

ANMC Obstetric Hemorrhage Guideline

| Content | Page |
|---|-------------|
| Background | 2 |
| Differential Diagnosis of Postpartum Hemorrhage | 3 |
| Obstetrical Hemorrhage Intervention Strategies | 4 |
| Post-partum Hemorrhage Response Algorithms | 6 |
| Post PPH Stabilization | 9 |
| Appendices: | |
| Appendix I: Iron therapy in pregnancy flow cart | 10 |
| Appendix II: PPH risk assessment tool | 11 |
| Appendix III: QBL tool | 12 |
| Appendix IV: L&D Stat Team | 13 |
| Appendix V: PPH medication kit | 14 |
| Appendix VI: PPH Cart | 15 |
| Appendix VII: PPH Instrument Tray | 16 |
| Appendix VIII: PPH flow sheet | 17 |
| Appendix IX: Blood product guide | 18 |
| Appendix X: Surgical options for PPH | 19 |
| Appendix XI: Quality review document | 21 |
| Appendix XII: PPH Response Algorithm Checklist | 23 |
| Appendix XIII: Debrief tool | 24 |
| Revised 11/26/17rsg/njm | |
| Revised 2/19/14sjh/njm | |
| Revised 5/19/11njm | |

ANMC Obstetric Hemorrhage Guideline

Background

The definition of early postpartum hemorrhage (PPH) is “**Cumulative blood loss of >1000ml accompanied by signs/symptoms of hypovolemia within 24h following the birth process**”. PPH is an increasing cause of maternal morbidity and mortality. It accounts for 30% of all maternal deaths worldwide and 10% of maternal deaths in the U.S. The rate of postpartum hemorrhage is steadily increasing throughout developed countries including the U.S. Between 1994 and 2006, pregnancy-related hemorrhage in the U.S. has increased 26-27% and is now the leading cause of maternal death.

The most common etiology for PPH (≈70-80%) is uterine atony, or a soft, non-contracted uterus. Other causes include retained placenta, lacerations of perineum, vagina, cervix, uterus, retroperitoneum, uterine rupture, pre-existing coagulopathy (inherited or acquired). For a more detailed list, review the next page on the differential diagnosis. Because most of the pregnant population is young and healthy, they don't show signs of cardiovascular stress until the last stage of bleeding. Therefore, recognition of blood loss before cardiovascular changes occur is paramount. Cardiovascular collapse in a young, healthy woman is an emergent, life-threatening situation, which can only be predicted by keeping track of the blood loss throughout the labor course.

Although 50% of the PPH occur in women without any risk factors, there is a group of patients who are at “high risk” of hemorrhage based on their medical or obstetrical history, including twin-gestation, large infants, long labors, prior uterine surgery and other risk factors indicated in the differential diagnosis below. Patient with a known or suspected abnormal placentation (placenta increta, percreta, accreta) are at extreme risk for PPH. For detailed management of these cases, review the ANMC Guideline: *Abnormal placentation management*.

Due to the alarming increase in PPH events and the potential morbidity and mortality associated with PPH, it is prudent to develop a response system. This system includes standardization of risk factor identification, guidelines on management, and continued training and evaluation of the care given to our patients. From expert reviews it is clear that the direct response to a PPH is multidisciplinary and should be practiced as such in order to keep the tasks and responsibilities pragmatic and clear.

This guideline is developed to be a centrally available tool to use for development and implementation of best practices, as well as a source of review regarding recognition and management of postpartum hemorrhage at ANMC. This guideline relied on information from protocols, guidelines and research summarized or done by the American College of Gynecologist (ACOG), the California Maternal Quality Care Collaborative (CMQCC) and World Health Organization.

Differential Diagnosis of Postpartum Hemorrhage

Effective management of postpartum hemorrhage requires understanding the potential causes. There are four main causes of postpartum hemorrhage that account for the majority of cases. Also known as the “Four T’s”, these are Tone (uterine atony), Tissue (retained placenta), Trauma (laceration), and Thrombin (coagulopathy).

TONE/Uterine atony: Lack of active contraction of the uterine smooth muscle. Accounts for 70-80% of post-partum hemorrhage. Can be caused by:

- Infection – chorioamnionitis
- Prolonged induction of labor
- Prolonged oxytocin use
- Prolonged second stage of labor
- Over-distention – LGA, multi-fetal pregnancies, polyhydramnios
- Forceps delivery – especially mid-forceps or rotational forceps
- Previous history of PPH - regardless of etiology
- Multiparity – grand multiparity carries a 4x risk of PPH over baseline
- Uterine inversion
- Maternal infusion of magnesium sulfate

TISSUE/Retained products of conception:

- Will cause uterine atony
- Amnion/chorion (fetal membranes)
- Abnormal placentation - accreta, increta, percreta, succenturiate lobe, cotyledon fracture
- Blood clot

TRAUMA/Vascular and soft tissue injury:

- Higher occurrence of tissue trauma with precipitous first and second stages of labor
- Uterine, cervical, vaginal, perineal lacerations
- Increased risk with operative vaginal delivery
- Hematomas- vulvar, paravaginal, broad ligament, retroperitoneal
- Uterine rupture
- Non-visible internal bleeding (change in vital signs out of proportion to witnessed blood loss)

THROMBIN/Coagulopathy:

- Inherited
- Acquired
- Dilutional - IVF infusion diluting effective clotting factors per ml “blood”
- Consumptive – Disseminated Intravascular Coagulopathy (DIC), Amniotic Fluid Embolism (AFE)
- A change of 0.2 of the INR suggests that almost 80% of clotting proteins have been used

Obstetrical Hemorrhage Intervention Strategies

With current strategies in prenatal care and with modern birthing facilities, there are multiple opportunities to limit risk of PPH as well as maximize response to PPH.

Antepartum:

Pregnant patients experience a 50% increase in circulating blood volume by 24 weeks gestational age; this persists until delivery. Red blood cell (RBC) mass increases to a lesser degree (25%) than serum volume causing a dilutional anemia. Additionally, there is a dilutional thrombocytopenia and to a lesser extent dilution of coagulation factors. Pregnancy increases iron requirements due to fetal needs as well as maintenance of maternal red blood cell mass. The majority of women can account for iron needs in the non-pregnant state by diet alone. The 2.5 fold increased need for iron during pregnancy is rarely achieved with diet alone. The antepartum period is an opportunity to maximize maternal RBC mass as well as iron stores. Studies clearly demonstrate that the less anemia and more iron stores a woman has in late pregnancy, the less likely she is to suffer morbidity or need a blood transfusion, even in the setting of mild to moderate PPH. There is a clinical guideline available for management of iron in pregnancy. See *ANMC Anemia In Pregnancy Guideline*. See **Appendix I: Iron Therapy in Pregnancy**.

Admission:

Every opportunity should be utilized to identify women at risk. However, despite the most robust identification criteria and risk stratification, almost 50% of cases of maternal postpartum hemorrhage have no identifiable risk factors. This supports the need for identification of those at risk as well as preparedness for those who have no risk factors. Health facility admission represents an ideal time for screening patients for risk factors. The risk assessment should be included on any SBAR (Situation, Background, Assessment, Recommendation) regarding the parturient. Please see **Appendix II: PPH risk stratification** with recommended management pathways. This risk assessment is dynamic and will change throughout a patient's labor, delivery and postpartum period. As new risk factors develop, this algorithm should be repeated. The presence of multiple risk factors should place them in the high-risk category.

Prevention:

The majority of obstetric literature endorses Pitocin® as the single most effective management option for prevention/prophylaxis of postpartum hemorrhage. On the labor unit at ANMC, this is supplied pre-mixed at a concentration of 30U Pitocin® in 500ml NS for safety and standardization. Pitocin® causes contraction of uterine smooth muscle, effectively closing the maternal circulation to the placental insertion site. It is recommended to initiate Pitocin® infusion immediately after delivery of the neonate. Initial rate of infusion is 350ml/h for 30 minutes (≈10 units) after delivery of the neonate followed by continued infusion of Pitocin® at 125ml/h for at least 4 more hours. There are no studies that endorse misoprostol for prevention or prophylaxis; however, anecdotal findings suggest that this may be a reasonable adjunct to Pitocin®. Once Pitocin® has begun, a response to continued postpartum bleeding should progress in a standardized escalating manner that is at once thorough, simple, easy to follow, and effective. It is vital to practice these algorithms frequently so that response to an emergent process becomes second nature. Early and accurate recognition of a postpartum hemorrhage can prompt a timely and potentially life-saving set of interventions.

Recognition – Qualitative Blood Loss (QBL):

Quantitation of blood loss at time of delivery has historically been based on a visual estimate by the provider visual, called estimated blood loss (EBL). To stay ahead of obstetrical hemorrhage quantification of blood loss should be continuously documented from admission to the end of delivery.

Quantification can be done by weighing any delivery materials soaked in blood, by measuring blood in a buttocks drape, and by keeping constant record of those measurements. See **Appendix III: QBL tool**. **Strive to quantitate at every delivery.** Every person in the labor room should be able to evaluate blood loss and trigger responses as needed. Trigger points are graded I through IV with the first trigger point at 500mL, followed by 1000mL, 1500mL and over 2000 mL. The details on management is outlined below in the post-partum hemorrhage response algorithms. The response algorithms of these escalating stages are important in effective communication and collaboration.

Tips and tricks for QBL:

1. For vaginal birth:
 - a. Immediately after the birth of the baby, notify the amount of amniotic fluid in the drape.
 - b. At the completion of the delivery/recovery period weigh all blood clots and blood soaked materials (which are placed in a kick-bucket after usage) to determine cumulative volume.
2. For cesarean birth:
 - a. Be aware of the total irrigation fluid on the OR. Suction all irrigation fluid at the end of the procedure.
 - b. Weight all sponges and laps; deduct the weight of the sponges and laps.
 - c. Add the total amount of fluid in the suction canister
 - d. Deduct total irrigation fluid and deduct estimated amniotic fluid (see point 3).
3. For birth without prior rupture of membranes, the following volumes can be used to estimate the contribution of amniotic fluid at term: Brace, et al. found **normal fluid volume 700 mL; oligohydramnios 300 mL; polyhydramnios 1400 mL**.
4. Unusual visual and auditory cues to excessive bleeding should be urgently investigated. Such cues include blood on the floor, walls, or ceiling, blood dripping off of the bed, table, or stretcher, continuously vibrating suction tubing or continuous full suction.
5. For all cases of ongoing hemorrhage, intake and output measurements should be documented, tallied, and reported to the team at frequent intervals (q5-15min). This data provides important direction to the team.
6. Antepartum bleeding should be taken in account when assessing total blood loss.
7. Labor and Delivery has under-the-buttocks drapes for delivery which have a calibrated graduated collection bag. Use of this graduated collecting system has been demonstrated to be an accurate way to quantitate blood loss at delivery. For accurate quantification of blood loss, it is calibrated to measure fluids only when hanging off of the bed or when lifted up by the provider to show the level of fluid collected.

POST-PARTUM HEMORRHAGE RESPONSE ALGORITHMS

STAGE I - QBL 500mL: Initial trigger point

RN 1 (primary RN): Notify Charge RN

- Increase Pitocin® infusion rate to 500-999ml/hr. (10u IM Pitocin® if no IV) **DO NOT PUSH IV**
- VS (pulse, BP, O2 saturation) frequently, state to providers when outside of normal
- Oxygen via facemask
- Stays at the bedside
- Keep patient warmth: Warm blankets
- Keeps charting, evaluating blood loss with providers

Charge RN:

- Pages OB physician to room
- Anesthesia (PAGER 2222) to be “aware”
- Assigns RN 2
- At any time the charge RN can call for the L&D Stat Team (**Appendix IV**)

RN 2 (runner):

- Brings PPH medication kit, PPH cart and PPH instrument tray into the room (**Appendix V, VI, VII**)
- Brings the ultrasound to the room
- Ensure working second IV line, give medications as ordered by provider
- Ensure adequate lighting and that provider has instruments for laceration evaluation/repair

STAGE II - QBL >1000ml or 10-15% change in BP/pulse, O₂ <92

RN 1 (primary RN):

- Notifies changes in BP/pulse, O2 sat or total QBL to the provider and Charge RN
- Continues with the above, stops charting when recorder is assigned and focusses on keeping patient informed and comfortable.
- Assists anesthesia with line placement, blood product verification, intubation as needed.

Charge RN:

- Notify House Supervisor (phone 1919)
- Anesthesia (pager 2222) to room
- Notify OR (phone 2275) and scrub tech (phone 8123)
- Assign: Recorder, Blood bank liaison, runner, family liaison/baby RN
- Order blood crossmatch STAT (2 units PRBC), sends lab request and calls lab

RN 2 (runner):

- IV access and medication administration and assists RN 1 in tasks.

Scrub tech:

- Ensuring lighting, instruments and disposables: sutures and sponges. If warranted prepares OR.

Recorder:

- Records all interventions with use of **Appendix VIII**, or time/intervention on any kind of paper.

Baby RN → becomes family liaison:

- Updates to family and/or escorts family pending on desires. Keeps neonate in safe situation.

House Supervisor:

- Crowd control, contact additional services as indicated by the provider (Interventional radiology x3100, GYN ONC x2300 etc). Calls backup OBGYN in the house.

Anesthesia: Takes over IV access (PRN central line), pain control, I&O and medication administration.

STAGE III - QBL>1500ml, patient unstable, DIC, >2 Units PRBC given

All of the above with:

Charge RN/House Supervisor:

- All of the above.
- Activate **Standby Massive Blood Transfusion Protocol (MBT)**
 - **Blood bank phone-1235 or 1223**
 - **Pull system:** blood products available immediately from the lab
- Contact additional services as indicated by the provider (Interventional radiology, GYN ONC etc.)
- Calls backup OBGYN in house. Calls for additional assistance as needed).

RN2 (runner): Nurse draws and sends MBT labs every 30-60 mins

- Coags and fibrinogen **Light blue top tube**
- CMP **Light green top tube**
- Ionized Ca⁺ **ABG syringe** (venous blood)
- CBC **Purple top tube**

STAGE IV - QBL >2000ml, patient unstable, DIC, multiple blood products transfused

RN1

- All the above
- SBAR to OR crew and other recent responders
- Stays in the OR for extra assistance

Charge RN/House Supervisor:

- All the above
- Activate **Immediate Massive Blood Transfusion Protocol**
- **Push system:** Blood products delivered to clinical area in bulk and used as needed
- Verify with provider need for GYN ONC/Interventional Radiology/ICU bed

Anesthesia:

- Management of intubation, IV fluids, blood product infusion, analgesia/anesthesia
- Call for 2nd Anesthetist if needed
- Antibiotics pre-incision or post-sweep (per surgeon), repeat antibiotics if it was a CS.

Operating room team:

- Receive SBAR from RN1
- Takes over primary care of patient
- Coordinate transport to the operating suite
- Coordinate operating room function/personnel/equipment
- **Analgesia:** preferably with CNMA or Anesthesiologist in the room. Use of Epidural, IV Fentanyl, Morphine, or Toradol, Tylenol. Realize that the latter two are the only medications not affecting blood pressures. Nitrous Oxide could be used as well, however patient needs to be fully capable of using the mask, furthermore with Nitrous Oxide the patient cannot receive 100% oxygen.

Provider Role throughout the stages I-IV:

- Orchestrate the resuscitation (for blood products see **Appendix IX**)
- Verbalize differential diagnosis to team
- Cessation of bleeding
- PROVIDER SHOULD CONSIDER THE 4 T's (Tissue, Tone, Trauma, Thrombus – see next page).

TISSUE:

- Evaluate the placenta for missing lobes.
- Manual sweep for clots or retained products, followed by a single dose Ampicillin® or other 1st generation cephalosporin for infection prophylaxis within 1 hour of sweep.
- Bedside ultrasound for evaluation of endometrium.
- Uterine-inversion; stop Pitocin, replace uterus if possible if not give Nitroglycerine SL 1-2puffs just prior to replacement of the uterus. If placenta still attached consider placenta accrete as differential and prepare as such (anesthesia, OR, blood products, Bakri-balloon and IR on standby).

➔ **TO OR IF NOT ABLE TO EVALUATE OR REMOVE PRODUCTS COMPLETELY IN LDR**

TONE: Uterine ATONY (See **Appendix V**: PPH medication kit)

- Uterine massage, make sure Pitocin is running
- Misoprostol 400mcg-1000mcg buccal or SL. If not able to tolerate, place rectally.
- Use of the 2 main injectable uterotonic medications per provider discretion
 - 0.2mg IM Methergine® (may repeat in x 1 in 15 minutes and again in 2h if effective)
 - CAUTION WITH **HYPERTENSION**
 - Do not give if still suspicious of retained placenta, as it clamps down lower uterine segment and may impede uterine evaluation.
 - 250mcg Hemabate® IM
 - CAUTION WITH **ASTHMA**.
 - Give with loperamide 4mg PO to prevent diarrhea
- Empty bladder with foley, consider leaving foley in place with urometer

➔ **TO OR IF NOT ABLE TO EVALUATE OR IF ATONY IS IN NEED FOR SURGICAL MANAGEMENT***

TRAUMA: Perineal, labial, vaginal, cervical or uterine lacerations

- Evaluate if repair is possible in L&D or the need for better lighting in the OR with dedicated CNMA for pain control.
- Have extra hand from CNM/MD for retraction
- RN runner/scrub tech available for assistance in supply need (laps, sutures, instruments)
- Pain control can be given locally, lidocaine perineal block or local infiltration.

➔ **TO OR IF NOT ABLE TO EVALUATE OR CONTINUED BLEEDING***

THROMBUS: COAGULOAPATHIC:

Replace with blood products. Typical ratios 6:4:1 PRBC:FFP:PLT Consider: Cryoprecipitate, rFactor VIIa. (See Appendix VI)

For all PPH > 1000mls regardless of cause:

WHO 2017 Guidelines advises Transexamic acid (Lysteda) for all PPH to be given within 3 hours post partum:

-1 gram (100mg/ml IV to be given over 10 min)

-repeat if ongoing PPH in 30 min

-or if re-bleed within 24 hours

-Only contraindications are known h/o thrombophilia on anticoagulation prophylaxis, or active VTE in this pregnancy.

ANMC Obstetric Hemorrhage Guidelines

IF PATIENT'S VITAL SIGNS SUGGEST SIGNIFICANTLY WORSE ANEMIA OR HYPOVOLEMIA THAN THE VISUALIZED/MEASURED BLOOD LOSS SUGGESTS, THIS IS CONCERNING FOR A RETROPERITONEAL OR INTERNAL BLEEDING. PATIENT SHOULD BE TAKEN TO LAPAROTOMY IMMEDIATELY.

***SEE APPENDIX X: Surgical options for PPH**

Post PPH Stabilization

RN

- Discuss with the provider if standard recovery is enough or whether more frequent fundal checks and vital signs are indicated
- Continue Pitocin® at 350ml/h for 30 minutes, after 30 mins, change Pitocin® to 125ml/h x 4 hours.
- If Methergine® was effective, consider an oral Methergine® series for 24h
- Blood products that have been pulled but not used must be “released” back to the blood bank

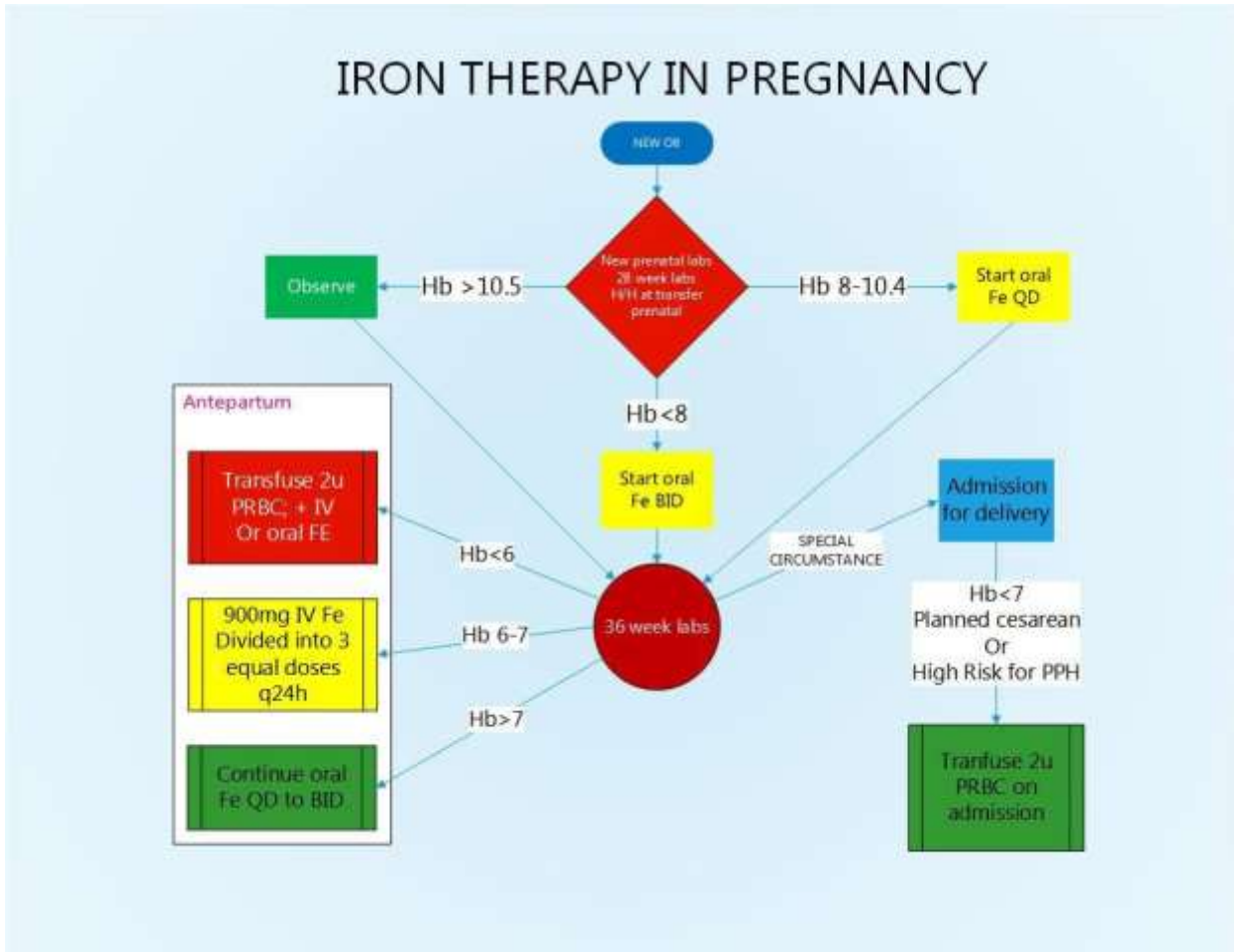
Provider:

- Management should be tailored to the etiology of the bleeding event, and co-existing conditions.
- After massive transfusion, intense fluid resuscitation or need for respiratory or vasopressor support, management should be with an intensivist in the ICU.
- Although counterintuitive, post massive transfusion patients are at higher risk of VTE and should receive appropriate prophylaxis with SCDs, early ambulation and SQ heparin.
- Consider an incentive spirometer for recovery, specifically if the patient was ventilated or intubated at some point during the resuscitation, even if not a surgical management was required.
- After a hemorrhage event, proper documentation of the event including blood loss, interventions and outcomes should be documented in the patient chart. (**Appendix X: Quality review document** to guide your documentation.)
- Debrief the situation with those who were involved. (**Appendix XIII: Debrief tool**)
- Email the SCF PPH EVENT the MRN and providers involved for quality assurance evaluations.
- The provider should meet with the patient to explain the event, provide support, and answer questions for the family members. Preferably this meeting is documented in the chart.
- Organize follow-up in 1-2 weeks post-event for anemia check and mental wellbeing.

Charge RN

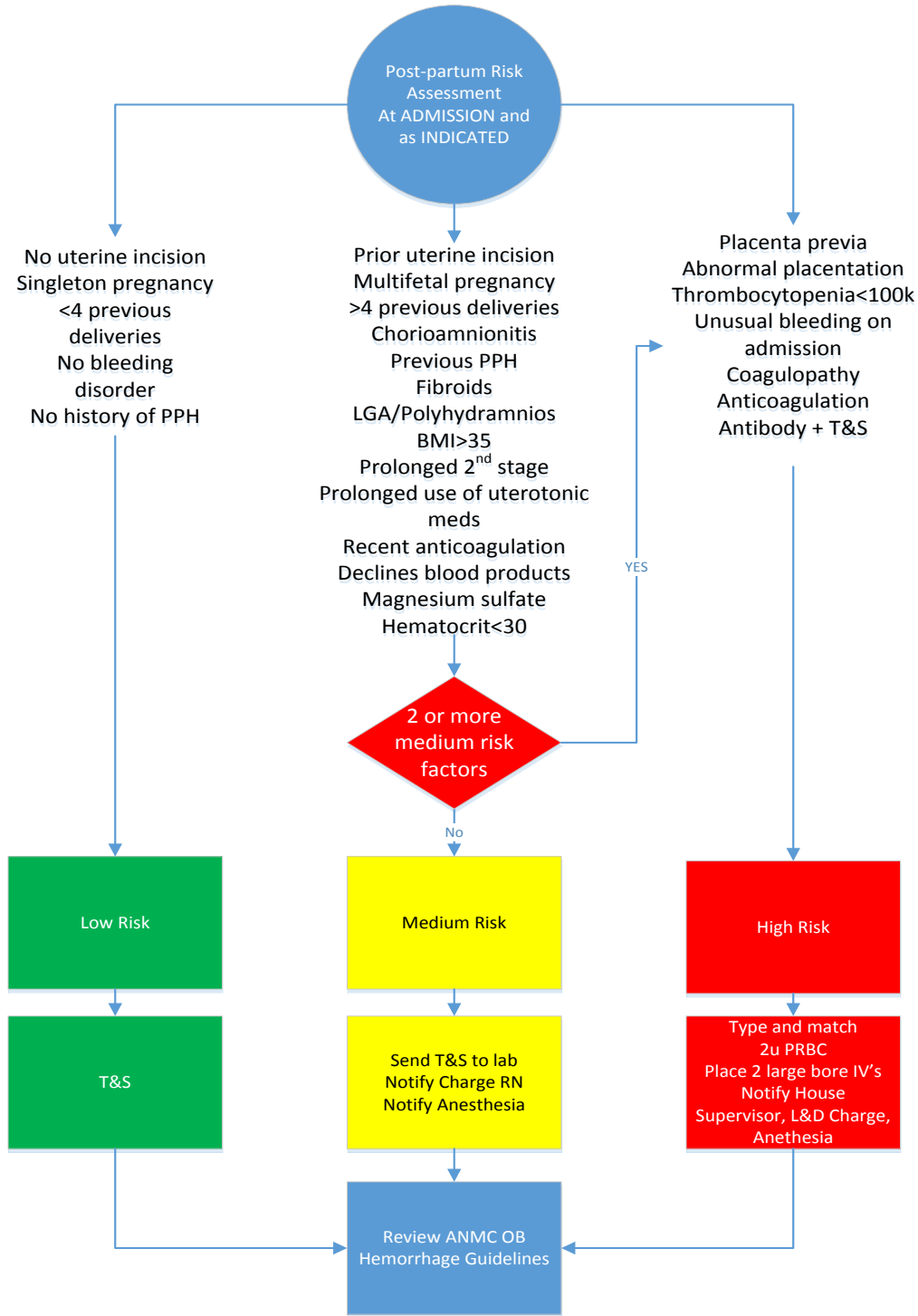
- Receive call from Lab to determine status of unused blood.

Appendix I: Iron therapy in pregnancy



Appendix II: PPH risk assessment tool

Post-Partum Hemorrhage Risk Assessment Tool



ANMC Obstetric Hemorrhage Guidelines

Appendix III: QBL tool

The following is a chart of typical products found on Labor and Delivery which may become blood-soaked during a delivery. To quantitate blood loss from these products, the dry-weights have been measured. Using a 1gm:1ml conversion, the total weight is measured and the dry weight subtracted, leaving the weight of blood.

| ITEM | Dry weight (grams) | Number used (per category) | Total dry weight: All per category | Total wet weight: All per category | Wet weight-dry weight: blood loss in ml. |
|--------------------------------|------------------------------|---|------------------------------------|------------------------------------|--|
| Blue chux | 45 | | | | |
| Light blue chux | 20 | | | | |
| Green chux | 70 | | | | |
| Peach chux | 100 | | | | |
| Ray-tek sponge | 5 | | | | |
| Lap sponge | 20 | | | | |
| Blue towel | 60 | | | | |
| Green towel | 80 | | | | |
| Peach/pink peri-pad | 30 | | | | |
| White peri-pad | 10 | | | | |
| White "old fashioned" peri-pad | 15 | | | | |
| Cloth bed pad | 345 | | | | |
| Large linen towel | 360 | | | | |
| Washcloth | 35 | | | | |
| Graduated drape volume | Subtract pre-delivery fluids | Subtract urine, irrigation after delivery | | | |
| | | | | TOTAL QBL→ | |

Updated weights April 2016, includes RF tagged products

Appendix IV: L&D Stat Team

In any given clinical situation on the Labor and Delivery, the **L&D Stat Team** is appropriate and further hands on deck can be called in separately. In the specific case of a PPH the Pediatric team may be informed that their assistance is not necessary or just limited to temporarily take care of the newborn while the focus of the L&D team is on the mother's wellbeing.

Call 1111: Ask for L&D Stat Team and state location of emergency.

The L&D Stat Team includes the following members:

- Patient primary RN (RN1)
- OBGYN physician on duty
- CNM on L&D duty
- Scrub tech
- L&D charge RN
- Mother-Baby Unit RN (RN2)
- House supervisor
- Anesthesia staff on duty
- Respiratory Therapy on duty
- Pediatrician on duty
- Inpatient Pediatric Unit Charge RN
- Neonatal Intensive Care Unit RN

When the operator is asked to call for an **L&D Stat Team** this will be communicated with an overhead page, which will be repeated 3 times. The on call OBGYN, Pediatrician and Anesthesia on duty will also receive a page.

The **L&D Stat Team** does not include an ICU doctor and is not the same as a rapid response or code.

With a **Rapid Response** the ICU nursing team, plus house supervisor and the respiratory therapist is called, for quick response to a rapid declining clinical situation.

With a **Code Blue**, which is appropriate for unresponsive, pulseless adult patients on L&D the house supervisor, ICU nursing team (ACLS trained), anesthesia, pharmacist and the respiratory therapist is called.

Appendix V: PPH medication kit

This “kit” contains single doses of the medications (see below) most useful for management of PPH (with exception of Pitocin®). There is also a hemorrhage cart that includes syringes, needles and alcohol swabs to minimize the time to administer an injection. Two of the medications in this kit must be refrigerated; thus the kits are located in the refrigerator in the medication room on Labor and Delivery. The critical trigger point of 500mL quantification of blood loss prompts this “kit” being brought to the bedside automatically.

Uterotonic Medication Guide

| MEDICATION | DOSE | ROUTE | FREQUENCY | OTHER |
|---|---|---|--|---|
| oxytocin (Pitocin®) | 30units in 500ml NS IV infusion 350ml/h x 30min 125ml/h x4h | IVPB preferred 10units IM (using 10 unit/mL 1mL vial) in an emergency NEVER PUSH IV | Continuous IV piggyback, premixed | NO IV PUSH Hyponatremia and H2O overload with high doses or prolonged use |
| methergonovine (Methergine®) | 0.2mg | IM Not given IV | Repeat (X 1) 15 minutes after 1st dose. Every 2-4h thereafter. Max dose is 5 total doses in a 24 hour period | Contraindicated with current hypertension, cardiac disease or recent ephedrine use |
| carboprost prostaglandin E2 (Hemabate®) | 250mcg | IM Not given IV | Every 15-90 minutes Max 8 doses in 24h May give loperamide for preventing diarrhea | Bronchospasm, N/V. Contraindicated with active cardiac or respiratory disease |
| misoprostol prostaglandin E1 (Cytotec®) | 400-1000mcg | Buccal, SL, or PR | Once | Transient hyperthermia. Unlikely to work if Hemabate® ineffective |

Misoprostol Pharmacokinetics:

SL or Buccal: These are the preferred routes for acute bleeding – most rapid onset, most prolonged duration, greatest bioavailability: 400mcg SL = fewest side effects and equivalent efficacy to higher doses.

Half-life 20-40min. WHO recommends 800mcg SL; PO- 2nd line for acute bleeding, slower onset than SL; PR: Helpful in prevention, or for anticipated delayed PPH (variable, weak recommendations); *PR not effective if copious diarrhea from Hemabate®

Appendix XI: PPH Carts

On the inpatient OB floor, there are several “Hemorrhage carts” located in clinical areas. These carts should be brought to the location of a PPH event with the initial trigger of 500mL. Carts are located in the following areas:

- **Labor and Delivery:** This cart is located at the nurse’s station on Labor and Delivery. It can be used to cover emergencies on Labor and Delivery as well as in OB Triage.
- **Annex:** nurse’s station
- **MBU:** Located in a cubby in the hallway on the Mother-Baby Unit.
- **On Hold:** There will always be one cart on hold in Central Supply (CS). Once a cart is used, it should be traded for the one held in CS. At that point, it will be restocked up to PAR level.

Most equipment needed to manage an acute PPH event should be located on the cart. This includes:

- IV fluids and tubing
- IV start supplies
- Urinary foley catheter and collecting system
- Blood draw tubes
- Bakri balloon, Kerlix and fluid/syringes
- Headlamp for adequate lighting if needed
- Scale to measure QBL by weight

The PPH Instrument Tray is in the medication room see next page for content.

ANMC Obstetric Hemorrhage Guidelines

Appendix VII: PPH Instrument Tray (Available in medication room)

| Instrument Name | Number | Quantity |
|---|------------------|-----------------|
| Straight Sponge Forceps | GL650 | 2 |
| Uterine Tenaculum Forceps | GL850 | 1 |
| Needle Holder Straight Jaws Carbide inserts 10 3/8" | CH2442 | 1 |
| Uterine Packing Forceps Curved | GL600 | 1 |
| 1x2 Tissue Forceps 10" | SU2337 | 1 |
| Russian Tissue Forceps 10" | SU2454 | 2 |
| Gelpi Retractor 7 1/2" | GA500 | 2 |
| Heaney Simon Retractor 4 1/2x1" | GL350 | 2 |
| Breitsky-Navratil Retractor 12" | GL467 | 2 |
| STEAM INDICATOR, Class D | 264101 | 1 |
| Banjo Curette | ER628R GL1625 | 1 |

Appendix IX: Blood product guide

Blood Product Guide

| PRODUCT | VOLUME | EXPECTED RESULT | OTHER |
|------------------------|--------|---|--|
| Packed Red Blood Cells | 450ml | Increase Hgb by 1gm and HCT by 3% | If AB screen +, may take 1-24 hours for a crossmatch |
| Fresh Frozen Plasma | 180ml | Increase fibrinogen by 10mg/dl | 1:1 or 2:1 PRBCs transfused. Use if PT or PTT >1.5x normal |
| Cryoprecipitate | | Increase in fibrinogen 80-100mg/dl | 30-45min thaw Priority for fibrinogen < 80. Pooled donors |
| Platelets | | Increase platelets by 40-50k Transient | Priority for plt < 50k Single dose is a "6-pack" |

Do not wait for lab results if transfusion is indicated by clinical signs (vitals) and QBL.

Typical ratios

6:4:1 PRBC:FFP:PLT

Or

6:6:1 PRBC:FFP:PLT

For low fibrinogen use cryoprecipitate to target fibrinogen >300

In cases where high risk of coagulopathy exist (for reasons other than dilutional), attempt to mimic whole blood ratios is supported by various studies. In other cases, direction of component therapy by explicit assessment of coagulopathy by either specific clinical or lab criteria is preferred. If bleeding and replacement go on long enough, factor replacement due to dilution will eventually be needed.

- **For all PPH > 1000mls regardless of cause:**
 - Tranexamic acid (Lysteda) to be given within 3 hours post-partum
 - 1 gram total (100mg/ml IV to be given over 10 min)
 - Repeat if ongoing PPH in 30 min or rebleed within 24 hours.
 - Contraindications are known h/o thrombophilia on anticoagulation prophylaxis or active VTE in this pregnancy.
- rFactor VIIa: 70-100mcg/kg IVPB. May repeat in 1 and 3 hours if bleeding continues
 - Off label use
 - No significant obstetric data. Use based on trauma and surgical cases with massive intraoperative blood loss
 - Conflicting evidence regarding thrombotic events post-administration (all uses, 95% off-label) 2-10%
 - 70-100mcg/kg

Appendix X: Surgical Options for PPH**Surgical Options**

Goal of surgical management is cessation of bleeding and vascular stability. Identification of source is paramount.

- Again, consider **the 4 T's: Tone, Tissue, Trauma, Thrombin.**
- **Tone:** If bleeding is from **atony** and a Bakri has not been placed, perform a uterine curettage and place a Bakri. Place the balloon, fill with 500cc saline, assure correct placement and pack the vagina with Kerlix. Some will pack the vagina first and then inflate the Bakri to keep the Bakri in the uterus however be sure the Bakri is not only in the lower uterine segment. Secure the vaginal pack to the Bakri. Attach a foley bag to drain outlet for Bakri and label as "Uterine".
 - Review atony medications and use as indicated
 - Foley catheter for bladder drainage
 - Massage/compression
- **Tissue:** If **cervical or vaginal lacerations** are present and there is no atony, proceed with vaginal exam in lithotomy position with adequate lighting, instruments and assistance. Pack if necessary, repair if able. With packing always place a urinary foley catheter.
- **Trauma:** Consider the mechanics of delivery as well as other contributing historical data such as previous cesarean, operative vaginal delivery. Change in vital signs or change in patient status that is out of proportion to the amount of witnessed blood loss is concerning for internal bleeding. Most concealed bleeding is usually retroperitoneal and laparotomy is indicated. Call out for backup/GYN onc/trauma surgeon if this is expected.
- **Thrombin:** Pre-existing inherited or acquired coagulopathy can increase the amount of post-partum bleeding significantly. Many of these patients will have been previously identified and they should be discussed with MFM and/or hematology. Consideration should be made for coagulopathy when bleeding occurs under unusual circumstances. Identification of other signs of bleeding, such as at the IV site, may be the only indicators. Certain conditions can also cause pregnancy/delivery related coagulopathy, such as disseminated intravascular coagulation (DIC), dilutional coagulopathy, hypofibrinogenemia, or amniotic fluid embolism (AFE). Suspicion of these conditions warrants aggressive blood product transfusion (FFP, CRYO). Possible use of tranexamic acid (Lysteda®) or rFactor VIIa may also be considered.

If no response with the above, proceed to **laparotomy** with the following options available.

- **Surgical/Laparotomy Options:** The following options all have some utility in managing PPH surgically.
 - **Midline laparotomy preferred due to better exposure and access to upper abdomen if needed.**
 - Uterine artery ligation- Decreases perfusion pressure to the uterus by 25-50%
 - 4 vessel ligation (Uterine and utero-ovarian 45-50% decrease in bleeding)
 - Compression sutures: very effective if indeed bleeding is from uterine atony. First attempt rolling up the uterus. If bleeding stops due to this temporary procedure
 - B-Lynch suture

ANMC Obstetric Hemorrhage Guidelines

- Placental bed hemostatic suturing
- Patterned compression figure of 8 sutures
- Bilateral hypogastric artery ligation (↓ perfusion pressure by 85%, ↓ blood flow by 75%) (Requires special skill and experience). **Have GYN ONC available for this procedure. If the posterior branch of the internal iliac is included this will lead to gluteal necrosis therefor do not attempt unless well-practiced** in this procedure.
- If patient is hemodynamically stable, consider arterial embolization (2-4h lag time)
- **Hysterectomy**
 - Fast procedure is better for total blood loss: perform “clamp-cut, clamp-cut” until the uterine arteries are clamped. Once vascular isolation is accomplished (uterine and uteroovarian vessel), then the pedicles can be sutured/tied.
 - Subtotal hysterectomy less changes of clamping the ureters, go across the uterus where you would normally do your lower uterine incision for cesarean section.
 - If planned hysterectomy in setting of placenta abnormalities: (1) deliver the fetus through a portion where the placenta is not attached. (2) close this hysterectomy with the placenta still inside.
 - Consider cystoscopy postoperatively

An additional intervention that is available is that of **Interventional Radiology (IR)**. Interventional radiology suites have fluoroscopic capability and instruments to be able to float catheters into terminal arteries and can either have a temporary balloon tamponade, or injection of substances that can occlude the arteries downstream. Unfortunately, the complexity of interventional radiology and the time required to mobilize, catheterize and actually float a catheter into the required artery takes an inordinate amount of time and is not useful during an acute event. However, once a patient is stabilized, continued mild/moderate bleeding can potentially be addressed with interventional radiology.

ANMC has a fully functioning interventional radiology suite and has an IR on-call team. To mobilize this resource during the day, the office manager of the Interventional Radiology (Avalisa Wroten) group should be called at 907-339-9455. She will then mobilize the team and arrange contact between the OB physician and radiologist-interventionist. After hours and on weekends, the on-call interventional radiologist should be contacted through their answering service (Phone: 907-339-9455). Alternatively the OR-staff can arrange this. Uterine artery embolization should be given consideration at any time during an event when the patient is stable and a 3-4h hour lag time would be acceptable. IR can be highly beneficial with the right circumstances.

Another use of interventional radiology is in the setting of abnormal placentation (accreta, increta, percreta) when a cesarean or post-partum hysterectomy is planned. Uterine artery catheters can be placed pre-operatively. Once the neonate is delivered, the catheters can be used to occlude the uterine arteries, significantly limiting blood loss. This takes careful consideration and planning but could potentially, greatly limit morbidity associated with massive blood loss, transfusion and operating time.

ANMC Obstetric Hemorrhage Guidelines

Appendix X: Quality review document

| PPH WORKSHEET | | | |
|---|--|--|-----|
| Date of occurrence (MM/DD/YY) | | MRN | |
| Date of review (MM/DD/YY) | | Pt (Age/Initials) | |
| Reviewer (RSG or HC) | | G (TPAL) | |
| Providers involved (initials as used on schedule) | | EGA at delivery (weeks + days) | |
| ANTEPARTUM | | | |
| Antepartum risk factors identified? (NA/Y/N) | | If risk factors present, treatment plan in chart? (NA/Y/N) | |
| Which risk factors? (NA or #'s of PPH risk factor from below) | | Reviewed refusal of blood with pt, declination signed? (NA/Y/N) | |
| ADMISSION | | | |
| Which risk factors identified in admission? (NA or #'s of PPH risk factor from below) | | Risk assessment documented? (No, Low, Medium, High = N, L, M, H) | |
| Which risk factors identified on review? (NA or #'s of PPH risk factor from below) | | Assigned risk assessment on review (Low, Medium, High = L, M, H) | |
| Order for 2 IVs if high risk (NA/Y/N) | | Order for blood products if high risk (NA/Y/N) | |
| LABOR | | | |
| New risk factors identified as needed (NA or #'s of PPH risk factor from below) | | Assigned risk assessment on review (Low, Medium, High = L, M, H) | |
| Appropriate risk level re-assigned in progress notes (NA/Y/N) | | New orders documented (NA/Y/N) | |
| PPH EVENT | | | |
| Time from delivery to identification of PPH (in hours) | | Differential of PPH (TISSUE, TONE, TRAUMA, COAGULOPATHIC) | N/A |
| QBL used after 500mLs (Y/N) | | Tissue: Sonogram done? (Y/N) | |
| Total QBL (in mLs) | | Tissue: Manual sweep? (Y/N) | |
| Prophylactic Pitocin given? (Y/N) | | Tissue: Antibiotics given with manual sweep? (NA/Y/N) | |
| Second IV placed? (Y/N) | | Tone: Pitocin increased? (Y/N) | |
| Presence of Abruptio, Previa or Antepartum Hemorrhage? (NA, A, P, APH) | | Tone: Methergine, Hemabate and/or Cytotec given? (M,H,C) | |
| External services involved? (write in) (Anesthesia, ICU, GYN ONC, Trauma, IR) | | Tone: Repetition of uterotonics given? (Y/N) | |
| STAT L&D, rapid response, code called? (Y/N) | | Tone: Bladder emptied with Foley? (Y/N) | |
| Delays identified? (Y/N, what kind) | | Trauma: Tech available with supplies (NA/Y/N) | |
| Complications (Y/N, what kind) | | Coagulopathy: # of units of RBC transfused | |
| Final diagnosis (write in) | | Coagulopathy: # of units of FFP transfused | |
| Cause treated according to guidelines? (Y/N) | | Coagulopathy: # of units of platelets transfused | |
| Correct diagnosis code entered into Cerner? (Y/N) | | Coagulopathy: other blood products given? (Y/N) | |
| Post PPH event | | | |
| Debrief with team done? (Y/N) | | Debrief with family documented? (Y/N) | |

ANMC Obstetric Hemorrhage Guidelines

Concerns from this review that warrant further review:

Patient factors contributing to the event:
(late prenatal care, refusal of treatment, labor preferences)

PPH RISK ASSESSMENT

| Medium Risk | High Risk |
|---|--|
| <ol style="list-style-type: none"> 1. Prior uterine incision 2. Multifetal pregnancy 3. >4 previous deliveries 4. Chorioamnionitis 5. Previous PPH 6. Fibroids 7. LGA/Polyhydramnios 8. BMI >35 9. Prolonged 2nd stage 10. Prolonged use of uterotonic meds 11. Recent anticoagulation 12. Declines blood products 13. Magnesium sulfate 14. Hematocrit <30 | <ol style="list-style-type: none"> 15. Placenta previa 16. Suspected abnormal placentation 17. Thrombocytopenia <100k 18. Bleeding on admission more than expected show 19. Coagulopathy 20. Anticoagulation 21. Antibody + T&S 22. Two or more medium risk factors |

Appendix XII: PPH Response Algorithm Checklist.

POST-PARTUM HEMORRHAGE RESPONSE ALGORITHMS

| STAGE I - QBL 500ml Initial trigger point | STAGE II - QBL >1000ml (or 10% ▲ BP/pulse, O2 <92) | STAGE III - QBL>1500ml (unstable, DIC, >2 Units PRBC) | STAGE IV - QBL >2000ml (unstable, DIC, multiple blood products transfused) |
|--|--|---|--|
| <p>RN 1 (primary RN):</p> <ul style="list-style-type: none"> Notify Charge RN Increase Pitocin® infusion rate to 999ml/hr. V5 (pulse, BP, O2 saturation) frequently, state to providers when outside of normal Oxygen via facemask Stays at the bedside Keep patient warm Keeps charting, evaluating blood loss with providers | <p>RN 1 (primary RN):</p> <ul style="list-style-type: none"> same as prior, stops charting when recorder is situated <p>Charge RN:</p> <ul style="list-style-type: none"> Notify House Sup (phone 1919) Anesthesia (pager 2222) to rm Notify OR (2275) & scrub (8123) Assign: Recorder, Blood bank liaison, runner, family liaison Order blood <p>RN 2 (runner):</p> <ul style="list-style-type: none"> Assist RN 1 <p>Scrub tech:</p> <ul style="list-style-type: none"> Ensuring lighting, instruments and disposables: sutures and sponges. If warranted prepares OR. <p>Recorder:</p> <ul style="list-style-type: none"> Records all interventions <p>Family Liaison:</p> <ul style="list-style-type: none"> Updates to family, keeps neonate in safe <p>House Supervisor:</p> <ul style="list-style-type: none"> Crowd control, contact back up and other services as indicated <p>Anesthesia:</p> <ul style="list-style-type: none"> IV access (PRN central line), pain control. | <p>All prior mentioned staff is continuing with their tasks with the following additions:</p> <p>RN2 (runner):</p> <ul style="list-style-type: none"> Nurse draws and sends MBT labs every 30-60 mins: <ul style="list-style-type: none"> Coags and fibrinogen (Light blue top tube) CMP (Light green top tube) Ionized Ca+ (ABG syringe - venous blood) CBC (Purple top tube) <p>Charge RN/House Supervisor:</p> <ul style="list-style-type: none"> Activate Immediate Massive Blood Transfusion Protocol Push system Verify with provider need for GYN ONC/Interventional Radiology/ICU bed <p>Anesthesia:</p> <ul style="list-style-type: none"> Management of intubation, IV fluids, blood product infusion, analgesia/anesthesia Call for 2nd Anesthetist Antibiotics per surgeon <p>Operating room team:</p> <ul style="list-style-type: none"> Receive SBAR from RN1 Takes over primary care of patient Coordinate transport to the operating suite Coordinate operating room function/personnel/equipment | <p>All prior mentioned staff is continuing with their tasks with the following additions:</p> <p>Charge RN/House Supervisor:</p> <ul style="list-style-type: none"> Activate Immediate Massive Blood Transfusion Protocol Push system Verify with provider need for GYN ONC/Interventional Radiology/ICU bed <p>Anesthesia:</p> <ul style="list-style-type: none"> Management of intubation, IV fluids, blood product infusion, analgesia/anesthesia Call for 2nd Anesthetist Antibiotics per surgeon <p>Operating room team:</p> <ul style="list-style-type: none"> Receive SBAR from RN1 Takes over primary care of patient Coordinate transport to the operating suite Coordinate operating room function/personnel/equipment |
| <p>RN 2 (runner):</p> <ul style="list-style-type: none"> Brings PPH medication kit, PPH cart and PPH instrument tray into the room Brings the ultrasound to the room Ensure working second IV line, give medications as ordered by provider Ensure adequate lighting and that provider has instruments for laceration evaluation/repair | <p>RN 2 (runner):</p> <ul style="list-style-type: none"> At any time the charge RN can call for the L&D Stat Team (Appendix IV) | <p>Charge RN/House Supervisor:</p> <ul style="list-style-type: none"> Activate Standby Massive Blood Transfusion Protocol (MBT) Blood bank phone-1235 or 1223 Pull system Contact additional services as indicated by the provider (Interventional radiology, GYN ONC etc.) Calls backup OBGYN and additional assistance as indicated. | <p>All prior mentioned staff is continuing with their tasks with the following additions:</p> <p>RN2 (runner):</p> <ul style="list-style-type: none"> Nurse draws and sends MBT labs every 30-60 mins: <ul style="list-style-type: none"> Coags and fibrinogen (Light blue top tube) CMP (Light green top tube) Ionized Ca+ (ABG syringe - venous blood) CBC (Purple top tube) <p>Charge RN/House Supervisor:</p> <ul style="list-style-type: none"> Activate Standby Massive Blood Transfusion Protocol (MBT) Blood bank phone-1235 or 1223 Pull system Contact additional services as indicated by the provider (Interventional radiology, GYN ONC etc.) Calls backup OBGYN and additional assistance as indicated. |

ANMC Obstetric Hemorrhage Guidelines

Appendix XIII: Debrief tool (can use any tool) to be placed in the QA box.

Date: _____

Team Members Attending Debrief: _____

Incident/Success: _____ **Area(s) Involved:** _____

Time of Debrief: _____

What Occurred ?

Contributing Factors? What led to the problem?

What went well?

Areas to Improve on:

Additional Comments: