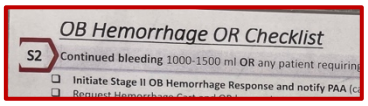
OB MATERNAL HEMORRHAGE

- Anesthesia Guide -

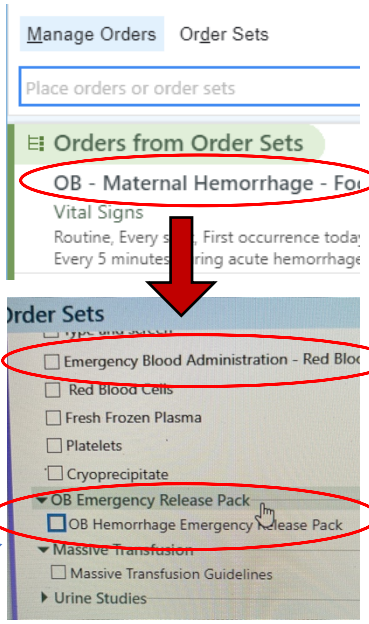
Hartford HealthCare

Stage 1: EBL > 500 VD, >1L C/S *or:* Δ in VS > 15%: BP < 85/45, HR >110, SpO2 < 95%

- 2 units pRBCs: crossmatched & available for issue
- **RUN OB Hemorrhage OR Checklist w/ room:**
  - Taped to OR pyxis
  - On clipboard on hemorrhage cart on L&D/maternity floors



- Order set: **"OB - MATERNAL HEMORRHAGE – Focused"**
  - → click ☐ *Emergency Blood Admin: Red Blood Cells*
    - This order rapidly releases 2 units RBC



Stage 2: EBL < 1500, continued bleed *or* unstable,

- 2 units pRBCs are issued to pt, preparation/issue of OB Hemorrhage Emergency Release Pack
- **RUN OB Hemorrhage OR Checklist w/ room AGAIN**
  - Lg bore IVs, give **TXA**
  - Labs: cbc, coags
  - Additional **uterotonics**
  - IF **> 1500** EBL ***or*** symptomatic: **begin transfusion** – don't wait for labs.→ move to OR

- Same order set: **"OB - MATERNAL HEMORRHAGE – Focused"**
  - → click ☐ *OB Hemorrhage Emergency Release Pack:*
  - **ORDER LABS FROM HERE**, as they are all automatically STAT labs

OB Hemorrhage Emergency Release Pack:

- ✓ **4 RBC**
- ✓ **2 FFP**
- ✓ **1 Cryo -** ⊘ *warmer, hang Cryo at room temp**

UTEROTONICS

1st line: Oxytocin: 10u rapid IV bolus over 10 min *or* 10u IM if no IV access, then 10u intrauterine. **SFX**: ↓ SVR

2nd line: Methergine: 0.2mg IM, Q2-4h, max 5 doses. Onset time: 2-5 min, $Et^{1}/_{2}$ 3.4h. **SFX**: HTN crisis → stroke. Avoid in: HTN/PreE, CAD, cardiomyopathy, protease inhibitors, caution w/ ephedrine use (↑HTN). **but in emergency situation, can still give: dilute the 0.2mg into 20cc syringe =10mcg/cc, titrate slow **IV** pushes to effect, monitoring BP.*

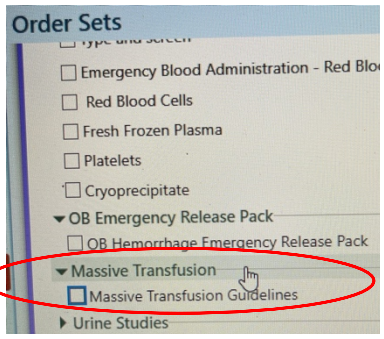
3rd line: Carboprost/Hemabate: 0.25mg IM, Q15-90min, max dose: 2g. **SFX:** *baseline doubles PVR & PAP,* diarrhea/vomiting. Contraindicated in: asthma (bronchospasm risk), RV strain/failure, pulm HTN, caution in R→ L shunt ASD/PFO/VSD

Retained Placenta or Uterine Inversion:

- **IV Nitroglycerin 100mcg** for rapid & brief tocolysis (Ob pacu pyxis)
- chase immediately w/ ~ 2cc neo & 2cc ephedrine for CV stability.

Stage 3: EBL > 1500 EBL, VS unstable, suspected DIC, or > 2u pRBC given.

- Initiate OB Massive Transfusion Protocol (MOVE TO OR)
- **RUN OB Hemorrhage OR Checklist w/ room AGAIN**
- **Transfuse aggressively. Restore volume* to limit pressors**
- Place A-line, consider central line, consider GA (cardiac-stable).
- SCDs on legs.
  - Support MTP w/:
    - CaCl after 1st unit pRBC, *and* Q4units pRBC, Ancef re-dose Q1,500 EBL
    - Warming measures:
      - Bair hugger, fluid warmer, ↑OR temp
      - Intrathecal morphine can cause central hypothermia - reversed w/ IV benzo.
    - Repeat labs Q ~30 min: **CBC & ABG**, + coags & TEG & as needed
    - MINIMIZE CRYSTALLOID – dilutional coagulopathy & ↑acidosis



- Same order set: **"OB MATERNAL HEMORRHAGE - Focused"**
- → click ☐ *Massive Transfusion Guidelines*
- RN to call blood bank and activate MTP

MTP Pack:

- ✓ **6 RBC**
- ✓ **6 FFP**
- ✓ **1 PLT –** ⊘ *warmer, hang PLT at room temp**
- ✓ **1 Cryo -** ⊘ *warmer, hang Cryo at room temp**

TRANSFUSE: 6 : 6 : 1 : 1 = 6 RBC : 6 FFP : 1 PLTpack: 1 Cryo

- **GA w/ cardiac-stable induction**: Etomidate/ketamine, Succs/Roc, midazolam*(prevent awareness!) & fent
  - Anticipate airway swelling** → position airway! ✓Consider safety of extubation if airway swollen
    - Swelling will only worsen w/ PP intravascular fluid shifts - esp after MTP. Check cuff leak → ICU if unable to safely extubate.
  - Can maintain GA w/: 50% N_2O *and* either ½ MAC sevo, *or* a propofol gtt (*prop preferred in uterine atony*) +/- ketamine if unstable or atony.
  - Parturients more susceptible to pulm edema - esp Pre-E/HELLP pts $^{2}/_{2}$ endothelial damage of disease process → ++ capillary leak
    - **may need diuresis.** (can use POCUS lung US to monitor edema & response to tx)

OB HEMORRHAGE NOTES:

- **Normal fibrinogen *in pregnancy* is ** 350-650 mg/dL ****
  - normal non-pregnant is 200-400mg/dL
    - A "normal" fibrinogen of ~200 in a *pregnant* pt is *abnormally low* and suggests DIC.

- If epidural catheter in place during hemorrhage, leave in place until labs prove safety of removal (PLT wnl & fibrinogen > 300)

- **ACOG defines PPH as > 1L QBL in 1st 24 hrs, or any blood loss with s/s hypovolemia, regardless of mode of delivery.**
  - **Vaginal > 500cc EBL is escalated, and C/S > 1000mL is escalated to Stage 1 Response.**
  - ***General guideline*: any delivery > 1500cc EBL should have received pRBCs/products other than crystalloid.**

- A leading cause of *delayed PPH identification, response, and tx* is imprecise estimation of actual blood loss during birth & immediate PP period (ACOG)

- **~ 40% of PPH occurs in low-risk women. EVERY woman giving birth is at risk for PPH** (ACOG)

- **Tachycardia or Hypotension *is* $^{2}/_{2}$ *hemorrhage* until proven otherwise and requires continuous reassessment.**

- Healthy women can compensate for significant hypovolemia/blood loss… until they can't anymore. VS Δ at ~20-30% blood volume lost.

- Baroreceptive HR response to hypovolemia can be blunted by beta blockers (Pre-E pts) or neuraxial for c/s (T4 block - cardiac accelerator fibers T4-T1) or just youth & good health. Unexplained H_OTN absent tachycardia **does not** rule out hemorrhage.

- Bleeding can occur for reasons **OTHER THAN UTERINE ATONY**:
  - eg: vaginal/cervical lacerations, coagulopathy, etc.
  - *Extra-uterine, intra-abdominal, or retroperitoneal bleeding* will not display vaginal bleeding, and persists regardless of uterine tone.
- Uterine clots can conceal intrauterine hemorrhage. "Adequate uterine tone" can be subjective and **does not** rule out hemorrhage as cause of Δ in VS.

- **Allowable Blood Loss** equation *for estimating Hgb* should use QBL instead of EBL.
  - Use existing hemorrhage protocols and established trigger volumes to initiate resuscitation. ABL equation can help assure we have not under-resuscitated, as vitals and initial lab values can inaccurately reflect severity of blood loss.
  - ***Qualitative Blood Loss*** should replace **Estimated Blood Loss** as EBL is imprecise if mixed with amniotic fluid.
  - **Est Blood Vol (EBV) mL/kg standards require adjustments in pregnancy, and for levels of obesity**:
  - Allowable **QBL*** = **[**EBV x ($H_{initial}$ - H_{final})**]** / $H_{initial}$
  - Functional blood loss can be underestimated in weighed QBL if **large clots present.** **Weight-wise, clots contain greater concentration of lost RBC/PLT/FACTORS than liquid blood***

Table 2 Blood volume estimations by BMI category.
(In pregnancy)

NHS obesity classification	BMI range (kg m^{-2})	Blood volume (ml kg^{-1})
Healthy weight	18.5–24.9	95
Overweight	25–29.9	85
Obese	30–39.9	75
Severely obese	>40	70

Kennedy, Helen, et al. 2022 "Maternal Body Weight and Estimated Circulating Blood Volume: A Review and Practical Nonlinear Approach." *BJA* https://doi.org/10.1016/j.bja.2022.08.011.

- Intra-op Hgb values can be slightly higher $^{2}/_{2}$ hemoconcentration & compensatory hypovolemic vasoconstriction, whereas postpartum Hgb/Hct labs often see further dilutional drop as extravascular fluid shifts back into intravascular compartment.

- Lactate can normally reach levels of ~ 2.0 – 4.0 mmol/L ***during labor***, but > 4.0 is unusual.
  - (so while a vaginal delivery or F+P → c/s may have elevated lactate, a planned c/s *not in labor* should not.)

- **Maternal MRO_2 and consumption (VO_2) is higher than non-pregnant levels**. (VO_2 ^ by ~ 20%, basal MRO_2 by ~15%)
  - Remember *SpO_2 can be normal*, while actual O_2 carrying capacity (DO_2), and therefore availability and uptake (VO_2) can be compromised, making the pregnant pt vulnerable to shock & acidosis in PPH.
    - $DO_{2\ mL/min}$ = C.O. x [1.34 x Hgb x SaO_2 + (0.30)] ← Arterial O_2 concentration

1.34 = O_2 binding capacity of Hgb
SaO_2 as fraction:100% = 1, 90% = 0.9, etc
0.30 = dissolved O_2 in blood at PO_2 of 100_{mmHg}

Admission Hemorrhage Risk Factor Evaluation

Low (Clot only)	Medium (Type and Screen)	High (Type and Crossmatch)
No previous uterine incision	Prior cesarean birth(s) or uterine surgery	Placenta previa, low lying placenta
Singleton pregnancy	Multiple gestation	Suspected Placenta accreta or percreta
≤4 previous vaginal births	>4 previous vaginal births	Hematocrit <30 AND other risk factors
No known bleeding disorder	Chorioamnionitis	Platelets <100,000
No history of PPH	History of previous PPH	Active bleeding (greater than show) on admit
	Large uterine fibroids	Known coagulopathy
	Estimated fetal weight greater than 4 kg	
	Morbid obesity (BMI >35)	

(CMQCC 2009)