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## Cardiovascular Disease in Pregnancy and Postpartum

Comprehensive Perinatal Services Program  
State Meeting  
November 4-5, 2015




Julie Vasher, DNP, RNC-OB, CNS, CEFM  
Clinical Implementation Lead  
California Maternal Quality Care Collaborative  
Stanford University

### Disclosure

I have no financial or personal conflicts to disclose.



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### Objectives

- Discuss the California Maternal Quality Care Collaborative mission
- Discuss relationship between pregnancy complications and future cardiovascular disease
- Discuss potential relationships between preeclampsia and preterm birth
- Identify potential ways to decrease future risk of cardiovascular disease associated with hypertension in pregnancy

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### NOT My objective...



*Paulin.*

"WE'RE OUT OF SLEEPING PILLS. I'M GOING TO READ YOU A BEPTIME STORY."

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### CMQCC



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**MDC**  
The Maternal Data Center (MDC) is an online tool that generates rapid-cycle performance metrics on maternity care services for hospital participants. The real-time tool supports quality improvement activities and service management for both clinicians and administrators.

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### Who is CMQCC?

- Our mission is to end preventable morbidity, mortality and racial disparities in California maternity care.

### What does CMQCC do?

- Our work is to discover, improve, implement and validate the work that we and others do in the state of California to improve maternity care.

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### What have we done

Collage of various CMOCC project reports and toolkits, including:

- Improving Health Care Response to Postpartum Hemorrhage: A California Quality Improvement Toolkit
- Improving Health Care Response to Diabetes Technology System II: A California Quality Improvement Toolkit
- Improving Health Care Response to Gestational Diabetes: A California Quality Improvement Toolkit
- Improving Health Care Response to Chorioamnionitis: A California Quality Improvement Toolkit
- Elimination of Non-medically Indicated (Elective) Deliveries Before 39 Weeks Gestational Age

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### The California Partnership for Maternal Safety

40 Active Mentor Leaders

20 Teams of 6-8 hospitals

123 Participating Hospitals

13,750 Healthcare Providers

Impacting 274,000 Births

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### The California Partnership for Maternal Safety

### Next...

#### Supporting Vaginal Birth Toolkit

- Reducing first birth Cesarean Section
- Multi-phase project
- Targeted hospitals
- Statewide
- Community and patient engagement

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### California Pregnancy Associated Mortality Review

- The **California Pregnancy-Associated Mortality Review (CA-PAMR)** was started in 2006 by the California Department of Public Health in response to rising rates of maternal mortality with the goal of understanding and reducing maternal morbidity and mortality.

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### How do we know what we know?

The Ca-PAMR collected information from and provided analysis of maternal deaths that occurred in California from 2002-2006

**THE CALIFORNIA PREGNANCY-ASSOCIATED MORTALITY REVIEW**  
 Report from 2002 and 2003 Maternal Death Reviews  
 This project was supported by Federal Title V block grant funds received from the California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division  
 April 2011

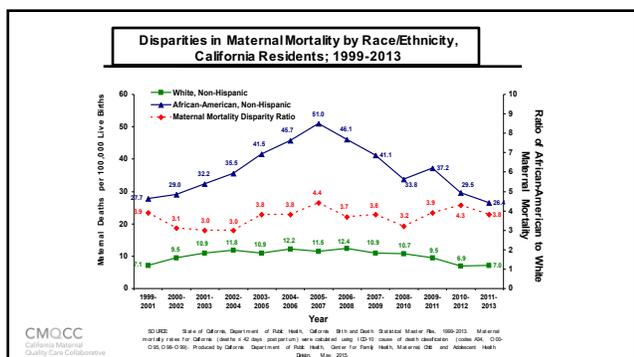
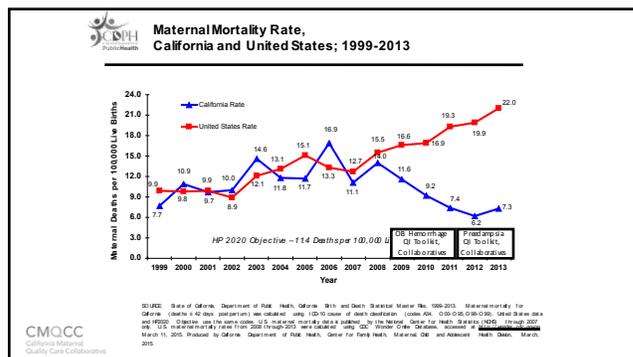
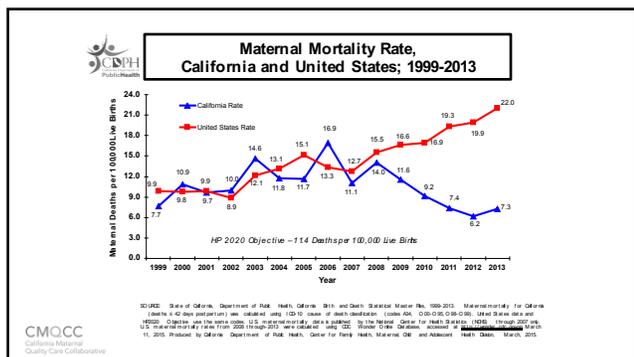
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### What is included in the maternal mortality review?

Criteria:

- Woman who gave birth in California
- Woman who died while pregnant or within one year postpartum from ANY cause
  - Statistical maternal mortality is pregnancy through 42 days following birth
- Death from causes related to the physiological changes in pregnancy, is the initiating or critical pathological event leading to death

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### Cardiovascular disease and pregnancy

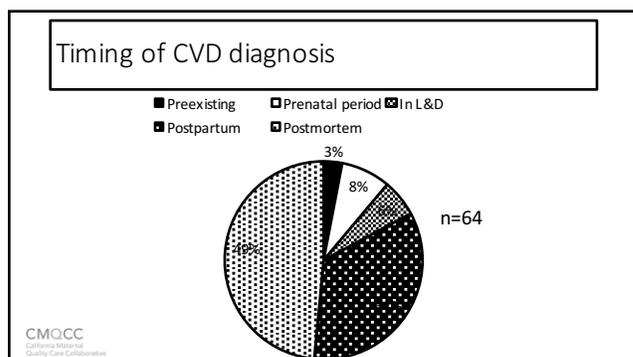
- CVD is the leading cause of pregnancy associated maternal mortality (Nicksens, Long & Gencic, 2013)

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Grouped cause of death – per CA-PAMR	Pregnancy related deaths N (%)
Cardiovascular disease	64 (25%)
Cardiomyopathy	42 (16%)
Other cardiovascular	22 (9%)
Preeclampsia/Eclampsia	45 (18%)
Obstetric Hemorrhage	25 (10%)
Sepsis	23 (9%)
Venous Thromboembolism	22 (9%)
TOTAL	257

CVD Pregnancy Related Mortality Rate: 2.4 deaths per 100,000 live births

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In the CA-PAMR review, **24%** of ALL CVD pregnancy-related deaths (and **31%** of cardiomyopathy deaths) were determined to be **POTENTIALLY PREVENTABLE**

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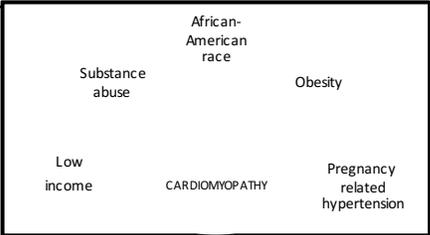
### Timing of CVD death

- Among all CVD pregnancy related deaths 1.6% (1) occurred prior to birth
- 70.3% occurred in the postpartum period



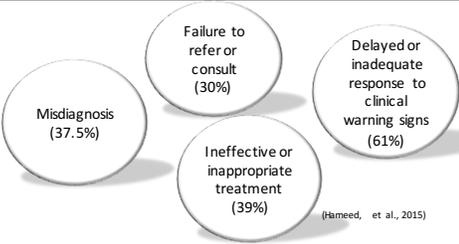
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### Risk factors



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### Contributing Factors: Health Care Provider Related



(Hameed, et al., 2015)

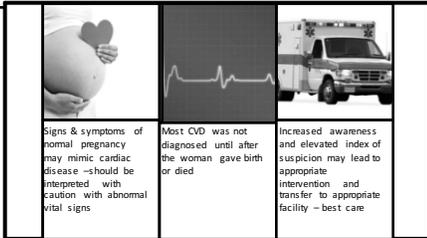
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### Contributing factors: Patient related

- Presence of underlying medical conditions (64%)
- Obesity (31%)
- Delays in seeking care (31%)
- Lack of recognition of CVD symptoms (22%)

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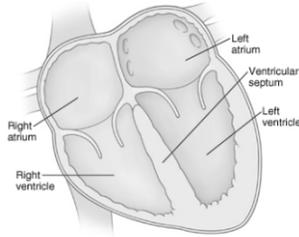
### CA-PAMR conclusions...



Signs & symptoms of normal pregnancy may mimic cardiac disease – should be interpreted with caution with abnormal vital signs	Most CVD was not diagnosed until after the woman gave birth or died	Increased awareness and elevated index of suspicion may lead to appropriate intervention and transfer to appropriate facility – best care
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You got to have heart...

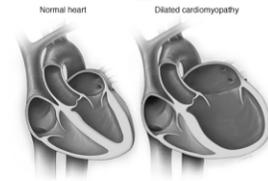


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Dilated cardiomyopathy

- Enlarged heart
- Increased chamber dimensions
- No identifiable structural heart disease

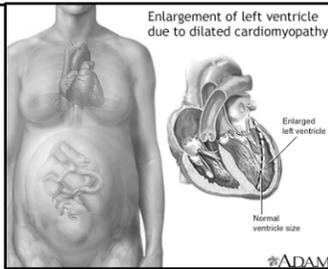
- More pronounced in:
- African American race
  - Obesity
  - Substance abuse



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Peripartum cardiomyopathy



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ADAM

Peripartum cardiomyopathy

- Presents in the final month of pregnancy up to the fifth month of the postpartum period
- Incidence in the US between 1/3000-4000 live births
- More than half of these women recovery completely within six months
  - 30%-50% increased risk of recurrence in subsequent pregnancies

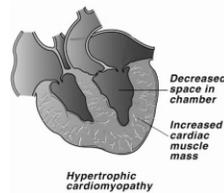
(Nickens, Long, & Geraci, 2013)



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Hypertrophic heart disease

- Increased heart weight
- Normal chamber dimensions
- Thickened heart walls
- Can occur from hypertension, drug use, valve disease or other unknown etiology

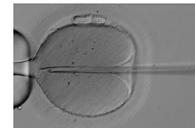


Hypertrophic cardiomyopathy

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Cardiac ischemia (blood flow deprivation)

- 30 fold higher risk for women over 40
- Increased incidence in women who had in-vitro fertilization to obtain pregnancy in later years
- Increased incidence of diabetes and hypertension, smoking (Nickens et al., 2013)



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### So much success – sometimes leads to different complications

- Improved survival of children born with congenital heart disease has increased the incidence of adults and child bearing women with congenital heart disease (NOMLS, 2012)
- Congenital heart disease comprises 50% of cardiac disease in pregnancy



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### Why the change in pregnancy?

- Early in pregnancy (first 24 weeks)
  - Blood volume increases
  - Blood vessel resistance decreases
  - Easy flowing
  - Heart changes in size a bit to help pump the additional blood volume
  - Early in pregnancy, this is accomplished by an increase in stroke volume



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### More changes...

- Later in pregnancy – after 24 weeks
  - Heart rate increases to meet the demands of the growing fetus
- Labor and delivery
  - An increased demand on the cardiac system
  - Up to 500 ml of blood is delivered in each heart beat to the placenta



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### Pregnancy protection

- Blood clotting
  - Help the mother not bleed to death at delivery
- May pose a higher risk (6-12x) of a blood clot or pulmonary embolus to those with cardiac dysfunction



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### Cardiovascular Disease in Pregnancy Toolkit Pending State Approval

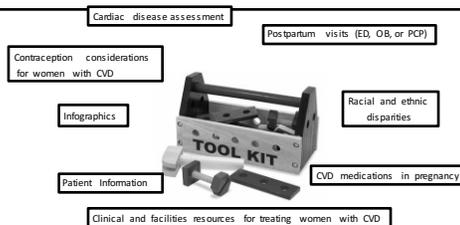
A California Toolkit to Transform Maternity Care  
Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum  
A California Quality Improvement Toolkit

THIS COLLABORATIVE PROJECT WAS DEVELOPED BY:  
THE CARDIOVASCULAR DISEASE IN PREGNANCY AND POSTPARTUM TASK FORCE  
CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE  
MATERNAL, CHILD AND ADOLESCENT HEALTH DIVISION, CENTER FOR FAMILY HEALTH  
CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

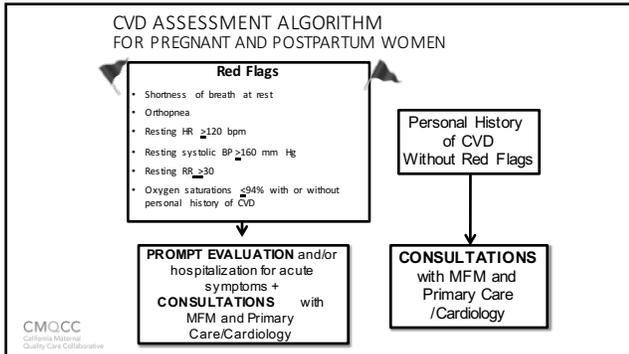
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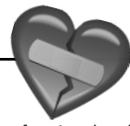
### CVD in pregnancy toolkit



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## Heart Failure



- Complex clinical syndrome from structural or functional cardiac disorder
- Dyspnea
- Fatigue
- Signs – related to fluid retention



## Signs and Symptoms

**Symptoms**

- Shortness of breath
- Fatigue

**Signs**

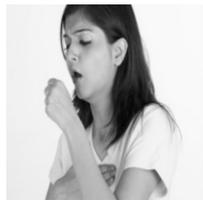
- HR  $> 120$  bpm
- Adventitious lung sounds
  - Crackles
  - Wheezes
- Edema
- Oxygen saturation  $\leq 94\%$
- JVD





## Symptoms that patients should report:

- Shortness of breath
- Swelling
- Chest pain
- Fatigue
- Dizziness
- Wheezing
- Palpitations





## Signs to be reported by the healthcare team

- Heart rate  $> 120$
- High blood pressure  $\geq 140$  or  $\geq 90$
- Low oxygen saturation  $< 90\%$
- Abnormal lung sounds
  - crackles





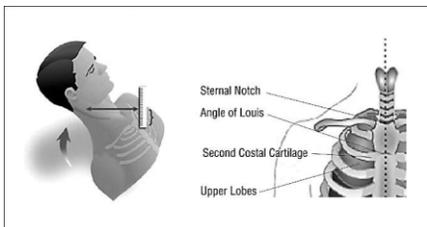
## Assessment pearls

- HR  $> 120$  bpm
- BP  $> 160$  mm Hg
- RR  $> 30$
- O2 saturation  $\leq 94\%$
- Lung – crackles, wheezes
- Cardiac – loud murmur, JVD
- Extremities – edema (edema should be resolving postpartum)





### JVD – Jugular Venous Distention



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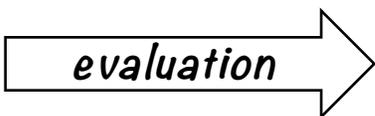
### Pregnancy focused self assessment - PPCM

Symptoms	Scale	Score
Orthopnea	None	0 points
	Need to elevate head	1 point
Dyspnea	Need to elevate at 5 degrees	2 points
	None	0 points
Unexplained cough	Climbing 8 or more steps	1 point
	Walking on level	2 points
Swelling (pitting edema) lower extremities	None	0 points
	At night	1 point
Excessive weight gain during last month of pg	Day and night	2 points
	None	0 points
Palpitations	Below knee	1 point
	Above and below knee	2 points
	Under 2 lbs/week	0 points
	2-4 lbs/week	1 point
	> 4 lbs/week	2 points
	None	0 points
	When lying down at night	1 point
	Day and night, any position	2 points

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### Pregnancy focused self assessment - PPCM

- Any pregnant woman with a score of 4 or greater indicates a need for further evaluation



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### How many women have these?

- Diabetes
- Hypertension
- Obesity
- Hyperlipidemia
- Metabolic syndrome



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### Case Study

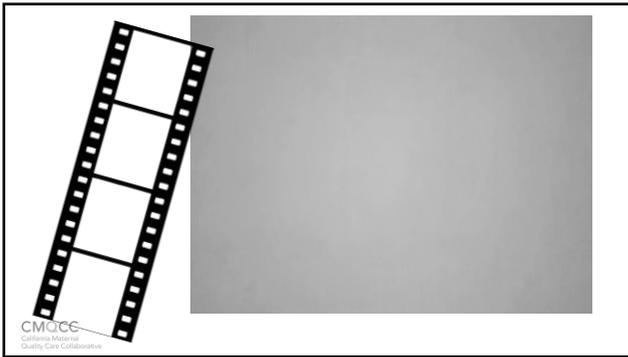


### Case Study

- 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.

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### What is eclampsia?

### Hypertension-Preeclampsia

- Preeclampsia occurs in approximately 4-8% of all pregnancies in the U.S.
- Preeclampsia was thought to be self-limiting
- One of the earliest clinically identifiable markers or a woman's heightened risk of cardiovascular disease

### Preeclampsia

- 2-4 x risk increase for cardiovascular disease
- Similar to smoking (Chen, Jaffe, & Karumanchi, 2014)

### Preeclampsia

- Not just for pregnancy anymore
- Blood pressure typically drops within 48 hours
- May increase again 3-4 days postpartum
- Late pp preeclampsia occurs 48 hours to six weeks postpartum (Sibai, 2011)
- PP preeclampsia has higher incidence of eclampsia (Bigelow, Pereira, & Wamsley, 2013)
- Any hypertension higher incidence of PPCM

### IUGR

- Intrauterine growth restriction
- Positive relationship with development of cardiovascular disease for baby
  - Genetics
  - Maternal environment
  - OTHER IMPACT ON OFFSPRING

### ACOG Recommendations

- ACOG HTN task force recommendation
  - For women with medical history of preeclampsia who gave birth preterm or recurrent preeclampsia
    - Yearly assessment of BP, lipids, fasting blood glucose and BMI is suggested



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### Born too soon?



### Preterm and Preeclampsia

- Preeclampsia is the most common complication of pregnancy
- Preeclampsia is an antecedent in 20%-30% of preterm births



### Preterm birth implications of preeclampsia

- Offspring of preterm preeclampsia moms have an increased risk of development of high blood pressure and double the risk of stroke later in life (Lewandowski, 2014)
- More than prematurity – may have much to do with the abnormal development of the placenta – as in preeclampsia and how it affects fetal development (Ananth, 2006)



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### Hope?

- Early administration of aspirin for preeclampsia made a difference by reducing the risk in preterm preeclampsia but not term preeclampsia (Roberge, 2012)
  - May alleviate early preterm delivery
- ACOG committee opinion
  - Women with history of early onset preeclampsia or history of more than one pregnancy complicated by preeclampsia – start low dose aspirin 60-80 mg in first trimester



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### Diabetes – Gestational or otherwise

- Correlation between preeclampsia and diabetes post birth identified
- Diabetes associated with two fold risk for the development of diabetes 16 years after pregnancy
- Diabetes of any kind associated with increased risk of CVD
  - Important counseling factor for health care providers (Kessous et al., 2013)



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### What can you do?

- Evidence based patient education provided by nurses, or other healthcare providers, improves clinical outcomes as well as an improvement in patient adherence to recommended self-care routines



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### Follow up post birth with preeclampsia

**If blood pressure medication was used during admission – labor or postpartum**

- 3-7 days
- BP monitored for 72 hours\*
- BP monitored again 7-10 days post birth
- See healthcare provider if other symptoms occur

**If NO blood pressure medication was used during admission – labor or postpartum**

- 7-14 days
- BP monitored for 72 hours\*
- BP monitored again 7-10 days post birth
- See healthcare provider if other symptoms occur

\* In hospital or outpatient equivalent

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### More what can you do...

- Keep in mind increased risk factors for these women
- Treat new onset symptoms with caution
- Auscultate heart sounds and lung sounds



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### PP presentation to ED or provider

- All emergency departments should have an initial screening question of:

**Are you pregnant?  
Or have you recently given birth?**

- Within the past six weeks**
- Within the past six months?**

- Maintain a high suspicion index for new moms with new onset shortness of breath

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### Timing of education

Pregnancy and the postpartum period are identified as key periods when women are receptive to recommendations for lifestyle changes



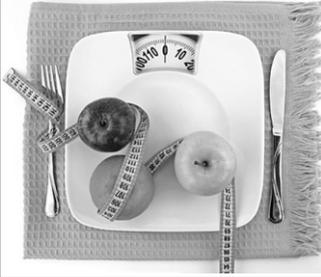
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### Do you know what to share?

- Weight management
- Healthy diet and regular exercise
- Breastfeeding

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### Weight management



- Weight loss decreased the incidence of preeclampsia in future pregnancies from 20.8% to 12% (Berks, Hedges, Raat, Davekot, Steegers, Hobbema, 2012)
- Inter-pregnancy weight gain comes with a two-fold risk of development of preeclampsia (Roberts & Hubel, 2010)

### Diet and Exercise



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### Breastfeeding

- Breastfeeding 6-12 months decreased the incidence of hypertension, diabetes, hyperlipidemia, and cardiovascular disease by up to 10% (Schwarz et al., 2009)



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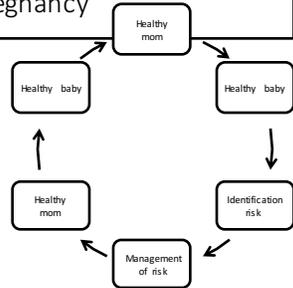
### Key ideas to share

- Hypertension in pregnancy can serve as a wake up call or warning
- Healthy lifestyle changes may reduce the risk of future cardiovascular disease
- Healthy lifestyle may reduce the risk of hypertension or preeclampsia in future pregnancies
- All family members will benefit from healthy lifestyle changes



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### Cycle of a healthy pregnancy



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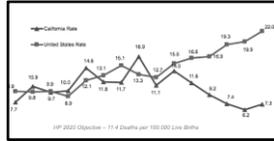
### We all play a part



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Collaborate

Collaborative effort  
=  
collective impact



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Questions and Contact info:

Julie Vasher  
[ivasher@stanford.edu](mailto:ivasher@stanford.edu)



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