

Maternal Early Warning Signs

An International System Implemented To Decrease
Maternal Mortality

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OBSTETRIC MEWS

- Prompted by the surviving sepsis campaign (2002)
 - Society of Critical Care Medicine
 - European Society of Intensive Care Medicine

Goal: Reduce mortality from sepsis by 25% in five years

Early recognition and treatment



OB MEWS: Rationale

- Maternal mortality reviews in UK, France, USA suggest 50% of maternal deaths are preventable (2009)
- Delay in recognition, diagnosis, treatment of:
 - Hemorrhage
 - Hypertension
 - Infection
 - Thrombosis



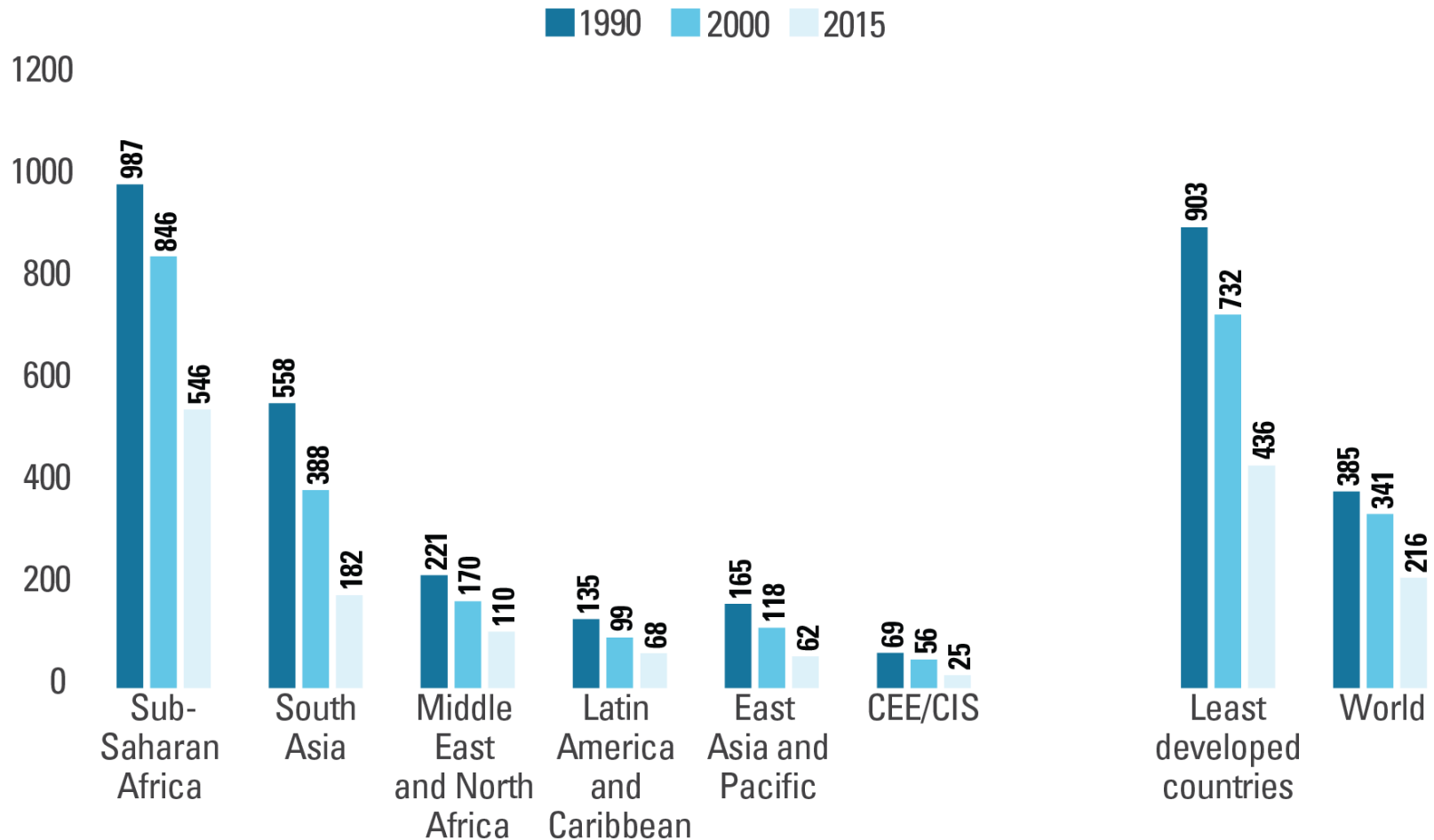
UK Validation Studies

- S. Singh, A. McGlennan, A, England. *A Validation Study of the CEMACH recommended modified early obstetric warning system.* Anesthesia 2012
- RD Swanton, S. Al-Rawi, MY Wee. *A National survey of obstetric early warning systems in the United Kingdom.* Int. J Obstet Anesth 2009.
- C Carle, P Alexander, M Columb. *Design and internal validation of an obstetric early warning score.* Anaesthesia 2013.

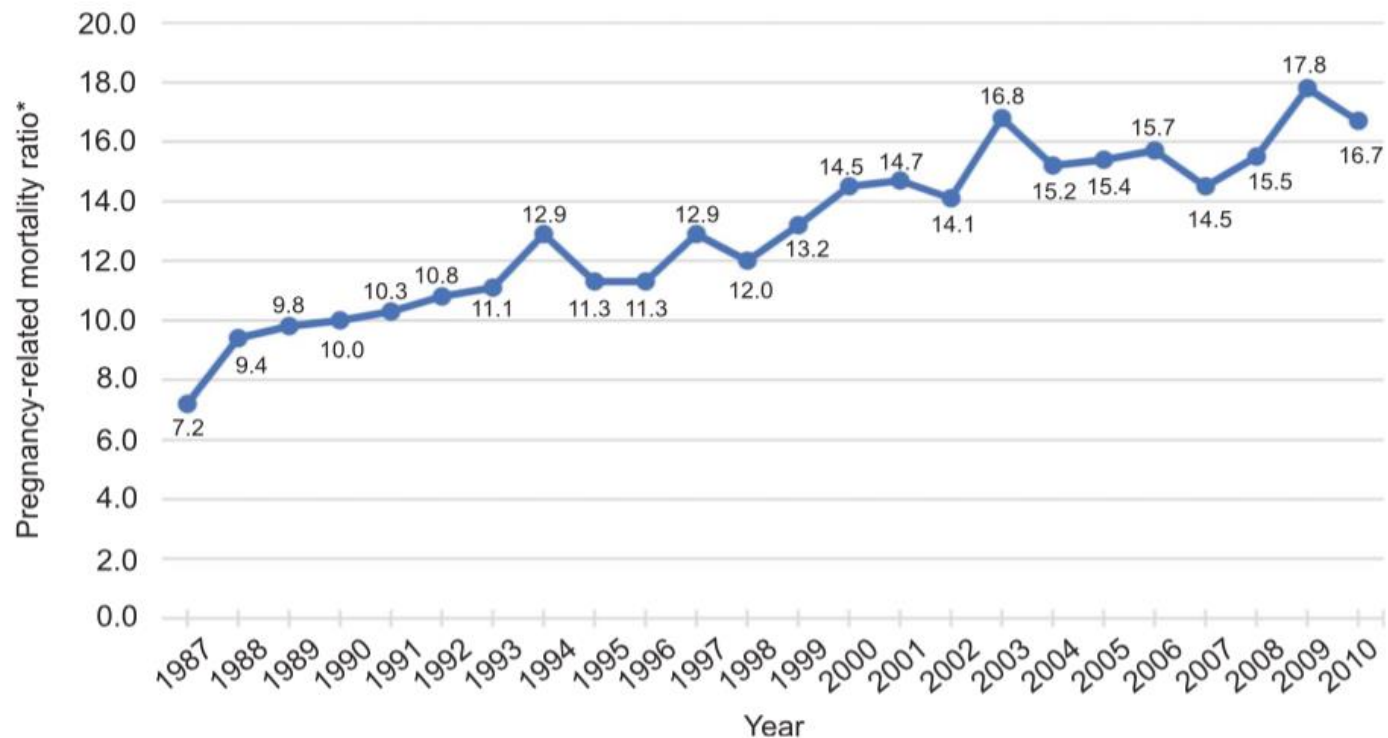


Maternal Mortality Ratio: maternal deaths / 100,000 births

WHO, UNICEF, The World Bank, United Nations



Maternal Mortality trends USA: 1987-2010



“Lifetime risk of maternal death is greater in the USA than in 40 other countries including almost all other industrial nations”

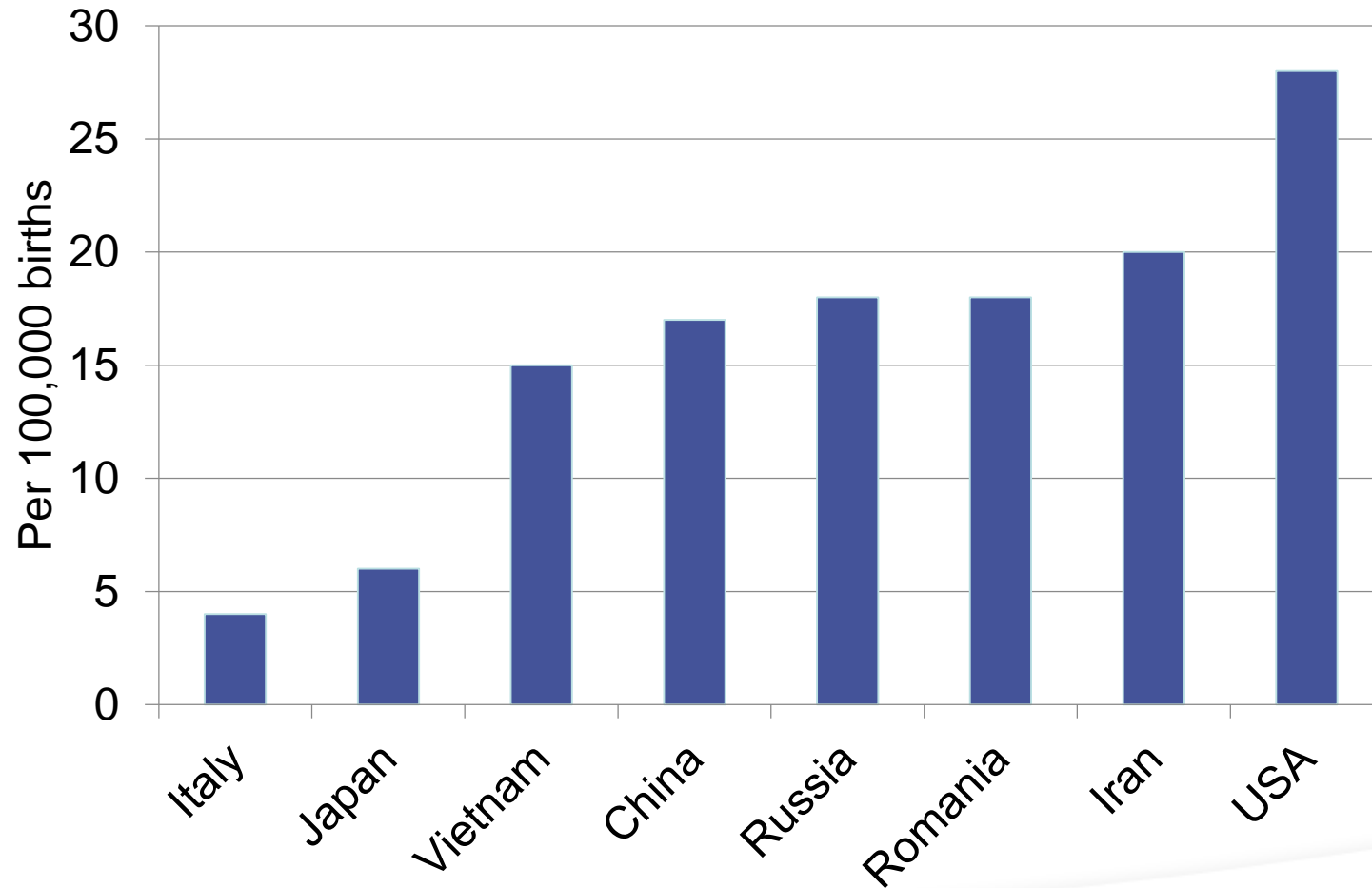
Amnesty International, “Deadly Delivery: The Maternal Health Care Crisis in the USA.” 2010



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Maternal Mortality 2015




Institute of Health Metrics and Evaluation



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Contributing Factors

	Preeclampsia or Eclampsia	Obstetric Hemorrhage	Cardiovascular Disease	Venous Thromboembolism	Amniotic Fluid Embolism
Delayed Response to Triggers	92%	85%	63%	75%	67%
Ineffective Care	69%	75%	45%	45%	50%
Misdiagnosis	42%	40%	31%	50%	—
Failure to Consult	8%	25%	10%	25%	6%
Lack of Continuity of Care	39%	30%	27%	25%	—

 > 15% to 30  > 30% to 60 %  > 60 %



Enough Already!



Nancy C. Chescheir, MD

The maternal mortality ratio is viewed as an important measure of the status of women, the status of health care, and the social and political determinants of health in a country. Since 1987, the Centers for Disease Control and Prevention has documented a persistent increase in the maternal mortality ratio from pregnancy-related causes in the United States, continuing, unfortunately, as reported by Creanga et al¹ (see page 5) in this month's issue. The ratio is now 16.0 per 100,000 live births, up from 14.5/100,000 live births from 1998 to 2005, 11.5/100,000 live births from 1991 to 1997, and 9.1/100,000 live births from 1987 to 1990. This is shown by year from 1987 to 2010 in Figure 1, a disturbing graph.²

In the 2006–2010 epoch, there were 3,358 pregnancy-related deaths and 5,028 pregnancy-associated deaths in the United States, and there is no sign of reversal of the rising ratios.¹ How can a health care provider, administrator, U.S. citizen, or politician not be alarmed by this?

While writing this editorial, I've vacillated between sadness, anger, disbelief, and a desire to say something remotely useful about these data. I have opted to have two goals: 1) to emphasize steps that we as individual clinicians, administrators, and politicians might take to decrease the risk



National Partnership For Maternal Safety

- Multidisciplinary working group that defined “Maternal Early Warning Criteria”
- List of abnormal parameters that indicate the need for urgent bedside evaluation



Organizations in USA

- District II: Safe Motherhood Initiative (2013)
- California Maternal Quality Care Collaborative “CMQCC” 1999, 2010, 2014
- Association of Women’s Health, Obstetric, Neonatal Nurses “AWHONN” 2013



What are early warning signs?

...a set of predetermined “calling criteria”
(based on vital signs) as indicators of the
need to:

- Escalate monitoring of the patient
- Call for assistance

Mackintosh, N. (2014) Value of a modified early obstetric warning system (MEOWS) in managing maternal complications in the peripartum period: and ethnographic study *BMJ Qual Saf*, 23, 26-34



OB Maternal Early Warning Signs (OB MEWS)

FIRST Priority - Stat Response

- Maternal agitation, confusion or unresponsiveness
- Signs & Symptoms of a stroke (FAST)
- Severe pain (not responding to ordered analgesia if indicated)

SECOND Priority - 15 Minute Response Recommended

RN/APRN caring for the patient needs to be notified ASAP and any abnormal assessments requires a re-check in 10 minutes

Systolic BP	< 85	>160
Diastolic BP	< 40	>110
Heart Rate	<50	>120
Respiratory Rate	<10	>30
Temperature		≥40
Oxygen Saturation (while awake): Or any patient who requires oxygen or has increasing oxygen requirements to maintain this saturation rate	<92%	
Oliguria	<35mL/2H	
Uncontrolled pain (not responding to ordered analgesia)		
New onset vaginal bleeding (preterm inpatient antepartum patient)	Nurse must visualize the bleeding (if pt. reports flushing it- please examine perineum for evidence of bleeding if not visible place a pad on the patient.	

THIRD Priority - ≤30 Minute Response ROUTINE MATTERS

OBSTETRICS

Use of Maternal Early Warning Trigger tool reduces maternal morbidity

Laurence E. Shields, MD; Suzanne Wiesner, RN, MBA; Catherine Klein, RN, CNM;
Barbara Pelletreau, RN, MPH; Herman L. Hedriana, MD

BACKGROUND: Maternal mortality in the United States has increased unabated for the past 20 years. Maternal morbidity is also affecting an increasingly large number of women in the United States. A number of national and state organizations have recommended the use of maternal early warning tools as a method to combat this problem. There are limited data suggesting that the use of these types of clinical assessment tools can reduce maternal morbidity.

OBJECTIVE: We sought to determine if maternal morbidity could be reduced with the implementation of a clinical pathway-specific Maternal Early Warning Trigger (MEWT) tool.

STUDY DESIGN: The tool was developed internally and prospectively implemented as a pilot project in 6 of 29 hospitals within a large hospital system. The primary goal was early assessment and treatment of patients suspected of clinical deterioration. The tool addressed the 4 most common areas of maternal morbidity: sepsis, cardiopulmonary dysfunction, preeclampsia-hypertension, and hemorrhage. To be considered positive, triggers needed to be sustained for >20 minutes and were defined as severe (single abnormal value): maternal heart rate (HR) >130 beats/min (bpm), respiratory rate >30/min, mean arterial pressure <55 mm Hg, oxygen saturation <90%, or nurse concern; or nonsevere (required 2 abnormal values): temperature >38 or <36°C, blood pressure >160/110 or <85/45 mm Hg, HR >110 or <50 bpm, respiratory rate >24 or <10/min, oxygen saturation <93%, fetal HR >160 bpm, altered mental status, or disproportionate pain. Within each group, recommended management or assessment was also provided. Outcome measures were Centers for Disease Control and Prevention

(CDC)-defined severe maternal morbidity, composite maternal morbidity, and intensive care unit (ICU) admissions. Two time intervals were used to analyze the effect of the MEWT tool: a 24-month baseline control period and a 13-month MEWT study period. To determine that the findings noted were not simply changes that would have occurred without the utilization of the early warning tool, we also compared a control population from nonpilot sites during the same baseline and 13-month time periods.

RESULTS: There were 36,832 deliveries at the pilot sites (24,221 pre- and 12,611 post-MEWT testing) and 146,359 at the nonpilot sites (95,718 pre- and 50,641 post-MEWT testing) during the 2 study time periods. Use of the MEWT tool resulted in significant reductions in CDC severe maternal morbidity ($P < 0.01$) and composite morbidity ($P < 0.01$). ICU admissions were unchanged. At nonpilot sites CDC severe maternal morbidity, composite morbidity, and ICU admissions were unchanged between baseline and the post-MEWT testing time period.

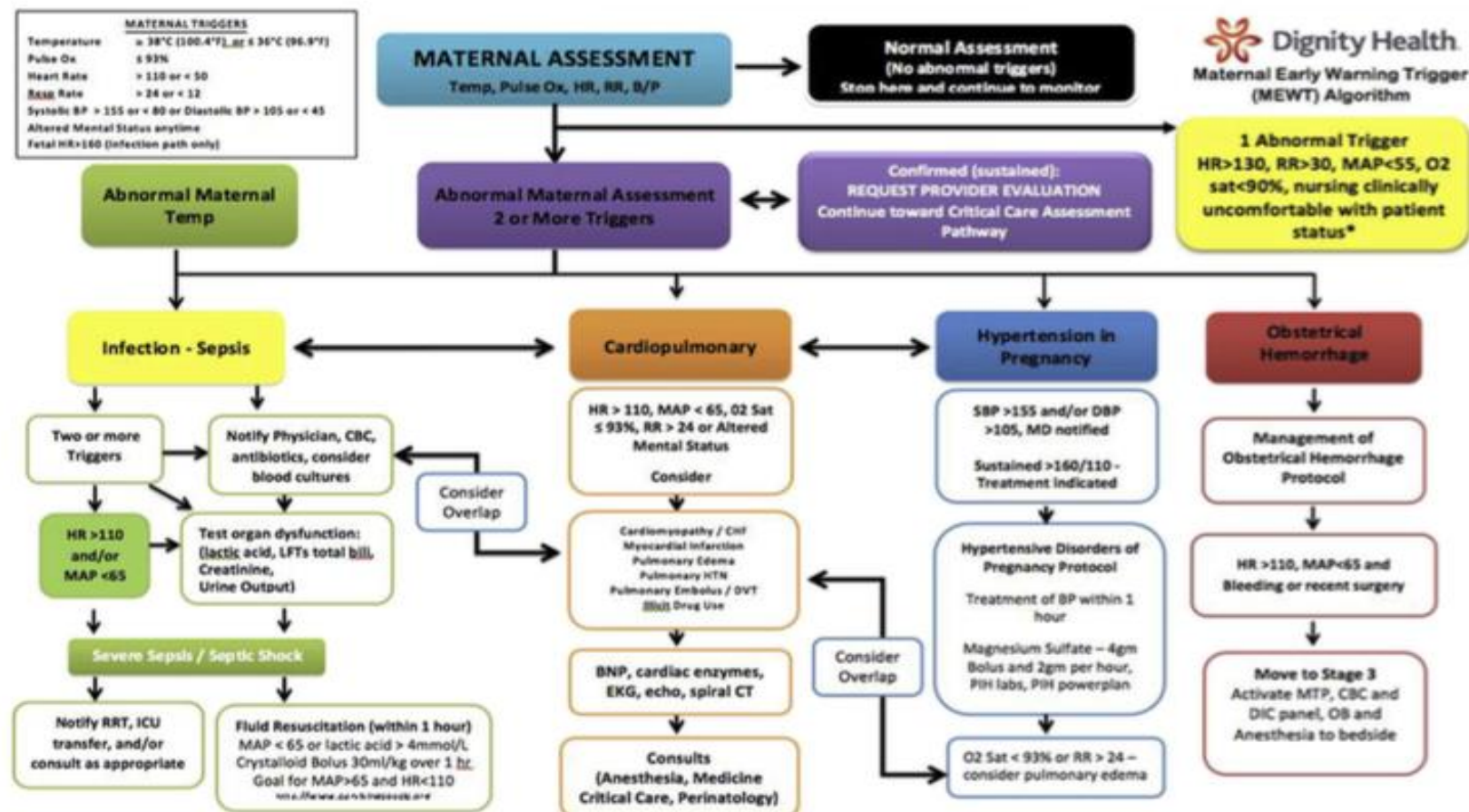
CONCLUSION: The use of the MEWT tool in this study, designed to address 4 of the most common causes of maternal morbidity, as well as provide assessment and management recommendations, resulted in significant improvement in maternal morbidity. The variation in hospital delivery services at the pilot sites suggests that this maternal early warning tool would be suitable for use in the majority of maternity centers in the United States.

Key words: critical vital signs, maternal decompensation, maternal mortality



FIGURE

Flow diagram for maternal early warning trigger (MEWT) tool



Maternal Early Warning Trigger (MEWT) tool.

bili, bilirubin; BNP, brain natriuretic peptide; BP, blood pressure; CBC, complete blood count; CT, computerized tomography; DBP, diastolic blood pressure; DIC, disseminated intravascular coagulation laboratory results; EKG, electrocardiogram; gm, grams; Hr, hour; HR, heart rate; ICU, intensive care unit; LFTs, liver function testing; MAP, mean arterial pressure; MTP, maternal transfusion protocol; OB, obstetrician; O₂ Sat, oxygen saturation; P/H, preeclampsia laboratory assessment; Powerplan, electronic medical record preeclampsia order set; Pulse O₂, pulse oximetry; RR, respiratory rate; RRT, rapid response team; SBP, systolic blood pressure; Temp, temperature.

Shields et al. Maternal trigger tool and severe maternal morbidity. *Am J Obstet Gynecol* 2016.



OB Hypertension Safety Bundle



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Safety Action Series

Severe Hypertension Patient Safety Bundle

- Hypertensive disorders in pregnancy affect 5%-10% of pregnancies in the United States.
- Preeclampsia is the leading cause of maternal morbidity and mortality, with an estimated 50,000 – 60,000 preeclampsia related deaths per year, worldwide.
- For every preeclampsia-related death in the United States, there are 50-100 other women who experience “near miss” events that stop short of death, but result in significant health risk and health care costs.

Safety Action Series – Severe Hypertension Patient Safety
Bundle Council on Patient Safety in Women's Health Care



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Readiness

- Education
 - Diagnostic criteria, monitoring, treatment
 - Simulation and team training
- Rapid access to medication
- Plan for obtaining consult if patient deteriorates



Recognition

- Well defined standards for:
 - Monitoring BPs
 - Recording BPs
 - Confirming abnormal results
 - Alerting Provider



Response

- Standardized protocols
 - Treatment
 - Timely triage
 - order sets and algorithms for labs, medication administration, fetal assessment
 - Rapid access to first line anti-hypertensive meds
 - System plan for escalating



Communication Orders

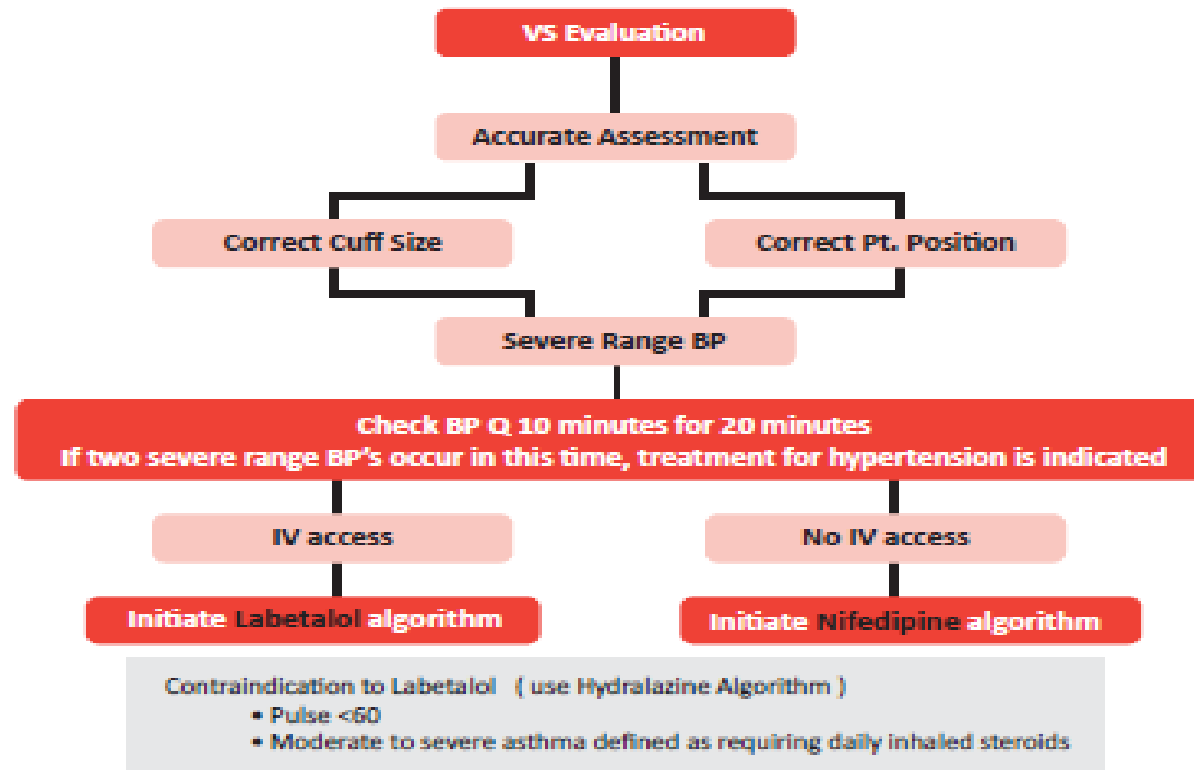
Communication Orders [130375]

[X]	Notify provider - hemodynamic Parameters - Elevated BP range [NUR183]	Routine, Continuous Temperature greater than: 38 Temperature less than: 36.5 Systolic BP greater than: 160 Systolic BP lower than: 96 Diastolic BP greater than: 100 Diastolic BP less than: 60 Heart rate greater than: 120 Heart rate less than: 60 Respiratory rate greater than: 20 Respiratory rate less than: 12 SpO2 less than: 92 Urine output less than 30 mL per hour or less than 240mL for 8 hours, antepartum
[]	Communication MD to HUC - Order US OB Fetal Non Stress Test Every Monday and Thursday [NUR304628]	Routine, As Directed Please place order for US OB Fetal Non Stress Test every Monday and Thursday
[]	Communication MD to HUC - Order US OB Fetal Non Stress Test Every Tuesday and Friday [NUR304628]	Routine, As Directed Please place order for US OB Fetal Non Stress Test Every Tuesday and Friday
[]	Communication MD to HUC - Order Daily US OB Fetal Non Stress Test [NUR304628]	Routine, Nightly For 1 Occurrences Please place order for US OB Fetal Non Stress Test daily
[]	Communication MD to HUC - Order Daily US OB Follow Up [NUR304628]	Routine, Nightly For 1 Occurrences Please place order for US OB Follow up



Severe range BP = systolic ≥ 160 OR diastolic ≥ 110

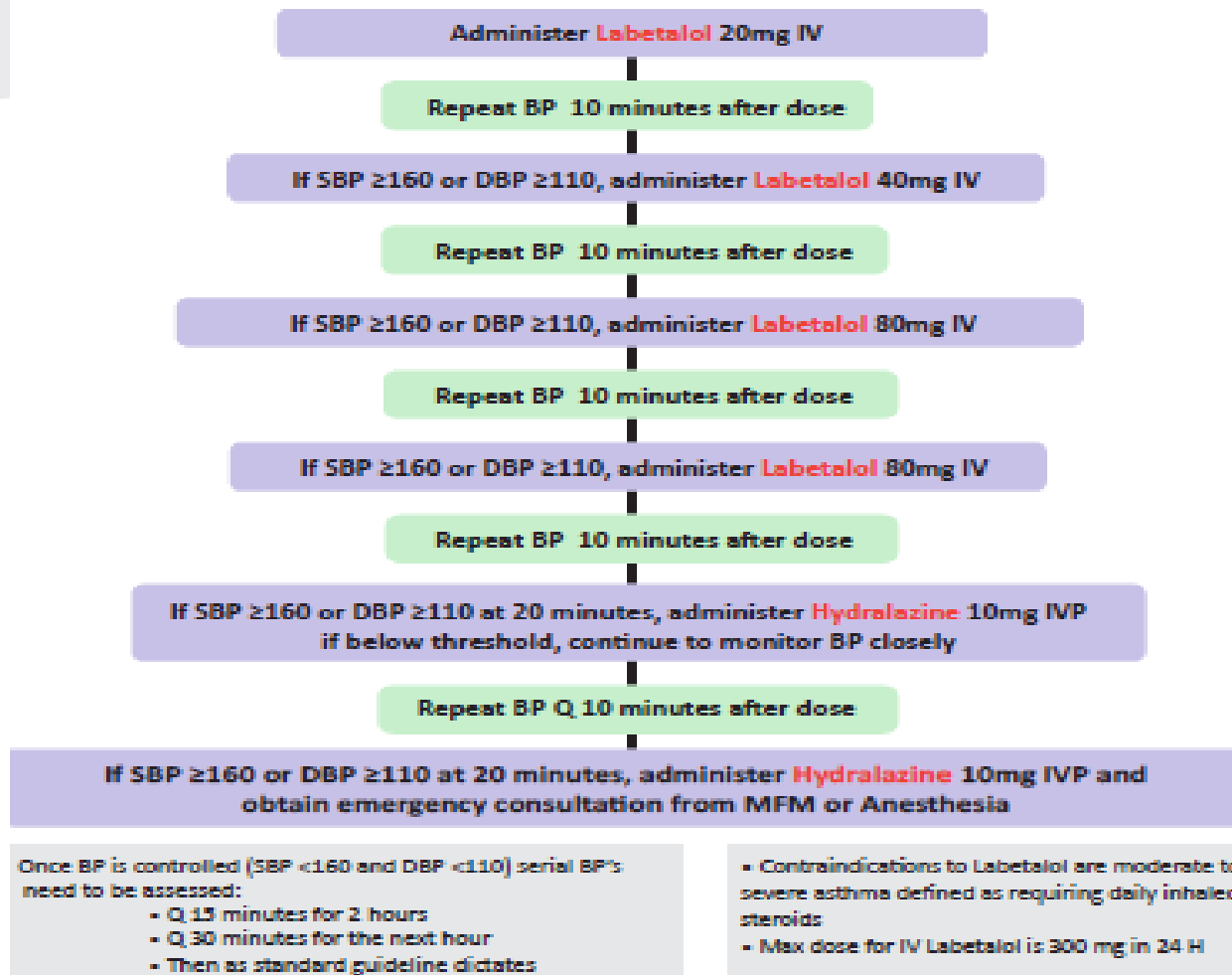
Verified severe range BP must be immediately reported to the OB provider



Severe Range BP's



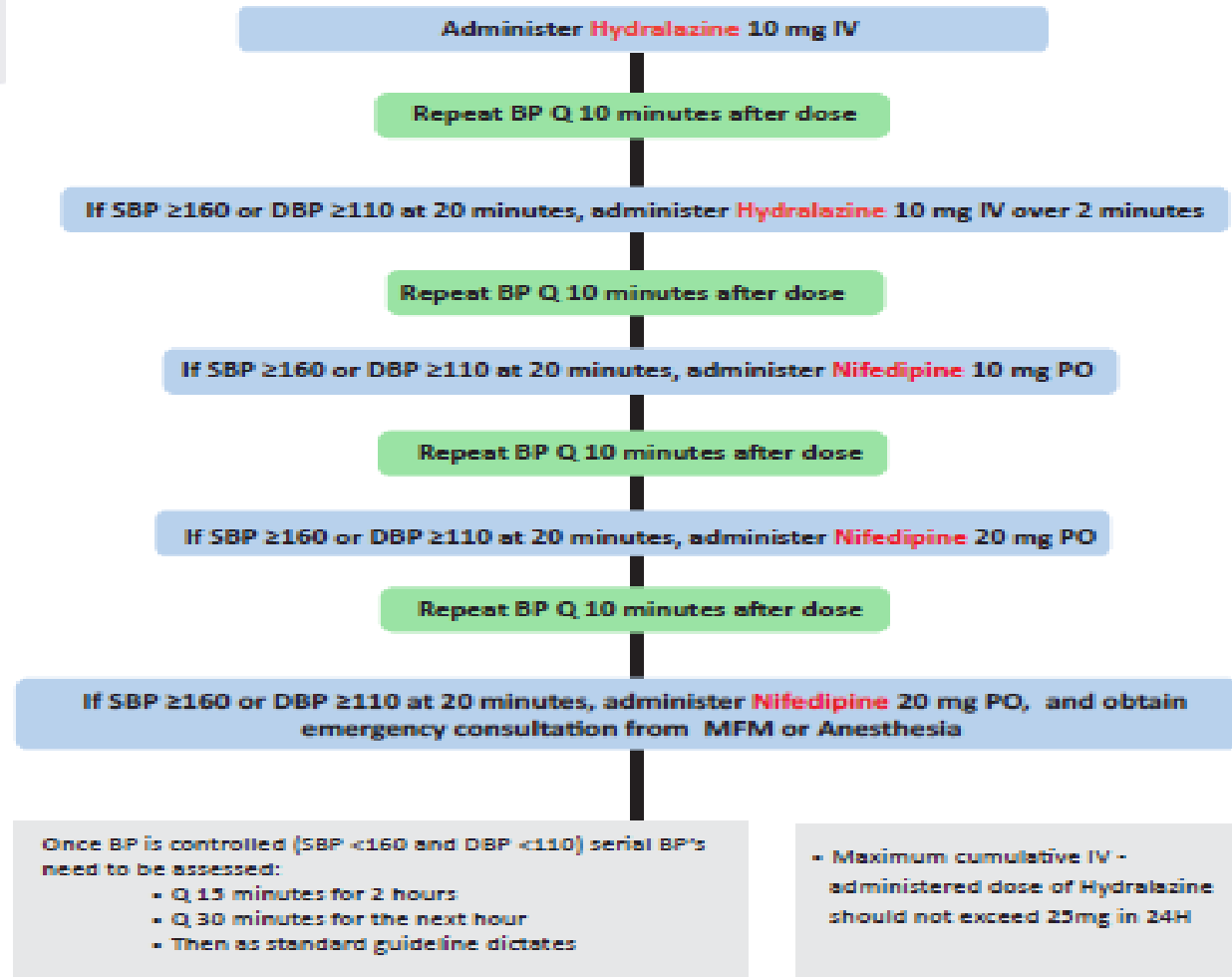
Verified severe range BP must be immediately reported to the OB Provider



Labetalol Algorithm



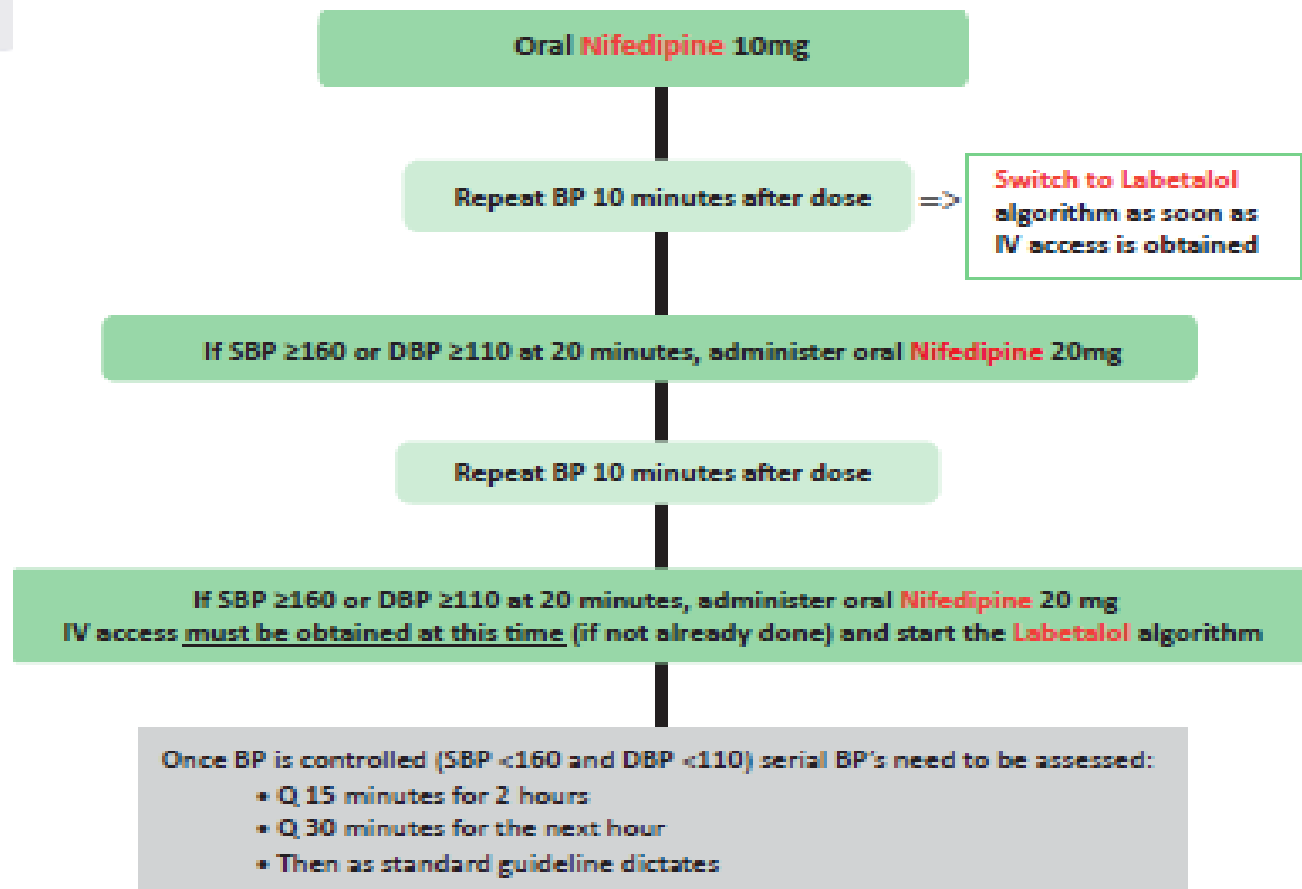
Verified severe range BP must be immediately reported to the OB provider



Hydralazine Algorithm



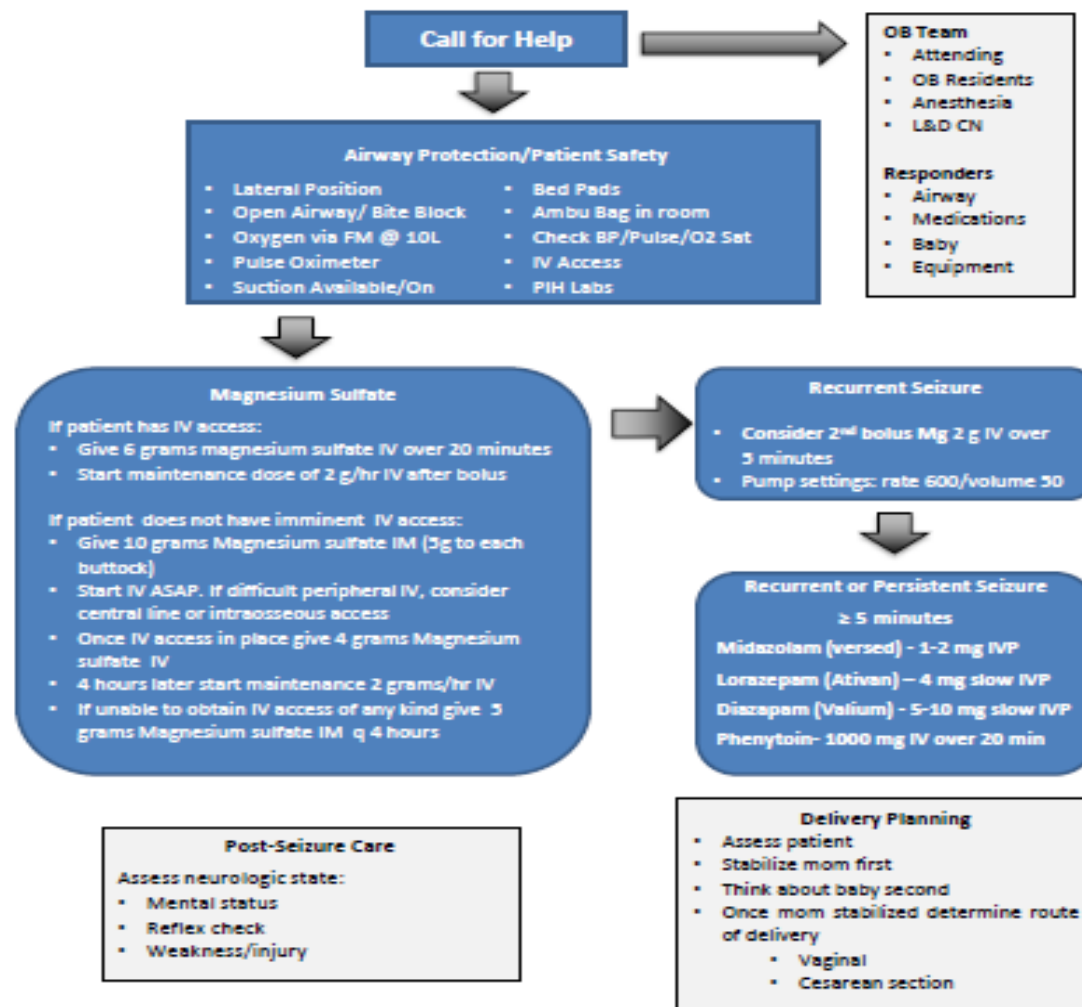
Verified severe range BP must be immediately reported to the OB provider



Oral Nifedipine Algorithm



Eclamptic Seizure Algorithm

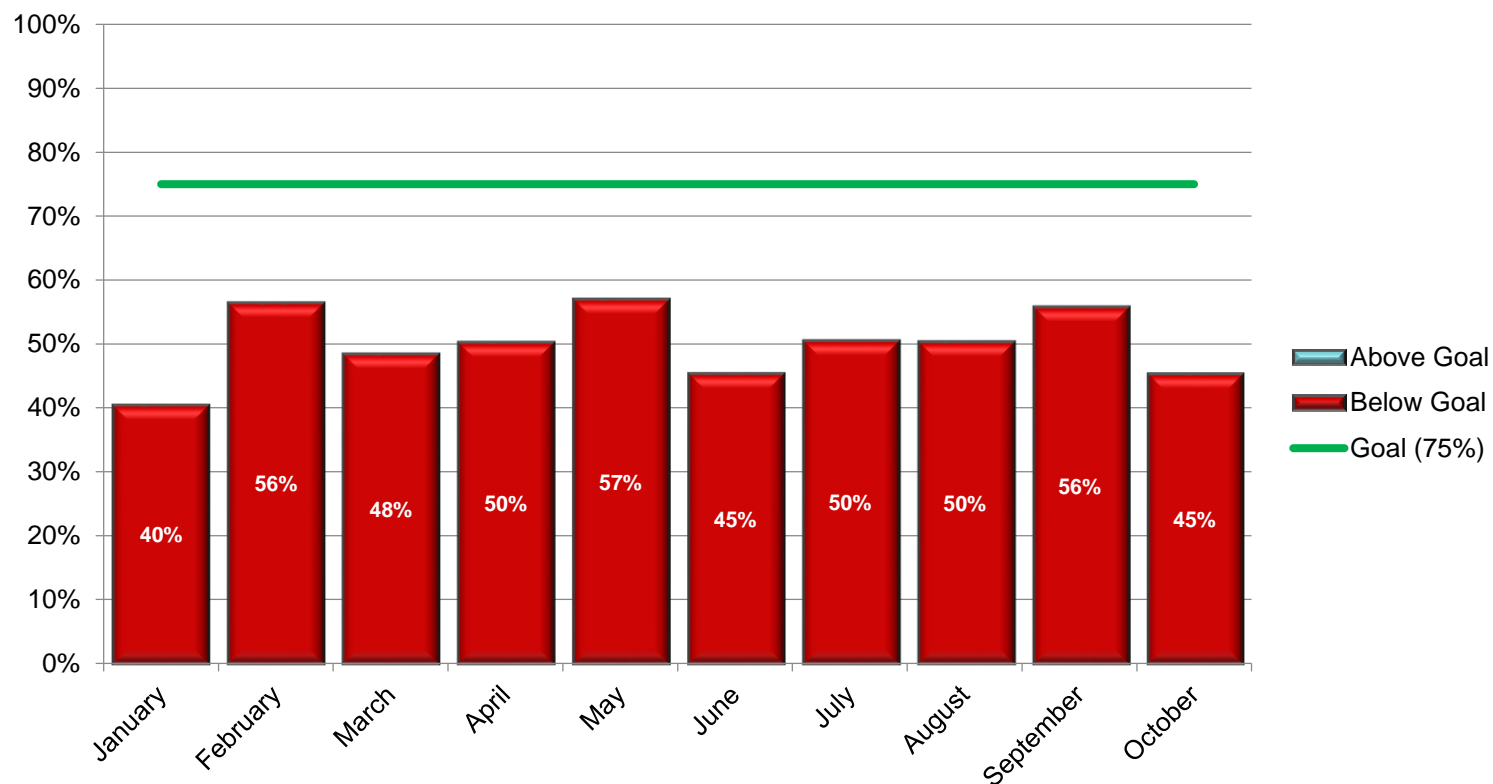


J. Fisher/Sept 2015 V2
SNL Update



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Hypertension Verified in ≤ 10 min. (All)

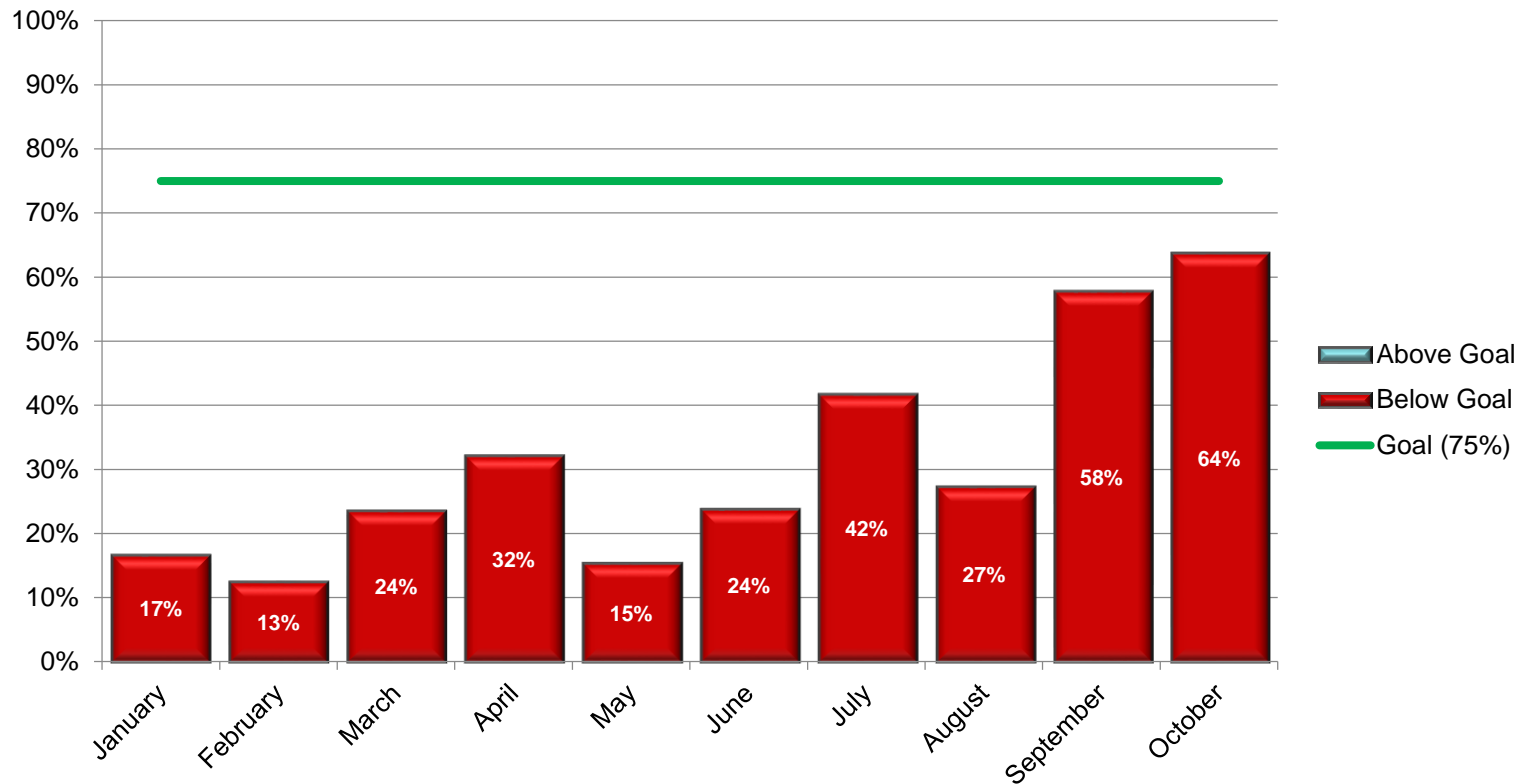


Reporting / Data Collection

- Quality Question:
 - Was a severe range BP ($\text{SBP} \geq 160$ **OR** $\text{DBP} \geq 110$) identified and verified within 10 minutes?
 - If a severe range BP was verified did the patient receive the correct dose of a first line antihypertensive within 30 minutes?



Received Meds Within 30 min. (All)



Promoting a Culture of Safety

All care providers are to be rewarded, not punished or ignored when they call for a bedside evaluation, regardless of the clinical outcome.



Steps for success

- Education (all units)
- Facility-wide acceptance or “buy in”
- Outcome audits
- Multidisciplinary review of complex cases



Summary

1. Delays in recognition and treatment precede a majority of events that result in severe maternal morbidity and mortality
2. HTN, PPH, thrombosis, and sepsis, are the most common causes of morbidity and mortality
3. Early warning signs have been validated to identify patients at risk
4. Safety bundles empower all providers, standardize care, and decrease maternal morbidity

