

Birthing Hospital Peripartum Hemorrhage Prevention Practices as a Component of the NYS Hemorrhage Project



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I have No Conflicts of
Interest to Disclose



OBJECTIVES

- Describe the Goal and Objectives of the NYSPQC Hemorrhage Project
- Review NYSPQC Hemorrhage Project data
- Discuss the consequences of Peripartum Hemorrhage
- Review the risk of peripartum hemorrhage
 - Provider/facility
 - Patient
- Describe the vital sign changes that occur with the onset of severe hemorrhage and shock
- Discuss evidence based tools to maximize early intervention with hemorrhage (MEWS and Shock Index)

NYS Obstetric Hemorrhage Project Goal

The goal of the NYS Obstetric Hemorrhage Project is to reduce maternal morbidity and mortality statewide by translating evidence-based guidelines into clinical practice to improve the assessment and management of obstetric hemorrhage.

- By June 2019, increase hemorrhage risk assessment on admission and postpartum to 85% of maternity patients.

NYS Obstetric Hemorrhage Project Objectives

- Improve **readiness** to respond to an obstetric hemorrhage by implementing standardized policies and procedures and developing rapid response teams;
- Improve **recognition** of obstetric hemorrhage by performing ongoing objective quantification of actual blood loss and triggers of maternal deterioration during and after all births;
- Improve **response** to hemorrhage by performing regular on-site, multidisciplinary hemorrhage drills;
- Improve **reporting** of obstetric hemorrhage using standardized definitions resulting in consistent coding.

Project Participation

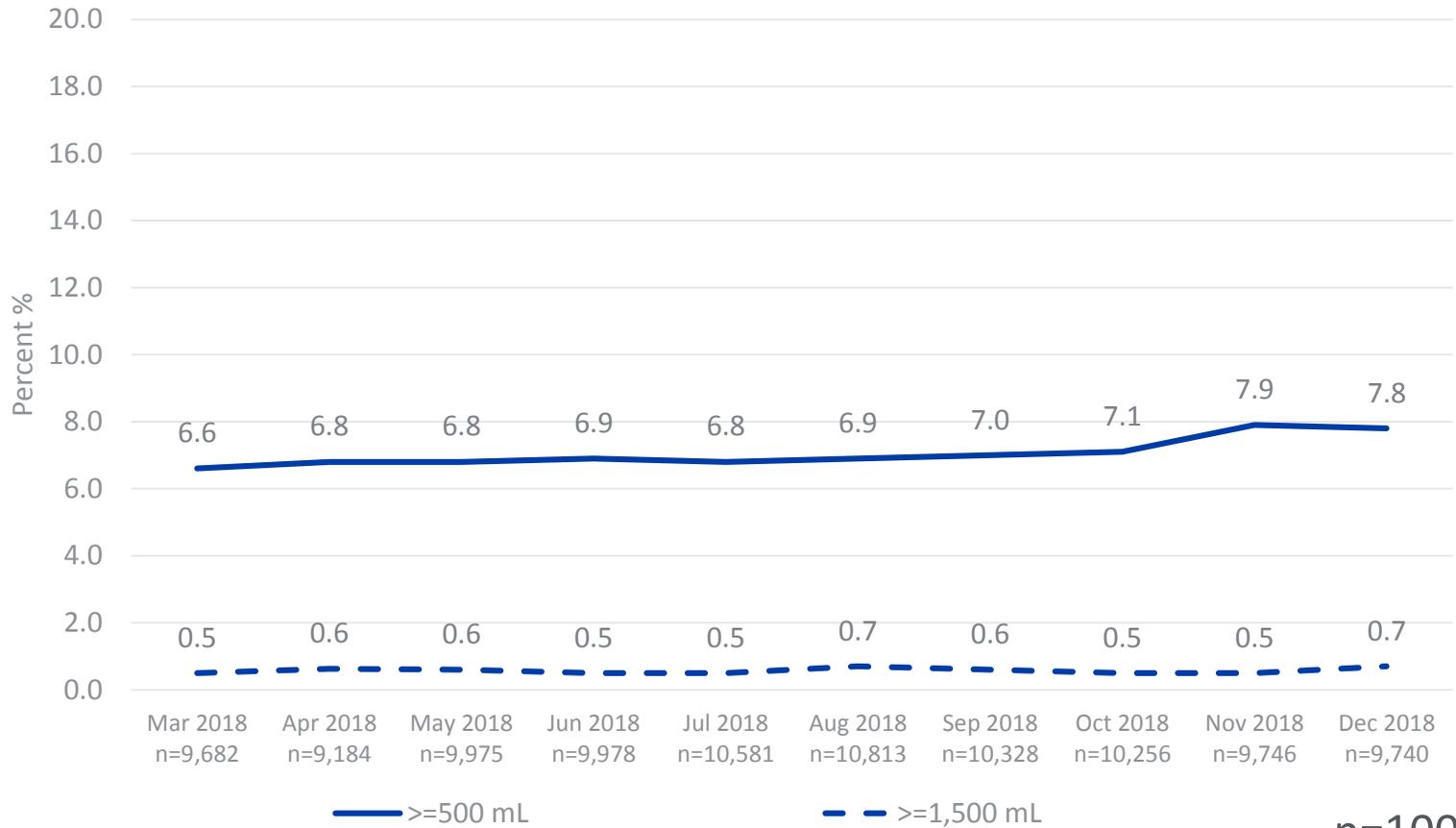
70% (86/123) of NYS birthing hospital are participating in the project:

- 100% (17/17) RPCs
- 74% (25/34) Level III hospitals
- 76% (19/25) Level II hospitals
- 53% (25/47) Level I hospitals

New York State Obstetric Hemorrhage Project

Obstetric Hemorrhage

Vaginal Delivery



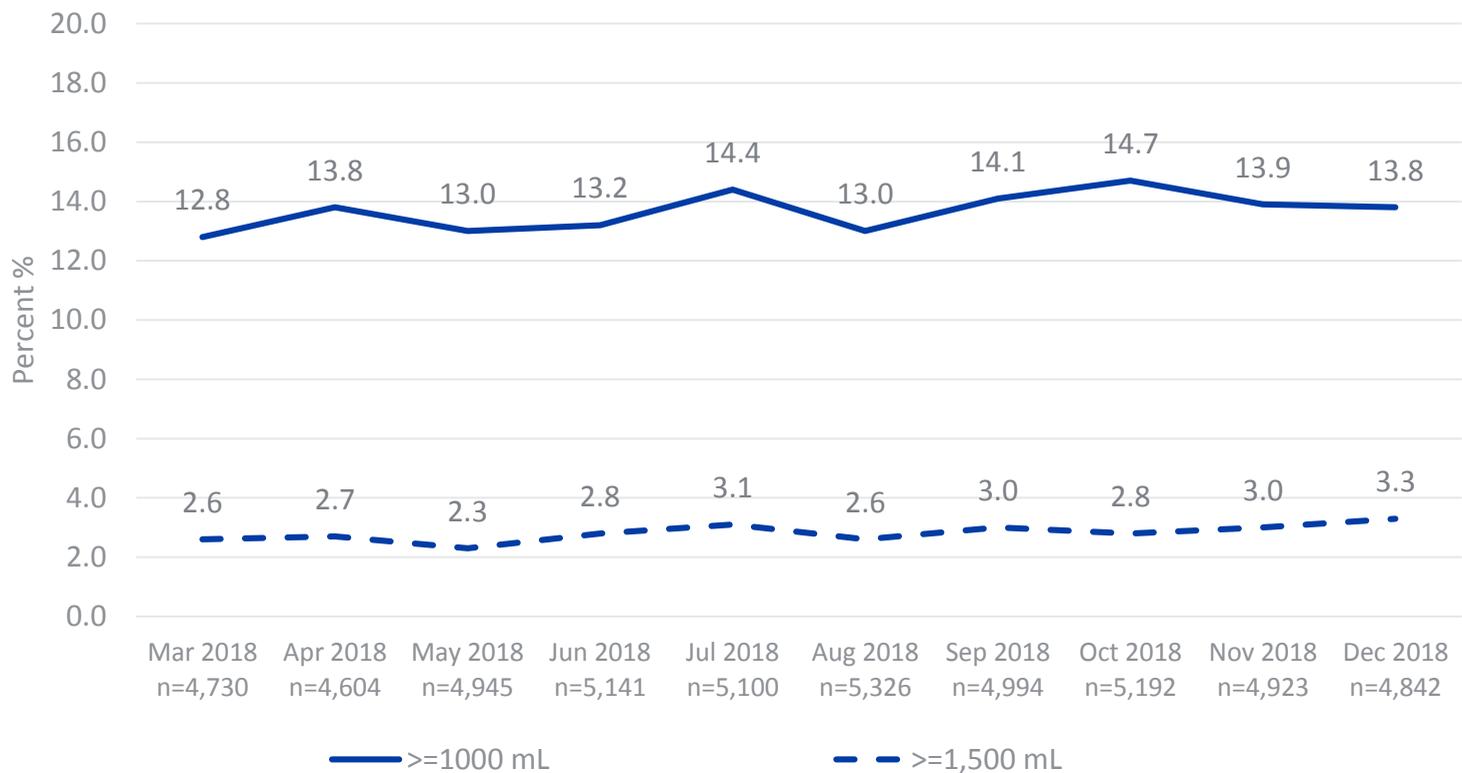
n=100,283

Volume	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
≥ 500	639	625	678	688	720	746	723	728	770	760	7077
≥ 1500	48	55	60	50	53	76	62	51	49	68	572

New York State Obstetric Hemorrhage Project

Obstetric Hemorrhage

Cesarean Section

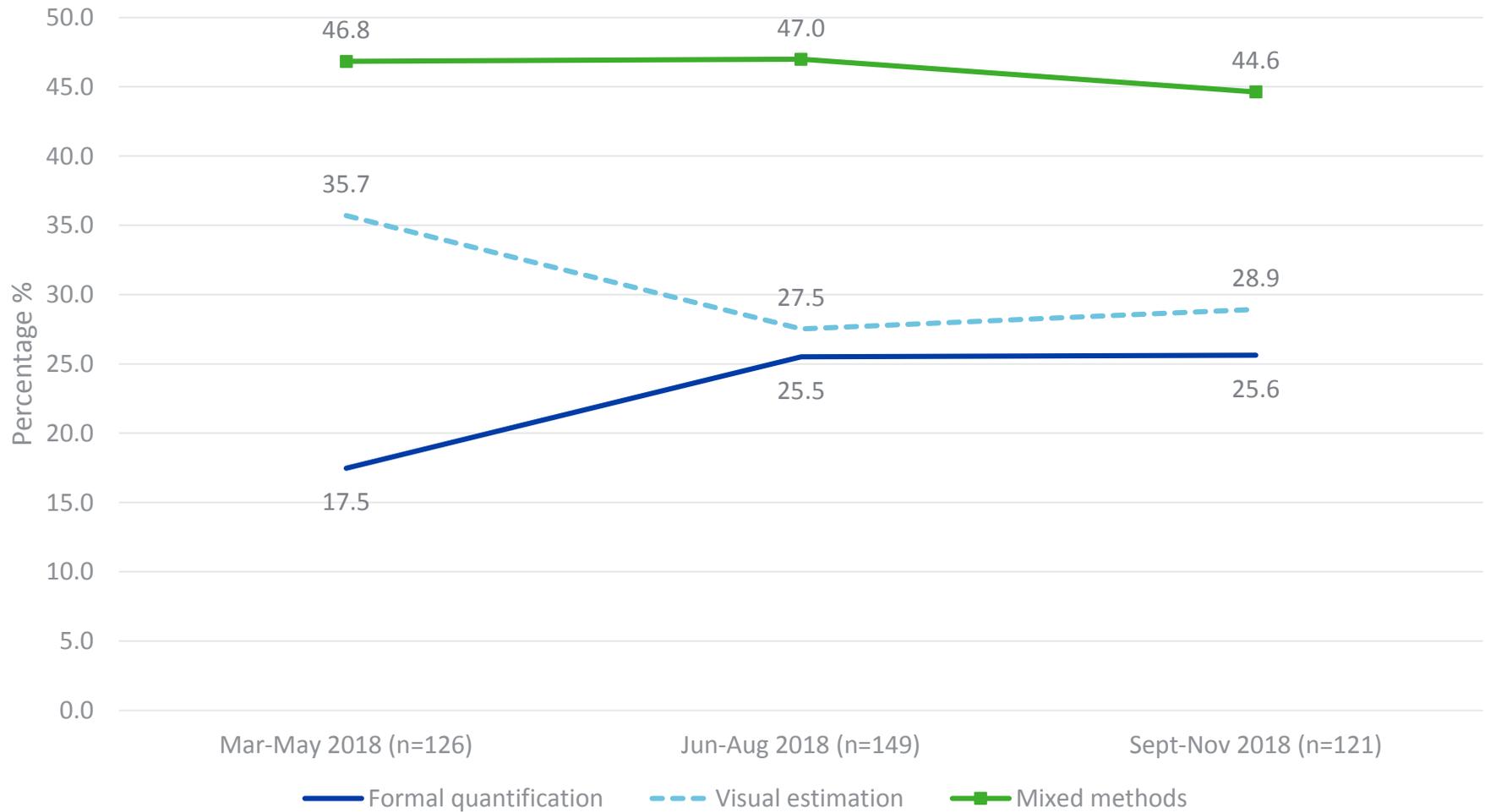


n=49,797

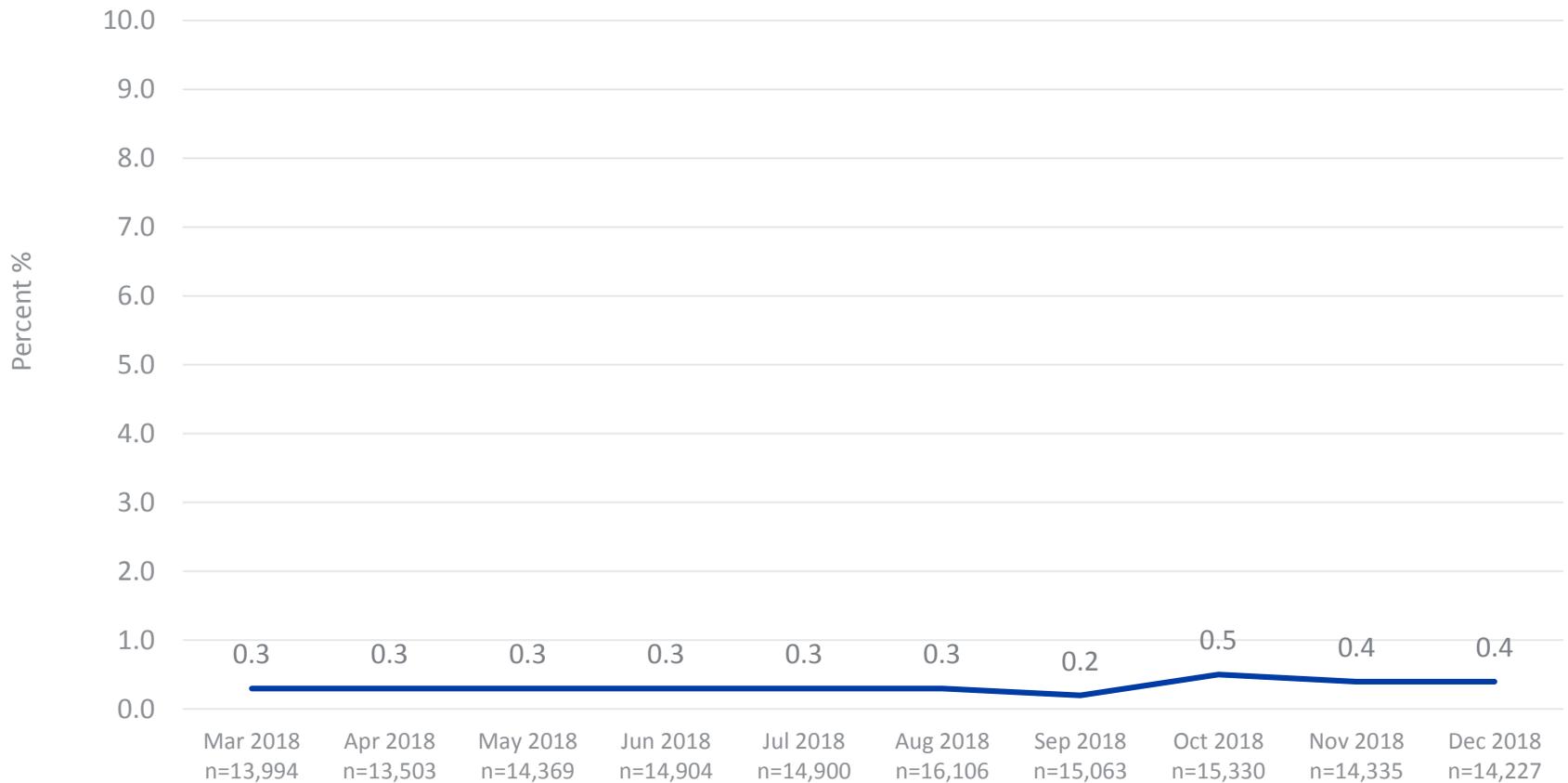
Volume	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
≥500	605	635	643	679	734	692	704	763	684	675	6814
≥1500	123	124	114	144	158	138	149	145	148	160	1403

New York State Obstetric Hemorrhage Project Method of Calculating Blood Loss (n=396)

(For patients with hemorrhage-related morbidity or mortality)

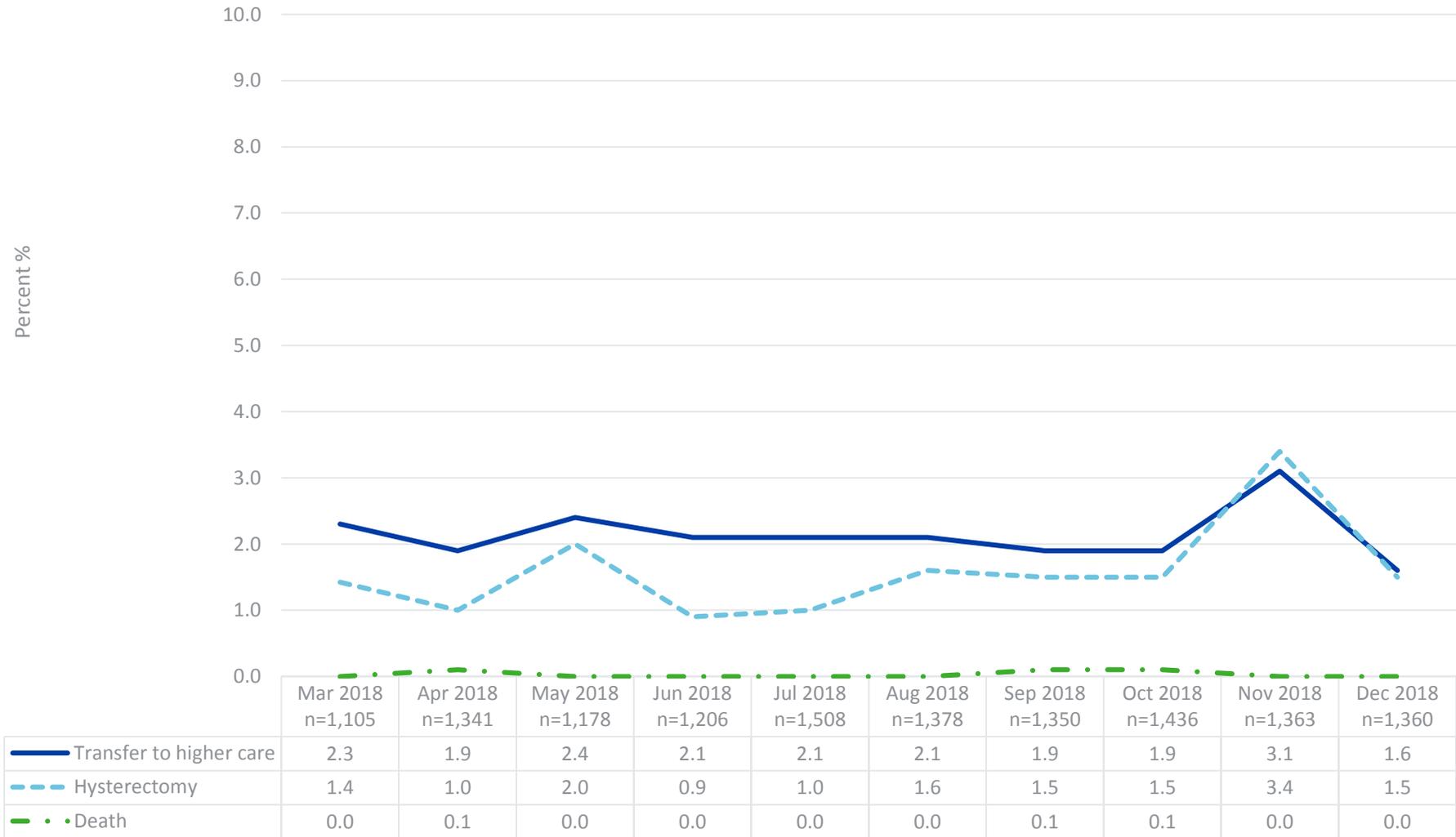


New York State Obstetric Hemorrhage Project Massive Transfusion (4+ units of blood)



≥4 units	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	42	41	43	45	45	48	30	77	57	57	485

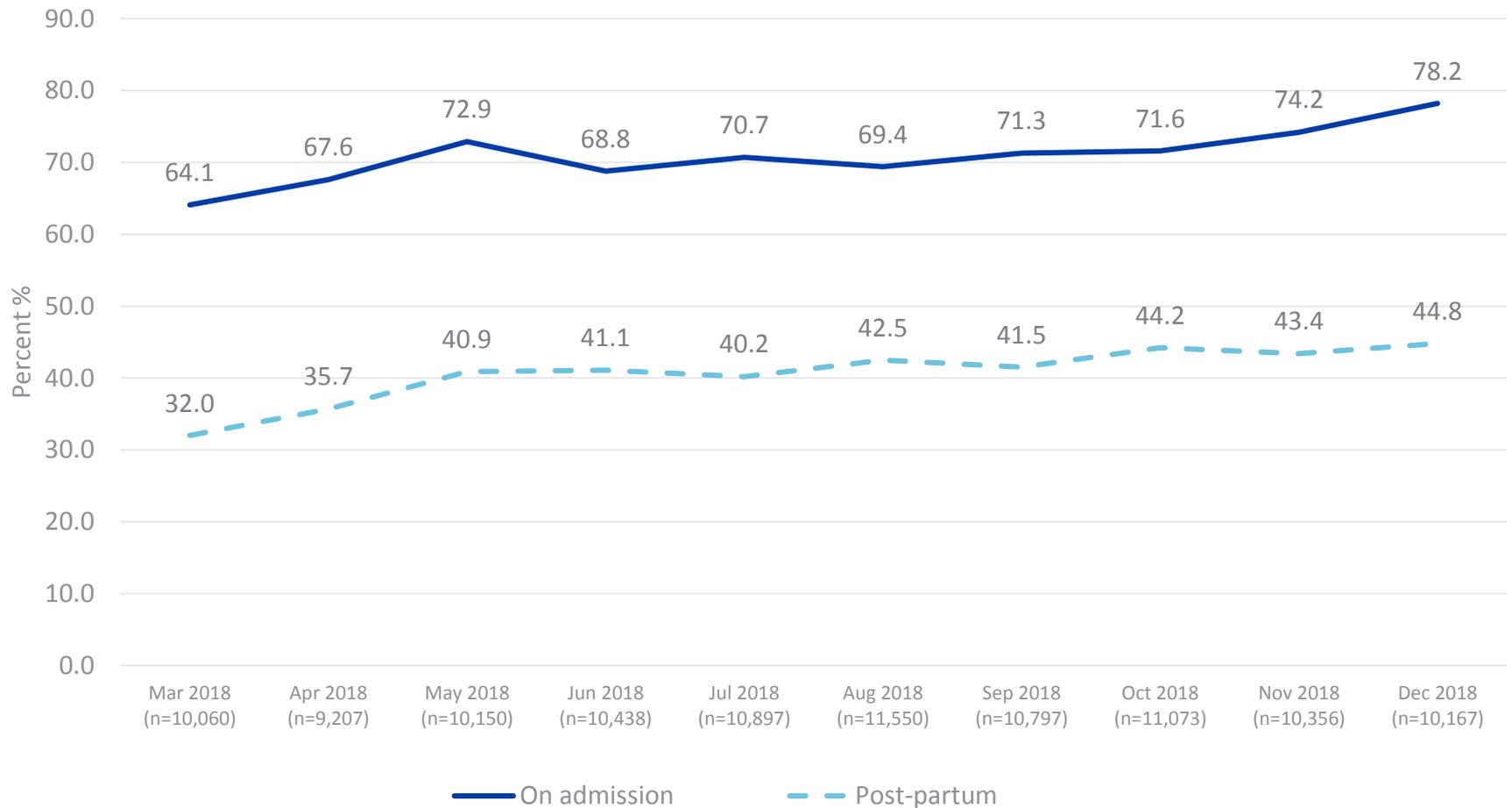
New York State Obstetric Hemorrhage Project Hemorrhage-Related* Comorbidities and Mortality



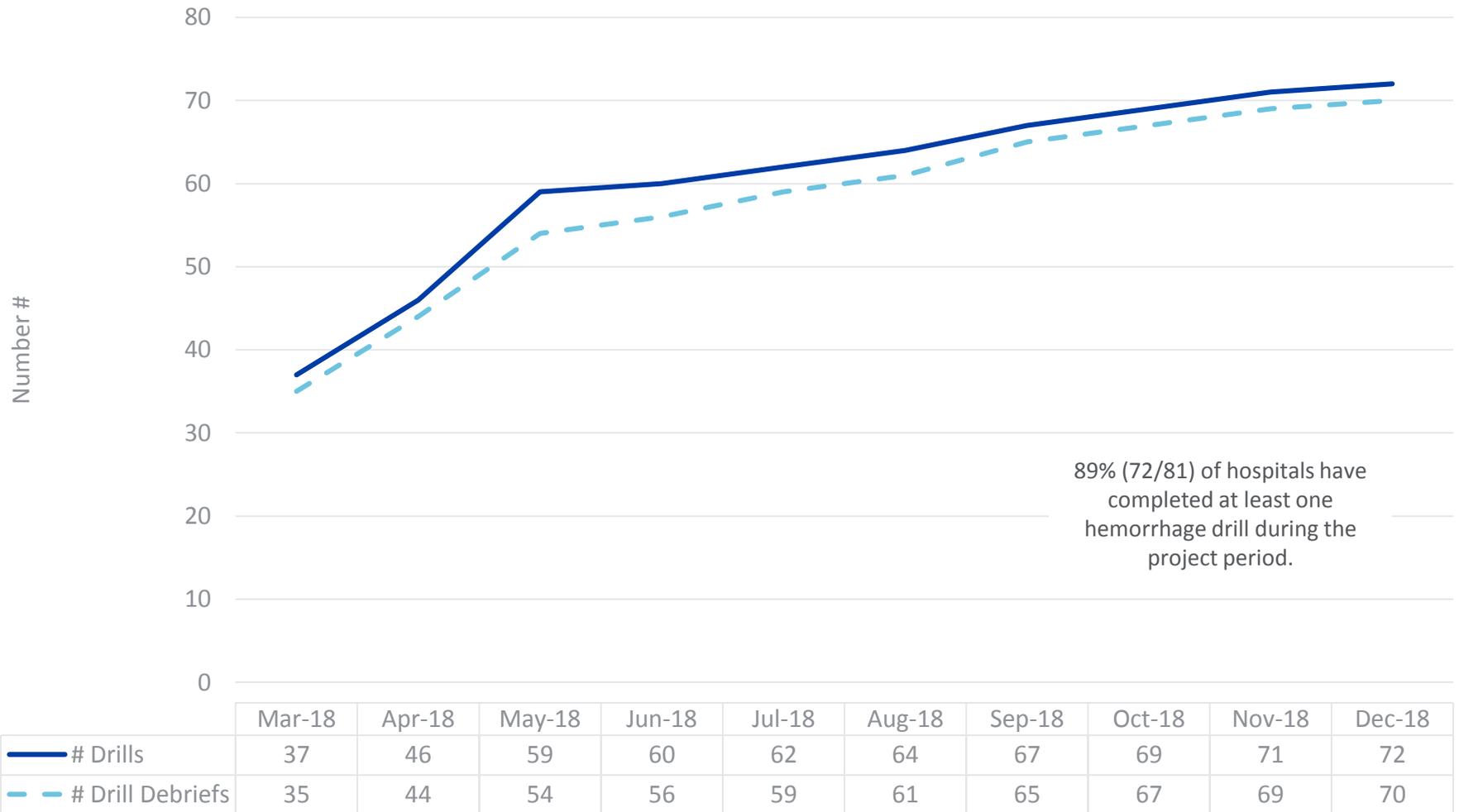
*Hemorrhage is defined as a blood loss of 500mL or greater for a vaginal delivery and 1,000mL or greater for a cesarean section.

New York State Obstetric Hemorrhage Project

Percent of Patients Receiving a Hemorrhage Risk Assessment on Admission/Postpartum



New York State Obstetric Hemorrhage Project Cumulative Hospital Completion of Hemorrhage Drills and Drill Debriefs (n=81)



Why the focus on Hemorrhage?

Cause of Death by Maternal Mortality Review Cohort

Cause of Death	2006-2008 n (%) (N=125)	2012-2014* (n) % (N=92)
Hemorrhage	29(23%)	15(16%)
Hypertensive disorders	29(23%)	6(7%)
Embolism (not cerebral)	21(17%)	22(24%)
Cardiovascular conditions	12(10%)	6(7%)
Other	10(8%)	4(4%)
Intracerebral hemorrhage (not associated with PIH)	5(4%)	4(4%)
Infection	4(3%)	15(16%)
Cardiac arrest/failure	4(3%)	2(2%)
Hematopoietic (sickle cell, thalassemia, ITP)	3(2%)	2(2%)
Pulmonary problems	3(2%)	3(3%)
Neurologic/neurovascular problems	3(2%)	2(2%)
Cardiomyopathy	2(2%)	11(12%)

Data source: NYS Maternal Mortality Review
*2014 not complete



Why the focus on Hemorrhage?

Clinical Cause of Death	Chance to Alter Outcome (%)			
	Strong/Good	Some	None	Total N (%)
Obstetric hemorrhage 	69	25	6	16 (11)
Deep vein thrombosis/ pulmonary embolism	53	40	7	15 (10)
Sepsis/infection	50	40	10	10 (7)
Preeclampsia/eclampsia*	50	50	0	24 (17)
Cardiomyopathy and other cardiovascular causes*	25	61	14	28 (19)
Cerebral vascular accident	22	0	78	9 (6)
Amniotic fluid embolism	0	87	13	15 (10)
All other causes of death	46	46	8	26 (18)
Total (%)	40	48	13	143*

* Two deaths lacked sufficient records to make determination (one from each cause of death).

INTERPRETATION: The CA-PAMR Committee judged that there was a strong-to-good chance to have altered the fatal outcome in 40% of the pregnancy-related deaths in California in 2002 to 2004. Some pregnancy-related deaths may have had a better chance of being prevented, for example deaths from obstetric hemorrhage, compared to others, such as amniotic fluid embolism.

SOURCE: The California Pregnancy-Associated Mortality Review, April 2012. © California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division.

CA-PAMR Pregnancy-Related Deaths, Chance to Alter Outcome by Grouped Cause of Death; 2002-2004 (N=143)

Peripartum Hemorrhage (PPH)

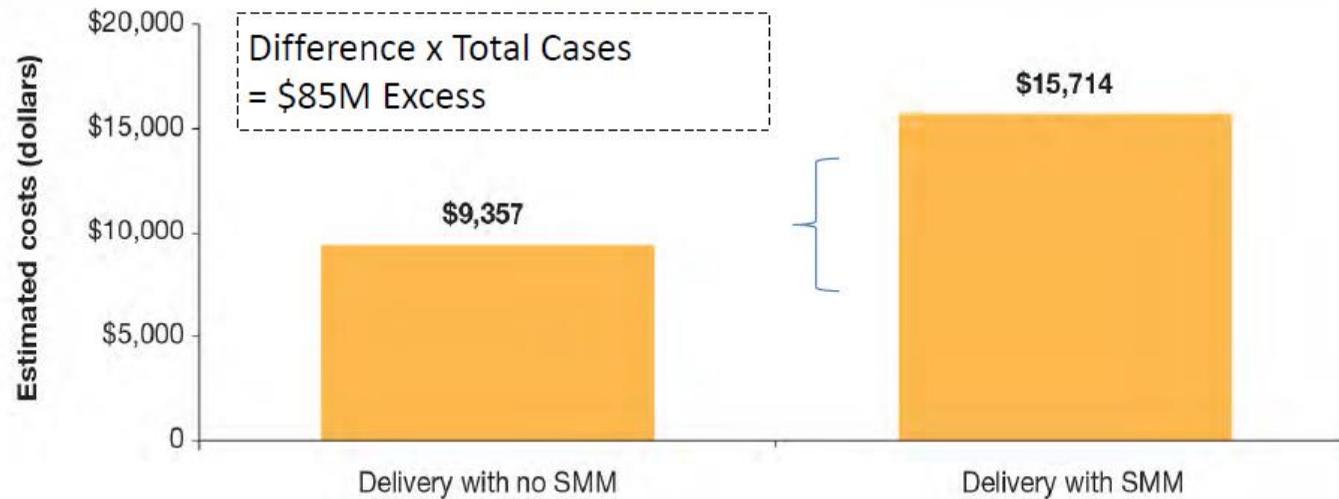
- Major cause of Severe Maternal Morbidity (SMM) and Mortality
 - Blood products
 - ICU admissions
 - Hysterectomies
- Unrecognized and untreated PPH can lead to **DEATH** in 2 to 6 hours
- Early recognition and treatment can lead to improved survival
- Tremendous emotional and financial impacts



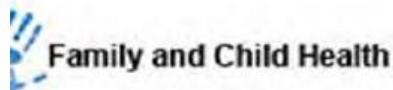
Hypovolemic shock → multi-organ dysfunction → DEATH

Financial Impact of Severe Maternal Morbidity

Figure 26. Estimated Delivery Cost With and Without Severe Maternal Morbidity, Adjusting for Other Factors,* New York City, 2008–2012



*Adjusted for maternal age, race/ethnicity, payer, method of delivery, plurality and comorbidity and clustered by hospital. The total sample for the adjusted analysis was 582,006 (excludes missing observations).

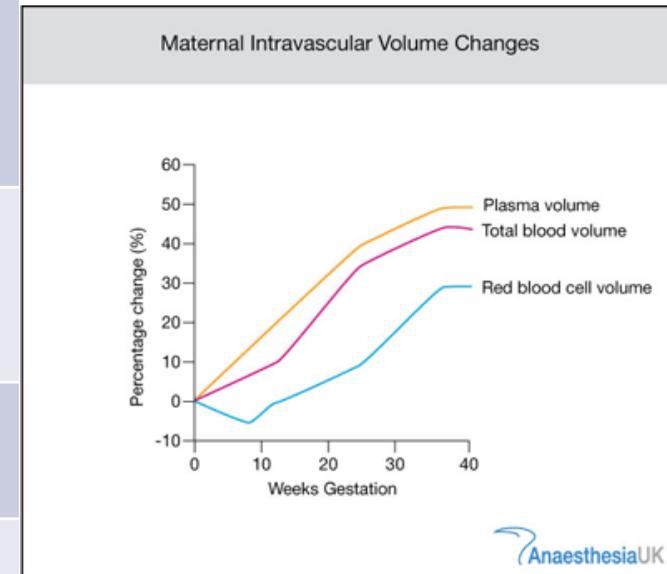


Source: New York City Department of Health and Mental Hygiene (2016). Severe Maternal Morbidity in New York City, 2008-2012. New York, NY.



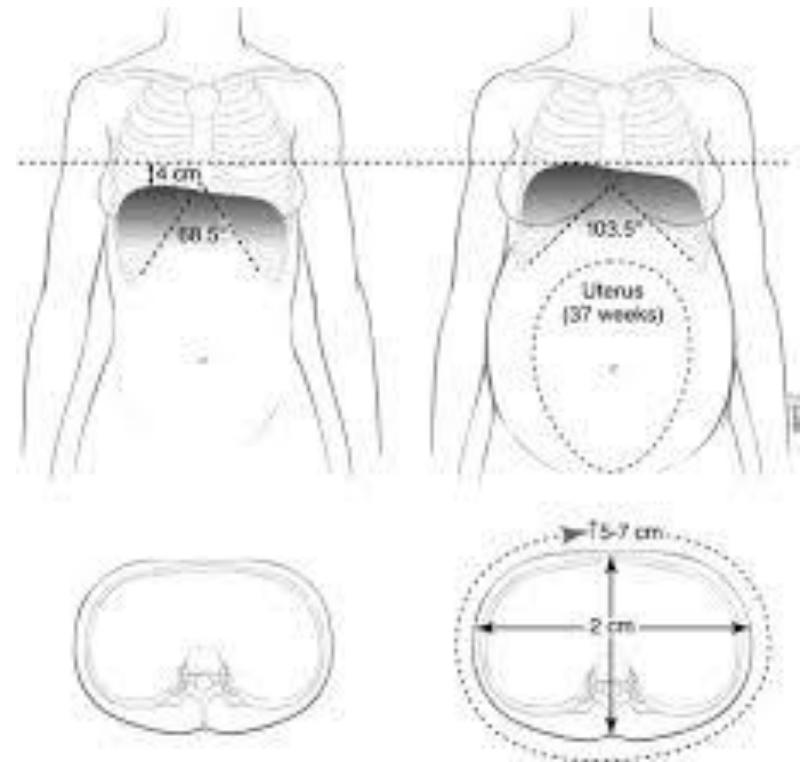
Cardiovascular Physiology during Normal Pregnancy

Physiologic Component	Change
Blood Volume	Increases by 25-52% by late pregnancy with a larger (45-50%) increase in plasma volume compared with red cell mass (20%)
Blood Pressure	Decreases until mid pregnancy with gradual increase to baseline at term
Heart Rate	Rises to 120% of baseline by 32 weeks GA
Cardiac Output/Stroke Volume	CO increases 30-50% with peak in the second trimester
Systemic Vascular Resistance	Reaches nadir by 24 weeks with a progressive increase by term



Respiratory Physiology during Normal Pregnancy

Physiologic Component	Change
Functional Residual Capacity	10-20% decrease by term
Minute Ventilation	20-40% increase by term
Alveolar Ventilation	50-70% increase by term
Tidal Volume	30-35% increase by term



Hemorrhage Risk: Facility and Provider Resources

- An assessment of the facilities resources; provider and system.
- Clear guidelines for when the patient's needs exceed the facilities capacity to treat and a process for immediate, safe transfer
- A method to quantify blood loss, used routinely.
- A thorough review and understanding of blood availability.
- A massive transfusion protocol
- A team that reviews all hemorrhages that require 4 or more units of blood

Hemorrhage Risk: Facility and Provider Resources



Hemorrhage Risk: Facility and Provider Resources

- A clear process to follow in the event of maternal blood loss and hemorrhage including clear escalation.
 - A Hemorrhage Team
 - A standard mechanism to document activities related to hemorrhage
 - A no judgement policy if someone calls a hemorrhage code, no intimidation accepted
 - Standard debriefing
 - Supportive administration
- Frequent in-situ, multidisciplinary drills that identify potential problems during hemorrhage (rarely cancelled).
 - A “hemorrhage cart”, reproducible anywhere a hemorrhage could occur
 - A medication box, reproducible anywhere a hemorrhage could occur
 - Recurrent education to all staff that may participate in hemorrhages
 - Nursing and nursing administration
 - Medicine, OB/Gyn, Anesthesia, Gyn/Onc, General surgery
 - RT
 - Blood bank

HEMORRHAGE RISK: PATIENT

Prenatal	Antepartum	Peripartum: Moderate	Peripartum: High
<ul style="list-style-type: none"> • Suspected previa/accrete/increta/percreta • BMI >50 • Clinically significant bleeding disorder • Other significant medical/surgical risk (consider patients who decline transfusion) 	<p>Placenta accreta 34 0/7 – 35 6/7</p> <p>Placenta previa 36 0/7 – 37 6/7</p> <p>Prior classical cesarean 36 0/7 – 37 6/7</p> <p>Prior myomectomy 37 0/7 – 38 6/7</p> <p>Prior myomectomy, if extensive 36-37</p>	<ul style="list-style-type: none"> • Prior cesarean, uterine surgery, or multiple laparotomies • Obesity (BMI > 40) • Hematocrit < 30% & other risk • Prior PPH • Active bleeding • Known coagulopathy • Large myomas • EFW > 4000 grams 	<ul style="list-style-type: none"> • Placenta previa/low lying • Suspected accreta/percreta • Multiple gestation • 4 prior births • Platelet count < 70,000 • 2 or more moderate risk factors
Transfer to appropriate level of care for delivery	High risk for accreta: Obtain proper imaging Be transferred to appropriate level	Type & SCREEN, review protocol	Type & CROSS, review protocol

Significant Blood Loss

- ACOG (reVITALize project) has recently endorsed a revised definition:
- Cumulative blood loss of > 1000 mL OR blood loss accompanied by **sign/symptoms of hypovolemia** within 24 hours following the birth process (Cumulative blood loss of 500-999 mL alone should trigger increased supervision and potential interventions as clinically indicated).



CMQCC
CALIFORNIA MATERNAL
QUALITY CARE COLLABORATIVE

WHY DOES THE PREGNANT STATE DISGUISE BLOOD LOSS?

Pregnant and immediate post partum women have an increased blood volume.

During Massive Hemorrhage there is a reduction in venous return.



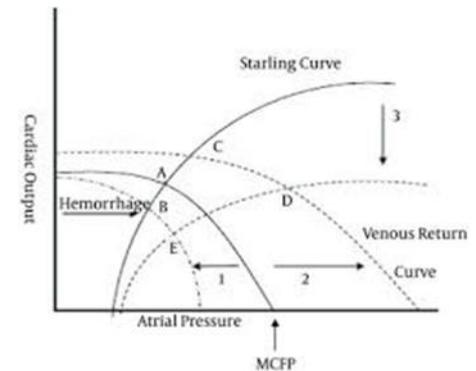
There is a compensatory increase in Maternal Heart Rate.



Blood pressure does not change until Heart Rate cannot increase further ($CO=SV \times HR$).



This leads to a 30% blood loss BEFORE BP changes.



Clinical Signs of Hypovolemia

Amount of Blood Loss	% Deficit	Clinical Signs
1000 ml	15%	Slight change in blood pressure, heart rate normal, palpitations, respiratory rate normal, dizziness, normal urine output
1500 ml	15-25%	Narrowed pulse pressure* (SBP-DBP), heart rate over 100, respiratory rate 20-30, diaphoretic, weak, urine output 20-30 mL/hr
2000 ml	25-40%	Hypotension, narrowed pulse pressure, heart rate over 120, respiratory rate 30-40, pale, extremities cool, restlessness, urine output 5-15 mL/hr
≥2500 ml	>40%	Profound hypotension, heart rate over 140, respiratory rate over 40, slight urine output or anuria

Shock Index=

Heart Rate/Systolic Blood Pressure

- First introduced in 1967
- Used in non-pregnant trauma and non-trauma patients
- Assessment of hypovolemic and non-hypovolemic shock to aid in clinical management
- “Normal” Shock Index=0.5-0.7

Multiple recent papers that supports that the Shock Index a strong predictor of adverse maternal outcomes

Threshold	Intervention
≥ 0.9	Need to refer
≥ 1.4	Urgent intervention in tertiary care center
≥ 1.7	High chance of adverse outcome

El Ayadi, E., Nathan, H., Seed, P., Butrick, E., Hezelgrave, N., Shennen, A., & Miller, S. (2016). Vital Sign Prediction of Adverse Maternal Outcomes in Women with Hypovolemic Shock: The Role of the Shock Index. *PLOS ONE*.

SHOCK INDEX

- Heart Rate/Systolic Blood Pressure

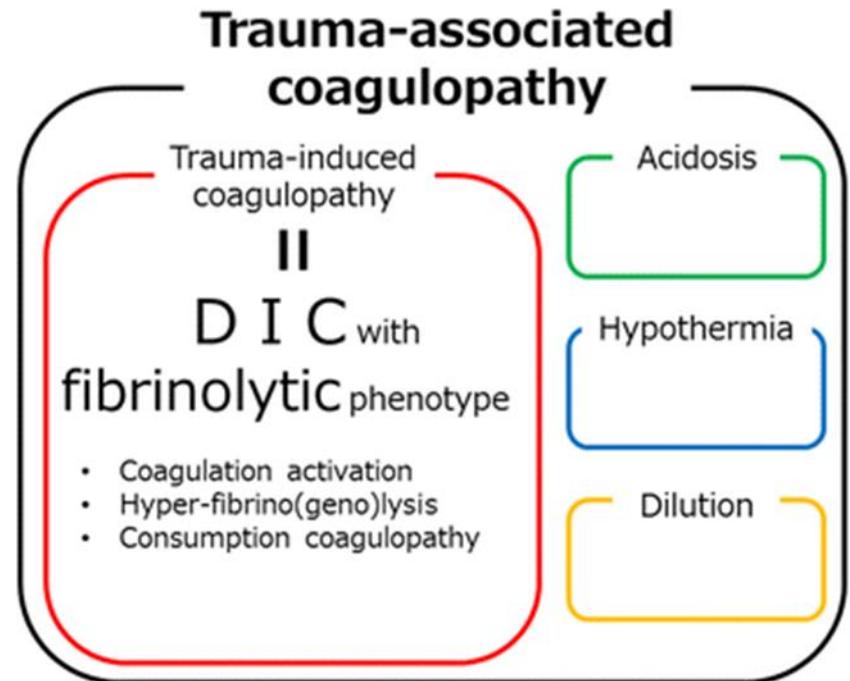
Heart Rate	Systolic BP	Shock Index
110	80	1.34
110	90	1.22
120	80	1.5
120	90	1.33
130	80	1.62
130	90	1.44

$$\text{Shock Index} = \frac{\text{Heart Rate (bpm)}}{\text{SBP (mm Hg)}}$$

Note: A large red handwritten '≥ 0.9' is overlaid on the equation, indicating a clinical threshold.

Prevention of Coagulopathy

- Dilution from transfusion of Blood Products without clotting factors (ratio of PRBCs to plasma to platelets)
- Hypothermia leads to platelet dysfunction (even with normal counts)
- Metabolic acidosis prevents clotting enzymes from functioning



Maternal Early Warning Signs (MEWS) Algorithm OBGYN

TOO FAR,
TOO LITTLE,
TOO LATE

READINESS,
RECOGNITION,
RESPONSE,
REPORTING

DENIAL LEADS TO
DELAY

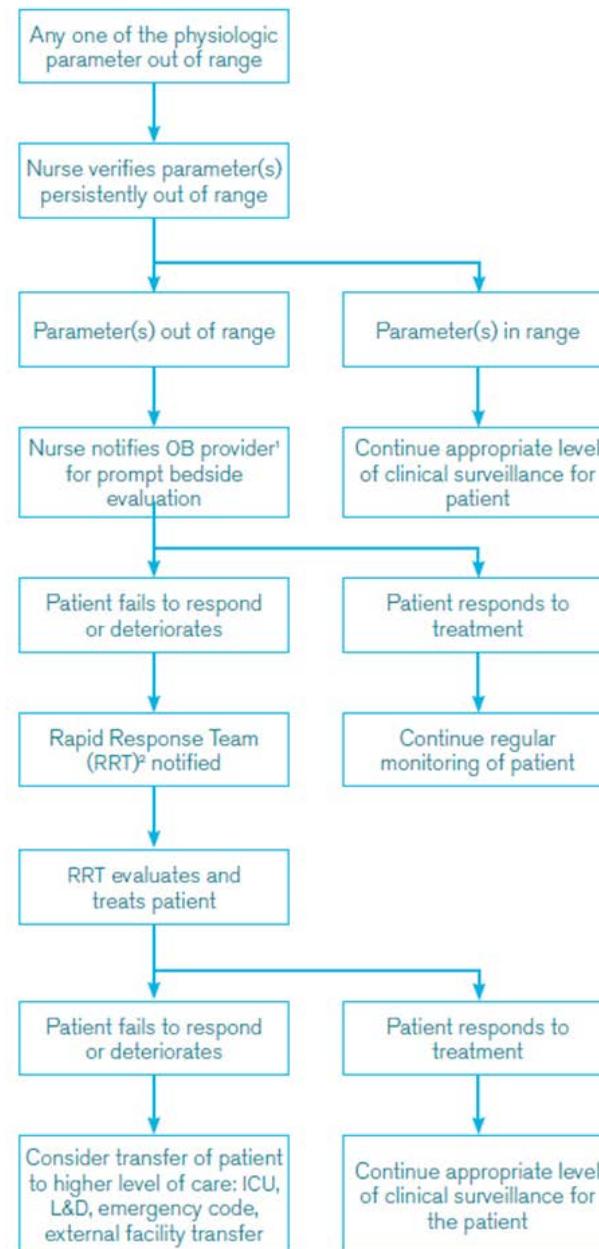
<p>Perinatal Huddle</p> <p>Communication that does not require immediate medical evaluation</p> <p><u>Conditions which may require Huddle:</u></p> <ul style="list-style-type: none"> Maternal medical or obstetrical complication requiring team/multidisciplinary approach Consults from additional services Suspected fetal abnormality Current treatment plan not effective Maternal transport Patients who refuse blood products Patients who have previously had a multidisciplinary meeting 	<p>Escalate</p> <p><u>Follow these steps for any of the items below:</u></p> <ul style="list-style-type: none"> Call provider for immediate evaluation <ul style="list-style-type: none"> Bedside evaluation w/i 15 minutes Notify nursing leadership and patient's attending Call Safety Officer – apprise of situation Request order for labs as ordered or as listed below Repeat and document VS q15 minutes until stable or return to baseline, escalate as necessary Implement treatment regimen as ordered based on underlying cause Evaluate/assess current IV access and report Notify anesthesiologist If poor response to interventions or a higher level of care is considered, provider must call ICU consult and/or RN to call RRT <p>Call (S)RRT if Safety Officer is unable to respond</p> <hr/> <p><u>Vital Signs – Requiring Provider Notification:</u></p> <ul style="list-style-type: none"> Shock index greater than 1 (HR/SBP e.g. HR 96/SBP 90 = 1.1) Document Shock index (in comment section of vital sign record) SBP of ≤ 90 or ≥ 160 DBP ≥ 110 HR < 50 bpm or > 120 bpm Respiratory rate < 9 or > 20 Any change in SBP or DBP of greater than 30mmHg Temperature less than 96.8 (36C) or greater than 100.4 (38C) Urine output $< 35\text{ml/hr} \times 2$ hours O2 saturation $< 95\%$ <hr/> <p><u>Lab Values – requiring provider notification:</u></p> <ul style="list-style-type: none"> Hgb $< 8\text{g}$ Hct $< 25\%$ (consider continuous Hgb) WBC $> 17,000$ Platelets $< 100,000$ Fibrinogen $< 200\text{mg}$ PT > 13 INR > 1.2 PTT > 37 Lactate > 2 <hr/> <p><u>Symptoms requiring provider notification:</u></p> <ul style="list-style-type: none"> Dizziness – Obtain orthostatics & VS Lightheadedness – Obtain orthostatics & VS Lethargy – Obtain full set of VS Altered mental status Continued vaginal bleeding – Orthostatics & VS Writhing in pain, restlessness (despite pain medication) can't stay still, suspected hematoma <p>Unusual moderate to severe signs and symptoms for which you cannot determine a cause</p>	<p>(S)RRT or Code OB</p> <p><i>Requires immediate bedside evaluation</i></p> <hr/> <p>Indications to call (S)RRT:</p> <ul style="list-style-type: none"> Lactic acid $> 3\text{mg}$, pH < 7.3 or base deficit > 3 plus any abnormal vital signs Circulatory: SBP $< 80\text{mm Hg}$, change in HR < 40 or > 130, worsening chest pain Neurological signs/symptoms - vision loss, change in LOC, altered mental status, agitation, or delirium, decreased responsiveness, repeating or persistent seizures, difficulty speaking Respiratory distress – SpO2 $< 90\%$ despite oxygen, change in RR: < 8 or $> 30/\text{min}$ Trauma – uncontrolled bleeding or pain Acute metabolic disorder Shock Index > 1.3 Oliguria $< 50\text{cc}/4$ hours <p>NSUH: X-6666 LJMC: Dial 22</p> <hr/> <p>CODE OB if:</p> <ul style="list-style-type: none"> Breech / Head entrapment Uterine inversion Prolapsed Cord Brisk vaginal bleeding $> 100\text{mL}$ within 10 min and /or shock index > 1 with hemodynamic compromise Shoulder dystocia Delivery outside L&D (antepartum, ED, ...) Category III tracing Main OR OB assistance needed <p><i>NOTE: There must be reassessment after interventions and escalation/notification should continue until the situation is resolved!</i></p> <p>August 31, 2018</p>
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USE SBAR TO COMMUNICATE CONCERNS– ESPECIALLY THE “R”

(S)RRT Response – Critical Care Team (at LJMC: PA and /or SICU resident, CIN)	OB Team: Service attending, chief or 3 rd year resident, primary RN, RN leadership
<p>Important Reminders: Document shock index with each set of vital signs. When a patient is returned to PACU for further evaluation and treatment, call a huddle and include the anesthesiologist. If vascular access is an issue, an intraosseous line can be placed by MICU trauma nurse X1622 at NSUH. At LJMC, call a (S)RRT.</p>	

MEWS: CRICO

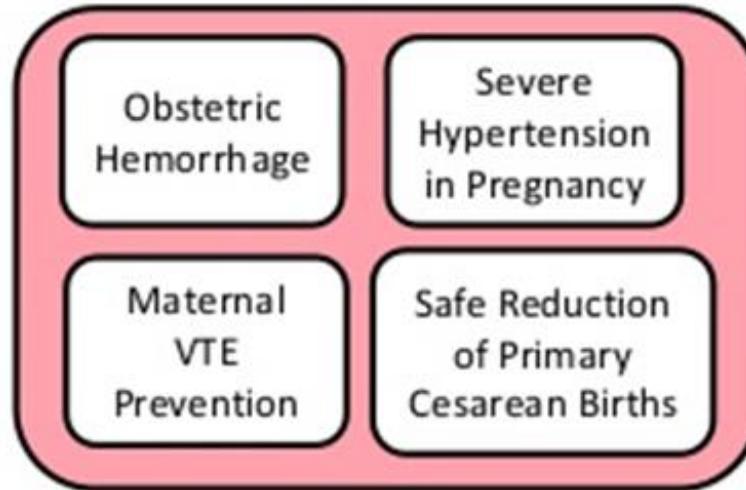
MEWS TRIGGER CRITERIA*	
Parameter	Value
systolic BP (mm Hg)	<80 or >160
diastolic BP (mm Hg)	>105
heart rate (beats per min)	<50 or >120
respiratory rate (breaths per min)	<10 or >30
oxygen saturation % (room air, at sea level)	<95
oliguria (mL for >2 hours): for catheterized patients	<30
maternal agitation, confusion, unresponsiveness	if any present
preeclampsia, with patient reporting non-remitting headache or shortness of breath	if any present



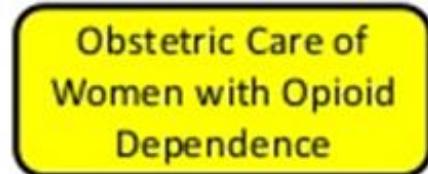
CRICO: Controlled Risk Insurance Company

AIM Safety/Quality Improvement Bundles

Safety Bundles



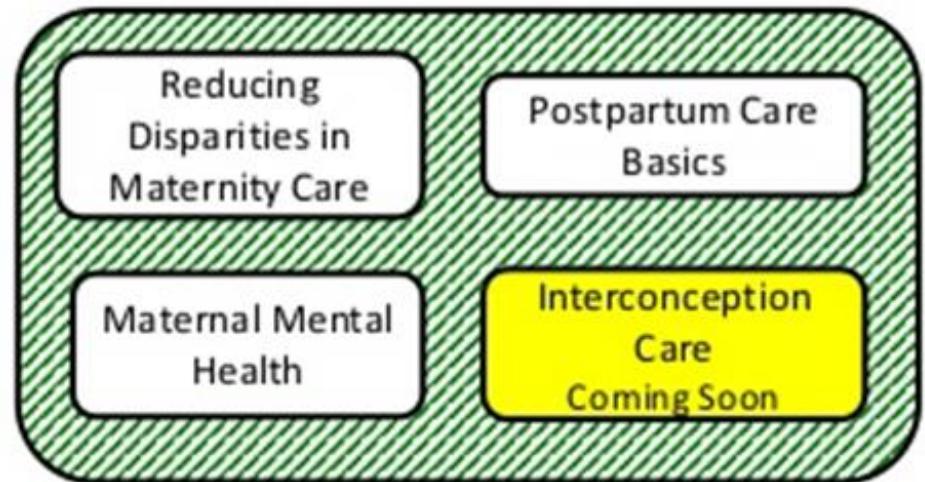
Just Released



Safety Tools



For Every Mother



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Maternal Early Warning Signs (MEWS) Protocol

1. Immediate action is required when any of the MEWS criteria are met (see table on page 2***)

Items that are not in the lower box should be confirmed, within 10 minutes, prior to calling the physician.

***Not applicable for BP systolic <90 when <=30 min post epidural and anesthesiologist present.

2. When immediate action is required:

- If the attending physician is immediately available, he/she will provide bedside evaluation of the patient within 10 minutes. The in-house OB will be notified to provide bedside evaluation if the attending physician is not at the bedside within 5 minutes.
- If the attending physician is not immediately available, the RN will call the in-house OB to provide bedside evaluation of the patient within 10 minutes. The attending physician or CNM will also be notified of the patient's status. If the CNM is notified, he/she will notify the attending physician.
- If in-house OB is called but not immediately available, he/she will receive a verbal report and determine what further action is necessary.

3. When called to the bedside, the physician will document by writing a note which includes but is not limited to:

- Differential diagnosis (the RN will provide this protocol and a differential diagnosis list to the bedside).
- Planned frequency of monitoring and re-evaluation.
- Criteria for immediate physician notification.
- Any diagnostic or therapeutic interventions.
- "Huddle" participants and summary of management plan.

The physician will communicate the assessment and plan via a "huddle." Huddle participants include the Primary RN, the Charge RN, the Anesthesiologist, the attending physician if present, and the in-house OB.

4. If MEWS conditions(s) persist after corrective measures undertaken, then MFM consult should be requested. Additionally, Intensivist consult &/or Rapid Response Team may be called.

5. Depending on the clinical evaluation, patient laboratory and diagnostic studies to consider include:

- ✓ Pulse oximeter
- ✓ CBC
- ✓ Type and screen or type and cross match if bleeding
- ✓ CMP
- ✓ Magnesium level
- ✓ EKG, particularly in the presence of tachycardia, bradycardia, or chest pain
- ✓ CT angiogram or perfusion scan in patients with acute chest pain
- ✓ CXR if the patient has SOB, particularly if pre-eclamptic
- ✓ Echocardiogram

6. If the primary RN and the charge nurse question any aspect of the patient's care and the issue is not resolved with the attending physician, another appropriate physician (MFM, Department Director or Associate Director, or the Chairman of the DQAIC committee) and a nurse in the Nursing Chain of Command (Nurse Manager, Clinical Practice Specialist, or Nursing Supervisor/AVP) will be notified.

Immediate Action Required

- Systolic BP; mmHg <90 or >160
- Diastolic BP; mmHg >100
- Heart rate; bpm <50 or >120
- Respiratory rate; bpm <10 or >30
- Oxygen saturation; % <95
- Oliguria; ml/hr x 2h <35
- ✓ Maternal agitation, confusion, or unresponsiveness
- ✓ Patient with hypertension reporting a non-remitting headache or shortness of breath

Conclusions

- Pregnant and postpartum women present unique challenges related to identifying emergencies.
- The NYS Hemorrhage Project has increased the # of women assessed for hemorrhage on admission and post partum.

Conclusions

- It is imperative that when an abnormal vital sign(s) is obtained and verified that this information is shared.
- Develop and utilize early warning systems and drills to promote collegiality and identification of system issues that can delay prompt responses.

New York State Obstetric Hemorrhage Project

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PREVENT SEVERE MATERNAL MORBIDITY AND MORTALITY

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