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Disclosures

- Bill Callaghan, MD, MPH, FACOG has no conflicts to disclose.
- Sarah Kilpatrick, MD, PhD, FACOG has no conflicts to disclose.
Objectives

This session will provide attendees an overview of:

• The standard definition of severe maternal morbidity
• How to effectively identify cases of severe maternal morbidity
• How to use the Severe Maternal Morbidity Data Abstraction and Assessment Tool
Overview

How can we account?

- National Surveillance
- Facility Identification and Review
Morbidity: The Problem

• Maternal morbidity is difficult to define
  – Broad range of complications and conditions
  – Broad range of severity

• Maternal morbidity cannot be captured by a defined set of metrics

• Administrative vs. more local records
  – We need to start somewhere
“A woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy.”

Say et al., Best Pract Res Cl OB 2009
WHO Near-miss Approach

Severe maternal complications
- Severe postpartum haemorrhage
- Severe pre-eclampsia
- Eclampsia
- Septis or severe systemic infection
- Ruptured uterus
- Severe complications of abortion

Critical interventions or intensive care unit use
- Admission to intensive care unit
- Interventional radiology
- Laparotomy (includes hysterectomy, excludes caesarean section)
- Use of blood products

Life-threatening conditions (near-miss criteria)
- Cardiovascular dysfunction
  - Shock, cardiac arrest (absence of pulse/heart beat and loss of consciousness), use of continuous vasoactive drugs, cardiopulmonary resuscitation, severe hypoperfusion (lactate >5 mmol/l or >45 mg/dl), severe acidosis (pH <7.1)
- Respiratory dysfunction
  - Acute cyanosis, gasping, severe tachypnoea (respiratory rate >40 breaths per minute), severe bradypnoea (respiratory rate <8 breaths per minute), intubation and ventilation not related to anaesthesia, severe hypoxemia (O2 saturation <90% for ≥60 minutes or PAO2/FIO2 <200)
- Renal dysfunction
  - Oliguria non-responsive to fluids or diuretics, dialysis for acute renal failure, severe acute azotemia (creatinine ≥300 μmol/ml or ≥3.5 mg/dl)
- Coagulation/hemostatic dysfunction
  - Failure to form clots, massive transfusion of blood or red cells (≥5 units), severe acute thrombocytopenia (<50 000 platelets/ml)
- Hepatic dysfunction
  - Jaundice in the presence of pre-eclampsia, severe acute hyperbilirubinemia (bilirubin >100 μmol/l or >6.0 mg/dl)
- Neurological dysfunction
  - Prolonged unconsciousness (lasting ≥12 hours)/coma (including metabolic coma), stroke, uncontrollable fits/status epilepticus, total paralysis
- Uterine dysfunction
  - Uterine haemorrhage or infection leading to hysterectomy

Maternal vital status
- Maternal death

Severe Maternal Morbidity: Near Miss

• Life-threatening events at delivery hospitalization
  – “a very ill pregnant or recently delivered woman who would have died had it not been but luck and good quality care was on her side” (Mantel et al. Br J Obstet Gynecol, 105:985-90, 1998)

• Variety of data sources to identify cases based on indicators
• Near miss by expert opinion

Geller et al., JAMWA 2002
Severe Maternal Morbidity: Near Miss

- 5 factor scoring system identified women with “near miss” morbidity (Se 100%; Sp 93%)
  - Organ system failure
  - Extended intubation
  - ICU admission
  - Surgical intervention
  - Transfusion ≥4 units

Geller et al., J Clin Epidemiol 2004
Severe Maternal Morbidity: Near Miss

- Overcomes the issue of severity
- Requires multiple sources or a dedicated perinatal database for identification
  - Most scoring system factors not available in administrative databases
  - Less useful in smaller institutions
  - Cumbersome for state-level and national surveillance
- Organ system failure performs well by itself (Se 95%; Sp 88%)
  - Indicators of such in administrative data are attractive candidates
- Transfusion ≥4 units and/or ICU admission is nearly as sensitive as the 5-factor system (Se 100%; Sp 78%)
- Geller et al. construct has been validated (You et al., Am J Perinatol 2013)
Severe Maternal Morbidity Among Delivery and Postpartum Hospitalizations in the United States

William M. Callaghan, MD, MPH, Andreea A. Creanga, MD, PhD, and Elena V. Kuklina, MD, PhD

- Nationwide Inpatient Sample database
- Aim to capture indicators of organ system failure
- Use mortality hospitalizations to identify morbidity not previously considered
- Length of stay >90th percentile for diagnosis-identified cases by mode of delivery
  - >2 days vaginal
  - >3 days repeat cesarean
  - >4 days primary cesarean
- Include postpartum admissions

Callaghan et al., Obstet Gynecol 2012
<table>
<thead>
<tr>
<th>Maternal morbidity</th>
<th>Codes</th>
<th>ICD-9-CM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute renal failure</td>
<td>584, 669.3</td>
<td>x</td>
</tr>
<tr>
<td>Cardiac arrest/ventricular fibrillation</td>
<td>427.41, 427.42, 427.5</td>
<td>x</td>
</tr>
<tr>
<td>Heart failure during procedure or surgery</td>
<td>669.4x, 997.1</td>
<td>x</td>
</tr>
<tr>
<td>Shock</td>
<td>669.1, 785.5x, 995.0, 995.4, 998.0</td>
<td>x</td>
</tr>
<tr>
<td>Sepsis</td>
<td>038.0-038.9, 995.91, 995.92</td>
<td>x</td>
</tr>
<tr>
<td>Disseminated intravascular coagulation</td>
<td>286.6, 286.9, 666.3</td>
<td>x</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td>673.1</td>
<td>x</td>
</tr>
<tr>
<td>Thrombotic embolism</td>
<td>415.1x, 673.0, 673.2, 673.3, 673.8</td>
<td>x</td>
</tr>
<tr>
<td>Puerperal cerebrovascular disorders</td>
<td>430, 431, 432.x, 433.x, 434.x, 436, 437.x, 671.5, 674.0, 997.2, 999.2</td>
<td>x</td>
</tr>
<tr>
<td>Severe anesthesia complications</td>
<td>668.0, 668.1, 668.2</td>
<td>x</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>428.1, 518.4</td>
<td>x</td>
</tr>
<tr>
<td>Adult respiratory distress syndrome</td>
<td>518.5, 518.81, 518.82, 518.84, 799.1</td>
<td>x</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>410.xx</td>
<td>x</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>642.6x</td>
<td>x</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>99.00-99.09</td>
<td>x</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>68.3-68.9</td>
<td>x</td>
</tr>
<tr>
<td>Ventilation</td>
<td>93.90, 96.01-96.05, 96.7x</td>
<td>x</td>
</tr>
<tr>
<td>Sickle cell anemia with crisis</td>
<td>282.62, 282.64, 282.69</td>
<td>x</td>
</tr>
<tr>
<td>Intracranial injuries</td>
<td>800.xx, 801.xx, 803.xx, 804.xx, 851.xx-854.xx</td>
<td>x</td>
</tr>
<tr>
<td>Internal injuries of thorax, abdomen, and pelvis</td>
<td>860.xx—869.xx</td>
<td>x</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>441.x</td>
<td>x</td>
</tr>
<tr>
<td>Operations on heart and pericardium</td>
<td>35.xx, 36.xx, 37.xx, 39.xx</td>
<td>x</td>
</tr>
<tr>
<td>Cardio monitoring</td>
<td>89.6x</td>
<td>x</td>
</tr>
<tr>
<td>Temporary tracheostomy</td>
<td>31.1</td>
<td>x</td>
</tr>
<tr>
<td>Conversion of cardiac rhythm</td>
<td>99.6x</td>
<td>x</td>
</tr>
</tbody>
</table>
Severe Morbidity

- Between 1998-1999 and 2008-2009 severe morbidity during delivery hospitalization increased ~75% (7.4-12.9 per 1,000 deliveries).
- Severe morbidity at postpartum hospitalizations more than doubled (1.4-2.9 per 1000 deliveries).
- Large proportions of women who died in hospital had indicators for severe morbidity
  - e.g. 1/3 had transfusion; nearly 2/3 had ventilation
- Severe morbidity 100 times more common than mortality
Severe Morbidity: Deliveries

Severe Morbidity per 10,000 Delivery Hospitalizations

- With Tx
- Without Tx


Values:
- 1998-1999: 74, 53
- 2000-2001: 79, 55
- 2002-2003: 91, 53
- 2004-2005: 106, 60
- 2006-2007: 117, 55
- 2008-2009: 129, 56
Severe Morbidity Trend: Postpartum

- Severe Morbidity per 10,000 Delivery Hospitalizations
- 1998-1999: 14
- 2000-2001: 15
- 2002-2003: 20
- 2004-2005: 23
- 2006-2007: 24
- 2008-2009: 29

With Tx

Rate per 10,000 delivery hospitalizations

0.0 20.0 40.0 60.0 80.0 100.0 120.0 140.0 160.0 180.0

Issues for Surveillance of Severe Morbidity

• Standardization of terminology
  ➢ Near miss; severe morbidity; severe obstetric morbidity. etc.

• Facility versus population
  ➢ Callaghan et al. construct is retrospective
  ➢ Real-time identification more important for facilities
  ➢ Availability of data systems

• Considerations for quality improvement
Severe Maternal Morbidity Among Delivery and Postpartum Hospitalizations in the United States

William M. Callaghan, MD, MPH, Andreea A. Creanga, MD, PhD, and Elena V. Kuklina, MD, PhD

Population-based surveillance

Callaghan et al., Obstet Gynecol 2012
Facility-Based Identification of Women With Severe Maternal Morbidity

It Is Time to Start

William M. Callaghan, MD, MPH, William A. Grobman, MD, MBA, Sarah J. Kilpatrick, MD, PhD, Elliott K. Main, MD, and Mary D’Alton, MD

• Facility surveillance AND REVIEW:
  - Transfusion ≥4 units
  - ICU admission

Callaghan et al., Obstet Gynecol 2014
Alignment

• The “M” in MFM
• Proposals to establish maternal levels of care
  – Hankins et al. Obstet Gynecol 2012; 120:929-34
• Maternal Mortality Initiative (CDC/DRH)
• National Maternal Health Initiative (HRSA/MCHB)
• Every Mother Initiative (AMCHP)

Current Commentary

The National Partnership for Maternal Safety

Mary E. D’Alton, MD, Elliott K. Main, MD, M. Kathryn Menard, MD, and Barbara S. Levy, MD

D’Alton et al., Obstet Gynecol 2014
Alignment
Why Evaluate Severe Maternal Morbidity?

- Not enough maternal deaths per institution to study

- 1.7 million women/year have maternal morbidity (Danel, 2003)

- If severe maternal morbidity cases are similar to deaths re disease diagnoses and preventable issues then we large number to study

Continuum of Morbidity
What is Below the Iceberg?

• Severe maternal morbidity cases
  ➢ 0.5% deliveries 1991-2003
    ▪ 291,000 cases, 464 hospitals, national hospital discharge survey
  ➢ Based on ICD-9 codes most common: transfusion, eclampsia, hysterectomy (75%)
  ➢ 50X more common than death

• What if we studied these?

Preventability

- 54% deaths in MA 1990-1999 (Nannini. (2002))

Preventable factors

- Providers (41% preventable deaths)
- Patients (15%)
- Both (15%) (Sachs. (1987). *NEJM*, 316)
Preventability Related to Cause

**High preventability**
- Hemorrhage (93%)
- Preexisting chronic disease (89%)
- PIH (60%)
- Infection (43%)
- Cardiovascular (40%)

**Less preventability**
- Choriocarcinoma (25%)
- Cardiomyopathy (22%)
- CVA (0)
- AFE (0)

Berg, *Obstet Gynecol* 2005
Multivariate Analysis

• Clinical diagnosis and provider related preventable factors sig associated with progression from severe morbidity on (p < .01)

• System and patient factors ns

Near Miss Preventable Factors

- 40% deaths preventable factors
- 45% near misses preventable factors
- 17% severe morbidities preventable factors ($p = .01$)
- Clearly opportunity for slowing progression through the continuum at least from severe morbidity to worse

Geller, Amj Obstet Gynecol 2004
Prevention or Opportunity to Alter Outcome

• Prevention morbidity: harder concept
  ➢ Reduce eclampsia, DIC, LOS, renal failure, HELLP, stroke etc.

• Identifying opportunities to alter outcome
  ➢ Strong, possible, none
Examples of Preventable Factors

• Provider
  ➢ Failure to identify high risk
  ➢ Incomplete/inappropriate management
  ➢ No referral to tertiary

• System
  ➢ Communication
  ➢ Policies
  ➢ Equipment
  ➢ Medication

• Patient
What To Do?

• Obtain data
  ➢ Follow CDC 2001 recommendations for severe morbidity and death
• Utilize multidisciplinary approach
• Identify opportunities to alter outcome
• Implement interventions based on data
  ➢ Educational programs on the basics: hemorrhage, hypertensive disease, infection, cardiac disease
Facility-Based Identification of Women with Severe Maternal Morbidity: 2014

- **Terminology**: severe maternal morbidity
- **Identification of cases**:
  - ICU admission or
  - 3-4/1000 deliveries
  - Transfusion of 4 or more units of packed red blood cells
  - 2/1000 deliveries
- **Review**: should be done to lessons can be learned
  - Facility based
- **Research**:
  - Are we identifying right cases
  - Can we improve outcome

*Callaghan, Obstet Gynecol 2014*
SMM Review: Process

• Identify women with 4 or more units of blood, ICU admission
• Develop multidisciplinary committee
  ➢ OB, MFM, RN, CNM, OB anesthesia, others
• Encourage debriefing after event
  ➢ This is not the same as a review
• Primary data abstracted from record and presented to committee

Kilpatrick et al., Obstet Gynecol 2014 (in press)
Council on Patient Safety in Women’s Health Care Website

www.safehealthcareforeverywoman.org
Council on Patient Safety in Women’s Health Care Website

www.safehealthcareforeverywoman.org

Get the Severe Maternal Morbidity (SMM) Forms

Below, please find information about how to complete the Severe Maternal Morbidity Reporting forms, as well as a form to complete that will allow you to download the forms immediately.

Full Name *
Jane Doe

Email Address *
jdoe@centralhospital.org

Organization *
Central Hospital

ZIP Code *
20024

Website:

Comments:
Council on Patient Safety in Women’s Health Care Website

www.safehealthcareforeverywoman.org
• Can use SMM abstraction and assessment form
  
  ➢ Abstraction:
    ▪ Trained abstractor
    ▪ Capture analyzable and descriptive data from medical record
    ▪ Narrative of key aspects of morbidity
    ▪ Focused questions re care quality
      ▪ Was hypertension recognized appropriately
      ▪ Did woman appropriately receive magnesium
      ▪ Was severe hypertension treated in a timely fashion
      ▪ Was woman delivered in a timely fashion
Council on Patient Safety in Women’s Health Care Website

www.safehealthcareforeverywoman.org
CASE NARRATIVE

Should include brief synopsis focused on the specific severe maternal morbidity that occurred that allow you to address the disease specific questions (See above). It should be concise and pertinent to the particular SMM and include appropriate timeline, evaluation, and be in chronologic format. Try to identify key moments that impacted care.
Assessment: Done by Committee

- Identify whether opportunities to alter outcome (strong, possible, none)
- If yes enumerate and make specific recommendations
- Identify things that went well

- Conduct of committee
  - Just culture or other nonjudgmental approach
Council on Patient Safety in Women’s Health Care Website

www.safehealthcareforeverywoman.org

### PART B ASSESSMENT - Severe Maternal Morbidity

**PATIENT ID ________**

Reviewers:

Date of review: __________  Date of event: __________

1. **Morbidity Category**
   - [ ] ICU ADMISSION
   - [ ] TRANSFUSED > 4 UNITS
   - [ ] OTHER

2. **Sequence of Morbidity**
   
   Indicate the course of events:
   1. General Cause of Morbidity: ______
   2. Specific Cause of Morbidity: ______
   3. Date of event: ______

   For example: 1. Preclampsia 2. Uncontrolled Hypertension 3. Intracranial bleed, so that 1. caused 2. that resulted in 3.

3. **Primary Cause of Morbidity**
   Select: ______

   | ( ) Abruption                      | ( ) Blood transfusion
   | ( ) Injury                        | ( ) Other non-maternal
   | ( ) Malignancy                     | ( ) Other maternal
   | ( ) Other cause (please specify)  | ( ) Other cause (please specify)

   **Intimate partner violence**

**Case Analysis**

Slide 42
### Part B - Assessment Severe Maternal Morbidity

*Scale of contribution to morbidity: (1) indicates direct contribution, (2) possible contribution, (3) no contribution, (4) NA*

<table>
<thead>
<tr>
<th>PATIENT FACTORS</th>
<th>PROMPTS AND CHECK LIST</th>
<th>ANALYSIS AND ACTION TAKEN</th>
<th>Scale*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-pregnancy: underlying significant medical or physical conditions</td>
<td>Choose up to 4 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Previous significant obstetric conditions</td>
<td>Choose up to 2 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Non-obstetric medical complications that occurred during pregnancy</td>
<td>Choose up to 2 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Complications due to conditions of pregnancy</td>
<td>Choose up to 4 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Significant fetal complications</td>
<td>Choose up to 2 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Patient psychiatric or behavioral health conditions</td>
<td>Choose up to 3 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Significant social conditions</td>
<td>Choose up to 3 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Barriers to health or health care due to financial constraint</td>
<td>Choose up to 3 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
<tr>
<td>Patient factors in seeking care and adhering to medical advice</td>
<td>Choose up to 2 items</td>
<td>Select</td>
<td>1-4</td>
</tr>
</tbody>
</table>
Part B - Assessment of Severe Maternal Morbidity

**Case Resolution**

<table>
<thead>
<tr>
<th>Opportunity to Alter Outcome</th>
<th>Strong</th>
<th>Possible</th>
<th>None</th>
</tr>
</thead>
</table>

List up to 3 things that could be done to alter outcome:

- [ ]
- [ ]
- [ ]

Identify practices that were done well and should be reinforced:

- [ ]
- [ ]
- [ ]

Recommendations for system, practice, provider improvements:

- [ ]
- [ ]
- [ ]
SMM Review Process Cont...

- Have institutional mechanisms to implement change
- Trend data internally potentially regionally etc.
- Review timing
- Confidentiality
- Focus on systems
Final Thoughts

• Review forms just suggestion
• Important to capture analyzable data locally, regionally, etc.
• ICU admission, transfusion of 4 or more units are not meant to be quality measures
• Debriefs are not the same as reviews
• Open to input re ease of use of forms
• Intent is not to have to log on for each form
Just Culture

**Followed Best Practices**
Regardless of outcome, blameless adverse event (console)

**Did Not Follow Best Practices**
Substitution Test?
(Could a competent provider with an equivalent level of training have done the same thing? Could you?)

<table>
<thead>
<tr>
<th>Test of Intention?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the provider knowingly violate standards of care?</td>
<td>At Risk Behavior* (coach)</td>
<td>Reckless Behavior (discipline)</td>
</tr>
<tr>
<td></td>
<td>Gray Area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Error (console)</td>
<td>Question of Competence (coach)</td>
</tr>
</tbody>
</table>

**Impaired Practices**
- Impaired by substance abuse (immediate escalation)
- Impaired by health issue – e.g. Surgeon with advancing Parkinson’s Disease (immediate fit for duty evaluation)
- Intentionally caused harm – i.e. Malevolent (immediate escalation)

Look for underlying “System Error.”
Q&A Session

Press *1 to ask a question

You will enter the question queue
Your line will be unmuted by the operator for your turn

A recording of this presentation will be made available on our website:
www.safehealthcareforeverywoman.org
Next Safety Action Series

Maternal Early Warning Criteria

Thursday, July 17
11:30 a.m. Eastern

Click Here to Register