E: MASSIVE TRANSFUSION PROTOCOLS

- Multiple protocols are available
  - 4u prbc:4u FFP:1u platelets
- Whatever one you pick:
  - HAVE one
  - Have a SIMPLE way to initiate it
  - Make it unbelievably simple to get it & start it

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D:DRUG THERAPY

Agent	*Dose*	*Route*	*Dosing Frequency*	*Side Effects*	*Contra-indications*
Oxytocin (Pitocin)	10-80 U/L NS/LR	IV (IM, IU)	Continuous	N/V, water intoxication	None
Cytotec (Misoprostol)	200-1000 mcg	SL/PR (PO)	Single dose	N/V, F/C, diarrhea	None
Methergine (Methyl-ergonovine)	0.2 mg	IM (IU, PO)	Q2-4hr	HTN, N/V, hypotension	HTN, migraines, Raynaud's, CAD, scleroderma
Hemabate (PG $F_{2\alpha}$)	0.25mg	IM (IU)	Q15-90min Max = 8	N/V, F/C, diarrhea	Active cardiac, renal, liver, lung disease

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DRUGS (PHARMACY)

- Tranexamic acid
- Recombinant factor VIIa
- Prothrombin complex concentrate
- Fibrinogen concentrate
- Hemostatic agents
- Calcium

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CALCIUM

- Needed for smooth muscle contraction, BP stabilization, and hemostasis
- Depleted with massive hemorrhage and replacement transfusion
- Dosage
  - Calcium gluconate or calcium chloride 1 ampule IV (multiple doses typically needed)

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RECOMBINANT FACTOR VIIA

- Vitamin K-dependent clotting factor that works via the extrinsic pathway
- Dosage (off-label use)
  - 60-100mcg/kg IV bolus
- Rapid (10-40 minutes) bleeding control with few side effects
- Disadvantages
  - Short half-life (2 hours)
  - Very expensive ($1 per mcg)
  - Limited availability
  - Potential for thrombosis

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PROTHROMBIN COMPLEX CONCENTRATE (KCENTRA)

- Contains factors II, VII, IX, X, protein C &S
- Dosage calculated upon level of coagulopathy
- Alternative to FFP
- Advantages
  - No need for thawing or blood group typing
  - Decreased risk of volume overload
  - Decreased risk of transfusion-related allergic reactions

TRANEXAMIC ACID

- Intravenous anti-fibrinolytic agent used for the prevention and treatment of hemorrhage
- World Maternal Antifibrinolytic Trial (WOMAN), 2017
  - 20-30% reduction in PPH-related death
  - 36% reduction in need for laparotomy
  - No change in hysterectomy, thromboembolism, all-cause mortality
- Dosage
  - 1g IV over 10-20 minutes, followed by repeat dose if persistent bleeding within 30 minutes
- Disadvantages
  - CNS depression, seizures, ocular effects, thrombosis potential

Lancet, 2017

VITAMIN K

- Necessary precursor for clotting factors II, VII, IX, and X
- Dosage
  - 5-10mg IV (po)
- Assists in replenishment of endogenous clotting factors

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FIBRINOGEN CONCENTRATE (RIASTAP)

- Intravenous human fibrinogen concentrate used for massive hemorrhage
- Dosage
  - Each vial contains 1000mg of fibrinogen
- Advantages
  - No thawing required
  - FDA-approved
- Disadvantages
  - Limited availability
  - Minimal data in obstetrical population

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I: INTRAOPERATIVE MANAGEMENT

- Bimanual massage
- Uterine curettage
- Laceration repair
- Arterial ligation
- Compression sutures
- Packing
- Hysterectomy
- Hemostatic Agents
- Staged management

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3 GROUPS OF SURGICAL TECHNIQUES

- 1: Restore uterine physiology and normal anatomy to restore the process of uterine involution
  - Repair of lacerations
  - Removal of retained products
  - Restoring normal uterine anatomy after inversion
- 2: Decrease uterine blood flow and decreases blood loss
  - surgical vascular ligation
  - uterine artery embolization
  - Give time for involution to take effect
- 3: Replicates vascular compression of uterine involution by tamponade
  - B-lynch
  - Uterine balloon
- 4. Failing these uterine and fertility salvaging procedures
  - Hysterectomy

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THROMBIN: SELECTIVE ARTERIAL EMBOLIZATION

- Technique
  - Pelvic arteriogram and selective placement of sterile pledgets (Gelfoam) into bleeding vessels
- Pros
  - Selectivity with uterine preservation
  - Highly successful (90-97%)
  - Definitive surgical therapy possible if embolization fails
- Cons
  - Often requires hemodynamically and hemostatically stable patient
  - Limited availability
  - Complications (<6%)
    - Fever/Pain, Infection, Procedure-related problems

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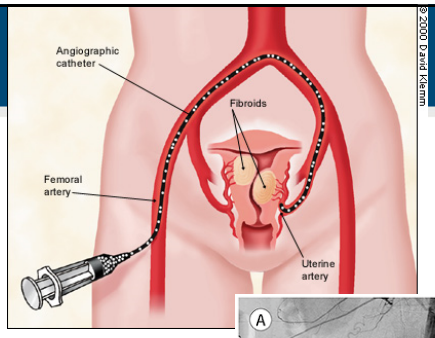

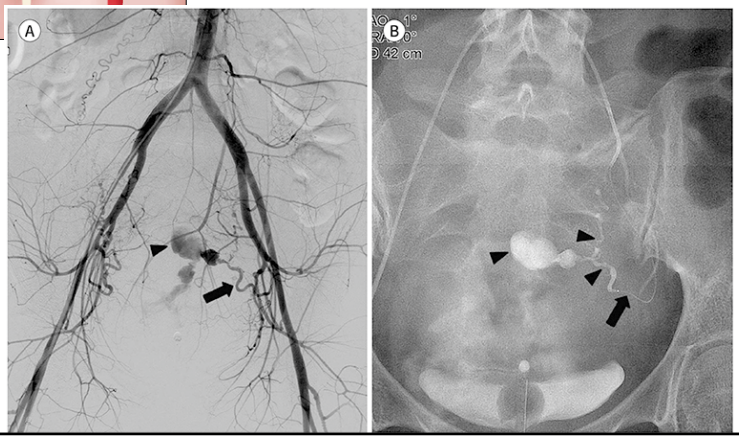

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HYSTERECTOMY

- Definitive therapy
  - Refractory atony
  - Irreparable uterine rupture or vessel lacerations
  - Invasive placentation
- Technique
  - Double clamps and ligatures; electrocautery dissection
  - Considerations
    - Pre-hysterectomy arterial ligation or balloon tamponade
    - Supracervical approach

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N: NON-OBSTETRICAL SERVICES

- ***Share your pain!***
  - Interventional radiology
  - Pharmacy
  - Intensive care team

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INTENSIVE CARE TEAM

- Massive hemorrhage and transfusion can be associated with multiple comorbidities
- Assistance from an intensive care team in the PPH recovery phase is recommended
- Make sure they have all the “ob” stuff
- Support their team in routine PP care

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G: GENERAL COMPLICATIONS-EARLY/IMMEDIATE

- ***Anticipate complications***
  - Hypoperfusion injuries
    - Brain, heart, kidneys, pituitary necrosis
  - Abdominal compartment syndrome
  - Infection
  - Transfusion-associated volume/circulatory overload (TACO)
  - Transfusion-related acute lung injury (TRALI)
  - Anemia

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G:GUIDELINES

- Practice!
  - PPH drills
  - Quantification of blood loss
  - Prescriptive checklists
  - Simulation devices
  - “walk throughs” with teams on plans
  - ”playing” oral boards style “what next” when reviewing cases or events

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10 Most Common Mistakes

- Treating PPH as a diagnosis (as opposed to a sign) and not identifying underlying cause(s)
- Underestimating blood loss
- Inattention to vital sign trends
- Delay in laboratory assessment for developing anemia and coagulopathy
- Delay in instituting blood component therapy
- Delay in surgical intervention
- Not making mental shift from “normal delivery” to “life-threatening emergency”

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10 Most Common Mistakes

- Poor perioperative communication between Ob/Anesthesia regarding who will primarily manage
  - blood loss estimation
  - laboratory assessment
  - blood component therapy
- Poor postpartum communication between RN/OB regarding EBL, vital signs and other clinical indicators
- Lack of preoperative preparation for massive hemorrhage
  - e.g. placenta previa with prior cesareans and suspected placenta accreta

Dildy et al. HCA online PPH course, Advanced Practice Strategies

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Preventing Maternal Death

- Angiographic embolization not meant to be useful for acute massive PPH
- If more than a single dose of medication is needed for atony, go to the bedside until atony is resolved
- Never treat PPH without simultaneously pursuing an actual diagnosis
- In a PPH patient with oliguia- furosamide is not the answer, volume repletion is!
- Any women with placental previa and prior cesarean should be evaluated & delivered at a tertiary care center
- If your L&D doesn't have a updated massive transfusion protocol- get one!

Clark & Hankins. Preventing maternal death:10 clinical diamonds. *Obstet Gynecol* 2012 Feb;119(2 Pt 1):360-4

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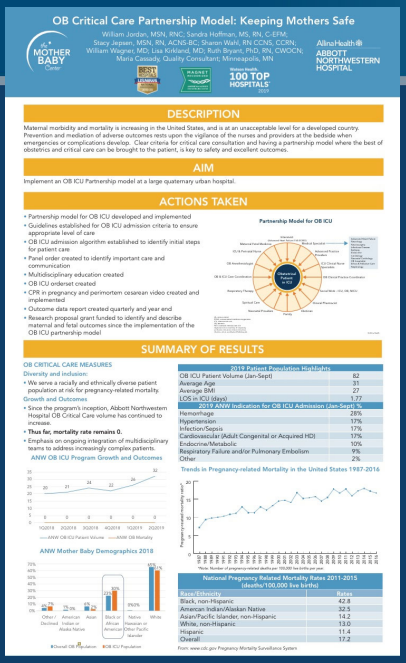
THANK YOU!



OB Critical Care Partnership Model: Keeping Mothers Safe

William Jordan, MSN, RNC; Sandra Hoffman, MS, RN, C-EFM; Stacy Jepsen, MSN, RN, ACNS-BC; Sharon Wahl, RN CCNS, CCRN; William Wegner, MD; Lisa Kirkland, MD; Ruth Bryant, PhD, RN, CWOCN; Maria Cassady, Quality Consultant; Minneapolis, MN

DESCRIPTION

Maternal morbidity and mortality is increasing in the United States, and is at an unacceptable level for a developed country. Prevention and mediation of adverse outcomes rests upon the vigilance of the nurses and providers at the bedside when emergencies or complications develop. Clear criteria for critical care consultation and having a partnership model where the best of obstetrics and critical care can be brought to the patient, is key to safety and excellent outcomes.

AIM

Implement an OB ICU Partnership model at a large quaternary urban hospital.

ACTIONS TAKEN

- Partnership model for OB ICU developed and implemented
- Guidelines established for OB ICU admission criteria to ensure appropriate level of care
- OB ICU admission algorithm established to identify initial steps for patient care
- Panel order created to identify important care and communication
- Multidisciplinary education created
- OB ICU orderset created
- CPR in pregnancy and perimortem cesarean video created and implemented
- Outcome data report created quarterly and year end
- Research proposal grant funded to identify and describe maternal and fetal outcomes since the implementation of the OB ICU partnership model

Partnership Model for OB ICU

SUMMARY OF RESULTS

OB CRITICAL CARE MEASURES

Diversity and inclusion:

- We serve a racially and ethnically diverse patient population at risk for pregnancy-related mortality.

Growth and Outcomes

- Since the program's inception, Abbott Northwestern Hospital OB Critical Care volume has continued to increase.
- **Thus far, mortality rate remains 0.**
- Emphasis on ongoing integration of multidisciplinary teams to address increasingly complex patients.

ANW OB ICU Program Growth and Outcomes

ANW Mother Baby Demographics 2018

2019 Patient Acuities Highlights	
OB ICU Patient Volume (Jan-Sept)	82
Average Age	31
Average BMI	27
LOS in ICU (days)	1.77
2019 ANW Indication for OB ICU Admission (Jan-Sept) %	
Hemorrhage	28%
Hypertension	17%
Infection/Sepsis	17%
Cardiovascular (Adult Congenital or Acquired HD)	17%
Endocrine/Metabolic	10%
Respiratory Failure and/or Pulmonary Embolism	9%
Other	2%

Trends in Pregnancy-related Mortality in the United States 1987-2016

National Pregnancy Related Mortality Rates 2011-2015 (deaths/100,000 live births)	
RACE/ETHNICITY	Rates
Black, non-Hispanic	42.8
American Indian/Alaskan Native	32.5
Asian/Pacific Islander, non-Hispanic	14.2
White, non-Hispanic	13.0
Hispanic	11.4
Overall	17.2

From: www.cdc.gov Pregnancy Mortality Surveillance System

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