Maternal Early Warning System

Jill Mhyre, MD
Associate Professor of Anesthesiology
Chair, Vital Sign Triggers Subcommittee,
National Partnership for Maternal Safety
National Partnership for Maternal Safety

“Committed to work together to establish, at every facility that provides maternity care in the US, protocols that address the leading causes of maternal harm or death, including hemorrhage, preeclampsia and thromboembolism prevention.”

*Obstet Gynecol* 2013;122:735-6
## California Maternal Mortality Review 2002-2005

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<tbody>
<tr>
<td>Delayed response to triggers</td>
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<tr>
<td>Preeclampsia</td>
<td>92%</td>
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<tr>
<td>Postpartum hemorrhage</td>
<td>85%</td>
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<tr>
<td>Cerebrovascular disease</td>
<td>63%</td>
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<tr>
<td>Venous thromboembolism</td>
<td>75%</td>
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<tr>
<td>Amniotic fluid embolism</td>
<td>67%</td>
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Preventing Maternal Death

• Identify specific triggers for responding to changes in the mother’s vital signs and clinical condition and develop and use protocols and drills for responding to changes.

January 26, 2010
Vital Sign Triggers Committee

• Jill Mhyre, MD (SOAP, AR)
• Mary D’Alton, MD (SMFM, NY)
• Afshan Hammed, MD (SMFM & Cardiology, CA)
• Sharon Holley, CNM, DPN (ACNM, TN)
• Stephen Hunter, MD, PhD (SMFM, IO)
• Robin Jones, MD (ACOG, IL)
• Jeffrey King, MD (ACOG, KY)
• Justin Lappen, MD (ACOG, OH)
• Janet Meyers, RN, MPH (Hospital Corp. of Am.)
• Robyn D’Oria, MA, RNC, APN (AWHONN, NJ)
• Tammy Witmer, CNM, MSN (ACNM, PA)
**MEOWS:** Maternal Early Obstetric Warning Score

<table>
<thead>
<tr>
<th>MODIFIED EARLY OBSTETRIC WARNING SYSTEM MEOWS</th>
<th>PATIENT INFORMATION / STICKER</th>
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<tbody>
<tr>
<td>FOR USE IN MATERNITY ONLY</td>
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**CONTACT DOCTOR FOR EARLY INTERVENTION OF PATIENT TRIGGERS ONE RED OR TWO YELLOW SCORES AT ANY TIME**

<table>
<thead>
<tr>
<th></th>
<th>0-100%</th>
<th>&gt;100%</th>
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<tbody>
<tr>
<td>RESPIRATORY RATE</td>
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<tr>
<td>BLOOD PRESSURE</td>
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<td>HEART RATE</td>
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</tbody>
</table>

“Contact doctor if one red or two yellow scores at any one time.”

Swanton, *IJOA* 2009; 18: 253-7
Singh, *Anaesth* 2012; 67: 12-18

Mackintosh N, *BMJ Qual Saf* 2014; 23: 26-34
Maternal Early Warning Criteria

- Systolic BP; mmHg <90 or >160
- Diastolic BP; mmHg >100
- Heart rate; beats per min <50 or >120
- Respiratory rate; <10 or >30 breaths per min
- Oxygen saturation; % <95 room air, sea level
- Oliguria; <30 mL/hr for 2 hours

- Maternal agitation, confusion, or unresponsiveness
- Patient with hypertension reporting a non-remitting headache or shortness of breath
Maternal Early Warning System

Maternal Early Warning

Effective Escalation Policy
Effective Escalation Policy

A abnormal parameter would require:

1. Prompt **reporting** to a physician or other qualified clinician

2. Prompt **bedside evaluation** by a physician or other qualified clinician with the ability to activate resources in order to initiate emergency diagnostic and therapeutic interventions as needed
Evaluating clinician

- Obstetric provider
- Anesthesia provider
- Rapid Response Team
- Hospitalist
- Intensivist
- ED Physician
Differential Diagnosis

Common diagnoses

• Hypertension (SBP>160 or DBP>100)
• Hypotension (SBP<90)
• Tachycardia (HR>120)
• Bradycardia (HR<50)
• Tachypnea (RR>30)
• Bradypnea (RR<10)
• Hypoxemia (SpO2<95% on room air)
• Oliguria (<30 cc/hr for >2 hrs)
• Confusion, agitation, or unresponsiveness

Rare but life-threatening diagnoses
Key Points

• Delays in diagnosis contribute to a large portion of preventable maternal deaths

• Maternal Early Warning Systems—3 Components
  1. Early Warning Criteria
  2. Prompt reporting
  3. Bedside evaluation

• Local implementation details
  o Cut-points, measurement artifact, trends
  o Who to notify, how to notify them
  o Back-up systems to ensure timely evaluation
Implementing a Maternal Early Warning System

Mary E. D’Alton, M.D.

Willard C. Rappleye Professor and Chair,
Department of Obstetrics & Gynecology

Columbia University College of Physicians & Surgeons
Experience at Columbia

• Maternal Early Warning System initiated August 1\textsuperscript{st}, 2013 for all antepartum and postpartum patients.

• Goal: Evaluation by a senior provider (senior resident, fellow, or attending) within 15 minutes of abnormal parameter being reported.
Effective Escalation Policy

An abnormal parameter requires:

1. Prompt reporting to a physician or other qualified clinician

2. Prompt bedside evaluation by a physician or other qualified clinician with the ability to activate resources in order to initiate emergency diagnostic and therapeutic interventions as needed
Effective Escalation Policy

An abnormal parameter requires:

3. Plan for and implementation of diagnostic work-up

4. Close follow up by senior provider of patient’s status until:
   - Abnormality resolves, or
   - Parameter judged to be of benign etiology, or
   - Patient is determined to be potentially critically ill and care is escalated (rapid response, higher acuity setting)
Experience at Columbia

• Majority of alerts (>80%) were for the following parameters:
  – Oliguria
  – Severe-range hypertension
  – Tachycardia
Early warnings

1. ABNORMAL VITAL SIGN PARAMETERS

2. PREVENT MAJOR MORBIDITY / CRITICAL ILLNESS?
Experience at Columbia/Preliminary data

• Breakdowns in system can occur on any level:
  – Medical/nursing assistants notifying nursing of abnormal parameters
  – Nursing notifying providers
  – Providers evaluating patients
  – Correct diagnostic assessment
  – Follow up of diagnostic evaluation
Experience at Columbia

• Excellent means of auditing clinical response by:
  – Medical assistants
  – Nursing
  – Residents
  – Fellows and attendings

• MEWS has helped:
  – Identify issues/challenges with timely evaluations at our own institution
  – Establish expectations for care
Experience at Columbia

• The protocol has thus far been associated with:
  – Timely bedside evaluations
  – Timely administration of antihypertensives
  – Timely workup for severe anemia in patients with oliguria and tachycardia
Moving forward

• Robust data on improvements in process measures and outcomes
• “Lessons learned” from implementation and education for a maternal early warning system
• Can decision support be used to help midlevel providers (nurse practitioners, midwives, junior residents) evaluate these patients effectively?
Moving forward

• Can MEWS responses be protocolized to avoid delays in diagnosis and treatment?
  – Severe-range hypertension
    ▪ Is it necessary or beneficial to wait for a senior provider evaluation before treatment?
    ▪ Simple algorithms for management:
      • ACOG District II
      • Hospital Corporation of America
  – Patient with tachycardia
    ▪ Should any patient with new onset tachycardia (HR >120) not have a CBC performed?
Key Points

- MEWS implementation is feasible
- Clear expectations for prompt evaluation and close follow-up
- Local implementation will depend on hospital type, provider staffing, and patient population
- Significant research opportunities exist