



UCSF Benioff Children's Hospitals

Hypertensive Disorders of Pregnancy

With atypical case presentations

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Disclosures

- I have no financial relationships with any commercial interests
- No relevant financial relationships exist

Objectives

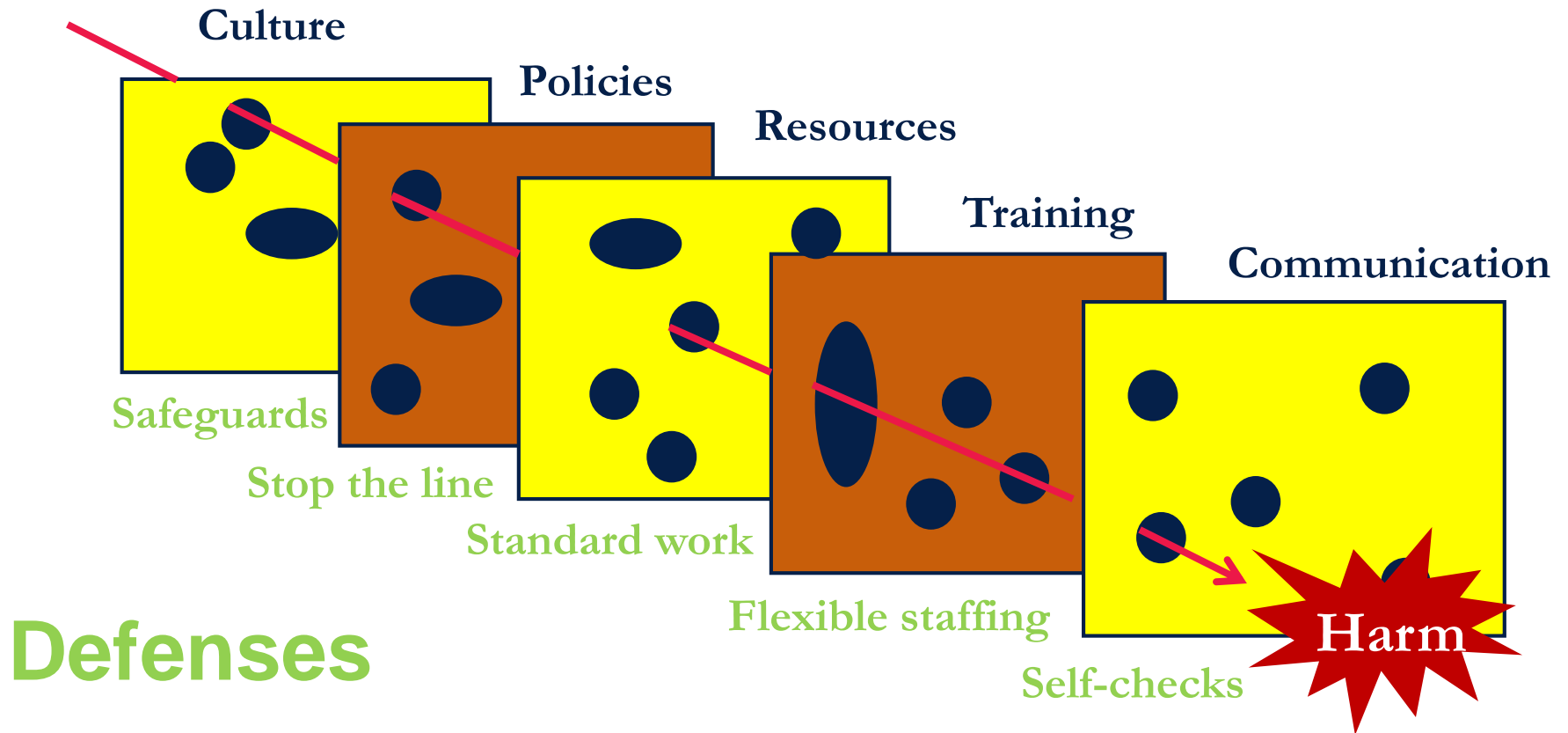
- Discuss incidence of hypertensive disorders in pregnancy related to severe maternal morbidity and maternal death
- Review atypical case presentations and highlight opportunities to improve patient outcomes.
- Describe implementation of the 4 “R”s: Readiness, Recognition, Response and Reporting for women preeclampsia, eclampsia, and acute decompensation.

Case Presentation

- 36 yo G3 P2, 37 + 2
- Spanish speaking woman admitted to L&D with her English speaking cousin as her support person. FOB not involved.
- Hx GDM diet controlled
- Precipitous birth 37+2 – Apgar 8, 9
 - Blood glucose at delivery 130
- IV Fentanyl x 1: (Repair of 2nd) Pain= 4/10
- Patient complaining of headache
 - **T: 98.8, Pulse: 96 BP: 156/92, R: 20**

How Errors Occur

Failures



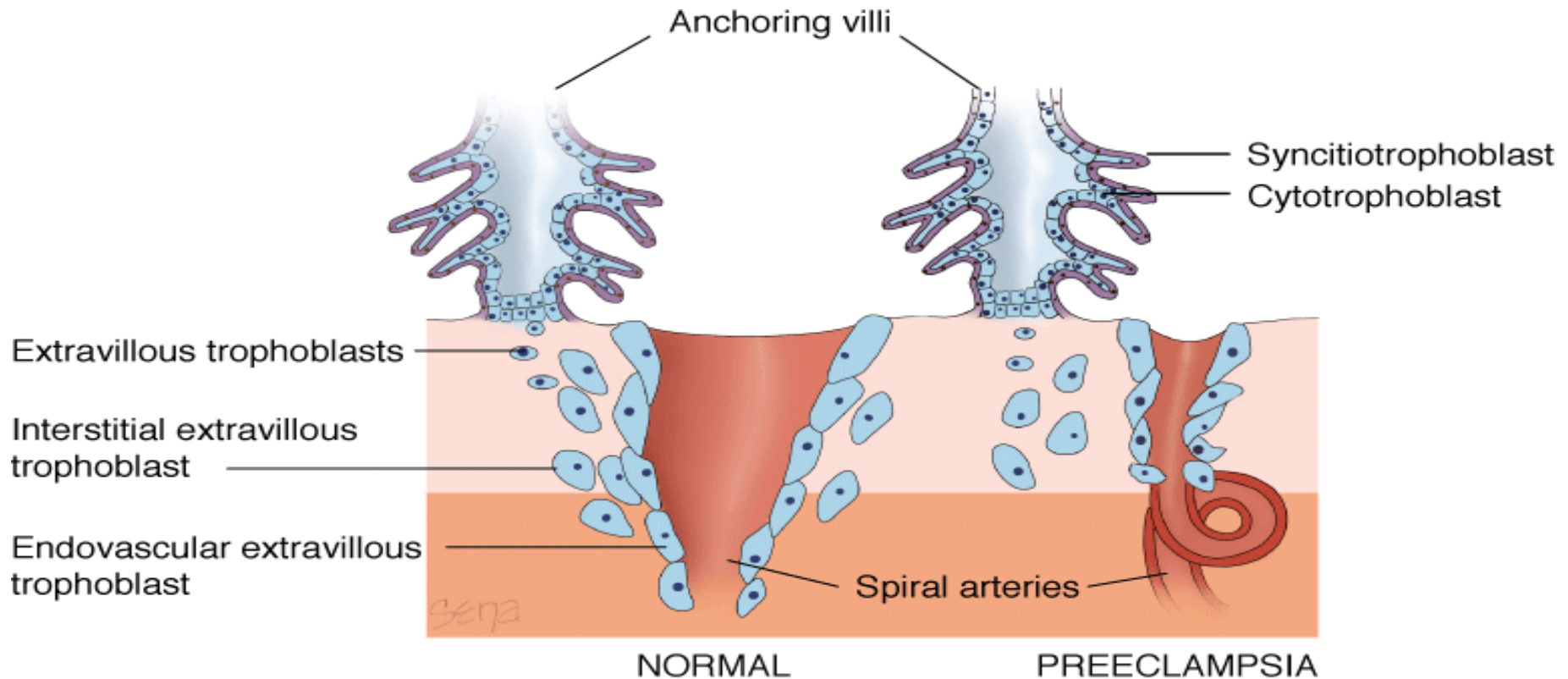
Hypertensive Disorders

- Most common medical complication of pregnancy
- **Chronic hypertension** is increasing in the general population
- Native American, African American, and Hispanic women affected disproportionately
- **Preeclampsia**
 - Complicates 3% to 6% of all pregnancies
 - Reason for up to 25% of VBLW births
 - Highest Morbidity occurs when GA <35 weeks (early onset)



Preeclampsia

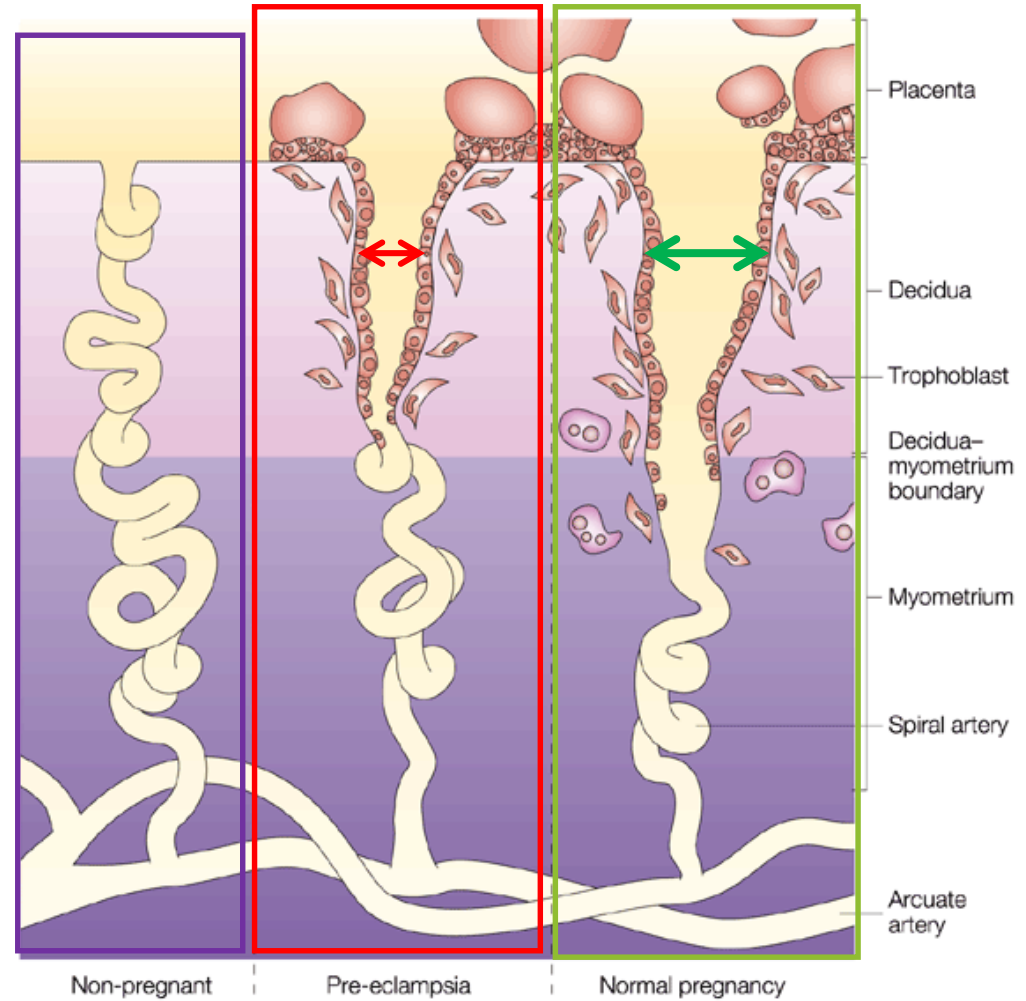
A multiorgan syndrome characterized by endothelial damage and vasospasm



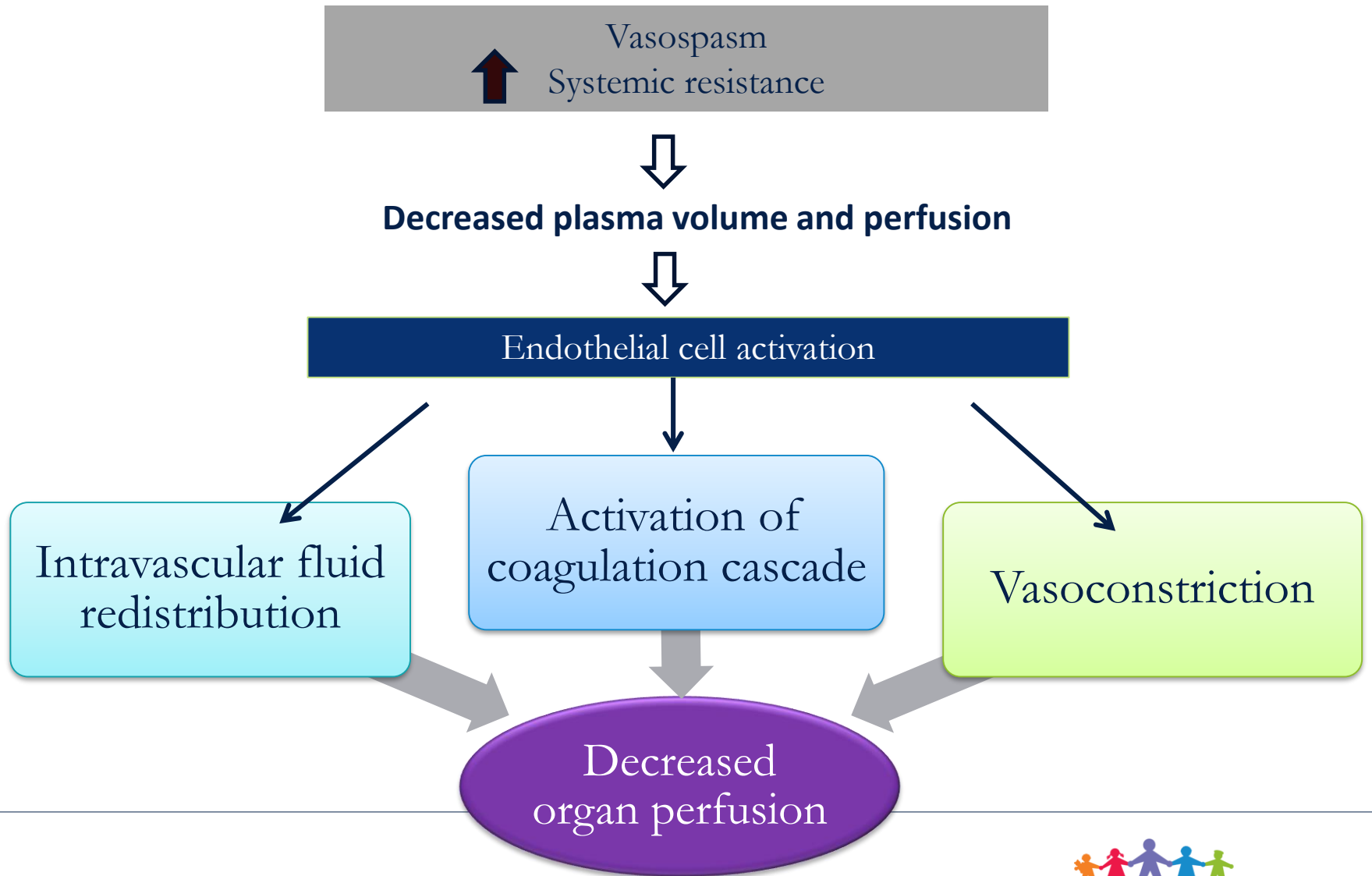
Source: Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY: *Williams Obstetrics, 23rd Edition*: <http://www.accessmedicine.com>
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Pathophysiology of Preeclampsia

- Failure of maternal spiral artery remodeling in early second trimester sets the stage
- Leads to release of vascular damaging agents



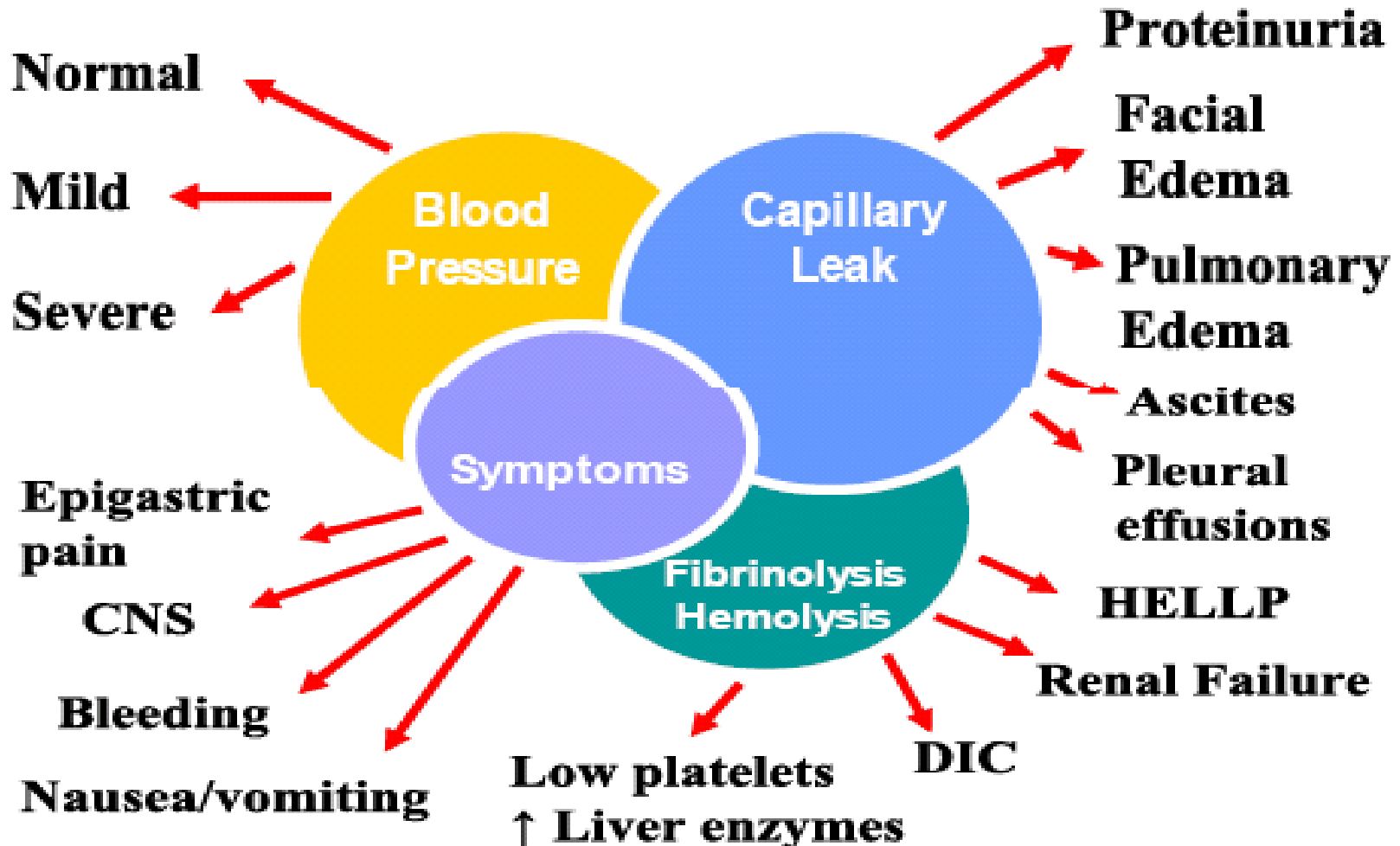
Cycle of Reactivity



Pathophysiology

FIGURE 1

Overlapping role of hypertension, capillary leak, maternal symptoms, and fibrinolysis/hemolysis in the spectrum of atypical preeclampsia



Pathophysiology of Preeclampsia

Maternal artery endothelial cell dysfunction causes:

- Vasoconstriction
- Hypertension
- Edema
 - Pulmonary edema
 - Headache
 - Epigastric pain
 - Oliguria

CA-PAMR: Chance to Alter Outcome

Grouped Cause of Death; 2002-2004 (N=145)

Grouped 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	25 (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	12	145

The Deadly Triad

Severe Preeclampsia + HELLP Syndrome + Eclampsia

- **Associated with an increased risk of adverse outcomes such as:**
 - * Placental Abruption
 - * Renal Failure
 - * Subcapsular Hepatic Hematoma
 - * Preterm Delivery
 - * Fetal or Maternal Death
 - * Recurrent Preeclampsia

HYPERTENSION IN PREGNANCY



The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

American College of
Obstetricians and
Gynecologists (ACOG),
2013.

Executive summary:
Hypertension in
Pregnancy.

Obstetrics and
Gynecology, 122(5),
1122–1131.



UCSF Benioff Children's Hospitals

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UCSF Benioff Children's Hospitals

A California Toolkit to Transform Maternity Care

Improving Health Care Response to Preeclampsia:
A California Quality Improvement Toolkit

THIS COLLABORATIVE PROJECT WAS DEVELOPED BY:
THE PREECLAMPSIA TASK FORCE

CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE
MATERNAL, CHILD AND ADOLESCENT HEALTH DIVISION; CENTER FOR FAMILY HEALTH
CALIFORNIA DEPARTMENT OF PUBLIC HEALTH



Druzin, Shields, Peterson, Cape.
2013.

**Preeclampsia Toolkit: Improving
Health Care Response to
Preeclampsia (California
Maternal Quality Care
Collaborative Toolkit to
Transform Maternity Care)**

Developed under contract #11-
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Health Division.

Published by the California
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Collaborative.

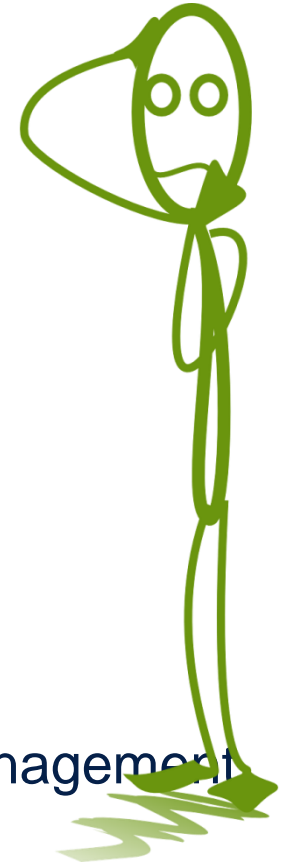
Outdated Terms

- PIH (pregnancy induced hypertension)
- Toxemia
- PET (preeclampsia/toxemia)
- Mild preeclampsia



What Changed?

- No more mild preeclampsia
- No more proteinuria requirements
- Edema not a diagnostic factor
- IUGR interventions separate from preeclampsia management





PATIENT SAFETY BUNDLE

READINESS

Every Unit

- Standards for early warning signs, diagnostic criteria, monitoring and treatment of severe preeclampsia/eclampsia (include order sets and algorithms)
- Unit education on protocols, unit-based drills (with post-drill debriefs)
- Process for timely triage and evaluation of pregnant and postpartum women with hypertension including ED and outpatient areas
- Rapid access to medications used for severe hypertension/eclampsia: Medications should be stocked and immediately available on L&D and in other areas where patients may be treated. Include brief guide for administration and dosage.
- System plan for escalation, obtaining appropriate consultation, and maternal transport, as needed

RECOGNITION & PREVENTION

Every Patient

- Standard protocol for measurement and assessment of BP and urine protein for all pregnant and postpartum women
- Standard response to maternal early warning signs including listening to and investigating patient symptoms and assessment of labs (e.g. CBC with platelets, AST and ALT)
- Facility-wide standards for educating prenatal and postpartum women on signs and symptoms of hypertension and preeclampsia

Hypertension



RESPONSE

Every case of severe hypertension/preeclampsia

- Facility-wide standard protocols with checklists and escalation policies for management and treatment of:
 - Severe hypertension
 - Eclampsia, seizure prophylaxis, and magnesium over-dosage
 - Postpartum presentation of severe hypertension/preeclampsia
- Minimum requirements for protocol:
 - Notification of physician or primary care provider if systolic BP \geq 160 or diastolic BP \geq 110 for two measurements within 15 minutes
 - After the second elevated reading, treatment should be initiated ASAP (preferably within 60 minutes of verification)
 - Includes onset and duration of magnesium sulfate therapy
 - Includes escalation measures for those unresponsive to standard treatment
 - Describes manner and verification of follow-up within 7 to 14 days postpartum
 - Describe postpartum patient education for women with preeclampsia
- Support plan for patients, families, and staff for ICU admissions and serious complications of severe hypertension

REPORTING/SYSTEMS LEARNING

Every unit

- Establish a culture of huddles for high risk patients and post-event debriefs to identify successes and opportunities
- Multidisciplinary review of all severe hypertension/eclampsia cases admitted to ICU for systems issues
- Monitor outcomes and process metrics

Note: "Facility-wide" indicates all areas where pregnant or postpartum women receive care. (E.g. L&D, postpartum critical care, emergency department, and others depending on the facility).

Hypertension





California Partnership for Maternal Safety

PATIENT SAFETY BUNDLE

P R E E C L A M P S I A

READINESS

Every unit

- ✓ Adopt standards for early warning signs, diagnostic criteria, monitoring and treatment for severe preeclampsia/eclampsia to include order sets and algorithms
- ✓ Unit team education, reinforced by regular unit-based drills
- ✓ Process for timely triage and evaluation of pregnant and postpartum women with hypertension including ED and outpatient areas
- ✓ Rapid access to medications used for severe hypertension/eclampsia: Medications should be stocked and readily available on L&D and in other areas where patients may be treated. Include brief guide for administration and dosage
- ✓ System plan for escalation, obtaining appropriate consultation and maternal transport, as needed

RECOGNITION & PREVENTION

Every patient

- ✓ Adoption of a standard process for the measurement and assessment of BP and urine protein for all pregnant and postpartum women
- ✓ Implementation of standard response to maternal early warning criteria
- ✓ Implementation of facility-wide standards for educating prenatal and postpartum women on signs and symptoms of preeclampsia and hypertension

RESPONSE

All severe hypertension/preeclampsia

- ✓ Facility-wide standard processes with checklists for management and treatment of:
 - Severe hypertension
 - Eclampsia, seizure prophylaxis, and magnesium over-dosage
 - Postpartum, emergency department and outpatient presentation of severe hypertension/preeclampsia
- ✓ Support plan for patients, families and staff for ICU admissions and serious complications of severe hypertension

REPORTING/SYSTEMS LEARNING

Every unit

- ✓ Implementation of a huddle for high risk cases and post-event team debrief
- ✓ Review all severe hypertension/eclampsia/ICU cases for systems issues
- ✓ Monitor outcomes and process metrics
- ✓ Documentation of education of pregnant and postpartum women about symptoms of preeclampsia

This bundle was developed by the Council On Patient Safety in Women's Health Care, National Partnership for Maternal Safety 2015



ACOG Executive Summary on Hypertension In Pregnancy, Nov 2013

1. The term “mild” preeclampsia is discouraged for clinical classification. The recommended terminology is:
 - a. “**preeclampsia without severe features**” (mild)
 - b. “**preeclampsia with severe features**” (severe)
2. Proteinuria **is not** a requirement to diagnose preeclampsia with **new onset** hypertension.
3. The **total** amount of proteinuria > 5g in 24 hours has been eliminated from the diagnosis of severe preeclampsia.
4. **Early** treatment of **severe** hypertension is mandatory at the threshold levels of **160 mm Hg** systolic or **110 mm Hg** diastolic.
5. Magnesium sulfate for seizure prophylaxis is **indicated** for **severe** preeclampsia and **should not** be administered universally for preeclampsia without severe features (mild).

ACOG Executive Summary on Hypertension In Pregnancy, Nov 2013

6. Preeclampsia with onset **prior to 34 weeks** is most often **severe** and should be managed at a facility with appropriate resources for management of serious maternal **and** neonatal complications.

7. Induction of labor **at 37 weeks** is indicated for preeclampsia **and** gestational hypertension.

8. The **postpartum period** is potentially dangerous. Patient education for early detection **during** and **after** pregnancy is important.

9. Long-term health effects should be discussed.





The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

COMMITTEE OPINION

Number 623 • February 2015 (*Replaces Committee Opinion Number 514, December 2011*)

Committee on Obstetric Practice

This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period

How to Accurately Measure Blood Pressure

- Patient seated comfortably, legs uncrossed, back and arm supported
- Use the correct sized cuff so that it **fits correctly** around the upper arm and line the middle of the BP cuff with the level of the right atrium (middle of the sternum)
- Patient should be **relaxed** and instructed **not to talk** during the measurement
 - Ideally a resting time of several minutes should elapse before the BP is taken
- If initial assessment elevated
 - Repeat after several minutes to determine if hypertension persists



What about this position?

“Her blood pressure was elevated when she first presented to triage but I had her rest on her side to cycle her blood pressures and all other measurements have been within normal limits”



Hypertension in Pregnancy

What is the definition of hypertension?

- Systolic BP 140 mm Hg or greater
and/OR
- Diastolic BP of 90 mm Hg or greater
- Considered **mild** until SBP \geq 160 mm Hg or DBP \geq 110 mm Hg
- Diagnosis **requires two** abnormal BP values at least 4 hours apart

Hypertension in Pregnancy

Four Categories

1. Preeclampsia-Eclampsia
2. Chronic Hypertension (any cause)
3. Chronic Hypertension with Superimposed Preeclampsia
4. Gestational Hypertension



Diagnostic Criteria



Photo from creative commons/pixabay

Hypertension in Pregnancy

PREECLAMPSIA-ECLAMPSIA

- New onset hypertension
 - Usually **after 20 weeks** gestation
 - Most common form of high BP to complicate pregnancy
 - Multisystem involvement
 - **May** have proteinuria and/or other organ involvement
- Eclampsia is the presence of seizures with preeclampsia

Hypertension in Pregnancy

PREECLAMPSIA-ECLAMPSIA

- Two subsets

1. Preeclampsia **WITHOUT** severe features

OR

2. Preeclampsia **WITH** severe features



Hypertension in Pregnancy

CHRONIC HYPERTENSION

- Hypertension present before pregnancy
 - Or detected early in pregnancy (before 20 weeks)



Hypertension in Pregnancy

CHRONIC HYPERTENSION WITH SUPERIMPOSED PREECLAMPSIA

Considered preeclampsia WITH severe features

- If diagnosis made with:
 - Increase in liver enzymes
 - Platelet levels of under 100,000/mL
 - Right upper quadrant pain or severe headaches
 - Pulmonary congestion or edema
 - Renal insufficiency
 - Sudden substantial increases in proteinuria

Hypertension in Pregnancy

GESTATIONAL HYPERTENSION

- New onset elevations in blood pressure **after 20 weeks** gestation **without proteinuria**
- Often **close to term**
- If blood pressure does not normalize postpartum, actually chronic hypertension

Hyper

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Diagnostic Criteria

TABLE E-1. Diagnostic Criteria for Preeclampsia ←

Blood pressure	<ul style="list-style-type: none">• Greater than or equal to 140 mm Hg systolic or greater than or equal to 90 mm Hg diastolic on two occasions at least 4 hours apart after 20 weeks of gestation in a woman with a previously normal blood pressure• Greater than or equal to 160 mm Hg systolic or greater than or equal to 110 mm Hg diastolic, hypertension can be confirmed within a short interval (minutes) to facilitate timely antihypertensive therapy
and	
Proteinuria	<ul style="list-style-type: none">• Greater than or equal to 300 mg per 24-hour urine collection (or this amount extrapolated from a timed collection) or <ul style="list-style-type: none">• Protein/creatinine ratio greater than or equal to 0.3*• Dipstick reading of 1+ (used only if other quantitative methods not available)
<u>Or in the absence of proteinuria, new-onset hypertension with the new onset of <u>any of the following:</u></u>	
Thrombocytopenia	<ul style="list-style-type: none">• Platelet count less than 100,000/microliter
Renal insufficiency	<ul style="list-style-type: none">• Serum creatinine concentrations greater than 1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease
Impaired liver function	<ul style="list-style-type: none">• Elevated blood concentrations of liver transaminases to twice normal concentration
Pulmonary edema	
Cerebral or visual symptoms	

* Each measured as mg/dL.

Severe Features of Preeclampsia

BOX E-1. Severe Features of Preeclampsia (Any of these findings) ↵

- Systolic blood pressure of 160 mm Hg or higher, or diastolic blood pressure of 110 mm Hg or higher on two occasions at least 4 hours apart while the patient is on bed rest (unless antihypertensive therapy is initiated before this time)
- Thrombocytopenia (platelet count less than 100,000/microliter)
- Impaired liver function as indicated by abnormally elevated blood concentrations of liver enzymes (to twice normal concentration), severe persistent right upper quadrant or epigastric pain unresponsive to medication and not accounted for by alternative diagnoses, or both
- Progressive renal insufficiency (serum creatinine concentration greater than 1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease)
- Pulmonary edema
- New-onset cerebral or visual disturbances

If you combine
the two...

Characteristics of Preeclampsia		
Measurement	Description	Severe Feature
Blood pressure	<ul style="list-style-type: none"> • $\geq 140^*$ systolic or $\geq 90^*$ diastolic (2 occasions ≥ 4 hr apart, after 20 weeks, previously normal BPs) 	<ul style="list-style-type: none"> • No
	OR <ul style="list-style-type: none"> • $\geq 160^*$ systolic or $\geq 110^*$ diastolic (can be confirmed in a short time [min] to encourage antihypertensive therapy) 	<ul style="list-style-type: none"> • Yes
And		
Proteinuria	<ul style="list-style-type: none"> • ≥ 300 mg/24 hr urine collection 	<ul style="list-style-type: none"> • No
	OR <ul style="list-style-type: none"> • Protein/creatinine ratio $\geq 0.3^{**}$ 	<ul style="list-style-type: none"> • No
or if no proteinuria, new-onset HTN*** w/ new onset of ANY of the following:		
Thrombocytopenia	<ul style="list-style-type: none"> • Platelet count $< 100,000/\mu\text{L}$ 	<ul style="list-style-type: none"> • Yes
Renal insufficiency	<ul style="list-style-type: none"> • Serum creatinine $> 1.1^{**}$ or doubled from previous values (in absence of other renal disease) 	<ul style="list-style-type: none"> • Yes
Impaired liver function	<ul style="list-style-type: none"> • Elevated serum liver transaminases to double normal values 	<ul style="list-style-type: none"> • Yes—with or without persistent right upper quadrant/epigastric pain not responsive to pain medication
Pulmonary edema	<ul style="list-style-type: none"> • Fluid collection in the lungs 	<ul style="list-style-type: none"> • Yes
New-onset visual or cerebral changes	<ul style="list-style-type: none"> • Blurred vision or scotoma • Headache • Stroke • Seizure 	<ul style="list-style-type: none"> • Yes • Yes • Yes • Eclampsia

Note. Adapted from ACOG (2013). Executive Summary: Hypertension in Pregnancy. Box E-1 & Table E-1 *mm Hg; **mg/dL; ***hypertension

Case Presentation

- 05:20 Ms. Davis is admitted to L&D as an outpatient - (out of network)
- 36 yo G4 P2 at 35+3 weeks gestation
- C/O upset stomach and pain around diaphragm
- VS: 98.6, HR 68, R 18, BP 161/85, re√ 140/84,
 - **Pain 7-8/10**
- FHR tracing on L&D 05:30 – 07:33
- Baseline 140, Moderate variability, accelerations to 165 no decelerations noted (Category I)

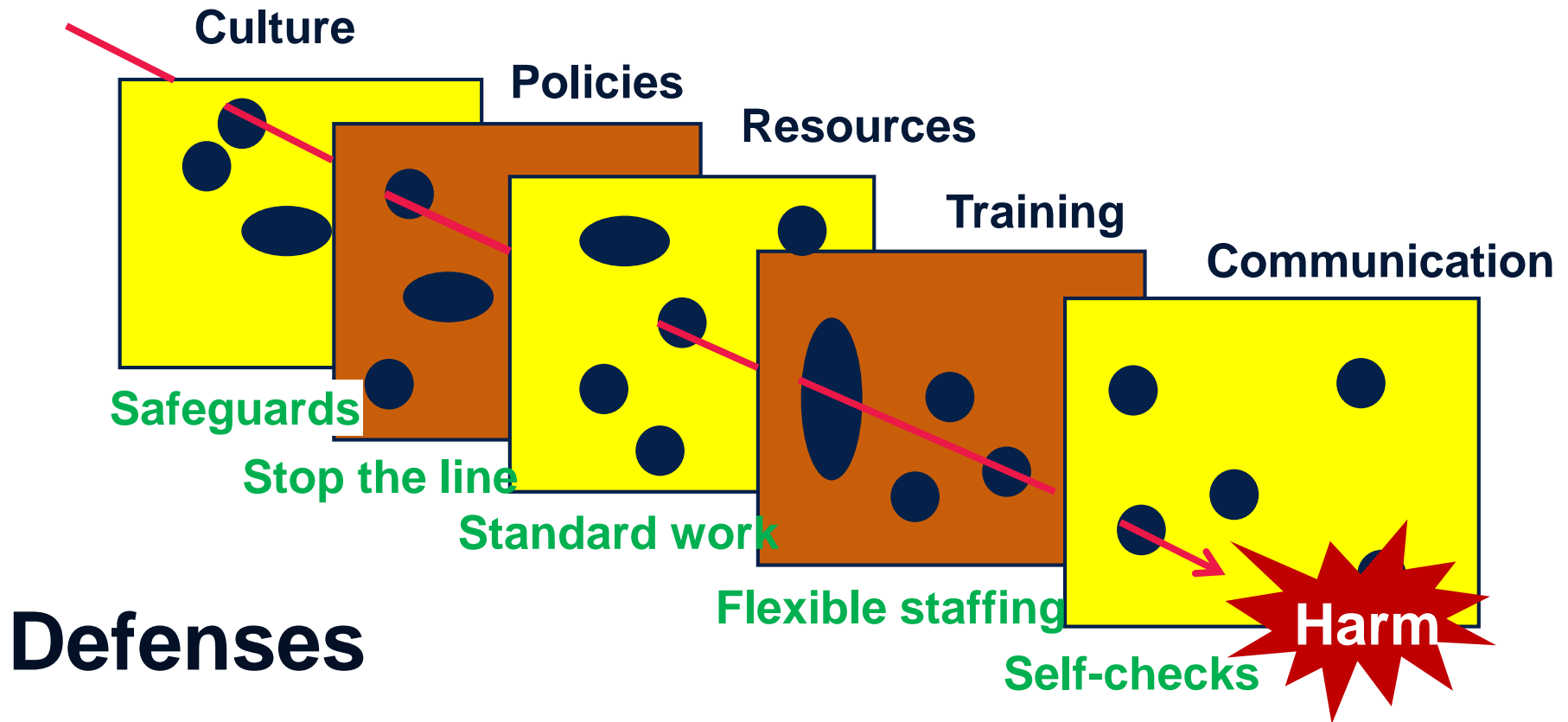
HELLP

A variant of severe preeclampsia

- **H**emolysis
 - Red blood cell destruction – hemolysis on peripheral smear
- **E**levated **L**iver Enzymes
 - Elevated bilirubin ≥ 1.2 mg/dL
 - Elevated LDH > 600
 - Elevated AST ≥ 70
- **L**ow **P**latelets
 - Decreased $< 100,000$

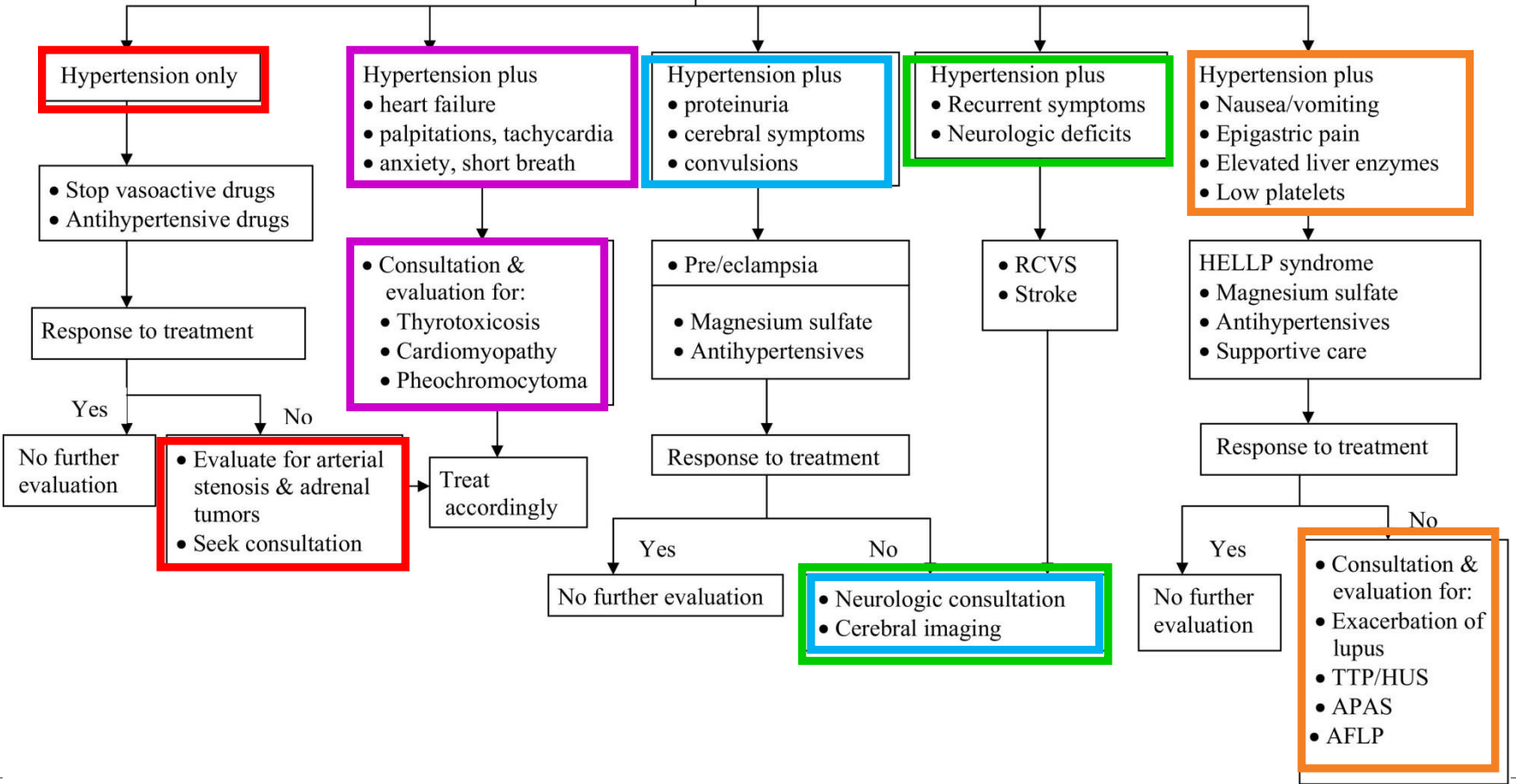
How did this happen?

Failures



Persistent hypertension postpartum

- Detailed history & physical examination
- Presence of cerebral/gastrointestinal symptoms
- Laboratory evaluation including proteinuria



Question: What is the recommended time to wait to confirm severe range BP in Triage

- A. 5-10 minutes
- B. 15 minutes
- C. 30 minutes
- D. 1 hour
- E. You must have 2 BP measurements 4-6 hours apart to diagnose Preeclampsia with severe features

Maternal Early Warning Criteria

The Maternal Early Warning Criteria	
Measure	Value
Systolic Blood Pressure (mm Hg)	<90 or >160
Diastolic Blood Pressure (mm Hg)	>100
Heart rate (beats per minute)	<50 or >120
Respiratory rate (breaths per min)	<10 or >30
Oxygen saturation on room air, at sea level %	<95
Oliguria, mL/hr for ≥ 2 hrs	<35
Maternal agitation, confusion, or unresponsiveness	
Woman with preeclampsia reporting a non-remitting headache or shortness of breath	

The Maternal Early Warning Criteria: A Proposal From the National Partnership for Maternal Safety.

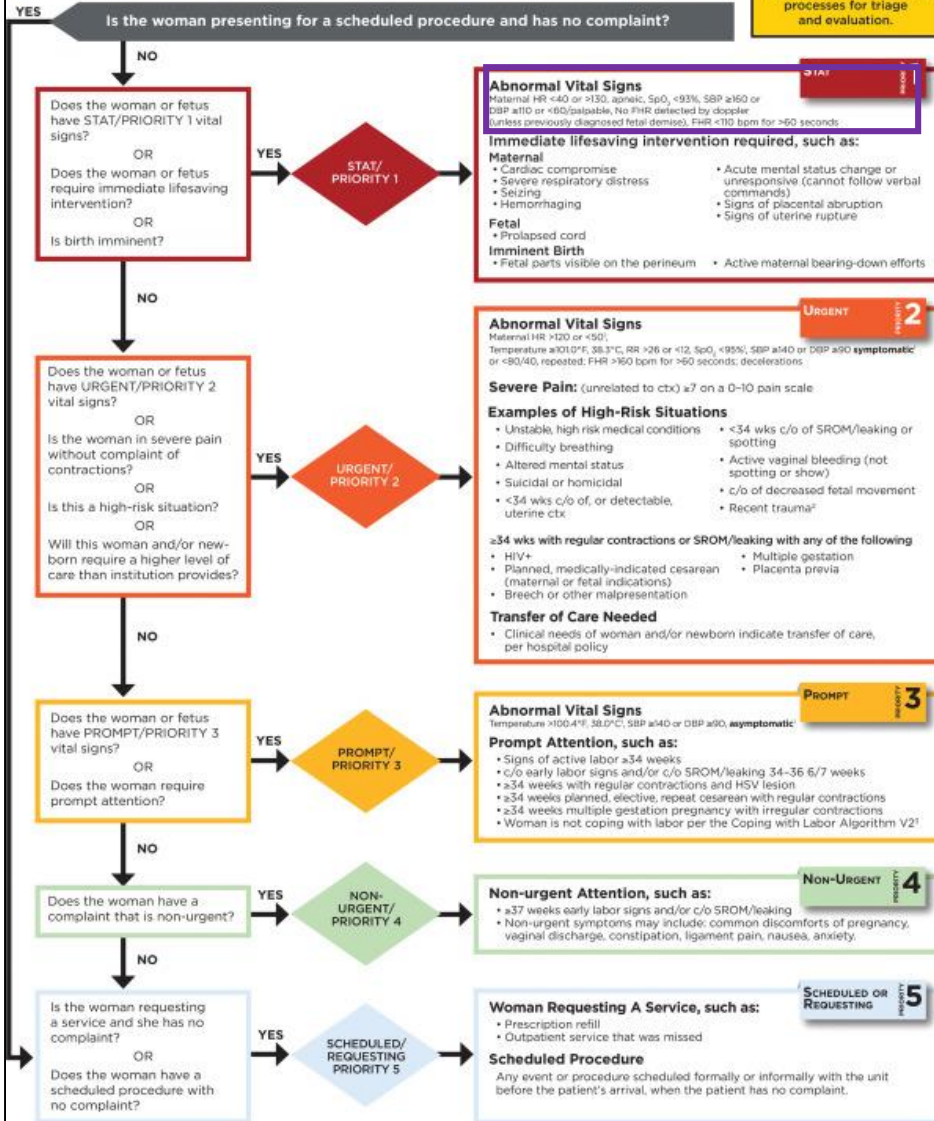
Mhyre, Jill; D'Orta, Robyn; MA, RNC; Hameed, Afshan; Lappen, Justin; Holley, Sharon; CNM, DPN; Hunter, Stephen; MD, PhD; Jones, Robin; King, Jeffrey; Dalton, Mary

Maternal Early Warning Systems

- Abnormal physiologic signs and symptoms precede critical illness
- Early intervention will avoid severe M&M occurrence
- Effective policy of escalation of care



Implement appropriate infectious disease control processes for triage and evaluation.



¹High Risk and Critical Care Obstetrics, 2013

²Trauma may or may not include a direct assault on the abdomen. Examples are trauma from motor vehicle accidents, falls, and intimate partner violence.

³Coping with Labor Algorithm V2 used with permission.

The MFTI is exemplary and does not include all possible patient complaints or conditions. The MFTI is designed to guide clinical decision-making but does not replace clinical judgement. Vital signs in the MFTI are suggested values. Values appropriate for the population and geographic region should be determined by each clinical team, taking into account variables such as altitude.

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Antihypertensive Medications

SBP \geq 160 OR DBP \geq 105-110?

- Medications should be given **NO MORE** than 1 hour after presenting in hypertensive emergency*
 - Aim for no more than 30 minutes
- This is the biggest step in decreasing morbidity and mortality
- Aim to return BP to a range where intracranial hemorrhage not a risk, but not to normal range
 - Goal: 140-160/90-100

*Hypertensive emergency: acute-onset, severe hypertension that persists for \geq 15 minutes

Anihypertensive Medications

First Line Agents

	IV Labetalol	IV Hydralizine
Dose (IVP over 2 minutes)	20 mg	5-10 mg
Onset	2-5 minutes	5-20 minutes
Peak	5 minutes	15-30 minutes
24 hour max	220 mg	25 mg

- ** If no IV access, PO nifedipine should be used
- Nifedipine PO 10 mg may repeat in 30 min
 - Onset: 5-20 min
 - Peak 30-60 min

Repeat and Treat

Algorithms - Checklists - Escalation policies

Early treatment of **severe** hypertension is mandatory at the threshold levels of **160 mm Hg** systolic or **110 mm Hg** diastolic.

Magnesium sulfate for seizure prophylaxis is **indicated** for **severe** preeclampsia and **should not** be administered universally for preeclampsia without severe features (mild).

The **postpartum period** is potentially dangerous.

Patient education for early detection **during** and **after** pregnancy is important.

Long-term health effects should be discussed.

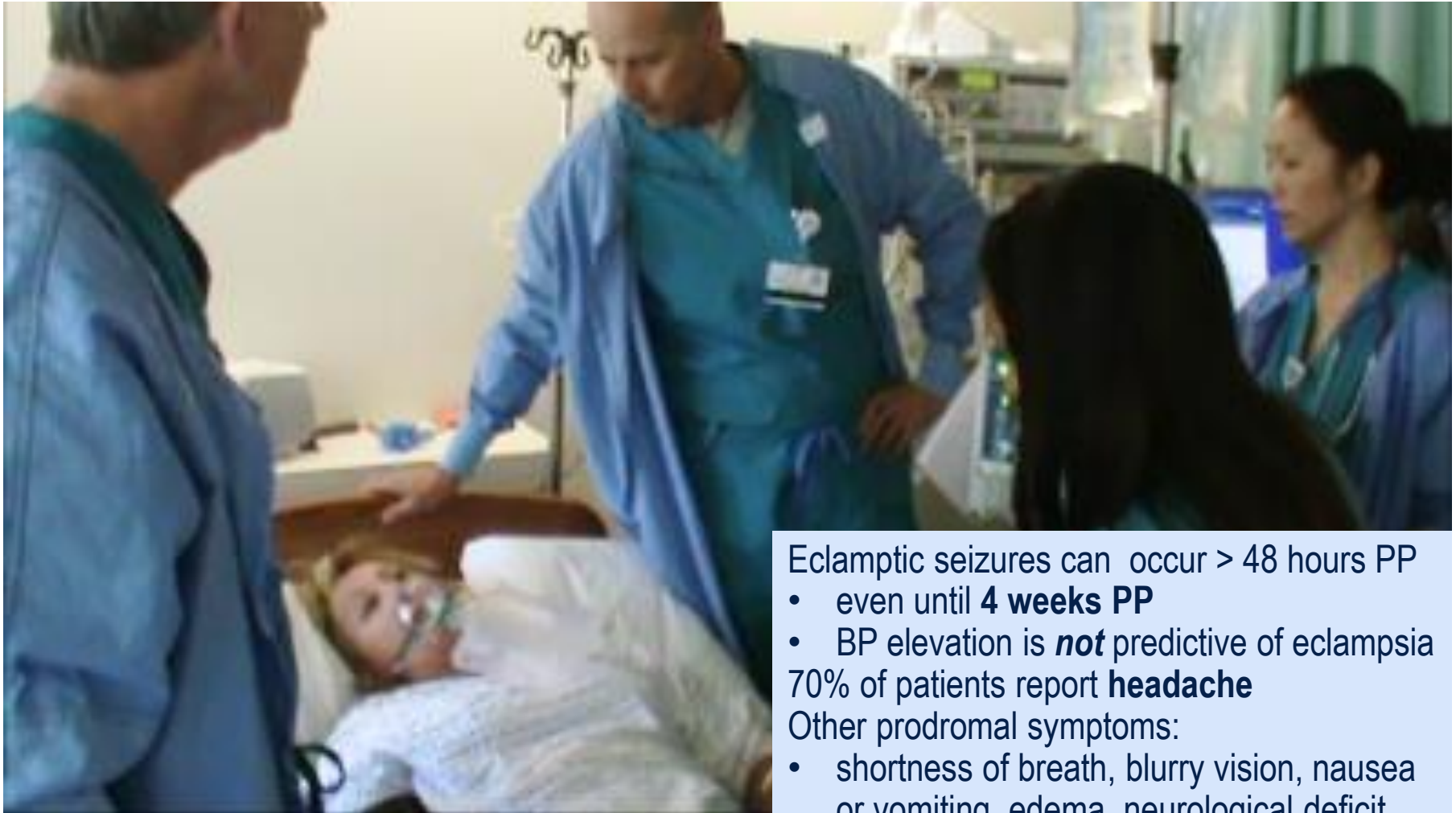
ACOG Executive Summary: Hypertension in Pregnancy Patient Education Materials

For women with persistent hypertension, systolic **BP** \geq **150** or diastolic **BP** \geq **100** on at least 2 occasions 4-6 hours apart, antihypertensive therapy is suggested. Persistent **BP** \geq **160** or diastolic **BP** \geq **110** should be treated within 1 hour



15% of Eclampsia occurs Postpartum

63% had NO Hypertension Diagnosis



Eclamptic seizures can occur > 48 hours PP

- even until **4 weeks PP**
- BP elevation is **not** predictive of eclampsia

70% of patients report **headache**

Other prodromal symptoms:

- shortness of breath, blurry vision, nausea or vomiting, edema, neurological deficit, and epigastric pain

ACOG Executive Summary: Hypertension in Pregnancy

“For women in the **postpartum period** who present with **new onset** hypertension associated with headaches or blurred vision or preeclampsia with severe hypertension, the parenteral **administration of magnesium sulfate** is suggested.”

ACOG. (2013). Hypertension in pregnancy. ACOG Task Force on Hypertension in Pregnancy. *Obstetrics & Gynecology*, 122(5), 1122-1131.

Magnesium Sulfate – High Alert Medication

- Safety Considerations
 - Precautions
 - Renal function
 - Standard Protocols
 - Rapid access (Eclampsia Supply Box)
 - Premix solutions
 - Independent double checks
 - Monitoring parameters
 - Guidelines
 - Staffing

Monitoring

Nursing Assessment Frequency

A. Preeclampsia Without Severe Features (Mild)

	Preeclampsia without Severe Features (mild)		
	Antepartum*	Intrapartum*	Postpartum*
BP, Pulse, Respiration, SaO2	Every 4 hours	Every 60 min	Every 4 hours
Lung sounds	Every 4 hours	Every 4 hours	Every 4 hours
Deep consciousness			
Edema	Every 8 hours	Every 8 hours	Every 8 hours
Assessment for headache, visual disturbances, epigastric pain			
Fetal status and uterine activity	Every shift	Continuous	N/A
Temperature	Per facility protocol		
Intake and output	Every 1 hour with totals every 8 and 24 hours		

*This is the minimum frequency recommended for the patient NOT on magnesium sulfate.

Monitoring

Nursing Assessment Frequency

B. Severe Preeclampsia Nursing Assessment Frequency

	Severe Preeclampsia Intrapartum and Postpartum for women on Magnesium Sulfate
BP, Pulse, Respiration, SaO2	<ul style="list-style-type: none"> • Every 5 mins during loading dose and q30 mins during maintenance of magnesium sulfate infusion • Can change to every 60 mins if any one or more of the following criteria are met: <ul style="list-style-type: none"> ○ Preeclampsia without severe features (mild) ○ BP stable without increases for a minimum of 2 hours ○ No antihypertensives within last 6 hours ○ Antepartum patient ○ Latent phase of labor • Continuous SaO2 during magnesium infusion for intrapartum. For postpartum patient, check with vital signs
Lung sounds	Every 2 hours
Deep tendon reflexes & clonus, Level of consciousness Edema Assessment for headache, visual disturbances, epigastric pain	Every 4 hours
Temperature	Per facility protocol
Intake and output	Intake: <ul style="list-style-type: none"> • IV solutions and medication drips should all be on a pump • Total hourly intake should be \leq 125 ml/hr • NPO with ice chips or as permitted by practitioner Output: <ul style="list-style-type: none"> • Insert foley with urometer Calculate hourly, end of shift, and 24-hour totals
Fetal status and uterine activity	Continuous fetal monitoring

Response

- **Facility-wide standard protocols with checklists and escalation policies for management and treatment of:**
 - Severe hypertension
 - Eclampsia, seizure prophylaxis, and magnesium over-dosage
 - Postpartum presentation of severe hypertension/preeclampsia
- **Minimum requirements for protocol:**
 - Notification of physician or primary care provider if systolic BP ≥ 160 or diastolic BP ≥ 110 for two measurements within 15 minutes

ACOG Executive Summary: Hypertension in Pregnancy Patient Education Materials

For all women in the postpartum period (not just women with preeclampsia), it is suggested that discharge instructions include information about the signs and symptoms of preeclampsia as well as the importance of prompt reporting of this information to their health care providers

ACOG Executive Summary: Hypertension in Pregnancy Patient Education Materials

Ask Your Doctor or Midwife

Preeclampsia

What Is It?

Preeclampsia is a serious disease related to high blood pressure. It can happen to any pregnant woman.

Risks to You

- Seizures
- Stroke
- Organ damage
- Death

Risks to Your Baby

- Premature birth
- Death

Signs of Preeclampsia



Stomach pain



Headaches



Feeling nauseous;
throwing up



Seeing spots



Swelling in your
hands and face



Gaining more than
5 pounds in a week

What Should You Do?

Call your doctor right away. Finding preeclampsia early is important for you and your baby.

www.preeclampsia.org/market-place

For more information go to www.preeclampsia.org

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CVD Case Presentation

- 25 year old obese (BMI 38) African-American G2P2 presents 10 days after an uncomplicated vaginal delivery with fatigue and persistent cough since delivery.
- BP 110/80, HR 110, RR 28, afebrile, with O2 sat 94% on room air.
- She gets diagnosed with respiratory infection and is prescribed an antibiotic. Fatigue is attributed to lack of sleep.

A California Toolkit to Transform Maternity Care

Improving Health Care Response to
Cardiovascular Disease in Pregnancy:
A California Quality Improvement Toolkit

THIS COLLABORATIVE PROJECT WAS DEVELOPED BY:
THE CARDIOVASCULAR DISEASE IN PREGNANCY TASK FORCE

CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE
MATERNAL, CHILD AND ADOLESCENT HEALTH DIVISION; CENTER FOR FAMILY HEALTH
CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

CMQCC
California Maternal
Quality Care Collaborative



For More Information
and to
Download the
Toolkit

- Visit
- www.cmqcc.org
- <https://www.cdph.ca.gov>
- Contact:
info@cmqcc.org

Rationale for Toolkit

Cardiovascular Disease is

- the leading cause of maternal mortality in CA and U.S.
 - under-recognized in pregnant or postpartum women
 - higher among African-American women
-
- 25% of deaths attributed to cardiovascular disease may have been prevented if the woman's heart disease had been diagnosed earlier.
 - Pregnancy is a period of frequent interaction with health care providers and offers an opportunity to detect and treat heart disease, improve pregnancy outcomes, and affect future cardiovascular health.

CVD Toolkit Goals

Given that CVD is the leading cause of maternal mortality & morbidity in California, the Toolkit aims to:

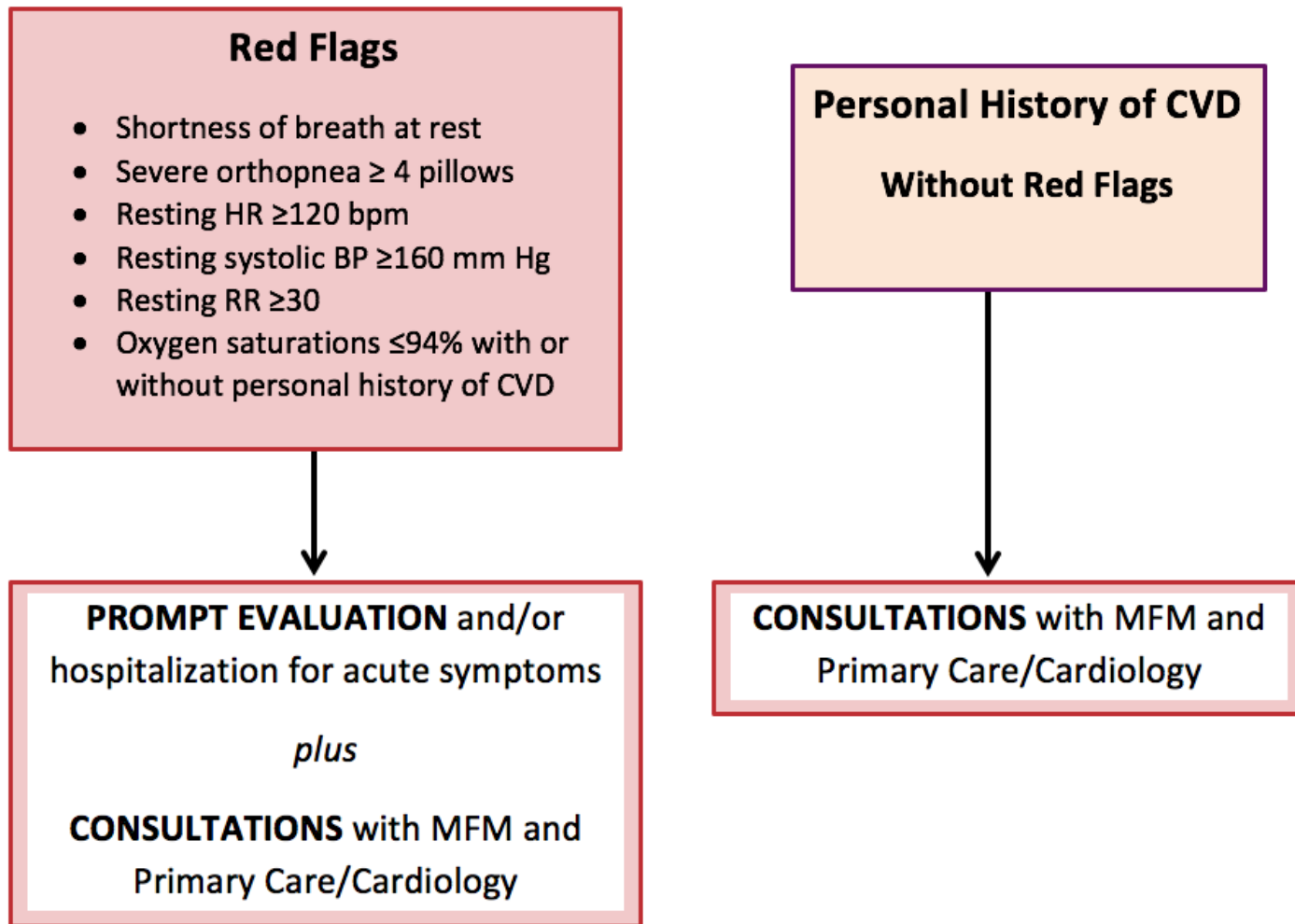
- Encourage obstetric and other healthcare providers to retain a high index of suspicion for CVD, particularly among women with risk factors who present with symptoms in late pregnancy or early postpartum period
- To serve as resource for generalists who provide maternity care to women, with special emphasis on
 - Prenatal visits
 - Postpartum encounters

Rationale for Toolkit

Cardiovascular Disease is

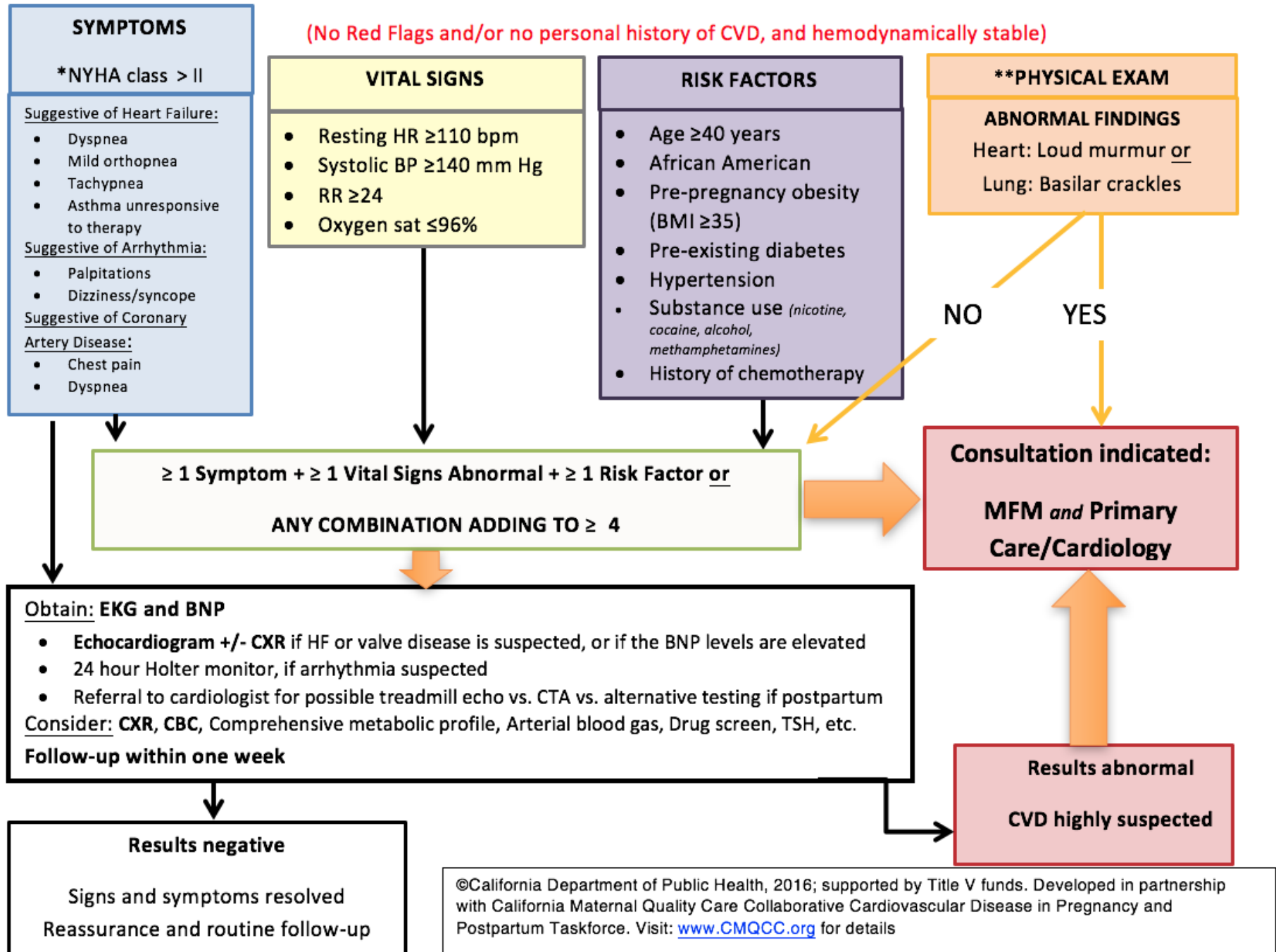
- the leading cause of maternal mortality in CA and U.S.
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 - Pregnancy is a period of frequent interaction with health care providers and offers an opportunity to detect and treat heart disease, improve pregnancy outcomes, and affect future cardiovascular health.

CVD Assessment Algorithm For Pregnant and Postpartum Women



CARDIOVASCULAR DISEASE ASSESSMENT IN PREGNANT and POSTPARTUM WOMEN

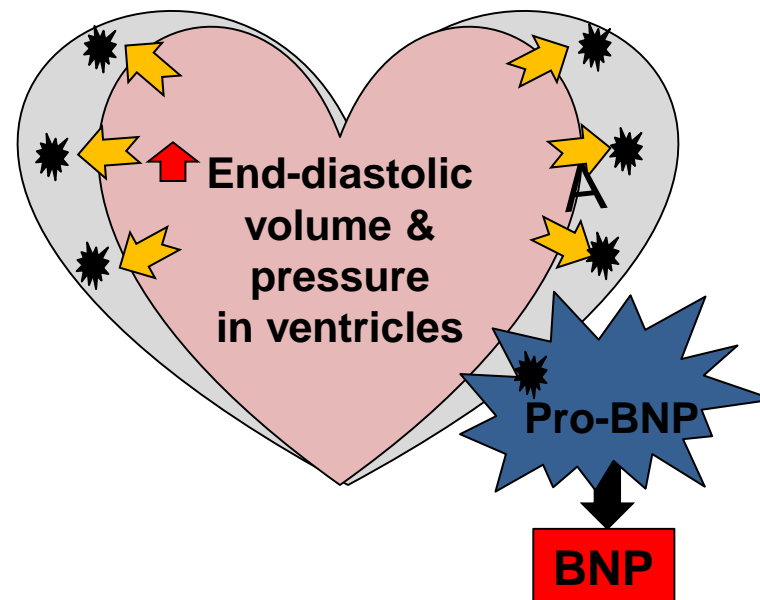
(No Red Flags and/or no personal history of CVD, and hemodynamically stable)



©California Department of Public Health, 2016; supported by Title V funds. Developed in partnership with California Maternal Quality Care Collaborative Cardiovascular Disease in Pregnancy and Postpartum Taskforce. Visit: www.CMQCC.org for details

B Type Natriuretic Peptide (BNP)

Neurohormone secreted by the cardiac ventricles in response to ventricular volume expansion and pressure overload



Relaxes vascular smooth muscle

Inhibits renin-angiotensin-aldosterone system

Increases natriuresis and diuresis

Clinical Uses of BNP in Pregnancy

- Diagnosis of heart failure
 - In pregnant women with dilated CMP, higher BNP predicts adverse cardiovascular outcomes
- Asymptomatic left ventricular function
 - Useful to evaluate shortness of breath
- Predictor of cardiovascular outcome
 - In pregnant women with congenital heart disease, higher BNP levels are associated with poor outcomes

- Blatt A, Svirski R, Morawsky G, et al. Short and long-term outcome of pregnant women with preexisting dilated cardiomyopathy: An NTproBNP and echocardiography-guided study. *The Israel Medical Association journal : IMAJ*. Oct 2010;12(10):613-616.
- Tanous D, Siu SC, Mason J, et al. B-type natriuretic peptide in pregnant women with heart disease. *J Am Coll Cardiol*. Oct 5 2010;56(15):1247-1253.
- Kansal M, Hibbard JU, Briller J. Diastolic function in pregnant patients with cardiac symptoms. *Hypertens Pregnancy*. 2012;31(3):367-374.

Key Clinical Pearls

- First presentation of cardiovascular disease may be during pregnancy or early postpartum.
- The highest risk period for CVD worsening is between 24-28 weeks or postpartum.
- CVD symptoms or vital sign abnormalities should not be ignored in pregnant/postpartum women.
- New onset or persistent asthma may be a sign of heart failure.
- Bilateral infiltrates on chest x-ray may be due to heart failure rather than pneumonia.

Key Clinical Pearls (continued)

- Pregnancy or postpartum women with significant risk factors should be counseled regarding future CVD risk.
- Women with known CVD should receive pre- & inter-conception counseling by an experienced perinatologist and cardiologist.
- Contraception choices should be tailored to the individual.
- Provider and patient education is essential.
- High index of suspicion, early diagnosis, appropriate referrals and follow up are the key elements to a successful outcome.

Postpartum Presentations to the ED, PCP or OB Provider

When a woman presents in the postpartum period with complaints of shortness of breath, ask if she has experienced:

- Worsened level of exercise tolerance
- Difficulty performing activities of daily living; Unexpected fatigue
- Symptoms that are deteriorating, especially chest pain, palpitations, or dizziness
- New onset of cough or wheezing
- Leg edema and if it is improving or deteriorating
- Inability to lay flat; if this is a change; how many pillows she uses to sleep
- Failure to lose weight or unusual weight gain, and how much
- A history of cardiac or pulmonary conditions
- A history of substance abuse and/or cigarette use
- Or has been seen by other providers or in other Emergency Departments since giving birth.

Postpartum Presentations to the ED, PCP or OB Provider

Key Points (1)

- Symptoms related to physiologic changes of pregnancy should be improving in the postpartum period.
- Any visits to Emergency Department for dyspnea should raise suspicion for cardiovascular disease.
- Women of childbearing age should be questioned about recent pregnancies, in addition to their last menstrual period (LMP).
- Postpartum dyspnea or new onset cough is concerning for cardiovascular disease.

Postpartum Presentations to the ED, PCP or OB Provider

Key Points (2)

- New onset asthma is rare in adults.
- Bilateral crackles on lung examination are most likely associated with Congestive Heart Failure (CHF).
- Improvement of dyspnea with bronchodilators does not confirm the diagnosis of asthma, as CHF may also improve with bronchodilators. Likewise, a lack of response to bronchodilators should prompt the entertainment of a diagnosis other than asthma.

Racial Disparities in CVD

Clinical Implications

- **Listen to women.** Take patient complaints seriously, and maintain a high index of suspicion for CVD especially in ALL African-American women.
- Any co-morbidity should further heighten the clinical index of suspicion.
- African-American women with chronic or gestational hypertension, high BMI (>35) who present with symptoms suggestive of CVD or vital signs indicated in the CVD Assessment Algorithm should be evaluated carefully and thoroughly for potential CVD.

Guide to Contraception Information for Women with Cardiovascular Disease

Patients with cardiovascular disease including hypertension, congenital heart defects, arrhythmia and heart failure should be educated about contraceptive choices to improve overall health and prevent unwanted pregnancy.

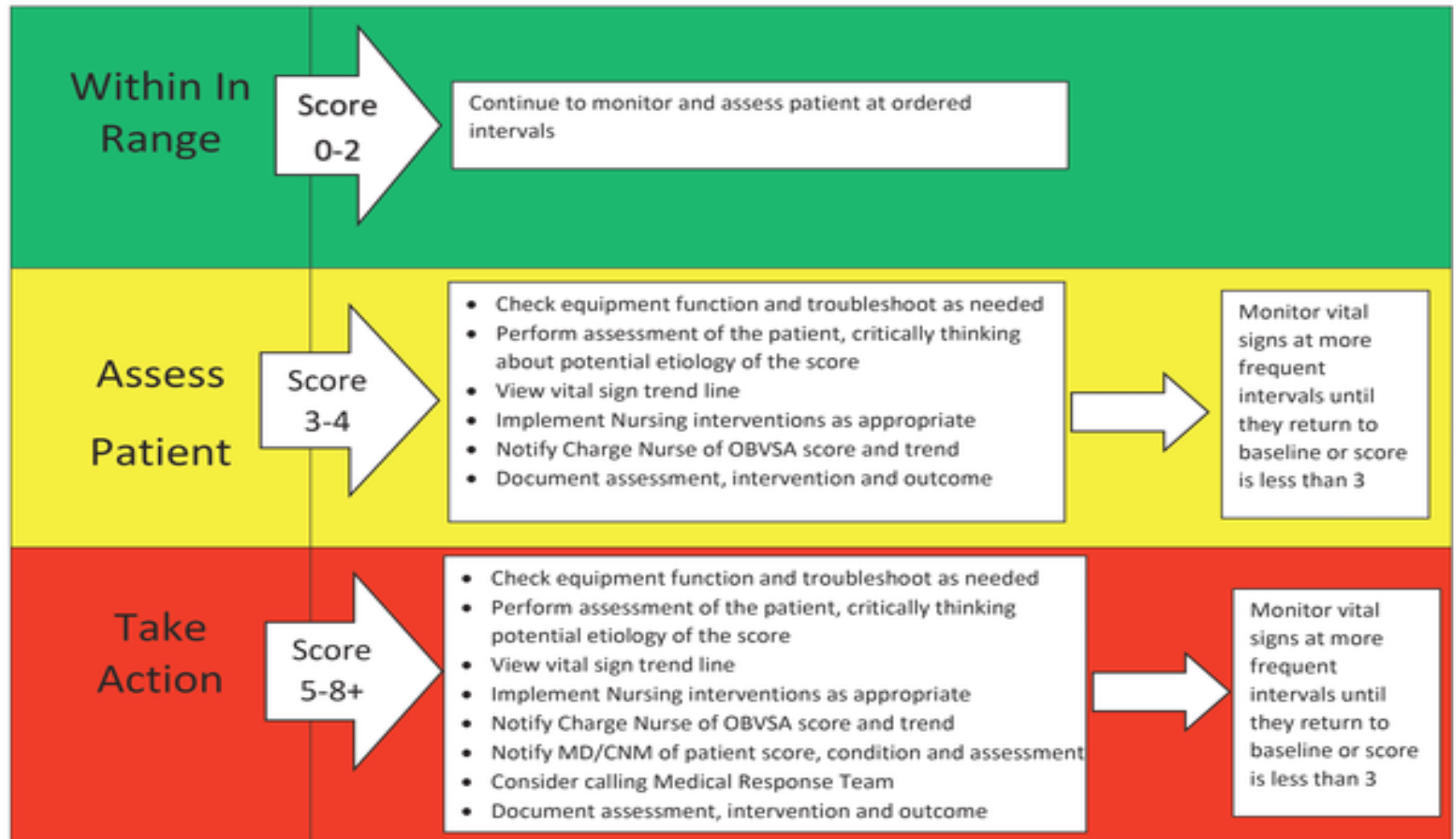
- **Non-hormonal methods** are the preferred contraception in patients with cardiovascular disease, given the minimal risk of thromboembolism with their use.
- **Hormonal methods** containing estrogen products and depot medroxy-progesterone acetate injection should be used with caution in patients who have multiple risk factors or a history of cardiovascular disease.

Lifetime Risks of Heart Disease After Pregnancy Complications

- Pregnancy complications increase heart disease (CVD) risk:
 - Gestational hypertension, preeclampsia and HELLP syndrome
 - Gestational diabetes
 - Preterm birth.
- Women are often unaware of their CVD risk but are enthusiastic to learn more.
- Hypertension and diabetes in pregnancy = wake-up call for women and families.
- Future CVD risk can be reduced by 4-13% with healthy lifestyle changes.

Obstetric Vital Sign Alert Scoring

The OBVSA algorithm prompts nursing action based on a woman's aggregate OBVSA score.



Preeclampsia Early Recognition Tool

ASSESS	NORMAL (GREEN)	WORRISOME (YELLOW)	SEVERE (RED)
Awareness	Alert/oriented	<ul style="list-style-type: none"> •Agitated/confused •Drowsy •Difficulty speaking 	<ul style="list-style-type: none"> •Unresponsive
Headache	None	<ul style="list-style-type: none"> •Mild headache •Nausea, vomiting 	<ul style="list-style-type: none"> •Unrelieved headache
Vision	None	<ul style="list-style-type: none"> •Blurred or impaired 	<ul style="list-style-type: none"> •Temporary blindness
Systolic BP (mm HG)	100-139	140-159	≥160
Diastolic BP (mm HG)	50-89	90-105	≥105
HR	61-110	111-129	≥130
Respiration	11-24	25-30	<10 or >30
SOB	Absent	Present	Present
O2 Sat (%)	≥95	91-94	≤90
Pain: Abdomen or Chest	None	<ul style="list-style-type: none"> •Nausea, vomiting •Chest pain •Abdominal pain 	<ul style="list-style-type: none"> •Nausea, vomiting •Chest pain •Abdominal pain
Fetal Signs	<ul style="list-style-type: none"> •Category I •Reactive NST 	<ul style="list-style-type: none"> •Category II •IUGR •Non-reactive NST 	<ul style="list-style-type: none"> •Category III
Urine Output (ml/hr)	≥50	30-49	≤30 (in 2 hrs)
Proteinuria <small>(Level of proteinuria is not an accurate predictor of pregnancy outcome)</small>	Trace	<ul style="list-style-type: none"> •≥ +1** •≥300mg/24 hours 	
Platelets	>100	50-100	<50
AST/ALT	<70	>70	>70
Creatinine	<0.8	0.9-1.1	>1.2
Magnesium Sulfate Toxicity	<ul style="list-style-type: none"> •DTR +1 •Respiration 16-20 	<ul style="list-style-type: none"> •Depression of patellar reflexes 	<ul style="list-style-type: none"> •Respiration <12



COUNCIL ON PATIENT SAFETY IN WOMEN'S HEALTH CARE

safe health care for every woman

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PULSE
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AND INFERTILITY



AWHONN
PROMOTING THE HEALTH OF
WOMEN AND NEWBORNS



Organizations United to Provide Safe Health Care for Every Woman

Missed something?

All of our informative [Safety Action Series sessions are available for audio playback](#).

[Click here for a comprehensive listing of these sessions](#). All sessions and recordings are provided free of charge.

Want to make a change but don't know where to start?



ALLIANCE FOR INNOVATION
ON MATERNAL HEALTH

[Contact Us](#) to learn more about the [AIM Program](#) and how to become a partner.

National Improvement Challenge

Learn more about this innovative new program designed specifically to drive quality improvement at the educational and residency program level. Awards are available for winning programs!

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Readiness

- Standards for early warning signs, diagnostic criteria, monitoring and treatment of severe preeclampsia/eclampsia (include order sets and algorithms)
- Unit education on protocols, unit-based drills (with post-drill debriefs)
- Process for timely triage and evaluation of pregnant and postpartum women with hypertension including ED and outpatient areas
- Rapid access to medications used for severe hypertension/eclampsia: Medications should be stocked and immediately available on L&D and in other areas where patients may be treated. Include brief guide for administration and dosage.
- System plan for escalation, obtaining appropriate consultation, and maternal transport, as needed



Recognition and Prevention

- Standard protocol for measurement and assessment of BP and urine protein for all pregnant and postpartum women
- Standard response to maternal early warning signs including listening to and investigating patient symptoms and assessment of labs (e.g. CBC with platelets, AST and ALT)
- Facility-wide standards for educating prenatal and postpartum women on signs and symptoms of hypertension and preeclampsia



Call for Help Early

Gee...she looks pretty good to me...

I wonder why we were called?

- Detect abnormal VS and clinical changes
- Alert the Team
- Mobilize a response
- Optimal patient outcome



Escalation

- An abnormal parameter requires:
 - Prompt reporting to a physician or other qualified clinician
 - Prompt bedside evaluation by a physician or other qualified clinical provider **with the ability to activate resources** in order to **initiate** emergency diagnostic and therapeutic interventions as needed



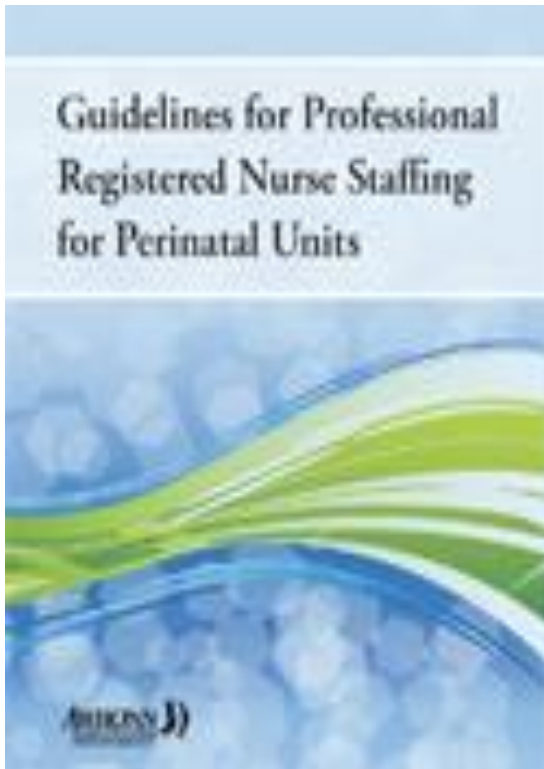
Simulated Multidisciplinary Drills

Conduct team training in perinatal areas to teach staff to work together and communicate more effectively.



Immediate Postpartum Recovery

1 to 1 Nursing

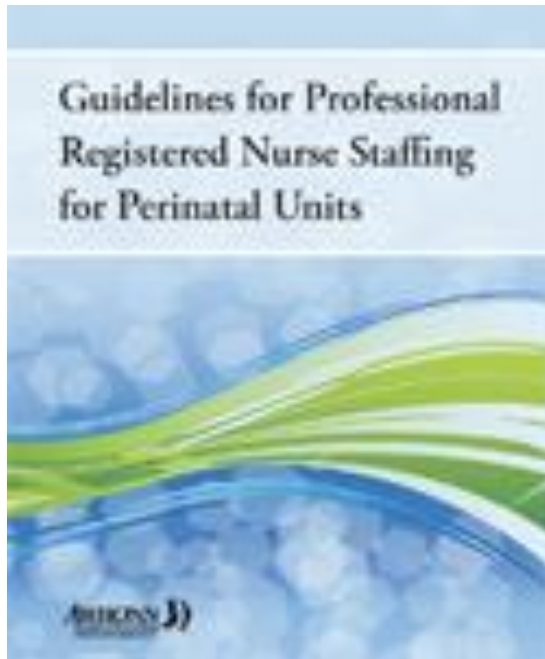


During the immediate recovery period after vaginal birth there should be:

**1 nurse for the mother and
1 nurse for the baby**

- **Stable**
- Once the **Critical Elements** are met
 - 1 RN for mother and baby
- 2 hours minimum

Nurse Staffing: Postpartum



- Healthy mother and baby should remain together
- Ideally mother and baby are cared for in a single family room
- No more than 2 women on the immediate day of C/S as part of 1 nurse to 3 mother-baby couplets

– • Ratios of mother – baby care were based on 16.3% C/S rate from 1983.
Delercq et al., 2006. Listening to Mothers II Survey

Learning from Review

2015 TJC issues new statement

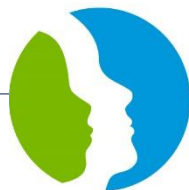
- Definition of sentinel event reporting
 - A patient safety event (not related to the natural course of the patient's illness or underlying condition) that reaches a patient and results in any of the following:
 - Death
 - Permanent harm
 - Severe temporary harm
 - For OB:
 - 4 or more units of blood
 - Admission to ICU

Learning from Review

Severe Maternal Morbidity

Adverse Outcome Review

- Why do it?
 - Finger point, blame, punish
 - Learn, improve future outcomes
- ACOG, AWHONN, SMFA –
- Recommend all severe morbidity whether sentinel or not:
 - Undergo review process:
 - thorough, credible, multidisciplinary, comprehensive



AWHONN
PROMOTING THE HEALTH OF
WOMEN AND NEWBORNS

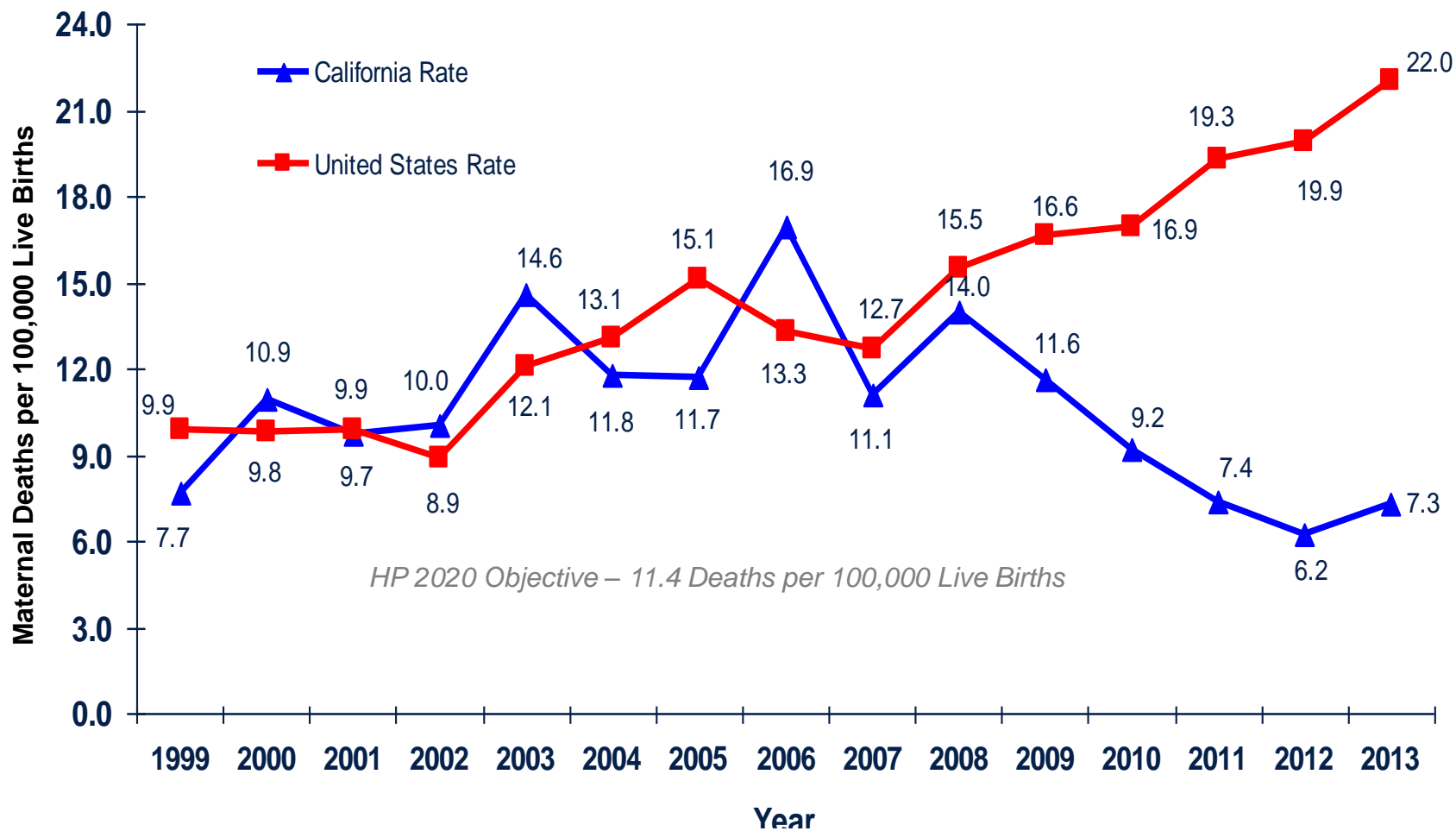


Society for
Maternal • Fetal
Medicine



UCSF Benioff Children's Hospitals

Maternal Mortality Rate, California and United States; 1999-2013



SOURCE: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1999-2013. Maternal mortality for California (deaths \leq 42 days postpartum) was calculated using ICD-10 cause of death classification (codes A34, O00-O95, O98-O99). United States data and HP2020 Objective use the same codes. U.S. maternal mortality data is published by the National Center for Health Statistics (NCHS) through 2007 only. U.S. maternal mortality rates from 2008 through 2013 were calculated using CDC Wonder Online Database, accessed at <http://wonder.cdc.gov/on> March 11, 2015. Produced by California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division, March, 2015.

ACOG Executive Summary on Hypertension In Pregnancy, Nov 2013

1. The term “mild” preeclampsia is discouraged for clinical classification. The recommended terminology is:
 - a. “preeclampsia without severe features” (mild)
 - b. “preeclampsia with severe features” (severe)
2. Proteinuria **is not** a requirement to diagnose preeclampsia with **new onset** hypertension.
3. The **total** amount of proteinuria > 5g in 24 hours has been eliminated from the diagnosis of severe preeclampsia.
4. **Early** treatment of **severe** hypertension is mandatory at the threshold levels of **160 mm Hg** systolic or **110 mm Hg** diastolic.
5. Magnesium sulfate for seizure prophylaxis is **indicated** for **severe** preeclampsia and **should not** be administered universally for preeclampsia without severe features (mild).

ACOG Executive Summary on Hypertension In Pregnancy, Nov 2013

6. Preeclampsia with onset **prior to 34 weeks** is most often **severe** and should be managed at a facility with appropriate resources for management of serious maternal **and** neonatal complications.
7. Induction of labor **at 37 weeks** is indicated for preeclampsia **and** gestational hypertension.
8. The **postpartum period** is potentially dangerous. Patient education for early detection **during** and **after** pregnancy is important.
9. Long-term health effects should be discussed.



FROM BIRTH TO THE COMPREHENSIVE POSTPARTUM VISIT

READINESS

Every woman

- Engages with her provider during prenatal care to develop a comprehensive personalized postpartum care plan that includes designation of a postpartum medical home, where the woman can access care and support during the period between birth and the comprehensive postpartum visit.
- Receives woman-centered counseling and anticipatory guidance regarding medical recommendations for breastfeeding in order to make an informed feeding decision.
- Receives woman-centered counseling regarding medical recommendations for birth spacing and the range of available contraceptive options.
- Identifies a postpartum care team, inclusive of friends and family, to provide medical, material, and social support in the weeks following birth.

Every provider

- Ensures that each woman has a documented postpartum care plan and care team identified in the prenatal period.
- Develops and maintains a working knowledge of evidence-based evaluation and management strategies of common issues facing the mother-infant dyad.

Every clinical setting

- Develops and optimizes models of woman-centered postpartum care and education, utilizing adult-learning principles when possible and embracing the diversity of family structures, cultural traditions, and parenting practices.
- Develops systems to connect families with community resources for medical follow up and social and material support.
- Optimizes counseling models, clinical protocols, and reimbursement options to enable timely access to desired contraception.
- Develops systems to ensure timely, relevant communication between inpatient and outpatient providers.
- Develops protocols for screening and treatment for postpartum concerns, including depression and substance abuse disorders, and establishes relationships with local specialists for co-management or referral.

PATIENT SAFETY BUNDLE

Postpartum Care Basics for Maternal Safety





PATIENT SAFETY BUNDLE

MATERNAL MENTAL HEALTH: PERINATAL DEPRESSION AND ANXIETY

READINESS

Every Clinical Care Setting

- Identify mental health screening tools to be made available in every clinical setting (outpatient OB clinics and inpatient facilities).
- Establish a response protocol and identify screening tools for use based on local resources.
- Educate clinicians and office staff on use of the identified screening tools and response protocol.
- Identify an individual who is responsible for driving adoption of the identified screening tools and response protocol.

RECOGNITION & PREVENTION

Every Woman

- Obtain individual and family mental health history (including past and current medications) at intake, with review and update as needed.
- Conduct validated mental health screening during appropriately timed patient encounters, to include both during pregnancy and in the postpartum period.
- Provide appropriately timed perinatal depression and anxiety awareness education to women and family members or other support persons.

Maternal Mental Health





PATIENT SAFETY BUNDLE

Maternal Mental Health

RESPONSE

Every Case

- Initiate a stage-based response protocol for a positive mental health screen.
- Activate an emergency referral protocol for women with suicidal/homicidal ideation or psychosis.
- Provide appropriate and timely support for women, as well as family members and staff, as needed.
- Obtain follow-up from mental health providers on women referred for treatment. This should include the necessary release of information forms.

REPORTING/SYSTEMS LEARNING

Every Clinical Care Setting

- Establish a non-judgmental culture of safety through multidisciplinary mental health rounds.
- Perform a multidisciplinary review of adverse mental health outcomes.
- Establish local standards for recognition and response in order to measure compliance, understand individual performance, and track outcomes.

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Standardization of health care processes and reduced variation has been shown to improve outcomes and quality of care. The Council on Patient Safety in Women's Health Care disseminates patient safety bundles to help facilitate the standardization process. This bundle reflects emerging clinical, scientific, and patient safety advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed. Although the components of a particular bundle may be adapted to local resources, standardization within an institution is strongly encouraged.

The Council on Patient Safety in Women's Health Care is a broad consortium of organizations across the spectrum of women's health for the promotion of safe health care for every woman.



Summary

- There are various ways direct care nurses can get involved and improve care for pregnant women and newborns
- Nurses and are the front line providers of patient care and have an essential role in quality improvement
- Utilizing a patient safety bundle can be an effective way to improve care and patient outcomes
- Standardization is encouraged however it's up to YOU and your colleagues to meet the needs and goals of your organization

*Nurses are a valuable
source of information
and support for women
and their families*



UCSF Benioff Children's Hospitals

Thank You!

valerie.huwe@ucsf.edu