Maternal Safety Bundles: MEWS

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Objectives

• Brief Review of Maternal Early Warning Systems (MEWS)

• Discuss why MEWS are important

• How can MEWs help with other safety bundles
Maternal Early Warning Systems

• System of escalation based on maternal vital signs

• Developed to facilitate timely recognition, diagnosis, and treatment for women developing critical illness
### Table 1. The Maternal Early Warning Criteria

<table>
<thead>
<tr>
<th>Condition</th>
<th>Criteria</th>
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<tbody>
<tr>
<td>Systolic BP (mm Hg)</td>
<td>&lt;90 or &gt;160</td>
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<tr>
<td>Diastolic BP (mm Hg)</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Heart rate (beats per min)</td>
<td>&lt;50 or &gt;120</td>
</tr>
<tr>
<td>Respiratory rate (breaths per min)</td>
<td>&lt;10 or &gt;30</td>
</tr>
<tr>
<td>Oxygen saturation on room air, at sea level, %</td>
<td>&lt;95</td>
</tr>
<tr>
<td>Oliguria, mL/hr for ≥2 hours</td>
<td>&lt;35</td>
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</table>

Maternal agitation, confusion, or unresponsiveness; Patient with preeclampsia reporting a non-remitting headache or shortness of breath.

BP, blood pressure.

These triggers cannot address every possible clinical scenario that could be faced by an obstetric clinician and must not replace clinical judgment. As a core safety principle, bedside nurses should always feel comfortable to escalate their concerns at any point.

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**Figure:** Flow diagram for maternal early warning trigger (MEWT) tool

1. Abnormal Trigger
   - HR>110, RR>30, MAP>55, O2 sat<90%, nursing clinically uncomfortable with patient status

   - **Abnormal Maternal Temp**
     - Temperature ≥ 100.6°F or ≥ 38°C
     - Pulse Ox < 95%

   - **Abnormal Maternal Assessment**
     - Maternal assessment 2 or more triggers

   - **Normal Assessment**
     - No abnormal triggers, then return and continue to monitor

   - **Confirmed (assuaged):**
     - Re-assessment/evaluation
     - Continue towards Critical Care Assessment Pathway

   - **Abnormal Maternal Temp**

   - **Abnormal Maternal Assessment**

   - **Infection - Sepsis**
     - Two or more triggers
     - Notify Physician, CBC, antibiotics, consider blood cultures

   - **Cardiopulmonary**
     - HR > 110, MAP > 65, O2 sat ≤ 95%, HR > 34 or Altered Mental Status

   - **Hypertension in Pregnancy**
     - SBP>155 and/or DBP>105, MD notified

   - **Obstetrical Hemorrhage**
     - Hyperensive Disorders of Pregnancy Protocol
     - Management of Obstetrical Hemorrhage Protocol

   - **Consults**
     - Anesthesia, Medicine Critical Care, Perinatology

   - **Severe Sepsis / Septic Shock**
     - Notify BRT, (O2) transfusion, and/or consult as appropriate

   - **Fluid Resuscitation** (within 1 hour)
     - MAP < 65 or lactate 4mmol/L, Omeprazole 30mg/25g over 1 hr
     - Goal for MAP>65 and HR>110

   - **BP (Antihypertensive Meds)**
     - Nitroprusside

   - **Stop**

   - **Mve Stage 3**
     - Activate MTP, CBC and CRF panel, OB and Anesthesia to bedside
Top Causes of Maternal Death in Texas: During Pregnancy & Within 7 Days Postpartum

Top Causes of Maternal Death, Occurring During Pregnancy or up to 7 Days Postpartum
Confirmed Maternal Deaths, 2012-2015

- DIC/Hemorrhage (n=15): 19.0%
- Cardiac event (n=14): 17.7%
- Amniotic embolism (n=10): 12.7%
- Cerebrovascular event (n=9): 10.1%
- Hypertension/eclampsia (n=7): 8.9%
- Pulmonary embolism (n=5): 6.3%

Slide from Dr. Lisa Hollier
Severe Maternal Morbidity: Top Causes

Severe Maternal Morbidity (SMM) in Texas
Overall and Top Causes, 2014

Cases per 1,000 deliveries

- Texas SMM rate: 19.5
- Hemorrhage*: 13.0
- DIC: 2.6
- Cardiac Event: 2.0
- Hysterectomy: 1.4
- Eclampsia*: 0.7

*AIM Patient Safety Bundle is available for this condition.

Data Source: Hospital Inpatient Discharge Public Use Data File, 2014
Prepared by: Office of Program Decision Support

Slide from Dr. Lisa Hollier
es for high risk patients and post-event debriefs to identify successes and opportunities
- Multidisciplinary review of serious hemorrhages for systems issues
- Monitor outcomes and process metrics in perinatal quality improvement (QI) committee

ucating prenatal and postpartum women on signs and symptoms of hypertension and preeclampsia
**FIGURE**
Flow diagram for maternal early warning trigger (MEWT) tool

**MATERNAL TRIGGERS**
- Temperature: > 39°C (102.2°F), ≤ 36°C (96.8°F)
- Pulse Ox: ≤ 93%
- Heart Rate: > 110 or < 50
- RR Rate: > 24 or < 12
- Systolic BP: > 155 or < 80 or Diastolic BP: > 105 or < 45
- Altered Mental Status anytime
- Fetal HR > 120 (Infection path only)

**Abnormal Maternal Temp**
- Infection - Sepsis
  - Two or more Triggers
    - Notify Physician, CBC, antibiotics, consider blood cultures
  - HR > 110 and/or MAP < 65
    - Test organ dysfunction: (lactic acid, LFTs total bill., Creatinine, Urine Output)
  - Severe Sepsis / Septic Shock
    - Notify RRT, ICU transfer, and/or consult as appropriate
    - Fluid Resuscitation (within 1 hour) MAP < 65 or lactic acid > 4mmol/l Crystalloid Bolus 30ml/kg over 1 hr Goal for MAP>65 and HR>110

**Abnormal Maternal Assessment 2 or More Triggers**
- Cardiopulmonary
  - HR > 110, MAP < 65 or 02 Sat ≤ 93%, RR > 24 or Altered Mental Status
    - Cardiomyopathy / CHF, Pulmonary Edema
    - Pulmonary HTN, Pulmonary Embolus
    - IV/Infusion Drug Use
  - BNP, cardiac enzymes, EKG, echo, spiral CT
  - Consults (Anesthesia, Medicine, Critical Care, Perinatology)

**Abnormal Maternal Assessment 2 or More Triggers**
- Hypertension in Pregnancy
  - SBP > 155 and/or DBP > 105, MD notified
  - Sustained > 160/110 - Treatment indicated
  - Hypertensive Disorders of Pregnancy Protocol
    - Treatment of BP within 1 hour
      - Magnesium Sulfate – 4gm Bolus and 2gm per hour, PIH labs, PIH powerplan
      - O2 Sat < 93% or RR > 24 – consider pulmonary edema

**Abnormal Maternal Assessment 2 or More Triggers**
- Obstetrical Hemorrhage
  - Management of Obstetrical Hemorrhage Protocol
    - HR > 110, MAP<65 and Bleeding or recent surgery
    - Move to Stage 3 Activate MTP, CBC and DIC panel, OB and Anesthesia to bedside
### Ben Taub PPH Outcomes following MEWS

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Pre-MEWS (n= 2291)</th>
<th>Post-MEWS (n=3946)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Adverse Event Rate (%)</td>
<td>4.5</td>
<td>2.2</td>
<td>0.006</td>
</tr>
<tr>
<td>Time to resolution of abnormal vital sign (minutes)</td>
<td>474</td>
<td>98</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PPH (%)</td>
<td>2.4</td>
<td>6</td>
<td>0.08</td>
</tr>
<tr>
<td>Transfusions ≥4 units (%)</td>
<td>1.5</td>
<td>0.3</td>
<td>0.002</td>
</tr>
</tbody>
</table>
Hypertension

Follow up scheduled HTN Education provided

% of Severe PreE treated with Magnesium Sulfate
% with severe range BP treated in 60 min

Jun-18  Jul-18  Aug-18

COUNCIL ON PATIENT SAFETY IN WOMEN'S HEALTH CARE

Educating prenatal and postpartum women on signs and symptoms of Hypertension and preeclampsia
Ben Taub Obstetrics Sepsis Algorithm

Did the patient trigger the maternal early warning system AND have either a temperature >100.4F or <96.8F

YES

Is this likely due to an infection?

NO

Reassess vitals per obstetric protocol

YES

What is the Sepsis in Obstetrics Score?

<6

Sepsis
- Cultures, labs and diagnostic tests as appropriate
- Reassess SOS q2-4 hours
- Give antimicrobials as appropriate
- Intravenous fluid resuscitation
- Reassess lactate

>= 6

Lactate >= 4

NO

Severe Sepsis

YES

Septic Shock
Table 1. The Sepsis in Obstetrics Score

<table>
<thead>
<tr>
<th>Variable</th>
<th>High Abnormal Range</th>
<th>Normal</th>
<th>Low Abnormal Range</th>
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<tbody>
<tr>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>Higher than 40.9</td>
<td>39–40.9</td>
<td>38.5–38.9</td>
</tr>
<tr>
<td>SBP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td>Higher than 179</td>
<td>150–179</td>
<td>130–149</td>
</tr>
<tr>
<td>RR</td>
<td>Higher than 49</td>
<td>35–49</td>
<td>25–34</td>
</tr>
<tr>
<td>SpO₂</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC</td>
<td>Higher than 39.9</td>
<td>25–39.9</td>
<td>17–24.9</td>
</tr>
<tr>
<td>% immature</td>
<td>10 or higher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>neutrophils</td>
<td>4 or higher</td>
<td></td>
<td></td>
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<tr>
<td>Lactic acid</td>
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</tr>
</tbody>
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SBP, systolic blood pressure; HR, heart rate; RR, respiratory rate; SpO₂, peripheral oxygen saturation; WBC, white blood cell count.
Thank You!