeding ongoing and patient stable)

→ Maintain normothermia

→ Treat hypocalcemia

Phase 3 (severe refractory):

→ Consider prothrombotic therapy (if life threatening and no evidence of AFE or circulating tissue factors)

→ Factor VIIa 40 mcg/kg IV bolus (repeat dose after 15 min if indicated)

CONSIDER

1. Invasive monitoring: Place arterial line, consider central line (large bore)
2. TEE/TTE
3. General anesthesia
4. Hematology consult
5. ICU consult
6. Check Plts/coag screen prior to removal of epidural catheter (if indicated)

END

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MATERNAL HYPERTENSION

START

DIAGNOSIS

Acute-onset, severe hypertension:

SBP ≥**160** or DBP ≥**110 mm Hg**

(elevated for ≥15 min)

Preeclampsia: SBP ≥140 mm Hg or DBP ≥90 mm Hg

** Committee Opinion No. 767. American College of Obstetricians and Gynecologists. Obstet Gynecol 2019;133:e174-80*

CALL FOR HELP

IMMEDIATE

- **Team leader** → Identify
- **Airway** → Adequate?
- **Breathing** → SpO_2 + RR
  - → Auscultation
- **Circulation** → HR + BP
  - → Consider arterial line if obese or very high BP for accuracy
  - → Urine output
- **Conscious level** → Adequate?
- **Position** → Left uterine displacement
- **IV access** → 2 IVs, 18G
- **Fetal heart rate** → Monitor
  - → CBC
  - → BMP
  - → LFTs
  - → Coag screen (if abnormal LFTs or thrombocytopenia)
  - → 24 hr urine protein
  - → Urine protein:creatinine

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MATERNAL HYPERTENSION

TREATMENT

Pain related? Yes
→ Administer PO, IV or neuraxial (if indicated) analgesia

Pain related? No
→ Treat for preeclampsia + administer 1st-line antihypertensive medication within 30–60 min; **select 1 chain below**:

1) Labetalol 20 mg IV bolus
→ Repeat BP in **10 min**, if elevated administer **labetalol 40 mg IV bolus**
→ Repeat BP in **10 min**, if elevated administer **labetalol 80 mg IV bolus**
→ Repeat BP in **10 min**, if elevated administer **hydralazine 10 mg IV bolus**
→ Repeat BP in **20 min**, if elevated obtain anesthesia consult

2) Hydralazine 5-10 mg IV bolus
→ Repeat BP in **20 min**, if elevated administer **hydralazine 10 mg IV bolus**
→ Repeat BP in **20 min**, if elevated administer **labetalol 20 mg IV bolus**
→ Repeat BP in **10 min**, if elevated administer **labetalol 40 mg IV bolus** and obtain anesthesia consult

3) Nifedipine 10 mg PO
→ Repeat BP in **20 min**, if elevated administer **nifedipine 20 mg PO**
→ Repeat BP in **20 min**, if elevated administer **nifedipine 20 mg PO**
→ Repeat BP in **20 min**, if elevated administer **labetalol 20 mg IV bolus** + obtain anesthesia consult

2nd-line antihypertensive medication
→ Esmolol infusion 0.05-0.3 mg/kg/min IV
→ Nicardipine infusion 5-15 mg/hr IV

Extreme emergency
→ Sodium nitroprusside infusion 0.1-1 mcg/kg/min IV

Committee Opinion No. 767. American College of Obstetricians and Gynecologists. Obstet Gynecol 2019;133:e174–80

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MATERNAL HYPERTENSION

PROPHYLAXIS

Magnesium sulfate
→ Administer for seizure prophylaxis: 4–6 g IV (over 20 min) + 1–2 g/hr IV infusion (monitor serum levels)

DDX

1. Preeclampsia (with or without severe features*)
2. Preeclampsia superimposed on chronic HTN
3. Gestational HTN
4. Chronic (essential) HTN
5. HTN crisis (≥180/120 mm Hg)
6. Acute pain
7. CVA -> Refer to neurology if suspected

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*Severe features

1. SBP ≥160 mm Hg or DBP ≥110 mm Hg on two occasions, 4 hr apart
2. Thrombocytopenia (<100,000/uL)
3. Elevated liver enzymes (2x normal range), RUQ or epigastric pain
4. Creatinine >1.1 mg/dL or 2x normal value
5. Pulmonary edema
6. New-onset cerebral or visual disturbances

END

Executive summary: hypertension in pregnancy. American College of Obstetricians and Gynecologists. Obstet Gynecol 2013;122:1122-31

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MATERNAL HYPOGLYCEMIA

START

DIAGNOSIS

Blood sugar **<60 mg/dL**

OR

Symptoms of hypoglycemia (regardless of blood sugar level)
and suspect if patient taking insulin/ hypoglycemic medication(s)

→ Tremor
→ Anxiety
→ Irritability
→ Tachycardia
→ Diaphoresis

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Airway ⇒	Clear
Breathing ⇒	SpO_2 + RR
Circulation ⇒	HR + BP
Temperature ⇒	Assess
Conscious level ⇒	Assess
IV access ⇒	18G
Stat finger stick ⇒	Obtain
Serum blood sugar ⇒	Obtain

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MATERNAL HYPOGLYCEMIA

TREATMENT

If blood sugar <60 mg/dL (conscious + eating)
→ Treat with 8 oz milk, 4 oz juice, or 3 glucose tablets
→ Recheck blood sugar within 15 min, if blood sugar <60 mg/dL, repeat previous step
→ Recheck blood sugar every 15 min until blood sugar >60 mg/dL (x2)

If blood sugar <60 mg/dL (conscious + NPO)
→ If on insulin drip, stop infusion
→ Maintain dextrose 5% in Lactated Ringer's solution at 125 mL/hr
→ Recheck blood sugar every 15 min until blood sugar >60 mg/dL (x2)

If blood sugar <50 mg/dL (conscious)
→ Give 3 glucose tabs
→ Recheck blood sugar every 15 min until blood sugar >60 mg/dL (x2)

If the patient is unconscious
→ If on insulin drip, stop infusion
→ Obtain stat finger stick and serum blood glucose
→ Administer 50% dextrose 50 mL IV
→ If no IV access, administer glucagon 1 mg IM

DDX

1. Diabetes mellitus, incorrect insulin dosage
2. Acute fatty liver of pregnancy (AFLP)
3. Insulinoma

END

MATERNAL HYPOTENSION

START

DIAGNOSIS

Systolic Blood Pressure

<100 mm Hg OR **20-30%** decrease below baseline

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Team leader	Identify
Airway	Clear?
Breathing	SpO_2 + RR Auscultation
Circulation	HR + BP Capillary refill Urine output
Conscious level	Adequate?
IV access	2 large bore IVs, 16G (above level of diaphragm)
IO access	Humeral IO, if no IV access
Labs	CBC, ABO/T+C, coag screen, fibrinogen, lactate
Position	Left uterine displacement Consider passive leg raise, Trendelenburg, left lateral pos.
Fetal heart rate	Monitor
Medication(s)	STOP or decrease (e.g. epi-dural infusion, Mg, oxytocin infusion as indicated)

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MATERNAL HYPOTENSION

TREATMENT

Oxygen ⇨ 100% (10 L/min) via non-rebreather facemask

IV fluid bolus ⇨ 500-1000 mL IV crystalloid (pressurized)
Repeat, consider albumin/colloid if no immediate response

Vasopressors ⇨ **HR >40 bpm**
→ **Phenylephrine** 100-200 mcg IV bolus
⇨ **HR <40 bpm**
→ **Ephedrine** 5-10 mg IV bolus or
Glycopyrrolate 100-200 mcg IV bolus
⇨ **HR <40 bpm, and hypotensive after spinal anesthetic**
→ Consider Bezold-Jarisch reflex
→ Fluids, left uterine displacement, passive leg raise, Trendelenburg, left lateral position
→ **Phenylephrine** 100-200 mcg IV bolus
→ **Atropine** 0.1-0.2 mg IV bolus
→ **Ephedrine** 5-10 mg IV bolus
→ **Epinephrine** 10-100 mcg IV bolus

Epinephrine ⇨ **10-100 mcg IV bolus prn** if no immediate response or severe refractory hypotension

Vasopressor infusion ⇨ **Phenylephrine** 0.5-1 mcg/kg/min IV
⇨ **Norepinephrine** 0.01-0.1 mcg/kg/min IV
⇨ **Epinephrine** 0.01-0.1 mcg/kg/min IV

Blood transfusion ⇨ If hemorrhage suspected

CONSIDER

1. Inadequate left uterine displacement
2. Vasodilation (sympathectomy) from epidural or spinal
3. Hemorrhage (see #8)
4. Dehydration
5. LAST (see #13)
6. Anaphylaxis (see #3)
7. AFE (see #2)
8. Cardiac event: MI, cardiac failure

END

MATERNAL HYPOXIA

START

DIAGNOSIS

PaO_2 <80 mm Hg (on room air) **or** **$SaO_2 \leq 94\%$** (on room air)

IMMEDIATE

Airway	⇒	Clear?
Breathing	⇒	SpO_2 + RR
Circulation	⇒	Auscultation
	⇒	HR + BP
IV access	⇒	2 IVs, 18G
Fetal heart rate	⇒	Monitor
Labs	⇒	ABG, CBC
Other	⇒	POCUS, TTE

TREATMENT

Oxygen	⇒	100% (10 L/min) via non-rebreather facemask
Respiratory therapy	⇒	If indicated
Non-invasive ventilation	⇒	Consider (CPAP or BiPAP)
Intubation + mechanical ventilation	⇒	Consider (with PEEP)
Administer	⇒	Bronchodilators
	⇒	Antibiotics (if indicated)
	⇒	Steroids
	⇒	Diuretics (if indicated)
Reversal agent	⇒	Administer if secondary to drug effect, e.g. opioids

Continued on next page

MATERNAL HYPOXIA

OTHER

Patient's torso ⇛ Elevate (avoid supine position)

DDX

Hypoventilation
→ Drugs: narcotics, benzodiazepines, resid. muscle blockade

→ Other: obesity, high neuraxial block

VQ mismatch
→ Atelectasis, aspiration, bronchospasm, pulm edema, pleural effusion, mucus plug, emb. (air/blood/amniotic fluid), pneumothorax, pulm htn

Right-to-left shunt
→ Anatomic (intracardiac, AVMs), physiologic shunts (pneumonia, ARDS)

Impaired diffusion
→ Interstitial lung disease

Reduced inspired oxygen tension
→ Altitude

END

LOCAL ANESTHETIC SYSTEMIC TOXICITY

START

DIAGNOSIS

Central Nervous System
- → Tinnitus
- → Metallic taste
- → Dizziness
- → Confusion
- → Seizures

Cardiovascular System
- → Bradycardia
- → Tachycardia
- → Hypotension
- → Hypertension
- → Arrthymias

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Epidural injection and/or infusion	➔	Stop
Team leader	➔	Identify
Airway	➔	Clear?
Breathing	➔	SpO_2 + RR
Circulation	➔	HR + BP
IV access	➔	2 large bore IVs, 16G
Position	➔	Left uterine displacement

Continued on next page

LOCAL ANESTHETIC SYSTEMIC TOXICITY

TREATMENT

1. Oxygen
→ 100% (10 L/min) via non-rebreather facemask

2. 20% Fat emulsion (immediate)
→ 1.5 mL/kg IV bolus + 0.25 mL/kg/min IV infusion
→ Repeat bolus x 1-2 if persistent CVS collapse
→ Increase infusion rate to 0.5 mL/kg/min IV if BP remains low
→ Continue infusion for at least 10 min after CVS stable

3. Seizing?
→ Midazolam 1–2 mg IV bolus or Lorazepam 4 mg IV bolus

4. Cardiac arrest
→ Start CPR (see #1) and immediately give 20% fat emulsion IV (if not al ready)
→ May require prolonged CPR (>1 hr)
→ Use reduced epinephrine doses (10-100 mcg IV bolus) initially
→ Avoid lidocaine and vasopressin
→ Consider CPB/ECMO

OTHER

Definitive airway ⇒ Intubate if altered mental status or hemodynamic instability

Invasive monitoring ⇒ Consider arterial line, central line

Perimortem cesarean delivery (PMCD) ⇒ Consider in cardiac arrest

END

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MASSIVE TRANSFUSION PROTOCOL

DIAGNOSIS

Maternal hemorrhage
→ Antepartum
→ Intrapartum
→ Postpartum

Stanford MTP contains
→ 6 RBC units
→ 4 FFP units
→ 1 plts (6 pooled units)

START

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

1. Activate MTP
→ Closed loop verbal communication to nurse
→ Or, activate in electronic medical record
→ Nurse to call Blood Bank (# on back cover) to activate MTP
→ Send runner to blood bank with a patient sticker

2. Send blood sample for ABO typing (prior to administering MTP)

3. Refer to Maternal Hemorrhage (#8) for other on-going management

TREATMENT

1. Transfuse (MTP or type-specific units) in the ratio of
→ 6 PRBCs
→ 4 FFP
→ 1 Plts (6 pooled units)

2. Replace fibrinogen early if coagulopathy suspected or fibrinogen <200 mg/dL
→ Cryoprecipitate (takes 45 min to thaw) or
→ Administer RiaSTAP® (fibrinogen concentrate 1-2 g IV over 10 min), (swirl, do not shake) reconstitute in 50 mL sterile water

3. Labs
→ CBC
→ Coag screen
→ Fibrinogen
→ TEG/ROTEM
→ ABG
→ Calcium
→ Lactate

OTHER

→ Always stay ahead with availability of at least one full MTP

→ Once patient is stable and no further need for transfusion, return un-used units to blood bank

END

PLACENTAL ABRUPTION

START

DIAGNOSIS

→ Vaginal bleeding (not in all cases)
→ Abdominal pain +/- back pain
→ Preterm labor
→ Fetal heart rate abnormalities
→ Maternal hypotension

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Team leader ⇒ Identify

Airway ⇒ Clear?

Breathing ⇒ SpO_2 + RR
⇒ Auscultation

Circulation ⇒ HR + BP

Conscious level ⇒ Adequate?

IV access ⇒ 2 large bore IVs, 16G

Labs ⇒ CBC
⇒ Coag screen
⇒ Fibrinogen
⇒ T+C
⇒ TEG/ROTEM

Position ⇒ Left uterine displacement

Fetal heart rate ⇒ Monitor

Invasive monitoring ⇒ Consider arterial line

Continued on next page

PLACENTAL ABRUPTION

TREATMENT

→ See Maternal Hypotension, aid #11

→ May need to proceed with cesarean delivery (use neuraxial anesthesia after confirming no DIC)

OTHER

→ Vital signs can be inconsistent with the amount of blood that is visible as it may be concealed (retro-placental hematoma)

→ Delivery management or expectant management depending on maternal + fetal status

→ Risk of DIC + fetal demise

→ Can be acute or chronic

DDX

1. Labor
2. Placenta previa
3. Uterine rupture
4. Subchorionic hematoma

END

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PLACENTA ACCRETA

DIAGNOSIS

→ Placenta accreta

→ Placenta increta

→ Placenta percreta

START

IMMEDIATE

Multidisciplinary team meeting
→ OB/MFM/GYN-ONC/ANES/NICU/Blood bank

Discuss anesthetic plan with patient
→ Neuraxial (CSE), GA, or combination

TREATMENT

→ 2 large bore IVs, 14-16G

→ Awake pre-induction arterial line

→ RIC or central line (large bore)

→ 1-2 MTP , fibrinogen concentrate, tranexamic acid, calcium chloride (in OR prior to start)

→ Rapid infuser connected to large bore PIV or central line

→ Uterotonics (in OR prior to start): oxytocin, methylergonovine, carboprost, misoprostol

→ Forced-air warming

→ See General Anesthesia (#27) if indicated

→ See Maternal Hemorrhage (#8) if indicated

OTHER

Discuss need for IR pre-op
→ Uterine artery balloons

Consider cell saver

Have vasopressors prepared in OR
→ Phenylephrine
→ Norepinephrine
→ Epinephrine
→ Consider TEE/TTE to guide resuscitation

Turn off oxytocin after uterine arteries are clamped/tied
→ Hysterectomy

Consider ICU admission post-op

Check Plts/coag screen prior to epidural catheter removal
→ If applicable

END

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PROLAPSED UMBILICAL CORD

DIAGNOSIS

Prolapsed umbilical cord (visual or palpable) following
→ SROM
→ AROM
→ Delivery of Twin A

START

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

OB team ⇒ Continuous fetal monitoring
⇒ Relieve compression on the umbilical cord by manually elevating the presenting part of the fetus until delivery + continuously monitor fetal heart rate

IV access ⇒ 18G

Immediate surgery ⇒ Prepare for stat cesarean delivery (see Stat Cesarean Delivery, #21)

TREATMENT

If fetal compromise
→ Administer GA (see General Anesthesia, #27)

If no fetal compromise (discuss with OB)
→ Administer neuraxial anesthesia with continuous decompression of the umbilical cord + continuous monitoring of the fetal heart rate
→ Single-shot spinal in lateral position, or
→ CSE in lateral position, or
→ Dose in-situ epidural catheter in supine position with left uterine displacement
→ Abandon neuraxial technique and proceed with general anesthesia if fetal heart rate changes indicate

END

MATERNAL SEIZURE

START

DIAGNOSIS

Pregnant or Postpartum + **Seizure**

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

- **Team leader** ⇒ Identify
- **Airway** ⇒ Clear?
- **Breathing** ⇒ SpO_2 + RR
- **Circulation** ⇒ HR + BP
- **Position** ⇒ Left uterine displacement
- **IV access** ⇒ 18G

TREATMENT

→ 100% (10 L/min) oxygen via non-rebreather facemask

→ Open airway maneuvers

→ Trendelenburg with lateral tilt

→ Protect limbs

→ Midazolam 2 mg IV bolus or lorazepam 4 mg IV bolus if seizure not self-terminating

→ Consider propofol 20-40 mg IV bolus if seizure not self-terminating (anesthesiologists only)

→ If Ddx Eclampsia: Administer magnesium sulfate 4-6 g (loading dose over 20 min) + 1-2 g/hr IV infusion (if already receiving magnesium, administer 2nd loading dose of 2 g IV (over 3-5 min))

→ Monitor fetal heart rate

Continued on next page

MATERNAL SEIZURE

OTHER

Induction of GA + intubation ⇒ Consider if:
→ Non-terminating seizure
→ Risk of aspiration
→ Hypoxic
→ Remains unconscious post-seizure

Antihypertensive medications ⇒ Consider (see Maternal Hypertension, #9)

Labs ⇒ CBC
⇒ LFTs
⇒ BMP
⇒ Glucose
⇒ Magnesium (if on infusion)
⇒ Toxicology screen

Delivery of fetus ⇒ Consider if prolonged fetal bradycardia after termination of seizure

DDX

1. Eclampsia
2. Epilepsy
3. Pseudo-seizure
4. Hypoxia
5. Hypoglycemia
6. CVA
7. AFE
8. Medication cause (LAST, drug error, substance abuse)

END

MATERNAL SEPSIS

START

DIAGNOSIS

- → Hypothermia
- → Tachycardia
- → Hypotension
- → Hypoxia
- → Tachypnea
- → Diaphoresis
- → Oliguria
- → Altered mental status

CALL FOR HELP

IMMEDIATE

- **Team leader** ⇒ Identify
- **Airway** ⇒ Clear?
- **Breathing** ⇒ SpO_2 + RR
  ⇒ Auscultation
- **Circulation** ⇒ HR + BP
  ⇒ Capillary refill
  ⇒ Urine output
- **IV access** ⇒ 2 large bore IVs, 16G
- **Position** ⇒ Left uterine displacement
- **Labs** ⇒ Lactate
  ⇒ CBC
  ⇒ BMP
  ⇒ Glucose
  ⇒ Coag screen
  ⇒ ABG
  ⇒ CRP
- **Obtain cultures (as appropriate)** ⇒ Blood
  ⇒ Urine
  ⇒ Sputum
  ⇒ CSF
  ⇒ Wound
  ⇒ Stool

Continued on next page

MATERNAL SEPSIS

TREATMENT

Respiratory support

→ Oxygen: 100% (10 L/min) via non-rebreather facemask
→ Consider non-invasive ventilation (CPAP or BiPAP)
→ Consider invasive ventilation if respiratory failure

Hemodynamic support (Crit Care Med 2017;45:486-552)

→ Volume resuscitation: 30 mL/kg crystalloid in 1st 3 hr (if hypotensive or lactate ≥4 mmol/L)
→ Consider albumin infusion or blood transfusion
→ Vasopressor infusion if MAP <65 mm Hg despite fluid resuscitation:
  → Norepinephrine 0.01-0.1 mcg/kg/min IV
  → Epinephrine 0.01-0.1 mcg/kg/min IV

Administer broad spectrum antibiotics within 1 hr of diagnosis of sepsis

→ Obtain blood cultures (x2) prior to administration of antibiotics (plus other cultures as indicated)
→ Consult local protocols and consider the most likely source, examples include:
  → Piperacillin/tazobactam + vancomycin
  → If patient has a penicillin allergy, substitute piperacillin/tazobactam with gentamicin + clindamycin

OTHER

→ Monitor fetal heart rate

→ Consider arterial line + central line for monitoring or if inotropic support required

→ Consider corticosteroids for refractory septic shock: hydrocortisone 50 mg IV bolus q6 hr

DDX

1. Sepsis
2. Septic shock
3. AFE
4. Hemorrhagic shock
5. Cardiogenic shock
6. Anaphylactic shock

END

HYPOTENSION AFTER NEURAXIAL ANESTHESIA

START

DIAGNOSIS

After neuraxial anesthesia block or bolus

→ Rapid rise in sensory blockade
→ Numbness and/or motor weakness in upper limbs
→ Hypotension: 20-30% decrease in SBP below baseline or SBP <100 mmHg
→ Bradycardia (may be preceded by tachycardia)
→ Vocal changes
→ Dyspnea -> apnea
→ Altered mental status -> unconsciousness
→ Cardiac arrest

CALL FOR HELP  OB RAPID RESPONSE

IMMEDIATE

Team leader	⇒	Identify
Airway	⇒	Clear?
Breathing	⇒	SpO_2 + RR + auscultation
Circulation	⇒	HR + BP
Conscious level	⇒	Adequate?
IV access	⇒	2 IVs, 18G
Position	⇒	Left uterine displacement, passive leg raise, Trendelenburg, left lateral position
Fetal heart rate	⇒	Monitor

TREATMENT

Oxygen ⇒ 100% (10 L/min) via non-rebreather facemask

IV fluid bolus ⇒ 500-1000 mL IV crystalloid (rapidly infuse)
Repeat, consider albumin/colloid if no immediate response

Vasopressors ⇒ **HR >40 bpm**
→ **Phenylephrine** 100-200 mcg IV bolus
⇒ **HR <40 bpm**
→ **Ephedrine** 5-10 mg IV bolus or
Glycopyrrolate 100-200 mcg IV bolus

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HYPOTENSION AFTER NEURAXIAL ANESTHESIA

TREATMENT

Vasopressors ⇨ **HR <40 bpm, and hypotensive after spinal anesthetic**
- → Consider Bezold-Jarisch reflex
- → Fluids, left uterine displacement, passive leg raise, Trendelenburg, left lateral position
- → **Phenylephrine** 100-200 mcg IV bolus
- → **Atropine** 0.1-0.2 mg IV bolus
- → **Ephedrine** 5-10 mg IV bolus
- → **Epinephrine** 10-100 mcg IV bolus

Vasopressor infusion
- ⇨ Phenylephrine 0.5-1 mcg/kg/min IV
- ⇨ Norepinephrine 0.01-0.1 mcg/kg/min IV
- ⇨ Epinephrine 0.01-0.1 mcg/kg/min IV

Fetal assessment
- ⇨ Monitor fetal heart rate continuously
- ⇨ If fetal distress, prepare for emergency cesarean delivery

Cardiac arrest ⇨ Start CPR (see Maternal Cardiac Arrest, #1), administer epinephrine, consider PMCD (aim for delivery of fetus by 5 min)

END

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STAT CESAREAN DELIVERY

DIAGNOSIS

Immediate surgical delivery for maternal and/or fetal indications

START

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

→ Immediately transfer patient to the OR

→ Discuss with OB if time permits for neuraxial anesthesia

TREATMENT

→ Monitors: EKG, BP, SpO_2, RR

→ IV access (18G) + fluids

→ Left uterine displacement (also consider ramped position for airway)

→ Administer non-particulate antacid (if GA)

→ Spinal/CSE/epidural (if not contraindicated) or GA (see General Anesthesia, #27) – TIME DEPENDENT

→ If functional epidural catheter in-situ: bolus with 2% lidocaine/bicarbonate/epinephrine (1:200,000) in 5 mL increments (or 3% chloroprocaine in 5 mL increments)

→ Inform Peds team

OTHER

If no neuraxial opioids, consider

- Multimodal analgesia regimen + opiate-based PCA
- Consider bilateral TAP block
- Consider local anesthesia infiltration at incision site

END

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THYROID STORM

DIAGNOSIS

→ Anxiety
→ Agitation
→ Diaphoresis
→ Exophthalmos
→ Hypertension
→ Hyperthermia
→ Nausea/vomiting
→ Tachycardia
→ **Consider in patients with history of hyperthyroidism or molar pregnancy**

START

IMMEDIATE

Airway ⇒ Clear?
Breathing ⇒ SpO_2 + RR
Circulation ⇒ HR + BP

Oxygen ⇒ 100% (10 L/min) via non-rebreather facemask

Position ⇒ Left uterine displacement

Fetal hear rate ⇒ Monitor

IV access ⇒ Initiate fluid resuscitation

Labs ⇒ TSH
⇒ Free T3 + T4
⇒ CBC
⇒ BMP
⇒ LFTs
⇒ Glucose
⇒ 12-lead EKG

TREATMENT

1. Pharmacologic Treatment
→ Propylthiouracil 1000 mg PO loading dose, 200 mg PO q6 hr
→ Iodine administration 1–2 hr after propylthiouracil:
→ Sodium iodide 0.5-1 g IV q8 hr, or
→ Potassium iodide 5 drops PO q8 hr, or
→ Lugol solution 10 drops PO q8 hr, or
→ Lithium carbonate (if patient has an iodine anaphylaxis history) 300 mg PO q6 hr
→ Dexamethasone 2 mg IV bolus q6 hr x4 doses, or hydrocortisone 100 mg IV bolus q8 hr x3 doses
→ Propranolol, labetalol or esmolol for HR control

2. Manage hyperthermia, may require cooling blanket

3. Correct fluid + metabolic abnormalities

OTHER

→ Transfer to ICU for close hemodynamic monitoring
→ Consider arterial line
→ Consider precipitating factors such as parturition, surgery, trauma, infection

END

TRANSFUSION REACTION

START

DIAGNOSIS

→ Recent or ongoing blood product transfusion

→ 20-30% ↓ in SBP below baseline, or SBP <100 mmHg

→ Fever, chills, pruritus, urticaria, wheezing or respiratory distress

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Transfusion ⇒	**Stop** + disconnect blood product tubing
Team leader ⇒	Identify
Airway ⇒	Clear?
Breathing ⇒	SpO_2 + RR + auscultation
Circulation ⇒	HR + BP
Conscious level ⇒	Adequate?
IV access ⇒	2 large bore IVs, 16G
Position ⇒	Left uterine displacement
Fetal heart rate ⇒	Monitor

TREATMENT

→ Oxygen: 100% (10 L/min) via non-rebreather facemask

→ Give IV fluid bolus → 500–1000 mL crystalloid, repeat as indicated

→ If hypotensive, see Maternal Hypotension (#11)

→ If developing severe reaction, consider administering epinephrine + antihistamine, see Anaphylaxis (#3)

Continued on next page

TRANSFUSION REACTION

DDX

1. TRALI, TACO, hemolytic reaction
2. Anaphylaxis
3. Sepsis

OTHER

→ Inform blood bank

→ Keep blood product bag/tubing + return to blood bank for testing

→ Other considerations:
→ May progress to DIC, respiratory failure, cardiovascular collapse

END

TWIN VAGINAL DELIVERY

START

DIAGNOSIS

→ Vertex-vertex presentation

→ Vertex-nonvertex presentation

→ Twin B – Vaginal delivery or cesarean delivery

IMMEDIATE

Review Physiology ⇒ Multiple gestation increases physiologic and anatomic changes of pregnancy
- ↑ Aortocaval compression
- ↑ Hypotension
- ↓ FRC
- ↑ Oxygen consumption

Logistics ⇒ Transfer patient to the OR

Airway + breathing ⇒ Monitor HR/BP/SpO_2

IV access ⇒ Ensure adequate IV access (2 IVs, 16-18G)

Analgesia ⇒ Ensure adequate neuraxial analgesia (epidural catheter-in-situ, or place CSE)

Anticipate + plan ⇒ Prepare for possible stat cesarean delivery under GA (see #27)
- → Position patient (ramp?)
- → Airway equipment
- → Drugs

Continued on next page

TWIN VAGINAL DELIVERY

TREATMENT

Following delivery of Twin A, monitor Twin B and assess immediate need for:

→ Uterine/cervical relaxation to deliver Twin B vaginally (may need breech extraction or internal/external version)
  → Nitroglycerine 400–800 mcg (1-2 sprays) SL
  → Nitroglycerine 100–250 mcg IV bolus
  → Terbutaline 250 mcg SC or IV bolus
  → RSI with high concentration of volatile anesthetic

→ Conversion to general anesthesia for stat cesarean delivery of Twin B
  → See General Anesthesia (#27)

OTHER

Risks:

→ After delivery of Twin A, Twin B may have:
  → Non-reassuring fetal heart rate
  → Non-vertex presentation
  → Umbilical cord prolapse
  → Head entrapment

→ PPH + uterine atony (see Maternal Hemorrhage (#8) + Uterine Atony (#25) + review contraindications of uterotonic medications)

→ Retained placenta

→ Infection, if prolonged intrauterine manipulation

END

UTERINE ATONY

START

DIAGNOSIS

→ **Surgeon notes atony by palpation**

→ **Uterus appears boggy + non-contractile**

 **CALL FOR HELP** 

IMMEDIATE

Team leader	➔	Identify
Airway + breathing	➔	SpO_2 + RR
Circulation	➔	HR + BP
IV access	➔	2 IVs, 16-18G
2nd-line uterotonics	➔	Obtain medications (PPH kit) if not available in OR

Continued on next page

UTERINE ATONY

TREATMENT

1. IV fluids
→ Bolus 1000 mL crystalloid + repeat if indicated
→ Consider colloid, blood transfusion

2. Oxytocin bolus
→ 2 U IV bolus

3. Oxytocin infusion
→ 30-40 U/500 mL fluid at 125–500 mL/hr (7.5-40 U/hr)

4. Reassess uterine tone + EBL (2 min)
→ If adequate: Decrease oxytocin infusion rate to 125 mL/hr (7.5 U/hr)
→ If inadequate: Repeat oxytocin 2 U IV bolus

5. Reassess uterine tone + EBL (2 min)
→ Consult with OB and administer 2nd-line uterotonic agents, if required:
→ Methylergonovine 0.2 mg IM q2-4 hr (contraindicated in HTN/PreE), or
→ Carboprost 0.25 mg IM q15 min (contraindicated in asthma), or
→ Misoprostol 600-800 mcg SL or 1000 mcg PR

6. Reassess uterine tone + EBL (2 min)
→ Consult with OB + give a second 2nd-line uterotonic agent, if required

OTHER

If uterine tone remains inadequate, discuss with OB team about other/surgical interventions:

1. Bakri balloon
2. B-Lynch suture
3. IR embolization
4. Hysterectomy

→ If EBL >1000 mL, see Maternal Hemorrhage (#8)

END

UTERINE INVERSION

START

DIAGNOSIS

→ Uterine fundus palpable at cervical os or uterine tissue visualized at introitis

→ Fundus not palpable on abdominal exam

→ High suspicion in setting of manual extraction of placenta

→ Hypotension, profuse vaginal bleeding postpartum

→ Unexpected shock state out of proportion to bleeding

CALL FOR HELP  **OB RAPID RESPONSE**

IMMEDIATE

Airway ⇒ Clear?
Breathing ⇒ Sats + RR
Circulation ⇒ HR + BP

Oxygen ⇒ 100% (10 L/min) via non-rebreather facemask

IV access ⇒ 2 large bore IVs, 16G

Hemodynamics ⇒ IV fluid + vasopressors + anticholingeric medication as indicated

Move to OR ⇒ If no **immediate** uterine replacement possible by OB

Continued on next page

UTERINE INVERSION

TREATMENT

Stop oxytocin infusion

Relax uterus to facilitate uterine replacement

→ Nitroglycerin 1–2 sprays SL (0.4 mg/spray) or 50-100 mcg IV bolus prn (AND administer 50-100 mcg phenylephrine IV bolus prn)

→ Terbutaline 250 mcg SC

→ If replacement of the uterus is unsuccessful, aid relaxation with intubation and general anesthesia using a volatile agent

If hemodynamically unstable

→ IV fluid bolus 1-2 L crystalloid (rapidly infuse)

→ Hypotension + HR <40 bpm (can have profound vagal response): administer atropine 0.1–0.2 mg IV bolus

→ Hypotension + HR >40 bpm: phenylephrine 100–200 mcg IV bolus or ephedrine 5–10 mg IV bolus

→ Prepare for massive transfusion, high risk of blood loss with inversion (see Maternal Hemorrhage, MTP and Uterine Atony, #8, #14, #25)

END

FAILED EPIDURAL TECHNIQUE FOR C-DELIVERY

START

DIAGNOSIS

Inadequate labor epidural technique (i.e. unilateral, patchy) for surgical anesthesia

IMMEDIATE

Time-dependent decision contingent on urgency of surgery + maternal/ fetal well-being

TREATMENT

Prior to start of surgery

- **Labor epidural catheter functioning well?**
  - **Yes**: Administer 10 mL (2 x 5 mL) 2% lidocaine/ bicarbonate/epinephrine (1:200,000)
    - Assess block, rising bilaterally?
      - **Yes**: Continue dosing with 2% lidocaine/ bicarbonate/epinephrine (1:200,000) 5 mL increments (usually ≤20 mL, max 7 mg/kg)
        - → Adequate block (T4 level): proceed with surgery
        - → Inadequate block: replace with a 'reduced dose' CSE or GA (see #27)
      - **No**: If unilateral, withdraw epidural catheter 1-2 cm and continue dosing as above
        - → Adequate block: proceed with surgery
        - → Inadequate block: replace with a 'reduced dose' CSE or GA
      - **No**: If no block, replace block with a 'reduced dose' CSE or GA
  - **No**: Replace block with a 'reduced dose' CSE or GA

Continued on next page

FAILED EPIDURAL TECHNIQUE FOR C-DELIVERY

TREATMENT

Intraoperative

Surgery started with an adequate block, but now inadequate

Prior to uterine incision (depending on urgency)

→ Dose epidural catheter with 2% lidocaine/bicarbonate/epinephrine (1:200,000) 5 mL increments (max 7 mg/kg) + epidural fentanyl 100 mcg (if not already administered)
  → If adequate: proceed with surgery
  → If inadequate: convert to GA

→ Convert to GA

After uterine incision

→ Dose epidural catheter with 2% lidocaine/bicarbonate/epinephrine (1:200,000) 5 mL increments (max 7 mg/kg) + epidural fentanyl 100 mcg (if not already administered)

→ Consider 50/50% N_2O/O_2
  → IV narcotics or adjuvants
    → Fentanyl 50-100 mcg IV bolus
    → Morphine 10-15 mg IV or hydromorphone 1-2 mg IV in divided boluses
    → Midazolam 1-2 mg IV bolus
    → Ketamine 10-20 mg IV bolus

→ Convert to GA

OTHER

Alternative local anesthetic solution

→ 3% chloroprocaine 5 mL increments administered via the epidural catheter

Administer preservative-free morphine 3 mg

→ Via epidural catheter (may still have a postoperative analgesia effect, despite inadequate surgical anesthesia efficacy)

→ After delivery if preservative-free morphine not administered intrathecally

Reduced dose CSE

→ Intrathecal component =
  → 0.75% Hyperbaric bupivacaine 0.8-1.4 mL
  → Fentanyl 15 mcg
  → Preservative-free morphine 100-150 mcg

END

GENERAL ANESTHESIA FOR C-DELIVERY

START

DIAGNOSIS

Indications for general anesthesia for cesarean delivery

- → Failure to extend in-situ labor analgesia epidural technique for surgical anesthesia, or insufficient time for epidural technique to be functional prior to surgery
- → Inadequate time to place neuraxial anesthesia
- → Neuraxial anesthesia contraindicated
  - → Coagulopathy
  - → Critical aortic stenosis
  - → Hemodynamic instability
  - → Patient preference
  - → Infection
  - → Patient refusal
  - → Other

IMMEDIATE

H+P ⇒ Perform

Equipment check
- ⇒ Anesthesia machine
- ⇒ Airway equipment
- ⇒ Video laryngoscope
- ⇒ Difficult intubation cart
- ⇒ Fiberoptic bronchoscope

Induction medications ⇒ Prepare

Monitors
- ⇒ EKG
- ⇒ BP
- ⇒ SpO_2
- ⇒ $ETCO_2$
- ⇒ Fetal monitor

IV access
- ⇒ 18G
- ⇒ IV fluid bag attached + infusing

Position
- ⇒ Good head/neck position (build ramp if indicated, tragus aligned with sternum)
- ⇒ Left uterine displacement

Other ⇒ Available staff member to escort partner out of the OR

Continued on next page

GENERAL ANESTHESIA FOR C-DELIVERY

TREATMENT

1. Premedications (if time permits)
→ Sodium bicitrate 30 mL PO
→ Ranitidine 50 mg IV bolus + metoclopramide 10 mg IV bolus

2. Preoxygenate
→ 100% oxygen via anesthesia circuit for 3 min, or 4 maximal capacity breaths
→ CPAP/semi-upright position, if indicated

3. Patient prepped, surgeon scrubbed and ready to start?

4. Perform RSI with cricoid pressure:
→ Propofol 2.0-2.5 mg/kg IV bolus (or etomidate 0.2 mg/kg IV bolus, or ketamine 2 mg/kg IV bolus in severely hypotensive patients)
→ Succinylcholine 1.5 mg/kg IV bolus (unless contraindicated)

5. After confirming correct placement of ETT, inform the surgeon to start

6. Maintenance anesthesia
→ Before delivery 50/50% N_2O/O_2 + 0.75-1.0 MAC volatile (sevo or iso)
→ After delivery 70/30% N_2O/O_2 + 0.5 MAC volatile (sevo or iso)

7. Administer prophylactic antibiotic(s) If time permits prior to skin incision (but do not delay induction of anesthesia), otherwise administer when able

8. Midazolam 2 mg IV bolus (if indicated for amnesia)

9. Additional monitors
→ Temperature probe
→ Consider awareness monitor

10. Administer uterotonic(s) after delivery

11. Narcotics (after delivery)
→ Fentanyl 200–300 mcg IV bolus
→ Morphine 10–15 mg IV in divided boluses, or
→ Hydromorphone 1-2 mg IV in divided boluses, or
→ Preservative-free morphine 3 mg via epidural catheter (if functional)

12. Administer antiemetics
→ Ondansetron 4 mg IV bolus
→ Dexamethasone 4 mg IV bolus

13. Local anesthesia (if no neuraxial block)
→ Consider bilateral TAP block, or
→ Infiltration at incision site

Continued on next page

GENERAL ANESTHESIA FOR C-DELIVERY

TREATMENT

14. Ensure patient fully awake prior to extubation
→ Semi-upright
→ Or left lateral position with Trendelenburg

15. Oxygen
→ 100% (10 L/min) via non-rebreather facemask

16. Postoperative analgesia (in addition to 13. above)
→ Multimodal (acetaminophen + NSAIDs)
→ IV PCA (if no neuraxial opioid)

OTHER

→ Be prepared for a difficult intubation
→ Modify RSI technique in patients with preeclampsia/eclampsia/raised intracranial pressure
→ Need to reduce a hypertensive response to laryngoscopy, therefore supplement induction drugs with
→ Nitroglycerine 1-2 mcg/kg IV bolus + esmolol 1-2 mg/kg IV bolus and/or
→ Remifentanil 1.5 mcg/kg IV bolus (if time permits) or
→ Fentanyl 100-200 mcg IV bolus

END

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MATERNAL INTUBATION

START

DIAGNOSIS

Elective or emergency requirement for a definitive airway

IMMEDIATE

H+P ⇒ Perform

Equipment check ⇒ Anesthesia machine
⇒ Airway equipment
⇒ Video laryngoscope
⇒ Difficult intubation cart
⇒ Fiberoptic bronchoscope

Induction medications ⇒ Prepare

Monitors ⇒ EKG
⇒ BP
⇒ SpO_2
⇒ $ETCO_2$
⇒ Fetal monitor

IV access ⇒ 18G
⇒ IV fluid bag attached + infusing

Position ⇒ Good head/neck position (build ramp if indicated, tragus aligned with sternum)
⇒ Left uterine displacement

Continued on next page

MATERNAL INTUBATION

TREATMENT

Preoxygenate
→ 100% oxygen (10L/min) via anesthesia circuit for 3 min, or 4 maximal capacity breaths

Rapid sequence induction with cricoid pressure

Medications
→ See General Anesthesia (#27)

Direct or indirect laryngoscopy
→ Short handled laryngoscopy blade with Miller 2 or Mac 3 blade
→ Consider video laryngoscope if anticipate difficult direct laryngoscopy
→ Anticipate difficult/failed intubation (see Difficult Airway, #6)
→ Have LMA (ProSeal + classic) size 3 + 4, bougie, stylet, oral airways available

If not NPO, place OG tube + suction stomach contents

OTHER

→ Size 6.0 – 7.0 endotracheal tube with stylet

→ Extubation (on OR table)
→ Criteria: Following commands, adequate tidal volumes on minimal pressure support, maintaining saturations on low FiO_2
→ Position patient semi-upright or left lateral position with slight Trendelenburg
→ Oxygen 10 L/min via non-rebreather facemask

END

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ANESTHESIA FOR ECV

ECV

→ External cephalic version (ECV)

→ Usually attempted ≥36 weeks gestation

→ Terbutaline 250 mcg SC may be administered for uterine relaxation (discuss with OB)

START

RISKS

→ **Fetal heart rate abnormalities**

→ **Placental abruption**

→ **Uterine rupture**

→ **Stat cesarean delivery**

ANESTHETIC OPTIONS

→ CSE: Intrathecal dose 0.75% hyperbaric bupivacaine 1 mL (dose range 2.5-10 mg) + fentanyl 10-20 mcg (or sufentanil 5 mcg) to achieve T6 level

→ If proceeding to cesarean delivery bolus epidural catheter to appropriate T4 Level

→ Bolus epidural catheter with 2% lidocaine/bicarbonate/epinephrine (1:200,000) 5 mL increments (max 7 mg/kg) or 3% chloroprocaine 5 mL increments

Epidural catheter left in-situ for labor analgesia or cesarean section depending on success of version

END

TROUBLESHOOTING LABOR EPIDURAL TECHNIQUES

TOPPING OFF

Patient complains of pain with labor epidural catheter in-situ

→ Interview patient to determine location, intensity + quality of pain

→ Assess dermatome level of neuraxial blockade, examine epidural catheter insertion site + catheter/ tubing connector

Unilateral block

→ Position patient with painful side downwards + administer a bolus of 0.125-0.25% bupivacaine 5–10 mL via the epidural catheter

→ Or position as above + withdraw the epidural catheter 1-2 cm + administer bolus of 0.125-0.25% bupivacaine 5–10 mL via the epidural catheter

Insufficient dermatomal spread

→ Administer bolus of 0.125% bupivacaine 5–10 mL via the epidural catheter

Insufficient dermatomal density

→ Administer bolus of 0.25% bupivacaine 5–10 mL via the epidural cathether

Sacral sparing or assisted delivery

→ Sit patient upright + administer bolus of 0.25% bupivacaine 5–10 mL via the epidural catheter

→ Consider a bolus of fentanyl 100 mcg via the epi dural catheter

Always check fetal heart rate after position change

Alternative local anesthetic: 0.2% ropivacaine 5-10 mL bolus

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TROUBLESHOOTING LABOR EPIDURAL TECHNIQUES

If you have bolused an epidural catheter x2 with insufficient pain relief, consider replacing with a CSE

TROUBLESHOOTING

CSF aspirated via epidural catheter

↳ Intrathecal catheter:

→ Dose as an intrathecal catheter, or

→ Remove catheter and replace

Blood aspirated via epidural catheter

↳ Intravascular catheter:

→ Withdraw epidural catheter 1-2 cm, flush 2 mL of normal saline, aspirate, if negative administer a test dose (1.5% lidocaine/ epinephrine (1:200,000) 3 mL) + if negative proceed with use, or

→ Remove epidural catheter + replace

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Abbreviations used in the *Obstetric Anesthesia Emergency Manual*

ABG – Arterial blood gas
ABO - ABO blood group system
AFE – Amniotic fluid embolism
AFLP – Acute fatty liver of pregnancy
ANES - Anesthesia
ARDS – Acute respiratory distress syndrome
AVM – Arteriovenous malformation
AROM – Artificial rupture of membranes
BiPAP - Bilevel positive airway pressure
BMP – Basic metabolic panel
BP – Blood pressure
bpm – Beats per minute
$CaCL_2$ - Calcium chloride
CBC – Complete blood count
Coag screen – Coagulation screening panel
CP – Cricoid pressure
CPAP - Continuous positive airway pressure
CPB – Cardiopulmonary bypass
CPR – Cardiopulmonary resuscitation
CRP - C-reactive protein
CSE – Combined spinal-epidural
CVA – Cerebrovascular accident
CVP – Central venous pressure
CVS – Cardiovascular system
CXR – Chest x-ray
DBP – Diastolic blood pressure
DKA - Diabetic ketoacidosis
DDx – Differential diagnosis
DIC – Disseminated intravascular coagulation
dL - Deciliter
EBL – Estimated blood loss
ECMO – Extracorporeal membrane oxygenation
ECV – External cephalic version
$ETCO_2$ - End-tidal carbon dioxide
ETT – Endotracheal tube
EKG – Electrocardiogram
ELM – External laryngeal manipulation
FFP – Fresh frozen plasma
FHR - Fetal heart rate
G – Gauge
GA – General anesthesia
GCS – Glasgow coma scale
Hb – Hemoglobin
Hct - Hematocrit
HELLP - Hemolysis, elevated liver enzymes, low platelets
H+P - History and physical
hr – Hour(s)
HR - Heart rate
HTN - Hypertension
Kg – Kilogram
ICP – Intracranial pressure
ICU – Intensive care unit
IJ - Internal jugular
IM – Intramuscular
IO – Intraosseous
IR – Interventional radiology
IV – Intravenous
L - Left
LAST – Local anesthetic systemic toxicity
LFTs – Liver function tests
Mac - Macintosh blade
MAC - Minimum alveolar concentration
MAP - Mean arterial pressure
mcg – Microgram
MDI - Metered-dose inhaler
MFM - Maternal-fetal medicine
mg – Milligram
Mg - Magnesium
MI – Myocardial infarction
min – Minute(s)
mL - Milliliter
MTP – Massive transfusion protocol
NEB – Nebulizer
NICU - Neonatal intensive care unit
NPO - Nothing by mouth (nil per os)
NSAIDs - Non-steroidal antiinflamatory drugs
OB – Obstetric
OG - Orogastric
OR - Operating room
PRBCs – Packed red blood cells
PCA – Patient-controlled analgesia
PE – Pulmonary embolism
PEEP - Positive end-expiratory pressure
pH - Potential hydrogen
PIV - Peripheral intravenous line
Plts – Platelets
PMCD - Perimortem cesarean delivery
PO – Per oral (by mouth)
POCUS - Point-of-care ultrasound
PPH – Postpartum hemorrhage
PreE – Preeclampsia
PR – Per rectum
PRN - Pro re nata (as needed)
Pulm – Pulmonary
QBL - Quantitative blood loss
RIC - Rapid infusion catheter
ROSC – Return of spontaneous circulation
ROTEM - Rotational thromboelastometry
RR – Respiratory rate
RSI – Rapid sequence induction
SpO_2 – Oxygen saturation
SBP – Systolic blood pressure
SC - Subcutaneous
SL - Sublingual
SROM – Spontaneous rupture of membranes
Stat – A common medical abbreviation for rush or urgent
T+C - Type and crossmatch
TACO – Transfusion-associated circulatory overload
TAP - Transversus abdominis plane
T3 – Triiodothyronine
T4 - Thyroxine
TEE – Transesophageal echocardiography
TEG – Thromboelastogram
TRALI – Transfusion-related acute lung injury
TSH – Thyroid stimulating hormone
TTE – Transthoracic echocardiography
VF – Ventricular fibrillation
VQ - Ventilation–perfusion
VT – Ventricular tachycardia

About this manual and the authors

Observing that practitioners often miss key actions under stress, Drs. Kyle Harrison and Sara Goldhaber-Fiebert along with Drs. Geoff Lighthall, Ruth Fanning, Steven Howard, and David Gaba developed several iterations of pocket cards for perioperative critical events, including some with rhythm strips, icons, and color design. In 2004, Dr. Larry Chu conceived adapting crisis management cognitive aids to a more visually striking format for a new book he envisioned for today's highly visual millennial learners. This became *The Manual of Clinical Anesthesiology*, published in 2011. In the Fall of 2010, Larry published the first electronic version of medical cognitive aids in the StanMed iOS application. To create the Emergency Manual, the Stanford Anesthesia Cognitive Aid Group was formed. The Stanford Emergency Manual was published in 2013.

Work on the Obstetric Anesthesia Emergency Manual started with the creation of an OBLS emergency aid by Larry which was first published in 2014. The roadmap for the 31 cognitive aids in the Obstetric Anesthesia Emergency Manual was established in March 2015 with Drs. Gillian Abir, Katherine Seligman and Larry Chu as co-authors. This manual should be viewed as a "living document" with incremental updates identified by version number. The current version is 1.0.

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Object-action language

We have adopted an object-action approach to our cognitive aids. This model emphasizes an object upon which we then apply an action. We hope this approach will simplify the interface and improve usability by defining tasks through object-action models.

Reviewers

The following individuals provided critical appraisal of this work prior to publication. We wish to thank them for their efforts which greatly enhanced the quality of the final publication: Listed in alphabetical order:

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Disclaimer

The material in this Obstetric Anesthesia Emergency Manual is not intended to be a substitute for sound medical knowledge and training. Clinicians should always use their own clinical judgment and decision making. Departure from the information presented here is encouraged when appropriate.

Important Phone Numbers

BLOOD BANK #:	
CLINICAL LABORATORY#:	
CODE TEAM #:	
L&D CHARGE NURSE #:	
MAIN OR CONTROL DESK #:	
MAIN OR ANES ATTENDING:	
MTG #:	
OB ANES ATTENDING #:	
OB ATTENDING #:	
PHARMACY #:	
RESPIRATORY THERAPY #:	

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OBSTETRIC ANESTHESIA

EMERGENCY MANUAL

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