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GEORGIA PERINATAL QUALITY COLLABORATIVE

Guardians of Maternal Health: Navigating the Future of Cardiac Screening in Pregnancy and Beyond

TERESA BYRD, MD, MSCI

Wellstar Kennestone
OBGyn Residency Program
Director

BRIDGETTE SCHULMAN, PHD, MSNED, RNC-OB, C-EFM, CPPS

NGMC
Women/Children's Services
Clinical Practice Specialist

ASHLEY AISABOR, MD

Wellstar Kennestone
Resident

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.

CDPH California Department of PublicHealth

CMQCC California Maternal Quality Care Collaborative

CVD Case Presentation (*Continued*)

Dr. Shalon Irving 1981-2017

- One week later, she presents again with continued symptoms. Antibiotics are switched and beta-agonists are added for presumptive “new-onset asthma.”
- Two days later, the patient experiences cardiac arrest at home and resuscitation attempts are unsuccessful.
- Autopsy findings were indicative of cardiomyopathy.

CDPH California Department of PublicHealth

CMQCC California Maternal Quality Care Collaborative

Objectives

Discuss the leading causes of maternal death and the time in which postpartum mothers have pregnancy related risk

Describe the Signs and Symptoms of Cardiovascular Disease (CVD) during pregnancy and postpartum

Understand the importance of implementing the CVD Risk assessments and the steps included in screening for CVD Risk

Definitions Associated with Maternal Mortality

- **Pregnancy associated maternal death:** Death during pregnancy or within one year of the end of pregnancy from a cause unrelated to pregnancy
- **Pregnancy related maternal death:** Death during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy
- **Maternal mortality ratio:** Number of pregnancy related deaths per 100,000 live births over a one-year period
- **Preventability:** A death in which there was at least some chance of the death being averted by one or reasonable change to patient, community, provider, family and/or system factors (CDC)

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What is the most recent maternal mortality rate? (as of 2021) per 100,000 live births

Time left: 5

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Votes: 0

What is the most recent maternal mortality rate? (as of 2021) per 100,000 live births

Time left: 5

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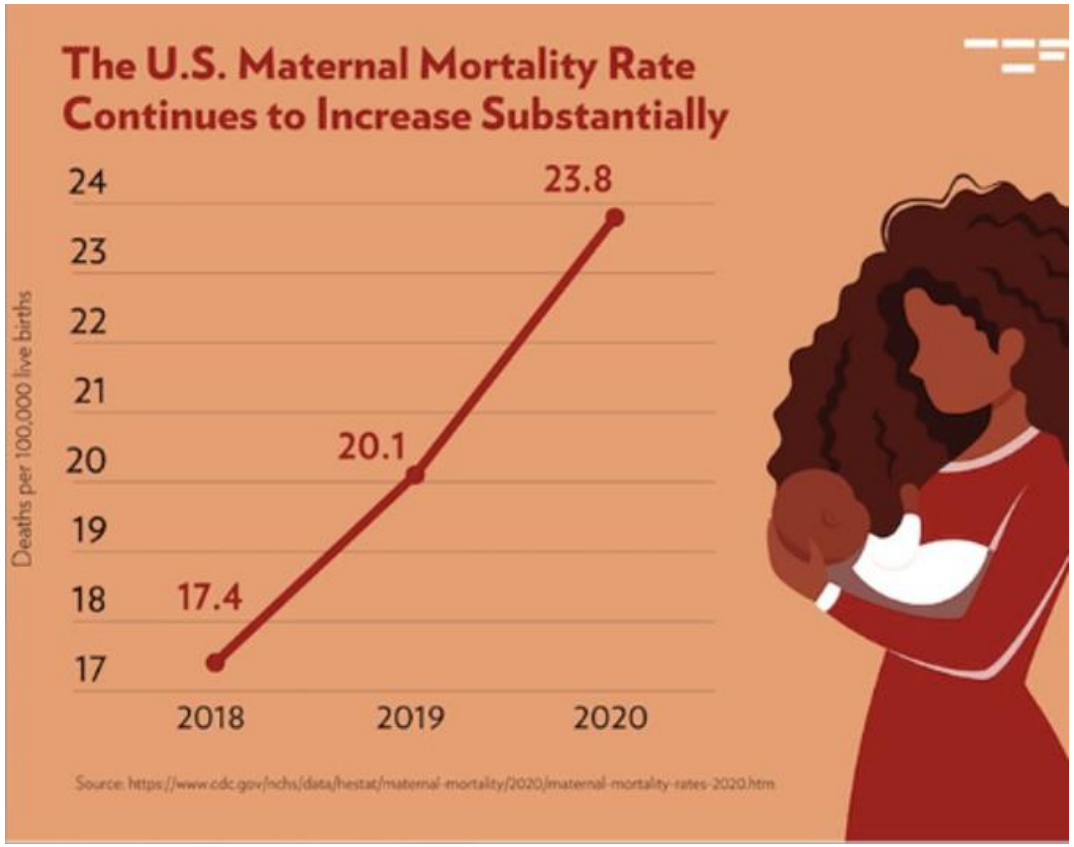
Votes: 0

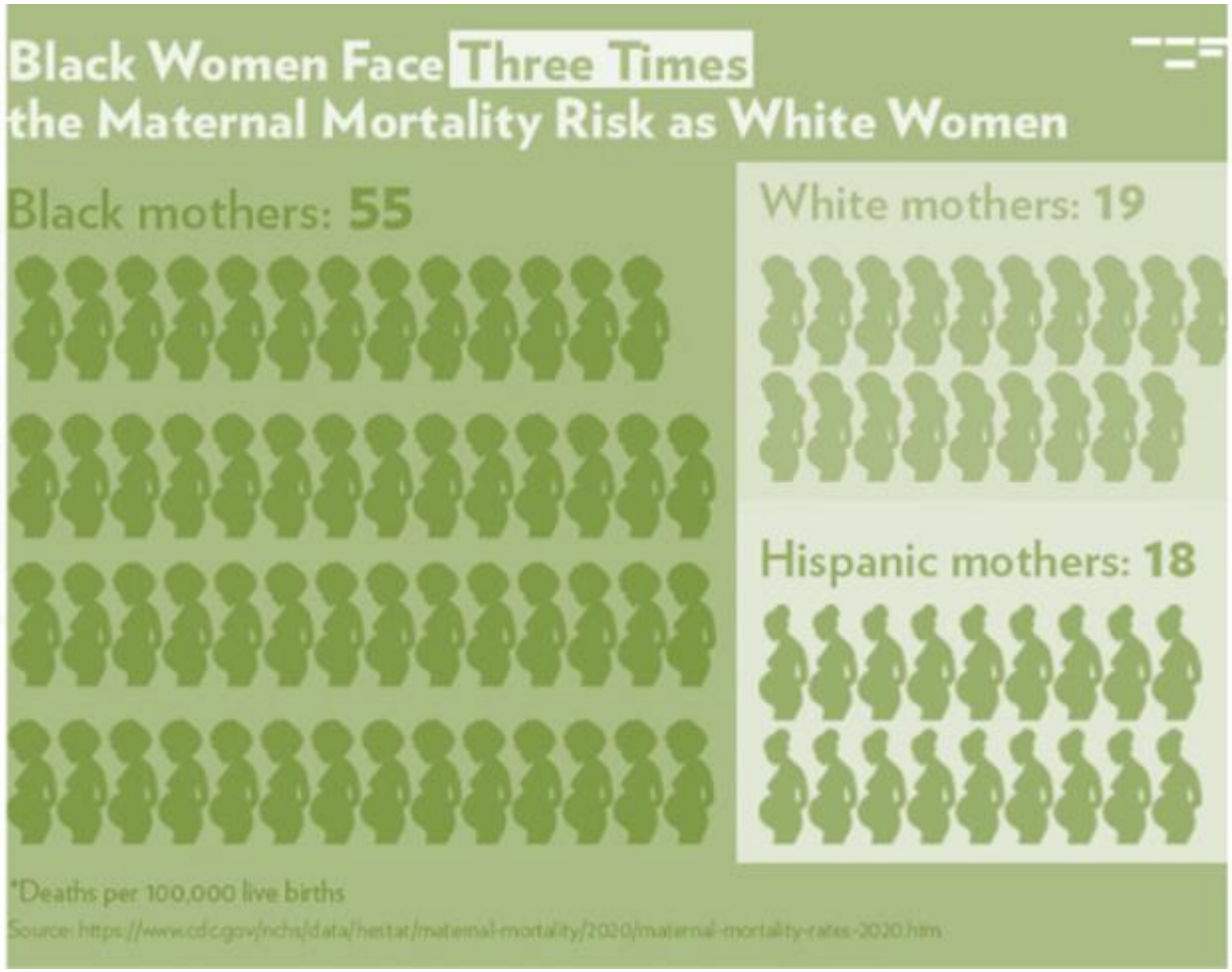
US Maternal Mortality Rates



Maternal Mortality rates continue to increase in the US

- 17.4 per 100,000 (2018)
- 20.1 per 100,000 (2019)
- 23.8 per 100,000 (2020)
- 32.9 per 100,000 (2021)

Maternal Mortality by Race/Ethnicity



- Maternal mortality is three times higher for Black women than White and Hispanic women
- Structural racism and implicit bias have been identified as contributing factors

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What is the leading cause of pregnancy-related deaths in Georgia?

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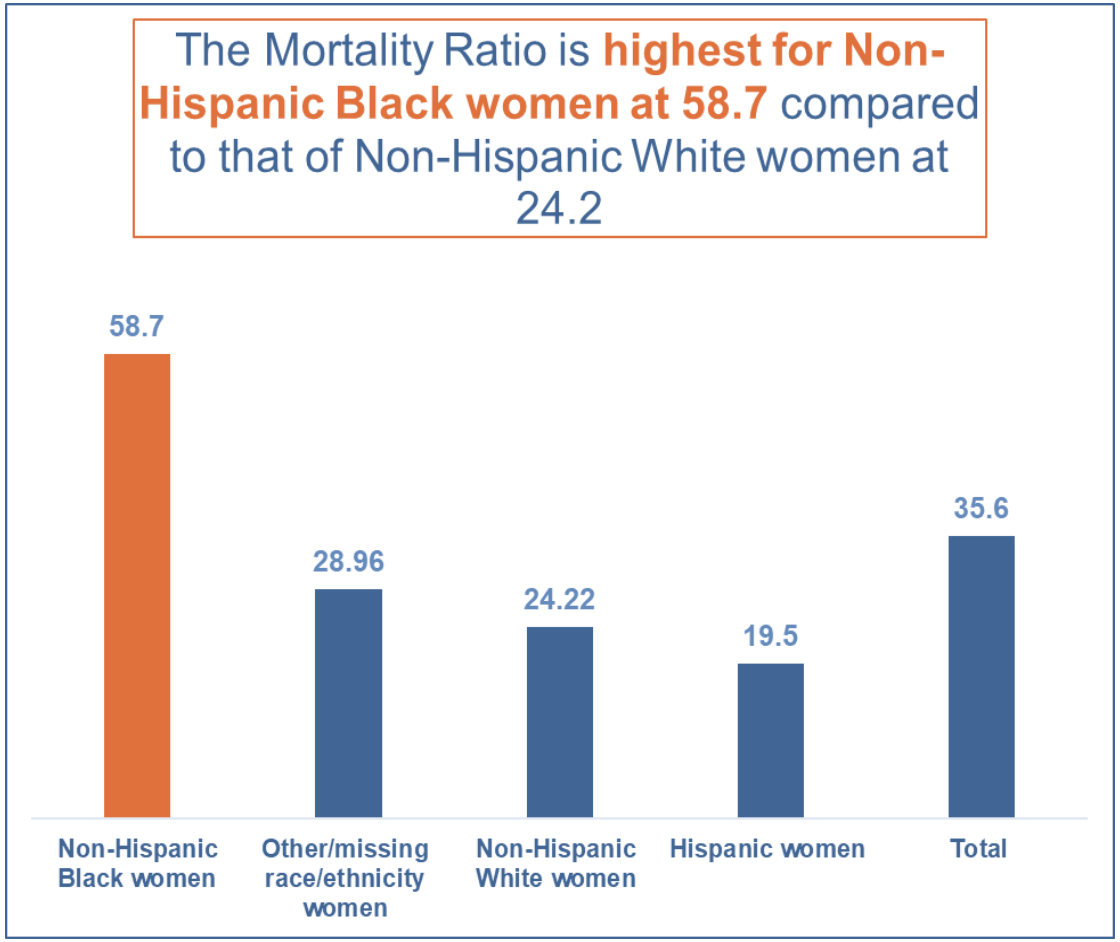
Votes: 0

What is the leading cause of pregnancy-related deaths in Georgia?

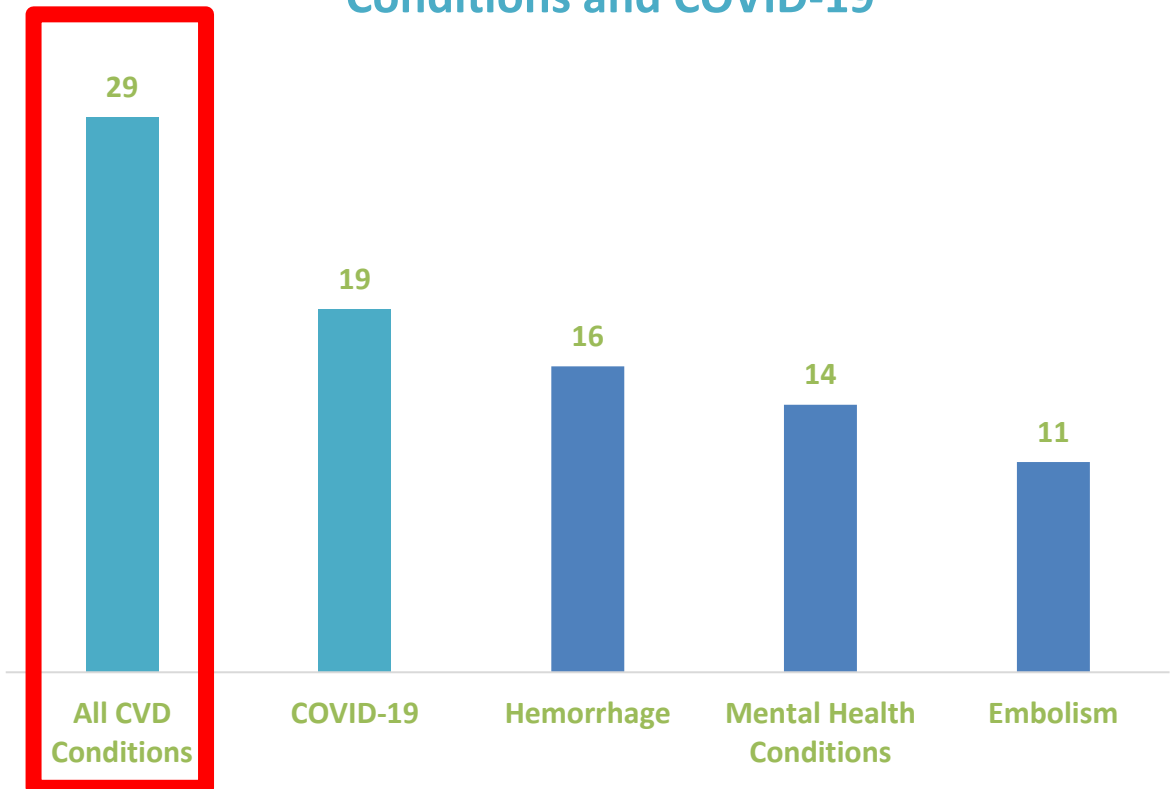
Georgia Maternal Mortality Report 2019-2021

- There were **35.6 pregnancy-related deaths per 100,000 live births**
  - There is a significant disparity in Maternal Mortality in race/ethnicity
- The 5 leading causes of death were Cardiac Conditions, COVID-19, Hemorrhage, Mental Health Conditions, Embolism
- Of the pregnancy-related deaths, **85% had at least some chance of being prevented**



Leading Cause of Pregnancy-Related Deaths 2019-2021

The 2 Leading Contributors to Maternal Death form 2019-2021 were **Cardiovascular Conditions and COVID-19**



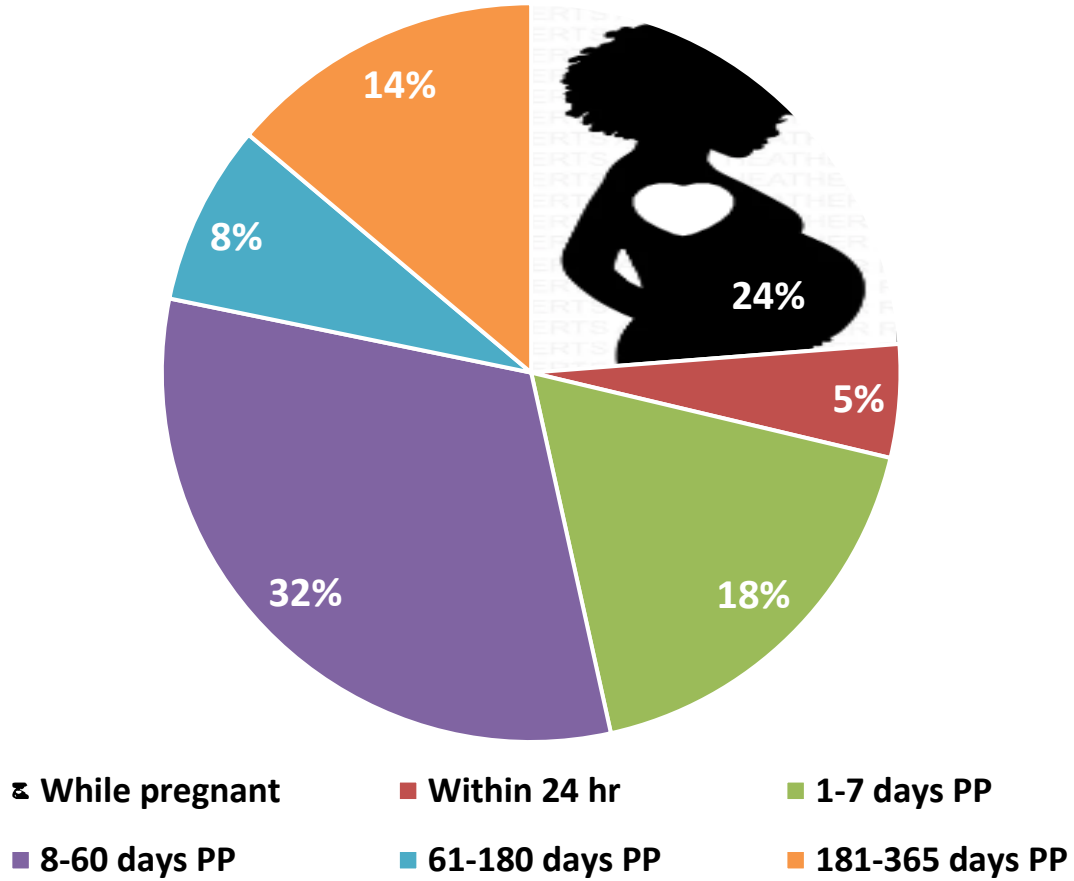
Leading Causes of Pregnancy-Related Deaths, 2019-2021	Frequency
All Cardiovascular Conditions	29
COVID-19	19
Hemorrhage	16
Mental Health Condition	14
Embolism	11

There were a total of 133 Pregnancy-related deaths

- 18 of the 19 deaths due to COVID-19 occurred in 2021
- COVID-19 vaccination was recommended for pregnant people until July 2021 by ACOG and SMFM, and in August 2021 CDC
- 85% of pregnancy-related deaths were determined to be preventable by MMRC

Timing of Pregnancy-Related Deaths 2019-2021

71% of Maternal Deaths in Georgia from 2019-2021 **occurred in the Postpartum Period**



Timing of Death	Pregnancy-Related Deaths	%
While pregnant	32	24.06
Within 24 hours	7	5.26
1-7 days postpartum	24	18.05
8-60 days postpartum	42	31.58
61-180 days postpartum	10	7.52
181 days -1 year postpartum	18	13.53
TOTAL	133	

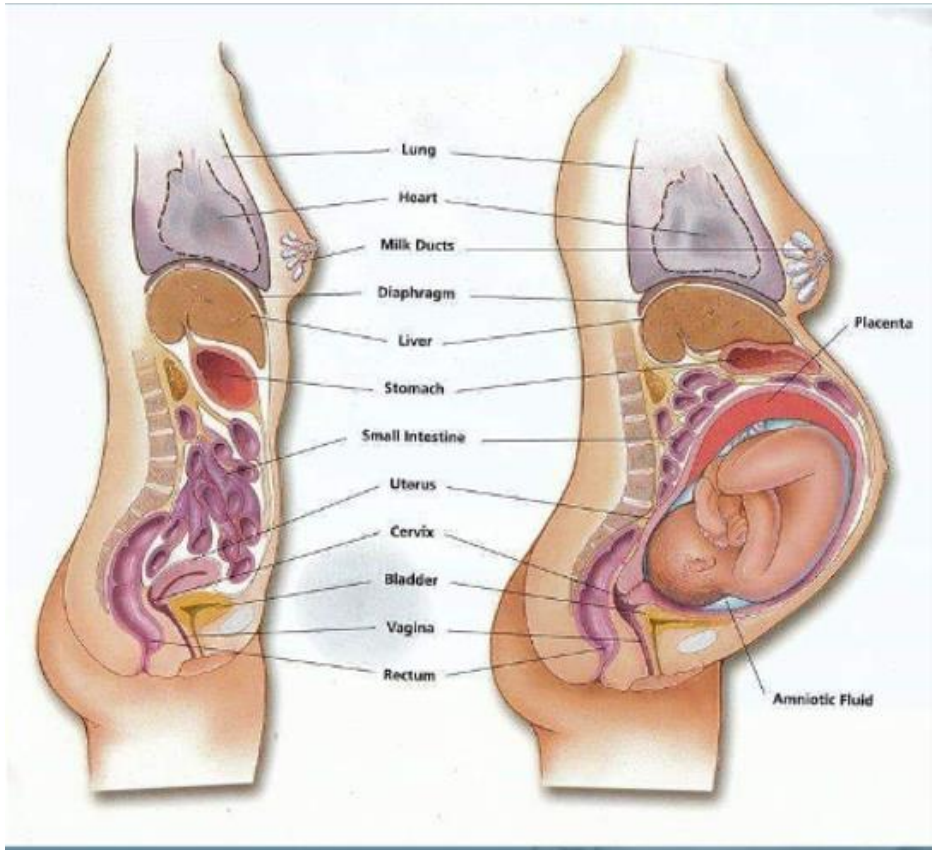
- 71.3% of all deaths were in the postpartum period
- 21% of deaths were 60-365 days postpartum
- It is important to monitor patients beyond the "traditional 6-weeks"


WHAT?
WHERE?
WHO?
WHEN?
WHY?
HOW?

Cardiovascular Disease in Obstetrics

Why is Cardiovascular Disease a Leading Cause of Maternal Mortality?

"Pregnancy is a Cardiac Stress Test"



- There are significant physiologic changes that occur during pregnancy
- Every system in the body adjusts to accommodations to pregnancy
- The cardiovascular system has many changes including:
  - Changes to the heart, pulse, cardiac output and total blood volume

Cardiovascular System

There is an overall decrease in systemic vascular resistance related to pregnancy hormones

Maternal heart rate increases approximately 10-15 beats per minute above normal baseline (up to 40% in multiples)

Blood volume increases up to 50% by third trimester (1450-1700mL) to maintain blood flow to uterus and maternal/fetal tissue

Changes in Cardiac Output

TIME FRAME	CARDIAC OUTPUT CHANGE
1St Trimester	20% greater than pre-pregnancy values due to increase stroke volume
3rd Trimester	30-50% greater than pre-pregnancy values due to increase HR and stroke volume
Labor	Up to 50% increase during 1st & 2nd stage of labor due to shunting blood from uterus to maternal circulation during contrx and pushing

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What is the MOST common presentation of cardiovascular disease during pregnancy or postpartum?

Time left: 10

Vote at: **attend.sl/m9yx**

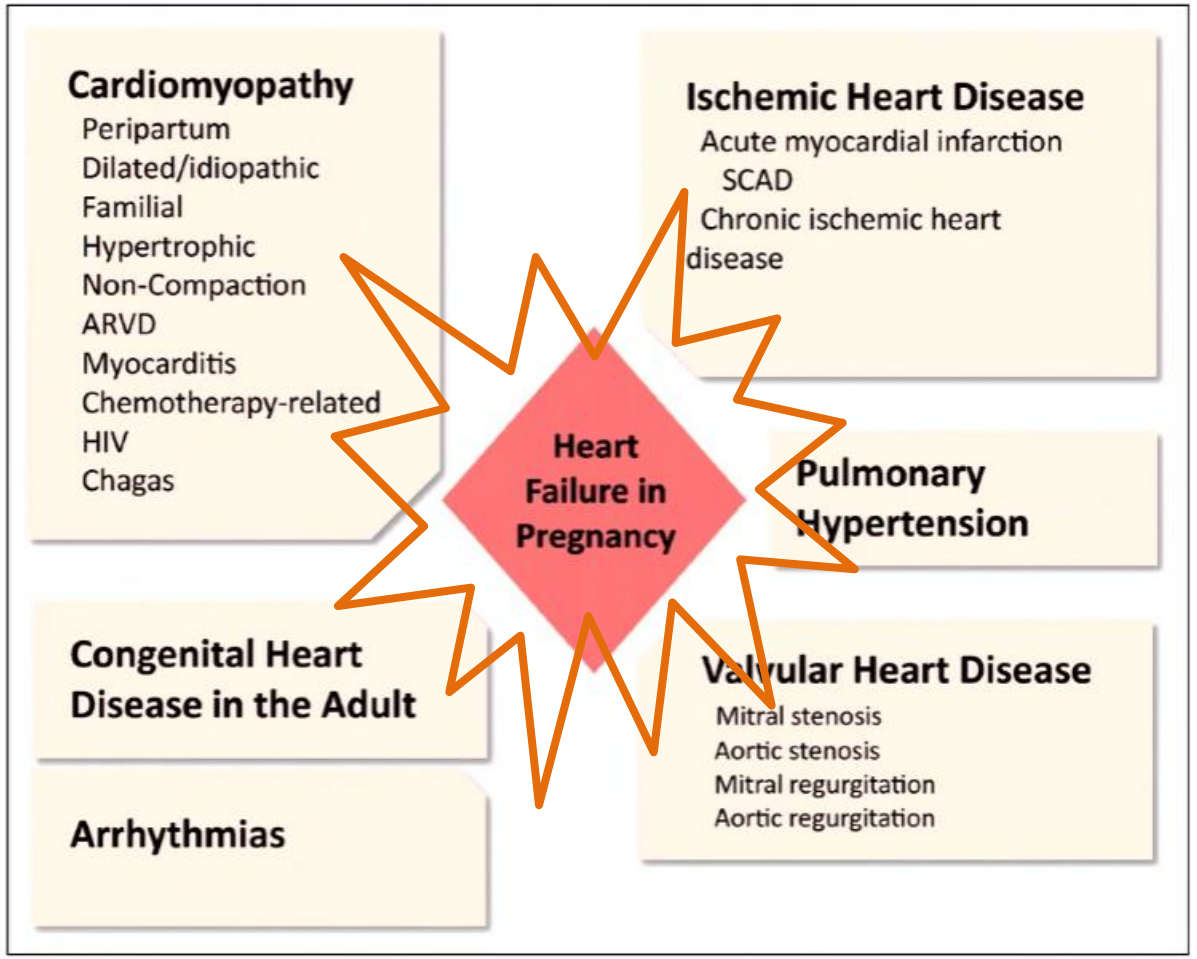
Votes: 0

What is the MOST common presentation of cardiovascular disease during pregnancy or postpartum?

Time left: 10

Votes: 0

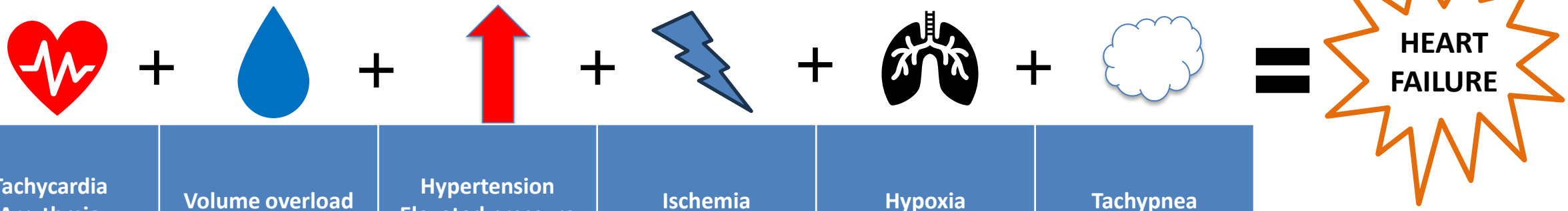
Cardiomyopathy is just one cause of dyspnea



AMERICAN COLLEGE of CARDIOLOGY.

Bright et al. JAMA 2021

The Perfect Storm



Vital signs	**Tachycardia Arrythmia**	**Volume overload**	**Hypertension Elevated pressure**	**Ischemia**	**Hypoxia**	**Tachypnea**
Symptoms	Palpitations Syncope	Swelling Orthopnea	Headache	Chest pain	Syncope Pleuritic chest pain Altered mental status	Dyspnea Cough Shortness of breath

Severe Maternal Cardiac Conditions

WHO Class III & IV

- Mechanical valve
- Systemic right ventricle
- Fontan circulation
- Cyanotic heart disease (unrepaired)
- Other complex congenital heart disease
- Aortopathies (Marfan's, EDS, Loeys-Dietz, etc.)
- Pulmonary artery hypertension
- Severe systemic ventricular dysfunction
- Previous peripartum cardiomyopathy w/ any residual impairment
- Severe symptomatic mitral/aortic stenosis
- Marfan syndrome w/ dilated aorta >45mm
- Aortic dilation >50 mm w/bicuspid aortic valve
- Native severe Coarctation

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Which condition does the WHO advise against pregnancy?

Time left: 10

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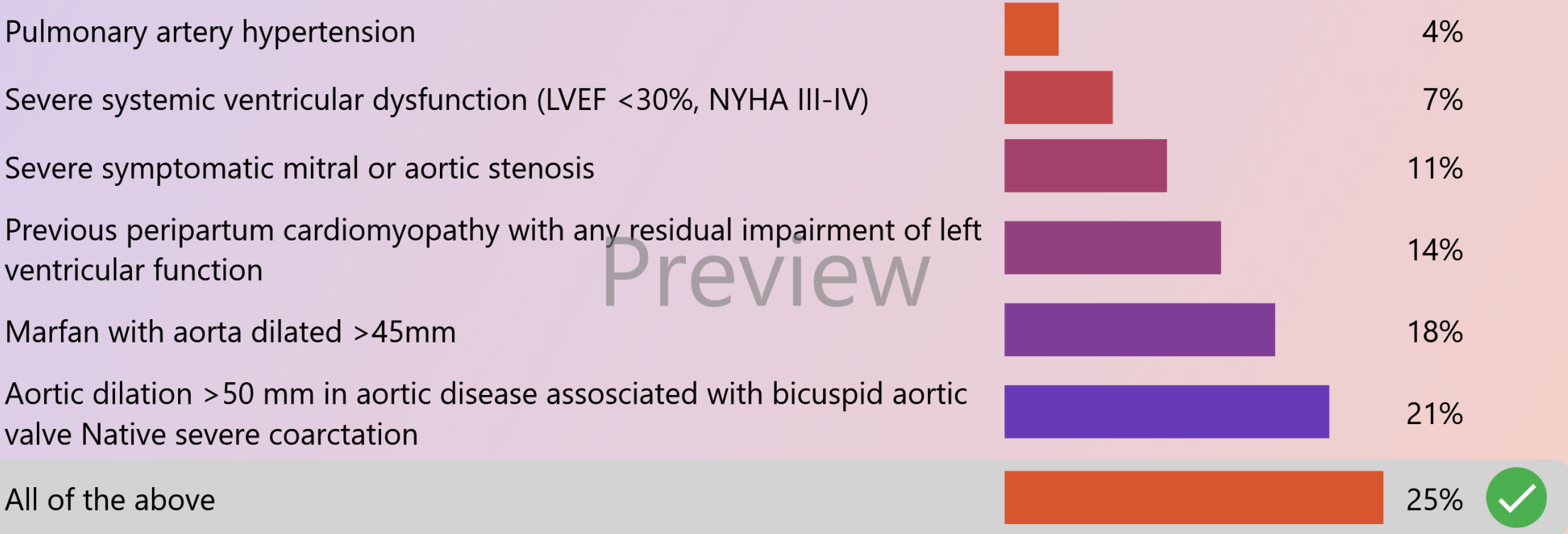
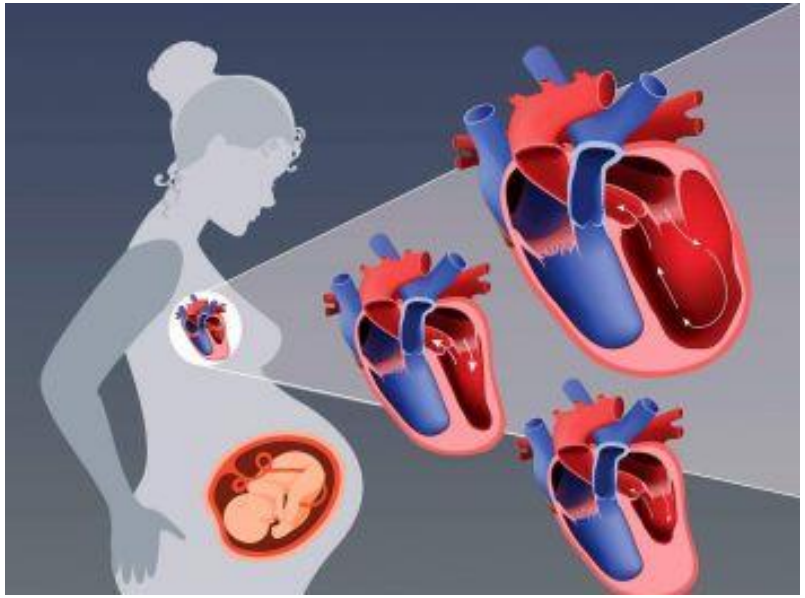
Which condition does the WHO advise against pregnancy?

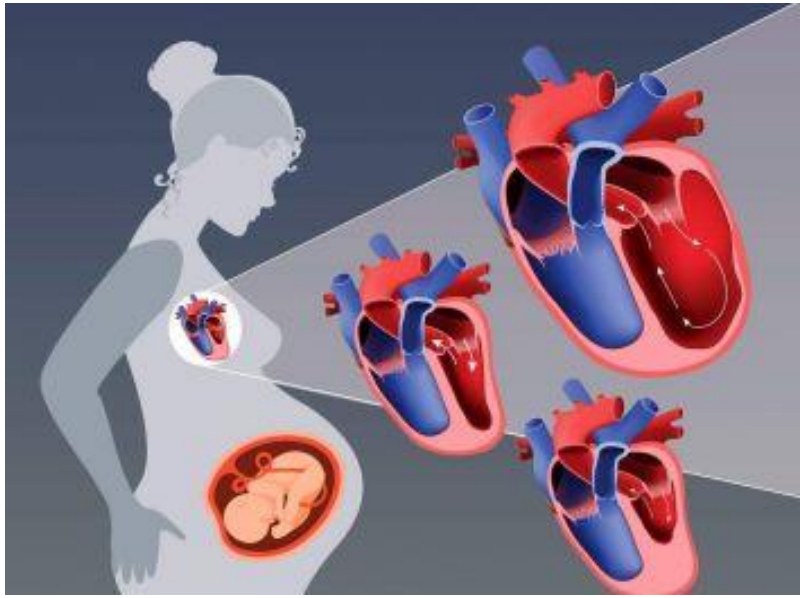


Severe Maternal Cardiac Conditions



- Cardiomyopathy / Heart Failure
- Myocardial Infarction / Coronary Artery Disease
- Pulmonary Artery Hypertension
- Aortopathies
- Valvular Disorders
- Congenital Heart Disease
- Arrythmias

Severe Maternal Cardiac Conditions



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Pregnancy Related Cardiac Conditions

Heart failure (HF)

- Identified as the underlying cause of over 9% of in-hospital deaths among pregnancy-related hospitalizations

Cardiomyopathy

- Represent the largest group of women who present with HF
- Risk of cardiovascular adverse events is nearly 50%

Cardiomyopathy / Heart Failure

Many pregnancy symptoms mimic CVD

- Swelling, fatigue, orthopnea, palpations, dizziness, syncope

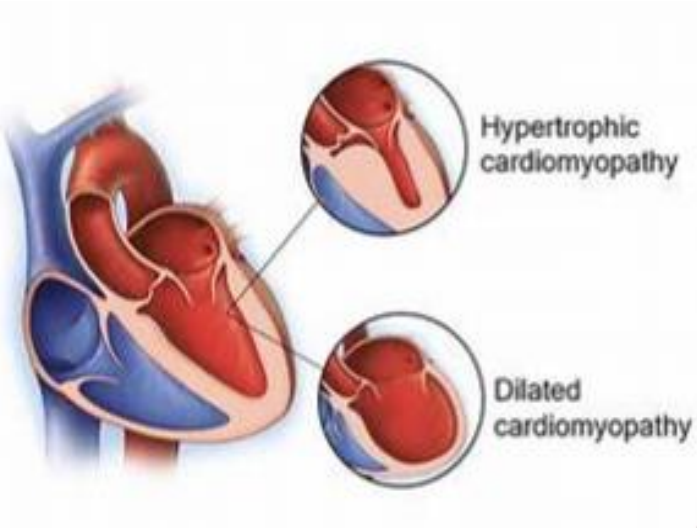
May have history of arrythmia, valve disease or MI

Can be genetic, caused by alcoholism, drug use, previous myocarditis, or chemotherapy

Likely to have elevated B/P or diagnosis of HTN

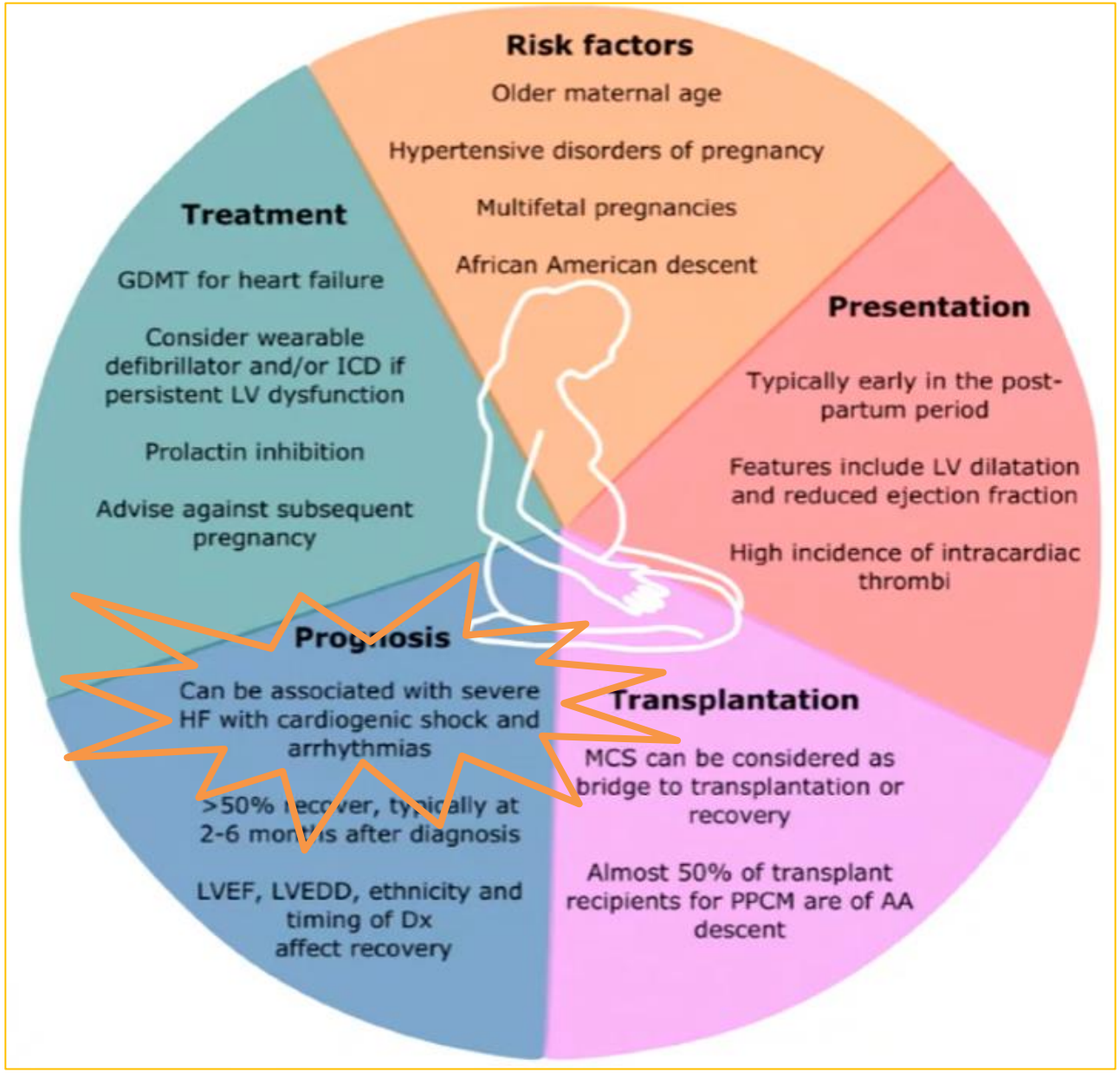
Adverse events associated with 30-60% when there is an Ejection Fraction (EF) = <40%

- Recommended to avoid pregnancy w/EF=<30%



Pregnancy specific risk factors:

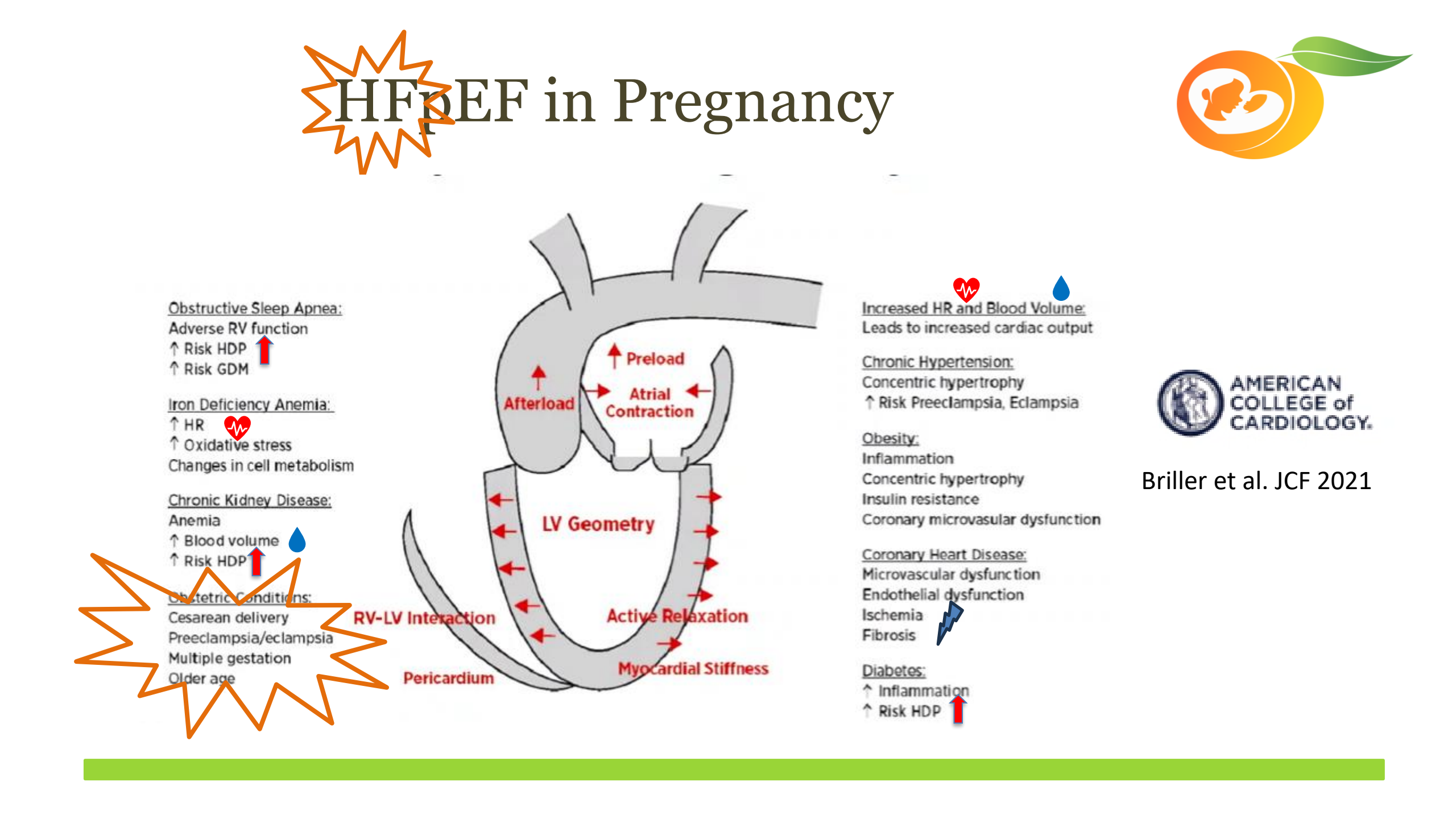
- Advanced Maternal Age, Multiple Gestation, Smoking, Identifies as African American



Peripartum Cardiomyopathy

DeFilippis et al. Circ Research 2022

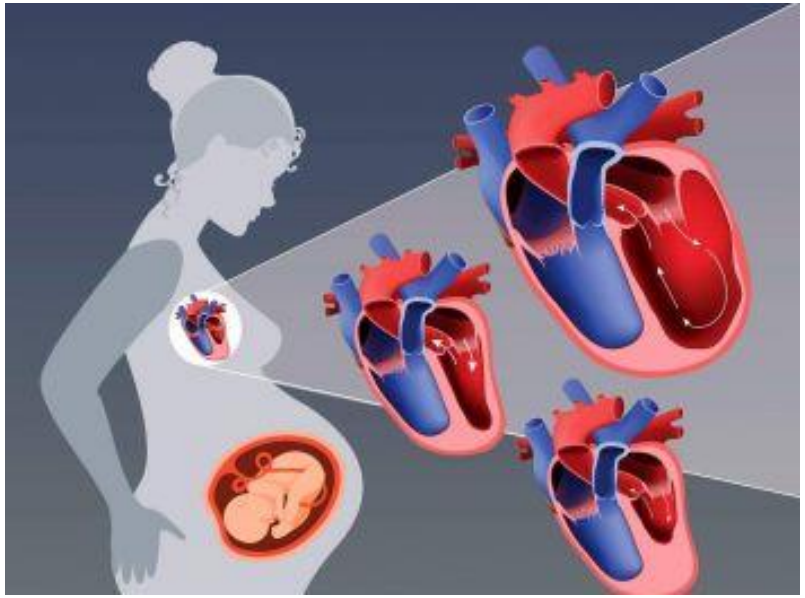
HFpEF in Pregnancy



AMERICAN COLLEGE of CARDIOLOGY.

Briller et al. JCF 2021

Severe Maternal Cardiac Conditions



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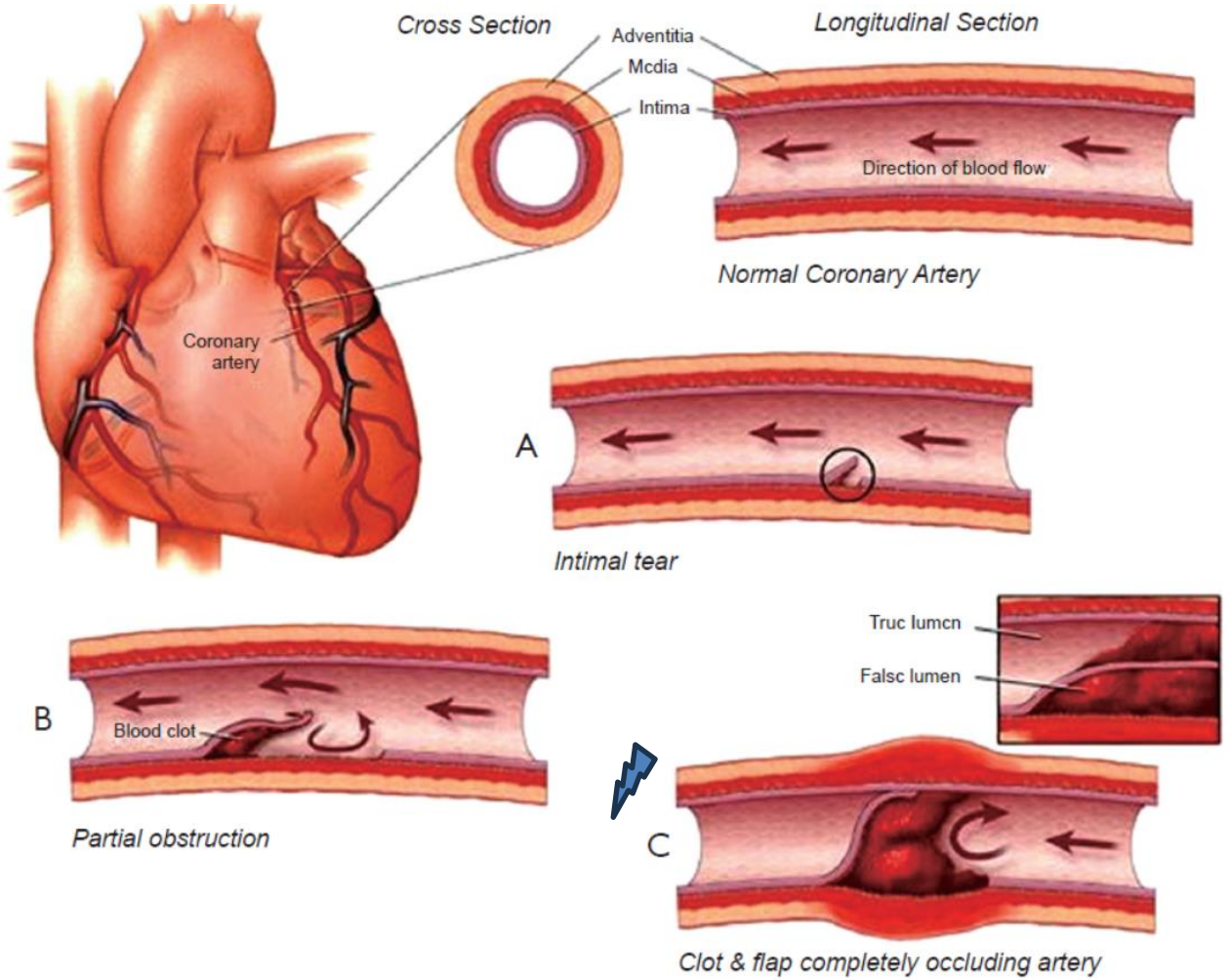
Pregnancy Related Cardiac Conditions

Acute Myocardial Infarction (MI)

- Two Types:
  - Spontaneous Coronary Artery Dissection (SCAD)
  - Pregnancy-Associated Myocardial Infarction (PAMI)
- Most common etiology in pregnancy is spontaneous coronary artery dissection
- Do not commonly have known pre-existing atherosclerotic disease
- Can lead to **heart failure and death!**
- Risk factors: Chronic HTN, diabetes, smoking, thrombophilia, and advancing maternal age

Spontaneous Coronary Artery Dissection (SCAD)



Acute Myocardial Infarction (MI)

Spontaneous Coronary Artery Dissection (SCAD)

- Most Common in pregnancy related to hormonal changes in estrogen and progesterone that lead to changes in vessel wall

Pregnancy Associated Myocardial Infarction (PAMI)

- Some caused by increased thromboembolic disease in patients with undiagnosed preexisting coronary artery disease, accompanied by hypertension ⬆ in many cases

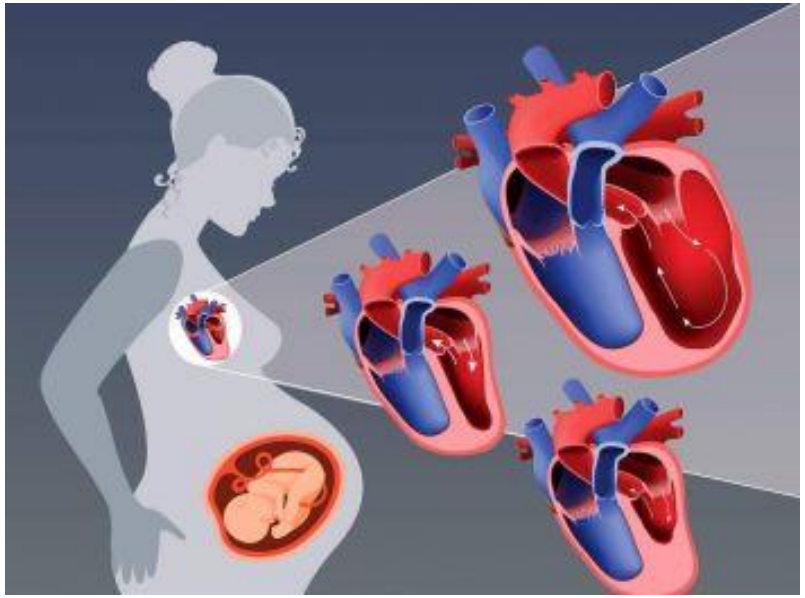
Blood pressure goals are to maintain < 120/80

Monitor blood pressure and heart rate closely in PP period

Risk Factors:

- Multiparity, Marfan's, Ehlers Danlos, infertility treatment, autoimmune disease, preexisting hypertension, ⬆ Valsalva, retching, lifting heavy objects

Severe Maternal Cardiac Conditions



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- **Pulmonary Artery Hypertension**
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- Valvular Disorders
- Congenital Heart Disease
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Pulmonary Artery Hypertension

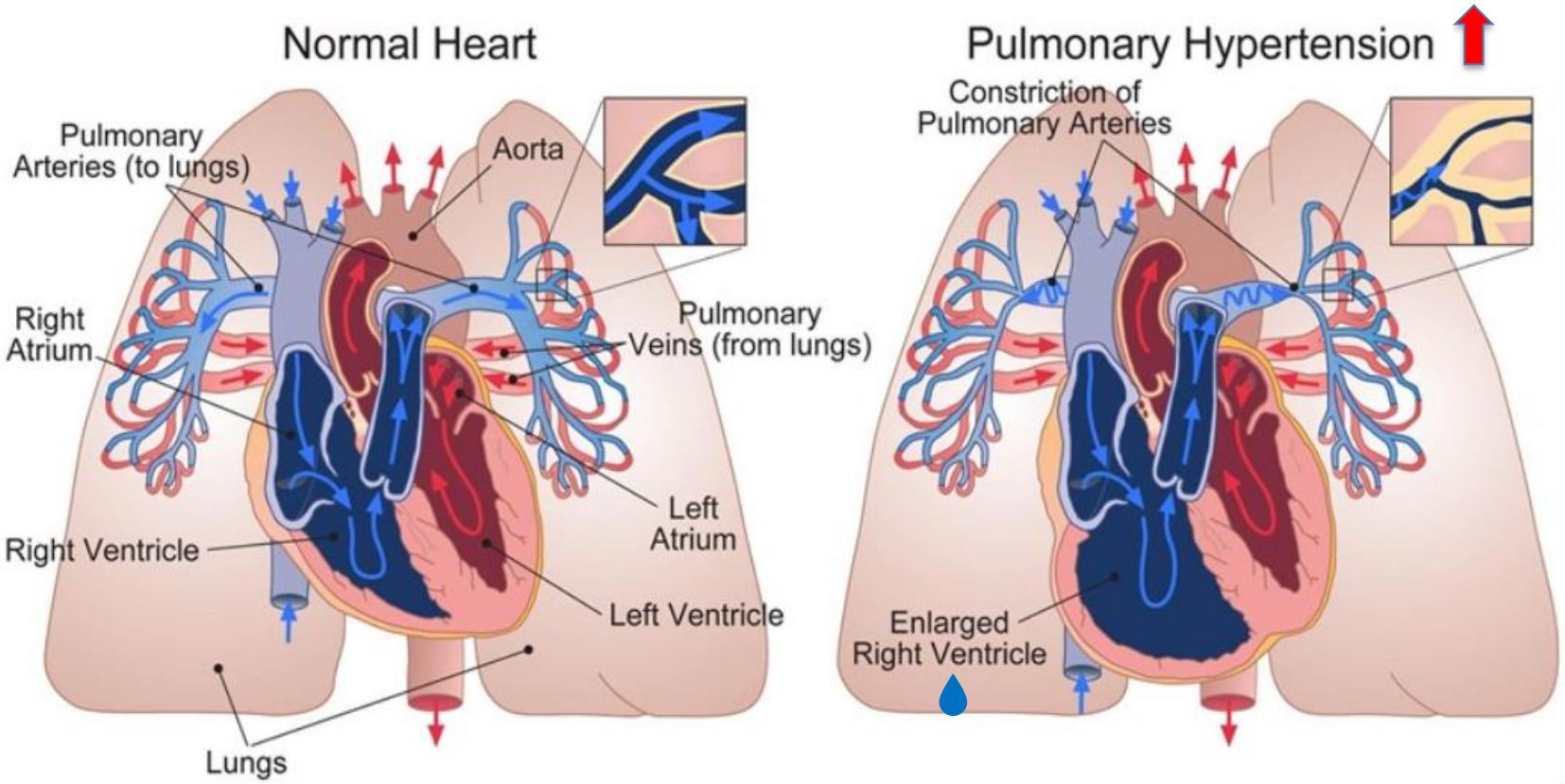


Image courtesy of the Columbus Ohio Adult Congenital Heart Disease Program of Nationwide Children's Hospital Heart Center, Columbus, Ohio

High mortality rate

Pulmonary Arterial Hypertension

Increased Cardiac Output	Failure of Pulmonary Vasodilation	Increased Pulmonary Arterial Pressure
Hypercoagulability	Risk Pulmonary Embolism	Increased Pulmonary Vascular Resistance
Decrease in Systemic Vascular Resistance	Increased Right-to-Left Shunting	Increased Hypoxia
Arrhythmias	Tachycardia	Myocardial Ischemia
Labor and Delivery	Delivery of Placenta	Autotransfusion, Relief of Caval Obstruction
Postpartum	Peripheral Volume Mobilization	Acute Right Ventricular Volume Overload

RIGHT VENTRICULAR FAILURE

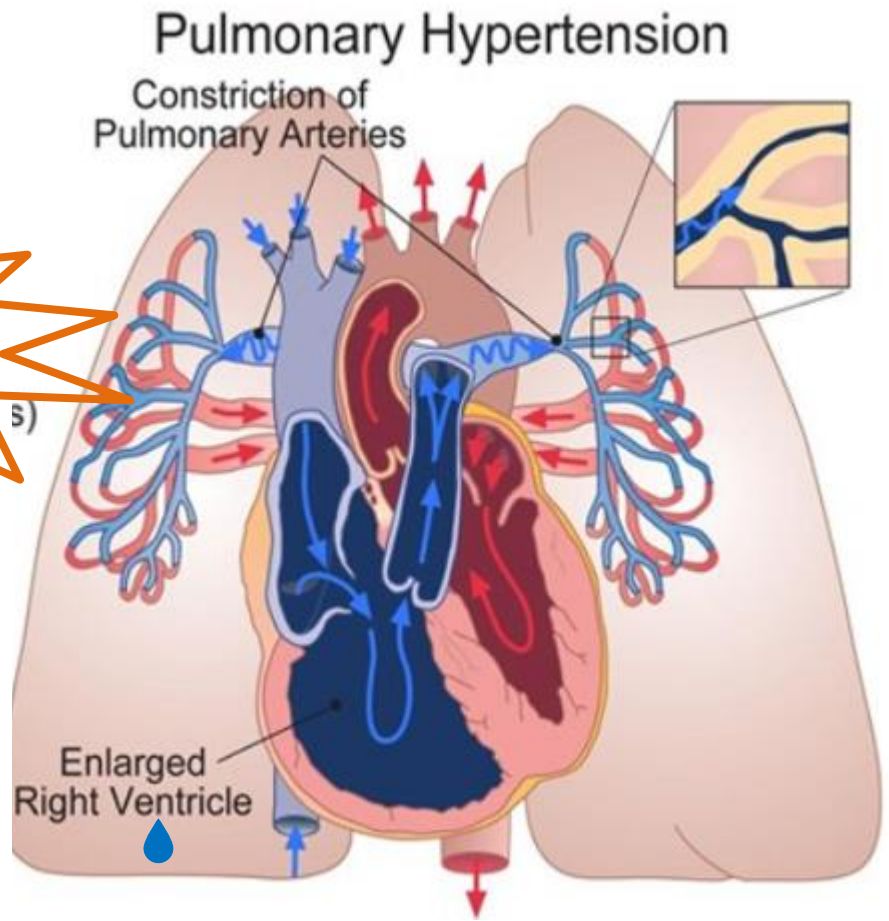
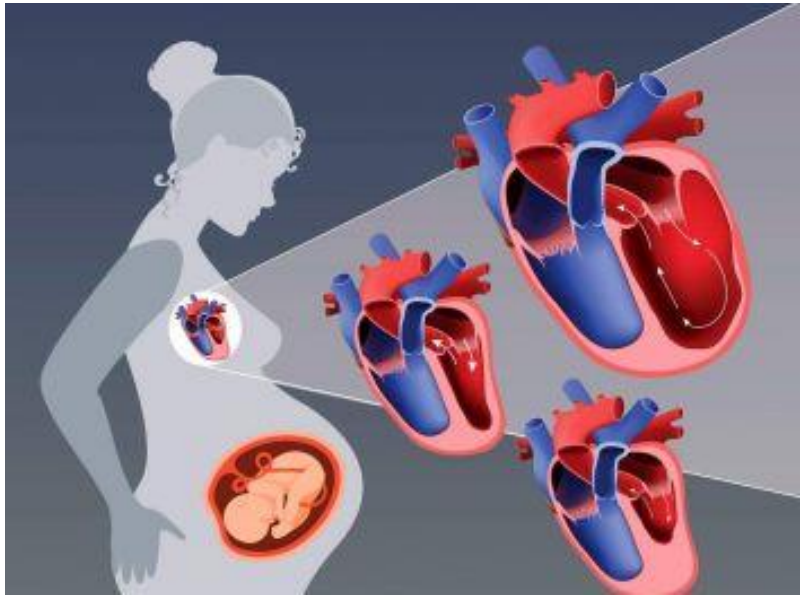


Figure 4

Contributors to Pregnancy-Associated Right Heart Failure in Women With Pulmonary Hypertension

Severe Maternal Cardiac Conditions



- Cardiomyopathy / Heart Failure
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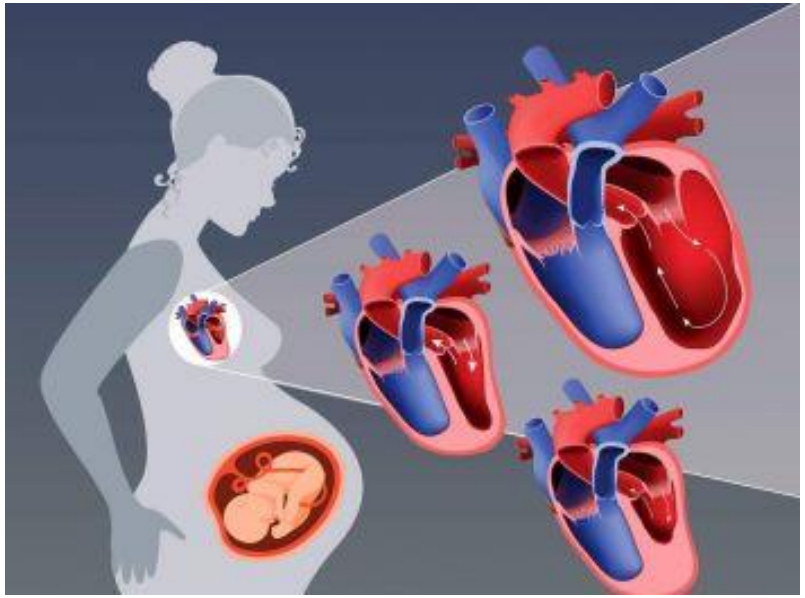
- Pulmonary Artery Hypertension
- **Aortopathies**
- Valvular Disorders
- Congenital Heart Disease
- Arrythmias

Aortopathies

Aortopathies (Marfan, Vascular Ehlers-Danlos, Bicuspid Aortic Valve, Turner, Loeys-Dietz, Familial Thoracic, etc.)

- Increased risk of aortic dissection during pregnancy and the postpartum period
- Aortic root diameters ≥4 cm should be considered for aortic root replacement prior to pregnancy.
- Uncontrolled hypertension and/or tachycardia can lead to dissection/rupture
- Aortic dissection/rupture leads to massive hemorrhage, stroke, cardiac tamponade, and death
- **High mortality rate**

Severe Maternal Cardiac Conditions



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Aortic stenosis

Increase in cardiac output in pregnancy leads to worsening left-sided stenotic lesions

As cardiac output increases- left ventricular pressure increases which can lead to symptomatic heart failure, arrythmia, syncope

As systemic vascular resistance decreases due to pregnancy physiology, DBP decreases leading to decrease coronary perfusion—Ischemia

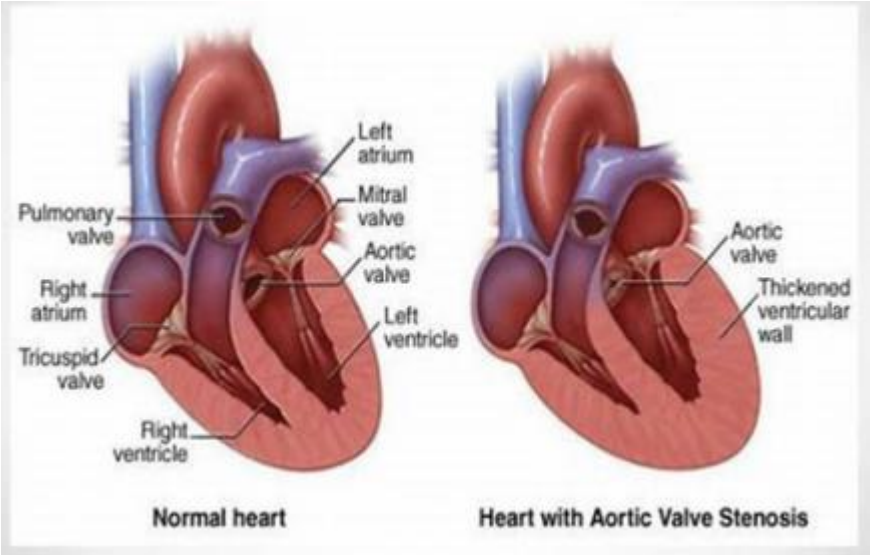
Myocardial ischemia leads to decrease LV function and further decrease cardiac output

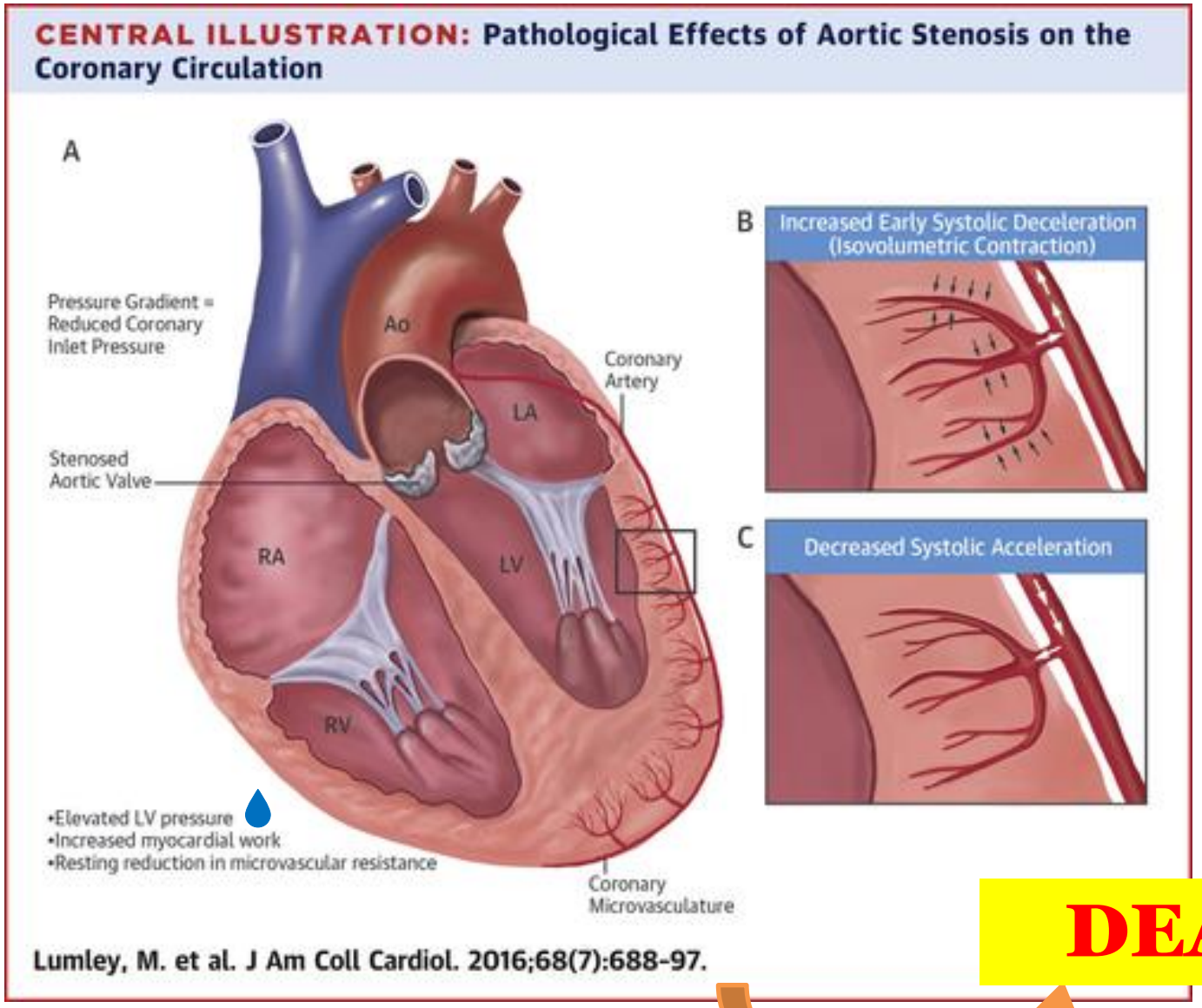
This leads to more ischemia and could lead to heart failure and even **death!!!**

10% Risk of Cardiac Event with severe aortic stenosis

Pay Attention to previous valve intervention, ventricular dysfunction, history of arrhythmia, history of non-vagal syncope, elevated BNP, new cardiac symptoms

Close monitoring in the PP period for pulmonary edema, hypotension and ischemia





Aortic Stenosis

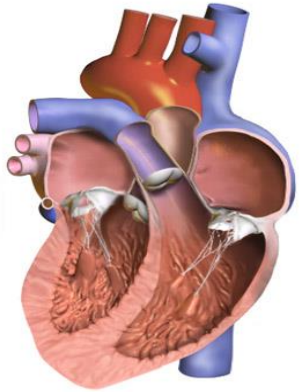
↓SVR
↓
↓DBP
↓
↓Coronary perfusion to thickened myocardium
↓
Ischemia
↓
↓LV Function (HF)
↓
↓CO
↓
↓Coronary perfusion

DEATH!!!

Pregnancy Related Cardiac Conditions

Aortic stenosis

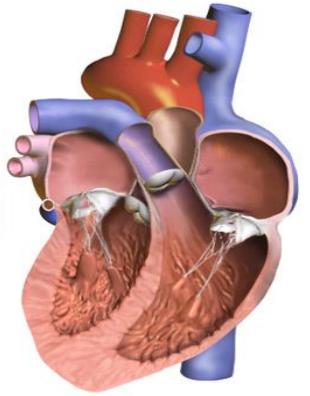
- Valve intervention recommended prior to pregnancy if severely symptomatic
- Increased cardiac output associated with pregnancy is associated with a high rate of cardiac complications
- Potential complications include arrythmias, aortic dissection (if bicuspid aortopathy), urgent surgery, **heart failure**, rarely **death** in WHO IV



Pregnancy Related Cardiac Conditions

Mitral Stenosis

- Has a 30% increased rate of cardiac event
- This can be higher with smaller valve areas AND if symptomatic prior to pregnancy



Mitral Stenosis

Increased Cardiac output leads to worsening to left sided stenotic lesions

Increased blood volume leads to increase in LT atrial pressure which leads to A. Fib and /or pulmonary edema

- This can lead to significant maternal complications and even death

Simultaneous fixed preload to LV leads to an inability to generate adequate Cardiac Output

- This can lead to cardiogenic shock and even death

This condition can get worse between 23-34 weeks and again in the PP period

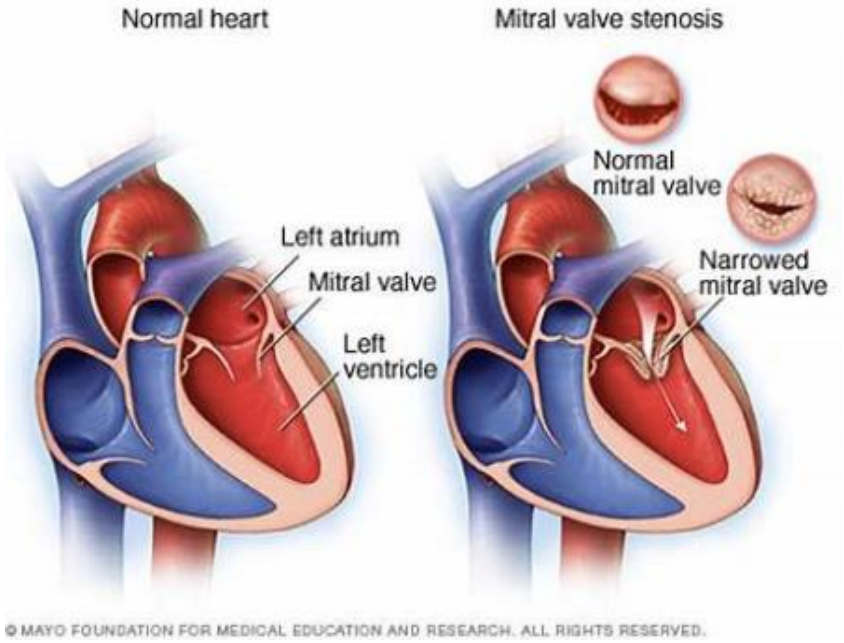
Monitor BNP and proBNP levels correlated with mitral valve area and pulmonary artery pressure

- Normal BNP in pregnancy =30-60pg/mL and >100 is concerning
- proBNP level >300 is concerning

Avoid fluid overload and start diuretics to treat pulmonary edema

Avoid tachycardia, decrease in Systemic Vascular Resistance/ Hypotension

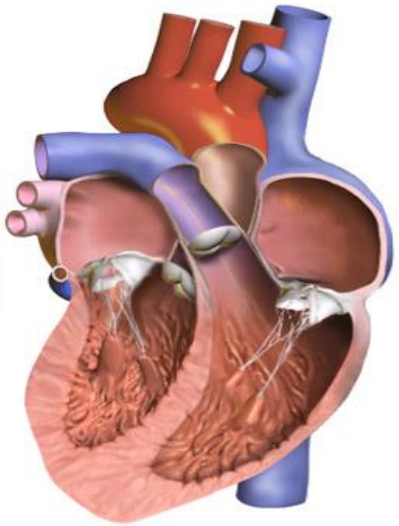
- Maintain goal HR <100 bpm



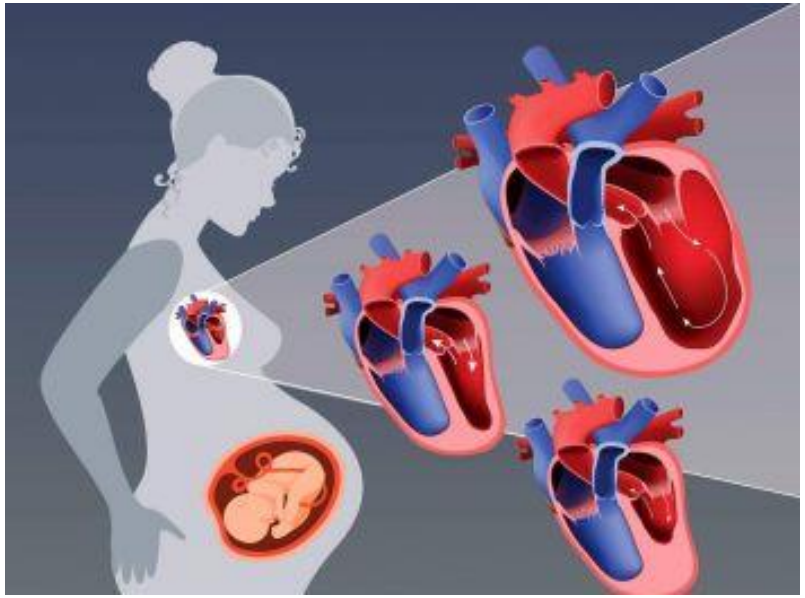
Pregnancy Related Cardiac Conditions

Regurgitant lesions (mitral regurgitation, aortic insufficiency)

- Usually tolerated in pregnancy
- Watch closely after delivery for pulmonary edema due to fluid shifts postpartum



Severe Maternal Cardiac Conditions



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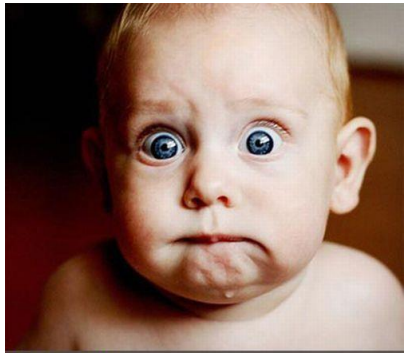
Preeclampsia and Cardiovascular Disease

History of preeclampsia is an early indicator of future CV disease in women

Double the risk of developing a heart attack or stroke	Diagnosed *before* 34 weeks = **4 times** increased risk of developing CVD

Patients who have Preeclampsia with *severe features* OR have Preeclampsia *with more than one pregnancy* have and increase risk of developing CVD when compared to patients with *mild/moderate* Preeclampsia and Preeclampsia *with one pregnancy*



In 2011 AHA added Preeclampsia, Gestational Diabetes, and Elevated Blood Pressure (in pregnancy) as risk factor for developing Heart Disease


WHAT?
WHERE?
WHO?
WHEN?
WHY?
HOW?

Why Are We Missing the Mark in Improving Mortality Related to CVD?

- Delay/ Inadequate response to clinical signs/ symptoms (61%)
- Ineffective or inappropriate treatment (39%)
- Misdiagnosis (37%)
- Failure to refer or consult (30%)

Benefits of Screening for Cardiovascular Disease

Increase Patient and Provider Awareness	• Providers include CVD in differential Diagnosis • Patients are aware of risk and more likely to seek care
Identify Patients at Increased Risk	• Leads to appropriate follow up with Cardiology • Opportunity for further testing and heightened observation
Opportunity to Modify Risk Factors	• Improve maternal/fetal outcomes • Opportunity to decrease long term risk of CVD

Important Points

For some women, the first presentation of cardiovascular disease may during pregnancy or early postpartum

Between 24-28 weeks gestation and/or postpartum is the time with the greatest risk for worsening CVD symptoms

CVD symptoms or vital sign abnormalities should not be ignored in pregnant/postpartum women

Screening all women who are pregnant and up to 365 days postpartum can help identify those at risk for CVD

GaPQC
GEORGIA PERINATAL QUALITY COLLABORATIVE

SlideLizard

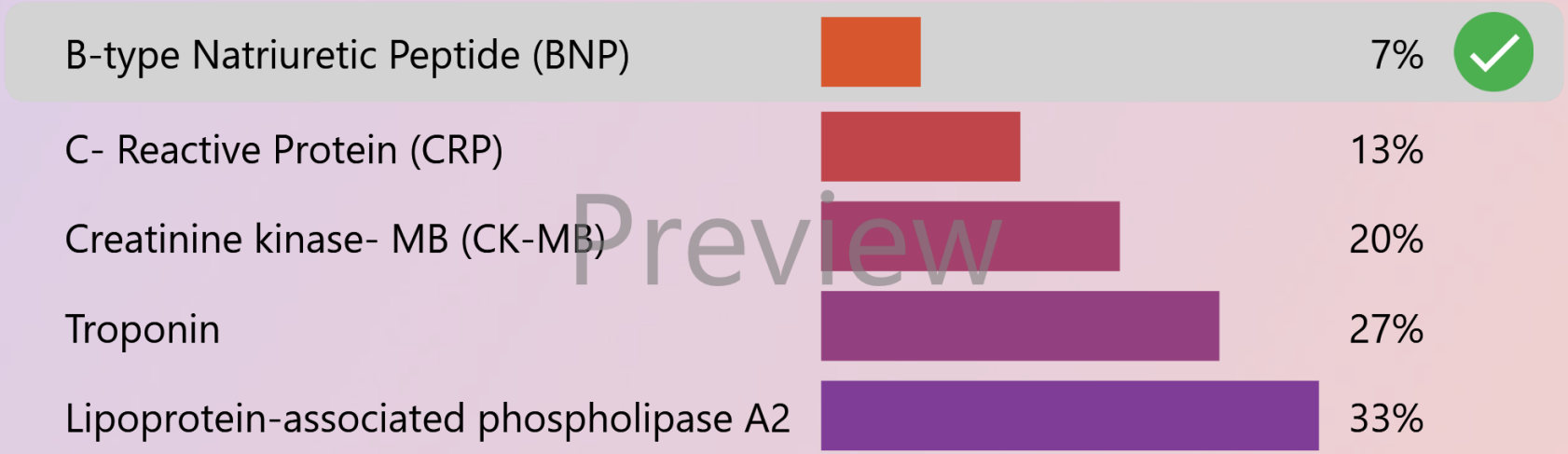
Which biomarker has been shown to aid in the diagnosis of heart failure?

Time left: -

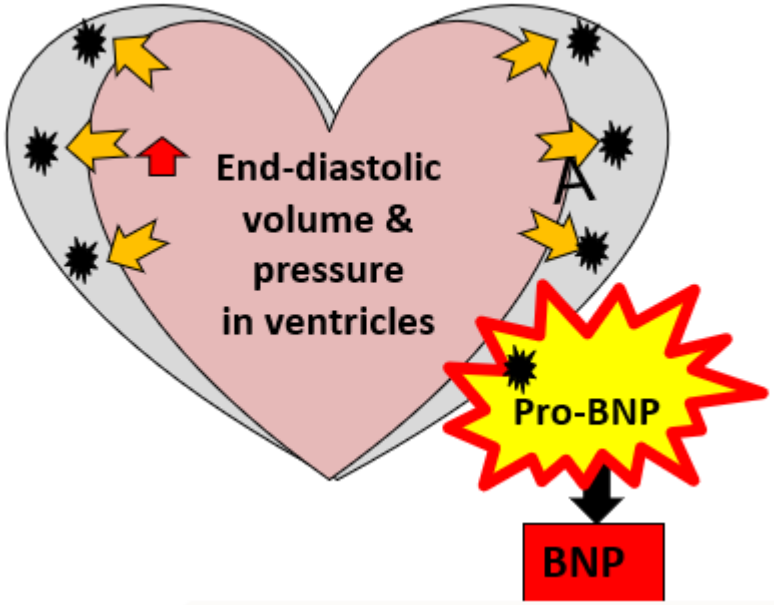
Vote at: **attend.sl/m9yx**

Votes: 0

Which biomarker has been shown to aid in the diagnosis of heart failure?



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 cardiomypathy: 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.

BNP in Pregnancy

Pregnancy is a state of physiologic volume overload

LV wall mass and the diastolic dimensions increase

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BNP Levels in Normal Pregnancy

Median longitudinal BNP in 72 healthy pregnancies:

- 1st trimester: 19.5 pg/mL
- 2nd trimester: 18.0 pg/mL
- 3rd trimester: 26.5 pg/mL
- Postpartum: 18.5 pg/mL

Hameed AB, Chan K, Ghamsary M, Elkayam U. Longitudinal changes in the B-type natriuretic peptide levels in normal pregnancy and postpartum. *Clinical Cardiology*. Aug 2009;32(8):E60-62.

GaPQC
GEORGIA PERINATAL QUALITY COLLABORATIVE

SlideLizard

What BNP level is diagnostic of heart failure? (>/= pg/mL)

Time left: -

Vote at: **attend.sl/m9yx**

Votes: 0

What BNP level is diagnostic of heart failure? (>/= pg/mL)

Time left: -

SlideLizard

Votes: 0

BNP and NT-proBNP Utility

Suggestive of Heart Failure

- BNP > 50 but < 100 pg/mL
- NT-proBNP > 450 but < 900 pg/mL
- Echo +/- cardiology consult may still be warranted in patient with other symptoms and/or risk factors

Diagnostic of Heart Failure

- BNP ≥ 100 pg/mL
- NT-proBNP > 900pg/ml
- Echo and cardiology consult should be obtained
- Patients with hx of cardiomyopathy/HF should have a baseline and each trimester including postpartum

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Preexisting cardiovascular disease and/or new-onset peripartum cardiomyopathy…

- may initially present during pregnancy or in the postpartum period.
- Physiologic changes associated with pregnancy gradually return to baseline by two weeks postpartum
- Peripartum cardiomyopathy most frequently presents in the first postpartum week, with 75% presenting in first month
- Pregnant or postpartum women with CVD frequently present with shortness of breath or a new-onset cough.

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
- Symptoms that are deteriorating
- Chest pain, palpitations, or dizziness
- New-onset cough or wheezing
- Pedal or lower extremity edema and if it is improving or deteriorating
- Unexpected fatigue, i.e., needing to stop frequently when walking
- Inability to lie flat due to shortness of breath, and if this is a change, how many pillows does she use
- Failure to lose weight or unusual weight gain, and how much
- A history of cardiac or pulmonary conditions
- A history of substance use and/or tobacco use
- Has been seen by other providers or in other Emergency Departments since giving birth

PEACH

Pregnant and Postpartum Heart Disease Warning Signs

P alpitations
Heart beating too fast or skipping beats

E dema
Swelling in your hands or feet

A bnormal Breathing
Hard time catching your breath

C hest Pains

H igh Blood Pressure

Georgia cares about the heart health of pregnant and postpartum people. Look out for the PEACH heart warning signs that something might be seriously wrong.

Pregnancy can impact your heart health for up to a year after the pregnancy ends. Not all doctors will know that you were pregnant. Remember to say *"I was pregnant this past year and now I am having..."*

Use this QR code to get more information about heart health warning signs.

Patient Cardiac Warning Signs Magnet

Patient Cardiac Warning Signs Flyer

PEACH

Pregnant and Postpartum Heart Disease Warning Signs

P alpitations

E dema

A bnormal Breathing

C hest Pains

H igh Blood Pressure

Georgia cares about the heart health of pregnant and postpartum people. Look out for the PEACH heart warning signs that something might be seriously wrong.

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Use this QR code to get more information about heart health warning signs.

CVD ALGORITHM

Hameed, AB, Morton, CH and A Moore. Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum Developed under contract #11-10006 with the California Department of Public Health, Maternal, Child and Adolescent Health Division. Published by the California Department of Public Health, 2017.

CVD Algorithm Validation

- The algorithm was applied to 64 CVD deaths from 2002-2006 CA-PAMR.
- 56 out of 64 (88%) cases of maternal mortality would have been identified.
- Detection increased to 93% when comparison was restricted to 60 cases that were symptomatic.

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Hameed, AB, Morton, CH and A Moore. Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum Developed under contract #11-10006 with the California Department of Public Health, Maternal, Child and Adolescent Health Division. Published by the California Department of Public Health, 2017.


WHAT?
WHERE?
WHO?
WHEN?
WHY?
HOW?

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

ACOG PRACTICE BULLETIN

Clinical Management Guidelines for Obstetrician–Gynecologists

NUMBER 212

Presidential Task Force on Pregnancy and Heart Disease

d management

counseling is
ve pregnancy
be conditional

upon her values and preferences, and patient autonomy must be ensured. A collaborative discussion with shared decision making should take place between the Pregnancy Heart Team (Table 4), the patient, and her family. A personalized approach estimating the maternal and fetal hazards related to the patient's specific cardiac disorder and the patient's pregnancy plans can provide anticipatory guidance to help support her decision making. For some patients, the prepregnancy evaluation may suggest a pregnancy risk that is unacceptable (Table 3). For those women, reproductive alternatives, such as surrogacy or adoption, and effective contraceptive methods should be discussed (58).

▶ ***Why is risk assessment indicated, what types are recommended, and which patients should be referred to centers with a high level of care?***

A key area of competence and expertise for obstetric care providers is the ability to differentiate between

of pregnancy, specifically peripartum cardiomyopathy. Therefore, all women should be assessed for cardiovascular disease in the antepartum and postpartum periods using the California Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum toolkit algorithm (Fig. 1). Use of this algorithm could have identified individuals as high risk requiring further cardiac evaluation and referral in 88% of maternal deaths (50). Patients with concerning symptoms or signs of cardiovascular disease should undergo consultation with a Pregnancy Heart Team (Table 4).

Risk Assessment of the Pregnant or Postpartum Patient With Known Cardiovascular Disease

Risk assessment can be accomplished using one of the several available risk stratification models, such as the Canadian Cardiac Disease in Pregnancy risk index (CARPREG II) (a comprehensive scoring system that incorporates general cardiac factors, specific cardiac lesions, and process of care factors), the Zwangerschap bij Aangeboren HARtAfwijkingen (ZAHARA) (a weighted risk score for congenital heart disease patients), and the modified World Health Organization (WHO) classification of maternal cardiovascular risk (54–56, 59). Among these, the modified WHO

CVD Assessment Algorithm For Pregnant and Postpartum Women

Red Flags

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥120 bpm
- Resting systolic BP ≥160 mm Hg
- Resting RR ≥30
- Oxygen saturations ≤94% with or without personal history of CVD

PROMPT EVALUATION and/or hospitalization for acute symptoms

plus

CONSULTATIONS with MFM and Primary Care/Cardiology

Personal History of CVD

Without Red Flags

CONSULTATIONS with MFM and Primary Care/Cardiology

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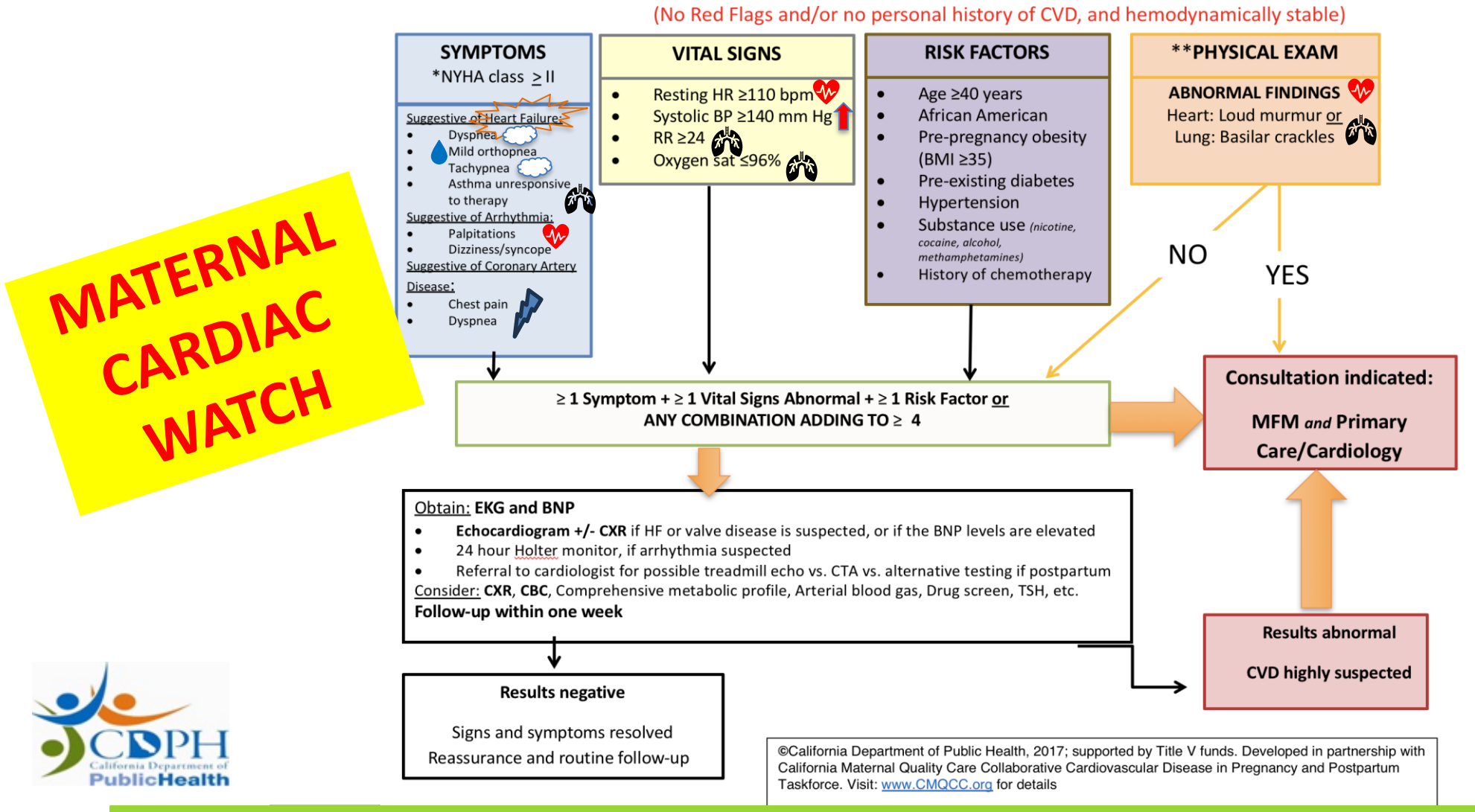
CVD Assessment Algorithm For Pregnant and Postpartum Women



MATERNAL CARDIAC WATCH

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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 screened using the CMQCC cardiac screening tool and is sent to the hospital for evaluation.

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Positive CVD Risk Assessment

Red Flags

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥120 bpm
- Resting systolic BP ≥160 mm Hg
- Resting RR ≥30
- Oxygen saturations ≤94% with or without personal history of CVD

PROMPT EVALUATION and/or hospitalization for acute symptoms *plus* **CONSULTATIONS** with MFM and Primary Care/Cardiology

The screen results as **"AT RISK" or "POSITIVE"** when there is a "YES" to:

- Any one of the RED FLAGS

Personal History of CVD

Without Red Flags

CONSULTATIONS with MFM and Primary Care/Cardiology

CVD Case Presentation (*CONTINUED*)

- At the hospital, she gets a chest x-ray, EKG and NT-proBNP.
- Chest x-ray reveals mild pulmonary edema. EKG is significant for sinus tachycardia. NT pro-BNP is 750 pg/mL. ECHO is ordered.
- ECHO shows EF of 45-49%. Cardiology is consulted.
- She is admitted to the CCU and treated for peripartum cardiomyopathy and remains in the hospital for 4 days until discharge home.
- She is followed by cardiology with q3 month ECHO, and brings the baby with her to her annual visit in your office when the baby is 1-year-old.

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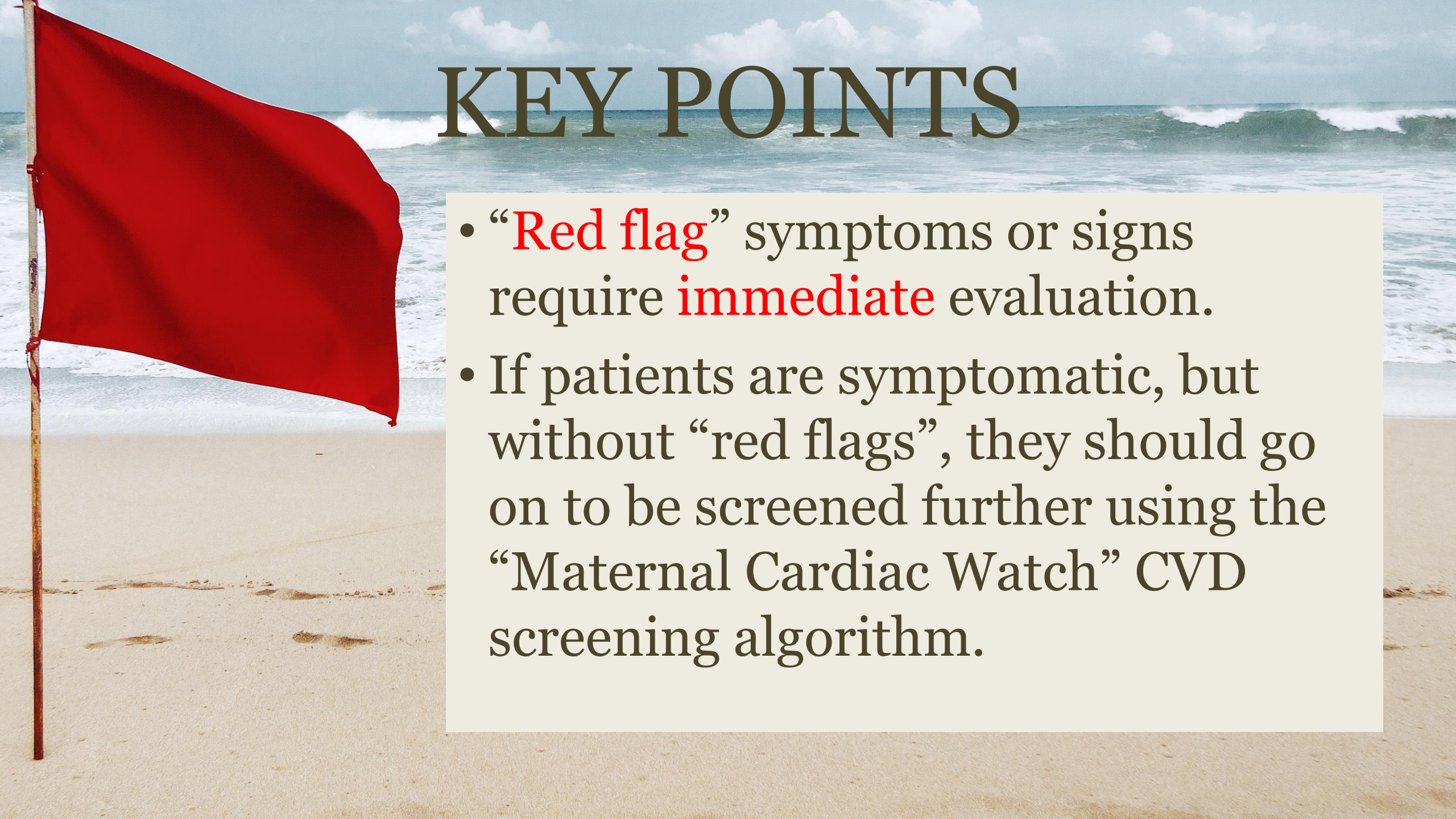


KEY POINTS

- "Red flag" symptoms or signs require immediate evaluation.
- If patients are symptomatic, but without "red flags", they should go on to be screened further using the "Maternal Cardiac Watch" CVD screening algorithm.

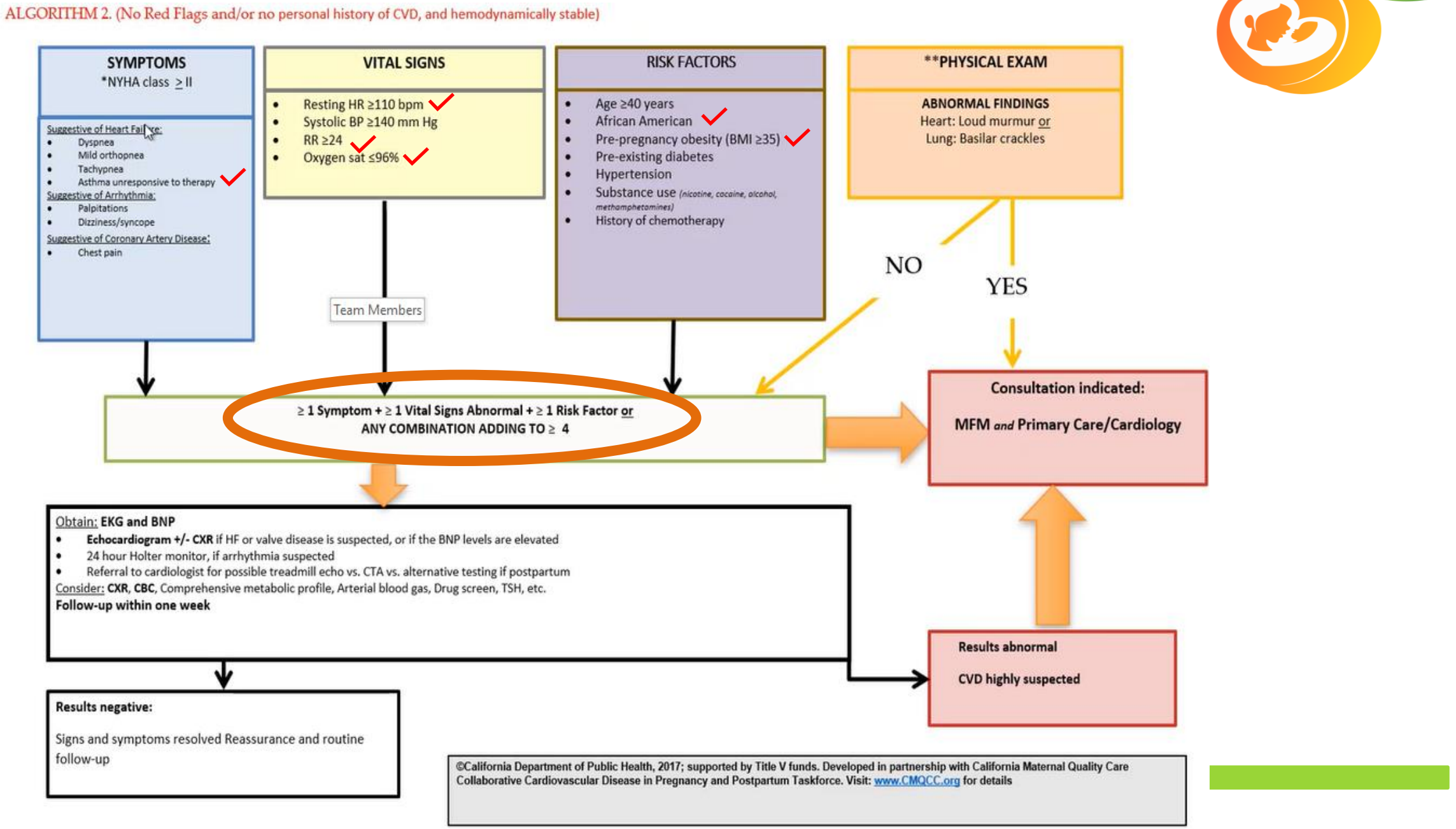
CVD Case Presentation

- 25-year-old obese (BMI 38) African-American G2P2 presents to the ED 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 95% on room air.
- She gets diagnosed with “new onset asthma” and is prescribed a beta-agonist.

CVD Case Presentation (*CONTINUED*)

- One week later, she presents again with continued symptoms and complains that “the inhaler is not working”.
- The nurse in the office applies the CMQCC screening algorithm and has the following findings:
  - Respiratory rate 28
  - Oxygen saturation 95% on room air
  - Heart rate 110 bpm
  - African-American
  - Asthma unresponsive to therapy
- The patient screens “POSITIVE” for CVD risk.

Validated CVD Risk Assessment



Positive CVD Risk Assessment

SYMPTOMS
*NYHA class ≥ II

Suggestive of Heart Failure:
- Dyspnea
- Mild orthopnea
- Tachypnea
- Asthma unresponsive to therapy

Suggestive of Arrhythmia:
- Palpitations
- Dizziness/syncope

Suggestive of Coronary Artery Disease:
- Chest pain
- Dyspnea

VITAL SIGNS
- Resting HR ≥110 bpm
- Systolic BP ≥140 mm Hg
- RR ≥24
- Oxygen sat ≤96%

RISK FACTORS
- Age ≥40 years
- African American
- Pre-pregnancy obesity (BMI ≥35)
- Pre-existing diabetes
- Hypertension
- Substance use *(nicotine, cocaine, alcohol, methamphetamines)*
- History of chemotherapy

The screen results as **"AT RISK"** or **"POSITIVE"** when there is a **YES** to:

- 1 SYMPTOM + 1 VITAL SIGN + 1 RISK FACTOR

OR

- Any combination of >/= 4 in the three categories (SYMPTOMS, VITAL SIGNS, RISK FACTORS)

CVD Case Presentation (*CONTINUED*)

- The patient is sent to the hospital where she gets a chest x-ray, EKG and BNP.
- Chest x-ray reveals mild pulmonary edema. EKG is significant for sinus tachycardia. BNP is 220 pg/mL. ECHO is ordered.
- ECHO shows an EF of 40-45%. She is admitted to the CCU and treated for peripartum cardiomyopathy and remains in the hospital for 8 days until discharge home.
- She is followed by cardiology with q3 month ECHO, and brings the baby with her to her annual visit in your office when the baby is 1-year-old.

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KEY POINTS

- New-onset asthma is rare in adults.
- Improvement of dyspnea with bronchodilators does not confirm the diagnosis of asthma, as CHF may also improve with bronchodilators.

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 95% on room air.
- She gets diagnosed with respiratory infection and is prescribed an antibiotic. Fatigue is attributed to lack of sleep.

CVD Case Presentation (*CONTINUED*)

- One week later, she presents to the ED again with continued symptoms.
- The PA does a lung exam and identifies bibasilar crackles on inhalation.
- MFM evaluates the patient, orders EKG, ECHO, and BNP and consults cardiology.
- The patient's labs and studies are consistent with cardiomyopathy. The patient is admitted and managed by cardiology. The patient is discharged home after a 2-week hospital course.

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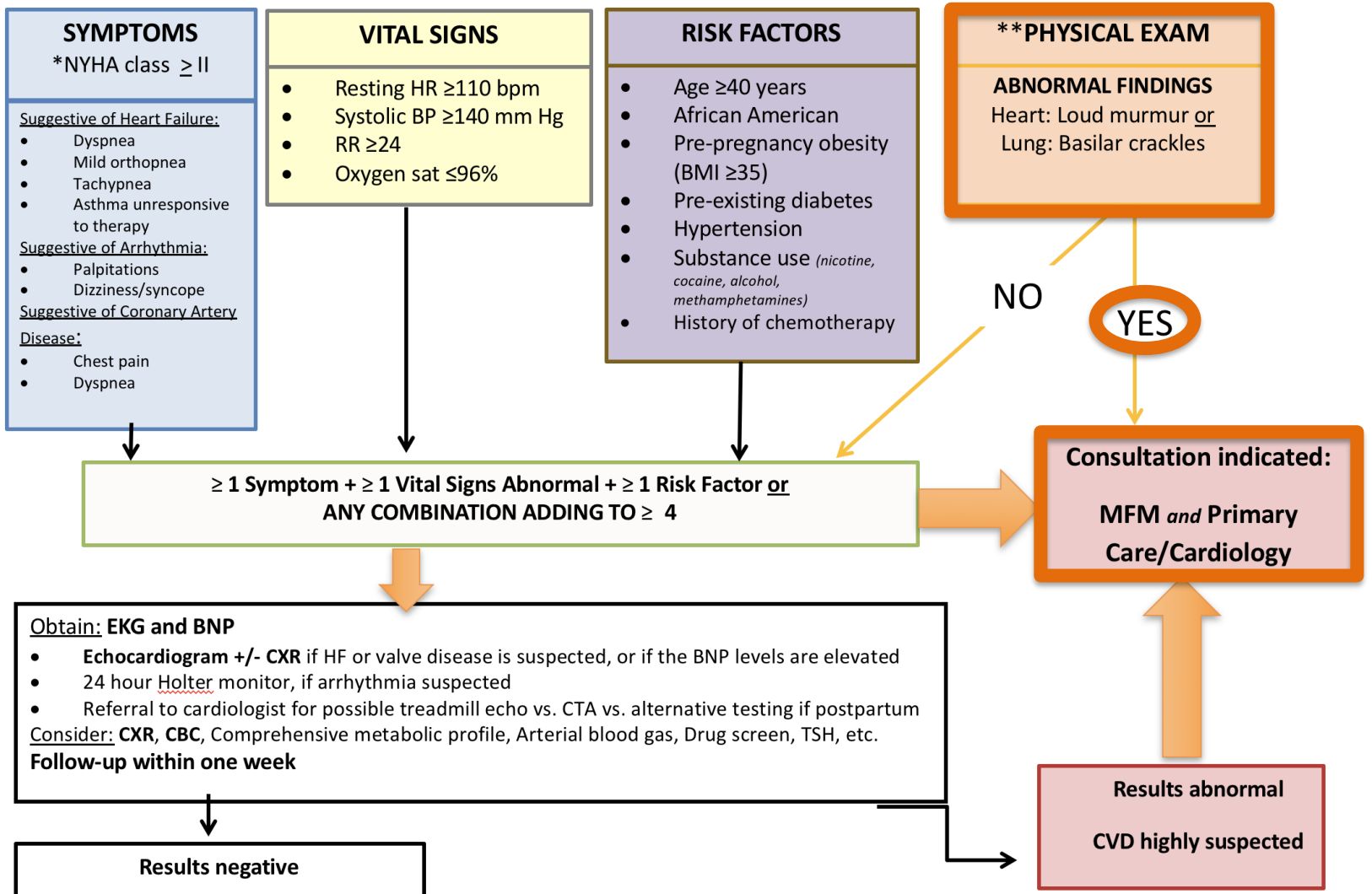
(No Red Flags and/or no personal history of CVD, and hemodynamically stable)



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Positive CVD Risk Assessment

**PHYSICAL EXAM
ABNORMAL FINDINGS Heart: Loud murmur or Lung: Basilar crackles

The screen results as **"at risk" or "positive"** when there is an abnormal finding in the PHYSICAL EXAM:

Basilar Crackles

Abnormal sounds in the base of the lungs

Cause: Basilar Crackles are usually associated with the heart and lungs	• Heart Failure • Pneumonia • Pulmonary Edema
Symptoms that may also be present with Basilar Crackles	• Trouble breathing • Coughing • Swelling of feet and lower legs • Fatigue
Additional Note	• More common to hear during inhalation

Loud Murmur

Grade I: Barely Audible	faint murmur
Grade II:	soft murmur
Grade III: Easily audible	easily audible but without a palpable thrill
Grade IV: Easily audible	easily audible murmur with a palpable thrill
Grade V: Loud Murmur	audible with stethoscope lightly touching the chest
Grade VI: Loudest murmur	audible with stethoscope not touching the chest

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KEY POINTS

- Symptoms related to physiologic changes of pregnancy should be improving in the postpartum period.
- Visits to Emergency Department for dyspnea should raise suspicion for cardiovascular disease.
- Bilateral crackles on lung examination are most likely associated with Congestive Heart Failure (CHF).
- Postpartum dyspnea or new-onset cough is concerning for cardiovascular disease.

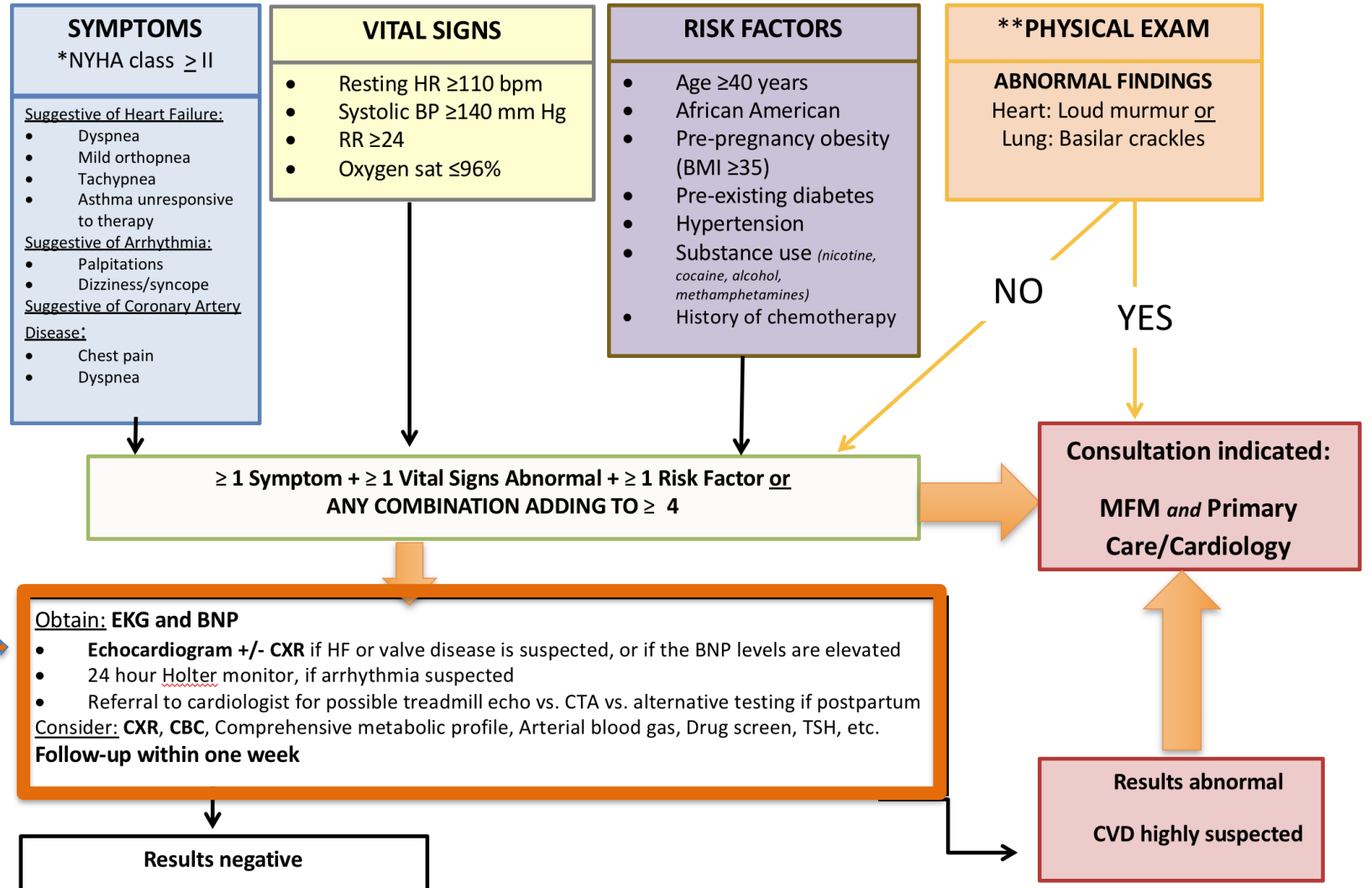
KEY POINTS

- Pneumonia in immunocompetent adults is rare.
- If a patient's presentation is **in**consistent with infection, consider cardiac workup.


SCREEN “POSITIVE” OR “AT RISK”


NOW WHAT?

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



Screen
"at risk" or
"positive"

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Screen "AT RISK" or "POSITIVE"

WORKUP FOR POSTPARTUM DYSPNEA

Labs / studies

- **EKG** – may be normal in cardiomyopathy, except for sinus tachycardia
- **BNP** – an elevated BNP should raise suspicion for CHF
- CBC, Basic Metabolic Panel, Thyroid Function Test (TSH) – if fever, tachycardia or hypertension
- D-dimer – may normally be elevated in pregnancy, however, may be considered for negative predictive value
- Arterial blood gas (ABG) - if O2 sat is low
- *Toxicology screen* - Substance use (e.g., methamphetamine, cocaine) is a strong risk factor for pregnancy-related cardiovascular disease

Imaging

- Chest radiograph – frequently normal in asthma
- Echocardiogram - this should be obtained on an emergency basis if the patient has abnormal vital signs or is very symptomatic, or if BNP abnormal - *Normal LV ejection fraction does not exclude heart failure, normal RV function does not exclude pulmonary embolism*
- Venous Doppler Ultrasound and/or CT pulmonary angiogram if pulmonary embolism suspected

Cardiology consultation as needed

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WHAT?
WHERE?
WHO?
WHEN?
WHY?
HOW?

How to Implement CVD Risk Assessment

Screen

- Use a standardized, validated assessment tool to help identify mothers at increased risk of CVD during pregnancy and 365 days postpartum

Recognize

- Recognize those that screen "At Risk" *(or "positive")* for CVD and have a standardized process for follow up

Refer

- Refer those that screen "At Risk" *(or "positive")* to Cardiology so they get the treatment and support to prevent further complications

Paper CVD Risk Assessment

DATE Screen Completed? _____

Positive Screen? ___YES ____NO

SYMPTOMS	Yes	No
Does the patient feel short of breath with activity?		
Does the patient feel short of breath when lying down?		
Does the patient have palpations? (feel like their heart races or is pounding?)		
Does the patient have dizziness or feel lightheaded?		
Does the patient have rapid respirations? (breathe faster than normal?)		
If the patient has asthma, is it unresponsive to therapy?		
Does the patient have a persistent cough?		
Does the patient have chest pain?		
TOTAL		

VITAL SIGNS	Yes	No
Is the resting Heart Rate 110 or more?		
Is the Systolic Blood Pressure 140 or more?		
Are the Respirations 24 or more?		
Is the Oxygen Saturation 96% or LESS?		
TOTAL		

RISK FACTORS	Yes	No
Is the patient 40 years or older?		
Does the patient identify as African American?		
Is your pre-pregnancy BMI more than 35?		
Does the patient have Diabetes? (before pregnancy)		
Does the patient have hypertension? (high blood pressure before pregnancy)		
Does the patient have a history of having Chemotherapy?		
Does the patient have a history of Use/Abuse of Nicotine, Alcohol, Methamphetamines, or Cocaine?		
TOTAL		

TOTAL Number of YES _____

**If there is at least 1 YES in EACH of the 3 category
OR
A total of 4 or more YES in ANY COMBINATION = POSITIVE CVD RISK

Red Flag SYMPTOMS	Yes	No
Does the patient feel short of breath at rest?		
Does the patient sleep with 4 or more pillows/in a recliner due to SOB/difficulty breathing?		

Red Flag VITAL SIGNS	Yes	No
Is the resting Heart Rate 120 more?		
Is the Systolic Blood Pressure 160 or more?		
Are the Respirations 30 or more?		
Is the Oxygen Saturation 94% or LESS?		

**ANY Red Flag = POSITIVE CVD RISK

IF Positive RED FLAG:
1. Notify OB Provider
2. Provider to Consider:
   - Rapid Response Team (if indicated)
   - Consult General Cardiology
   - Enter "Maternal Cardiac High Risk Nursing Protocol
3. After acute symptom management, complete risk assessment and Consult Women's Heart Center

PHYSICAL EXAM	Yes	No
Basilar Crackles in Lungs Present?		
Loud Heart Murmur Present?		

**ANY Physical Exam Finding = POSITIVE CVD RISK

If POSITIVE CVD Risk Assessment:
1. Enter "Maternal Cardiac High Risk Nursing Protocol
   - This will order:
     - Women's Heart Center Consult
     - NT proBNP

Patient Sticker

Symptom, Vital Signs, and Risk Factor Categories:

Positive Screen is when:
- One YES in EACH CATEGORY (Symptoms, Vital Signs, Risk Factors)
  OR
- YES to 4 or more in any combination of CATEGORY

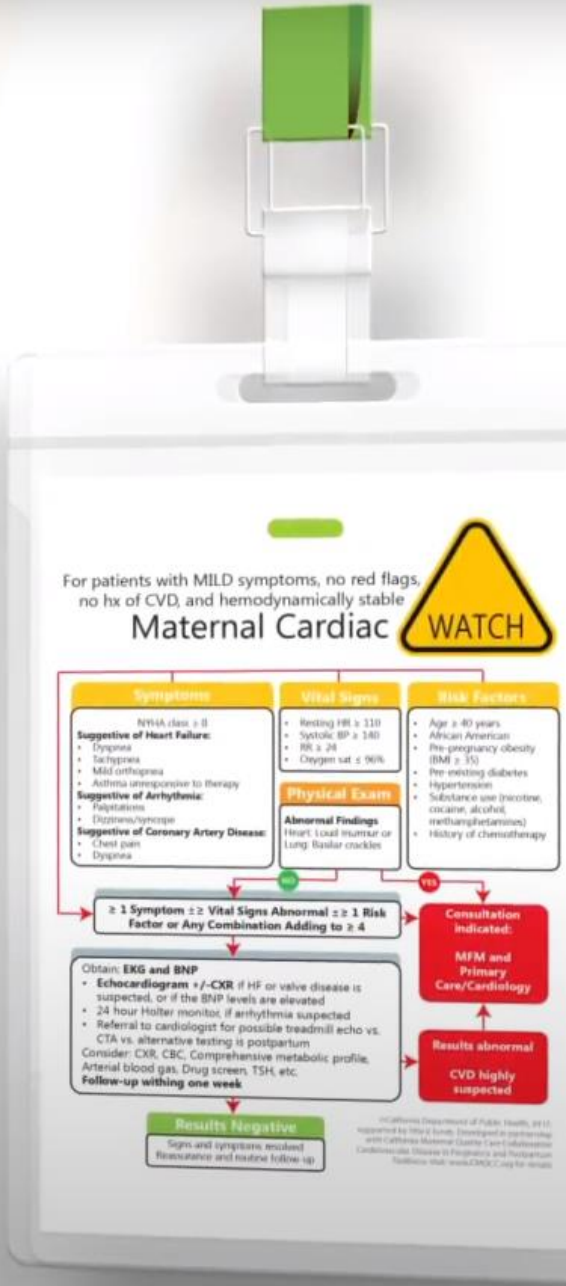
Physical Exam:

Positive Screen is when:
- One YES in Physical Exam

RED Flags

Positive Screen is when:
- YES to ANY RED FLAGS

Maternal Cardiac Watch and Warning Badge Buddy



Provides immediate access to screening tools

Providers

screen pregnant and postpartum patients at every visit

Maternal Cardiac Watch and Warning Posters

Maternal Cardiac

For patients with SEVERE symptoms and/or personal hx of CVD

WARNING

Red Flags

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥ 120 bpm
- Resting systolic BP ≥ 160 mm Hg
- Resting RR ≥ 30
- Oxygen saturations ≤ 94% with or without personal history of CVD

Personal History of CVD without Red Flags

Prompt Evaluation and/or Hospitalization for acute sysmptoms

Consultations with MFM and Primary Care/Cardiology

GaPQC
GEORGIA PERINATAL QUALITY COLLABORATIVE

For more information, scan the QR code.

For patients with MILD symptoms, no red flags, no hx of CVD, and hemodynamically stable

Maternal Cardiac

WATCH

Symptoms

NYHA class ≥ II

Suggestive of Heart Failure:
- Dyspnea
- Tachypnea
- Mild orthopnea
- Asthma unresponsive to therapy

Suggestive of Arrhythmia:
- Palpitations
- Dizziness/syncope

Suggestive of Coronary Artery Disease:
- Chest pain
- Dyspnea

Vital Signs

- Resting HR ≥ 110
- Systolic BP ≥ 140
- RR ≥ 24
- Oxygen sat ≤ 96%

Physical Exam

Abnormal Findings
Heart: Loud murmur or
Lung: Basilar crackles

Risk Factors

- Age ≥ 40 years
- African American
- Pre-pregnancy obesity (BMI ≥ 35)
- Pre-existing diabetes
- Hypertension
- Substance use (nicotine, cocaine, alcohol, methamphetamines)
- History of chemotherapy

NO

YES

≥ 1 Symptom ±≥ Vital Signs Abnormal ±≥ 1 Risk Factor or Any Combination Adding to ≥ 4

Consultation indicated:

MFM and Primary Care/Cardiology

Obtain: **EKG and BNP**
- **Echocardiogram +/-CXR** if HF or valve disease is suspected, or if the BNP levels are elevated
- 24 hour Holter monitor, if arrhythmia suspected
- Referral to cardiologist for possible treadmill echo vs. CTA vs. alternative testing is postpartum

Consider: CXR, CBC, Comprehensive metabolic profile, Arterial blood gas, Drug screen, TSH, etc.
Follow-up withing one week

Results abnormal

CVD highly suspected

Results Negative

Signs and symptoms resolved
Reassurance and routine follow-up

Post in areas where pregnant and postpartum patients are evaluated

CVD Risk Assessment in EHR

Does the patient have shortness of breath with activity?	
Does the patient have shortness of breath at rest?	
Does the patient have mild difficulty breathing when lying flat?	
Does the patient sleep on 4 or more pillows?	
Does the patient have rapid respirations?	
If patient has asthma, is it unresponsive to therapy?	
Does the patient have palpitations?	
Does the patient have dizziness or syncope?	
Does the patient have chest pain?	
Does the patient have a cough?	
Vital Signs	
Is the patient's resting HR greater than or equal to 110 to 119 bpm?	
Is the patient's HR greater than or equal to 120bpm?	
Is the patient's resting systolic BP greater than or equal to 140 mmHg?	
Is the patient's resting systolic BP greater than or equal to 160 mmHg?	
Are the patient's respirations greater than or equal to 24?	
Are the patient's respirations greater than or equal to 30?	
Is the patient's O2 sat 95-96%?	
Is the patient's O2 sat less than 95% with or without personal hx of CVD?	
Risk Factors	
Is the patient 40 years of age or older?	
Is the patient african american?	
Is the patient's pre-pregnancy BMI greater than or equal to 35?	
Does the patient have pre-existing diabetes?	
Does the patient have HTN?	
Does the patient have substance use (nicotine, cocaine, alcohol, methamphetami...	
Does the patient have a hx of chemotherapy?	
Physical Exam	
On physical exam does the patient have a murmur?	
On physical exam does the patient have basilar crackles?	
CVD Total Risk Score	
Total Risk Score	
Screening Result	

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
- Symptoms that are deteriorating
- Chest pain, palpitations, or dizziness
- New-onset cough or wheezing
- Pedal or lower extremity edema and if it is improving or deteriorating
- Unexpected fatigue, i.e., needing to stop frequently when walking
- Inability to lie flat due to shortness of breath, and if this is a change, how many pillows does she use
- Failure to lose weight or unusual weight gain, and how much
- A history of cardiac or pulmonary conditions
- A history of substance use and/or tobacco use
- Has been seen by other providers or in other Emergency Departments since giving birth.


WHAT?
WHERE?
WHO?
WHEN?
WHY?
HOW?


OB Triage
OB ED
ANYWHERE
Outpatient office
Emergency Department

PRACTICE CASES

42 yo G2P2 AAF on POD 1 s/p repeat CD complicated by PPH c/o palpitations & lightheadedness. Vitals BP 98/65, HR 120 bpm, RR 14/min, T 98.9°F, and O2 sat is 98% RA. What is the best next step?

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SlideLizard

43 yo AA G1P1 at 6 wk postpartum visit with c/o congestion, SOB, sore throat, subjective fevers, and chills. BP is 149/88, HR is 117 bpm and temp is 101.3°F. What is the best next step?

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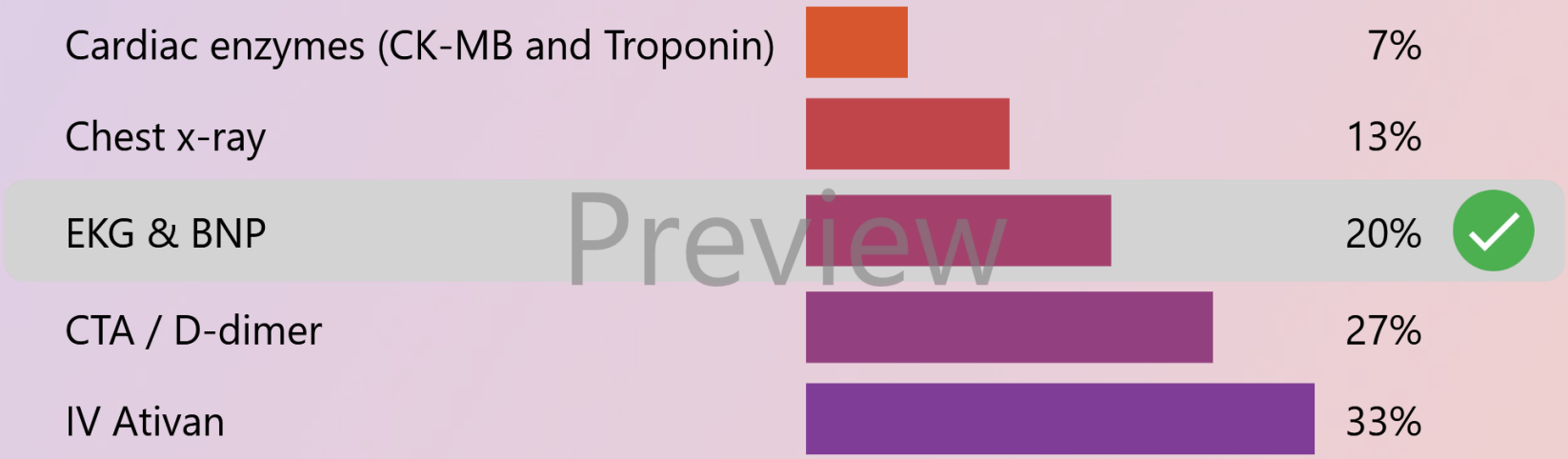
34 yo G3P2 PPD 0 s/p SVD c/o chest pain and dyspnea 30 minutes after delivery. VS: BP 116/73, HR 115 bpm, T 99.0°F, O2 sat 98% RA, and on lung exam you hear bilateral crackles. What is the next step?

34 yo G3P2 PPD 0 s/p SVD c/o chest pain and dyspnea 30 minutes after delivery. VS: BP 116/73, HR 115 bpm, T 99.0°F, O2 sat 98% RA, and on lung exam you hear bilateral crackles. What is the next step?



Time left: -

Votes: 0

SlideLizard

32yo G1P0 @ 38 wk w/ a PMH of asthma presents to OB ED with cold-like sx for the past 3 days. She reports worsening SOB & wheezing not relieved with her albuterol inhaler. What is the best next step?

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SlideLizard

32 yo G1 @ 39 wk w/ hx of asthma c/o worsening SOB & wheezing was seen in ED last wk w/same complaints & now breathing tx not working. VS: BP 118/70, HR 126 bpm, RR 30, T 98.8F, O2 sat 96%. Next step?

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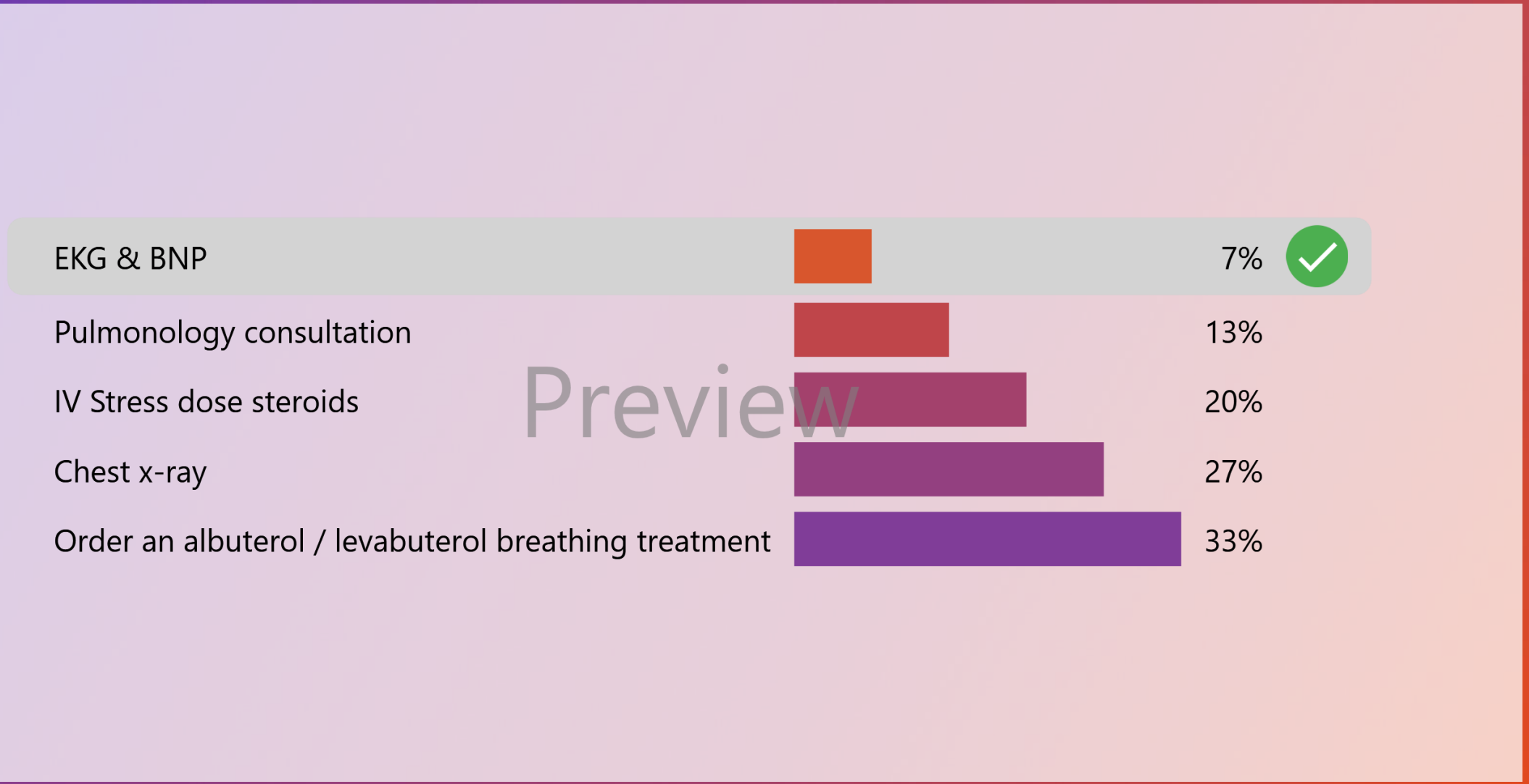

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SlideLizard

Votes: 0

SlideLizard

A 25 yo G2P1001 at 12 weeks gestation with a h/o congenital heart defect, presents with a BP of 130/80 and a resting HR of 120 bpm. What is the best next step?

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SlideLizard

A 35yo G4P2012 with a h/o Marfan's Disease presents to clinic at 8 weeks gestation initial prenatal visit. Vital signs are stable and she is currently asymptomatic. What is the best next step?

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SlideLizard

30 yo AAF @18 wk w/ PMHx of PPCM here for new OB visit. While taking her hx you notice that she stops to breathe in the middle of sentences. BP is normal and urine is negative. What is the next step?

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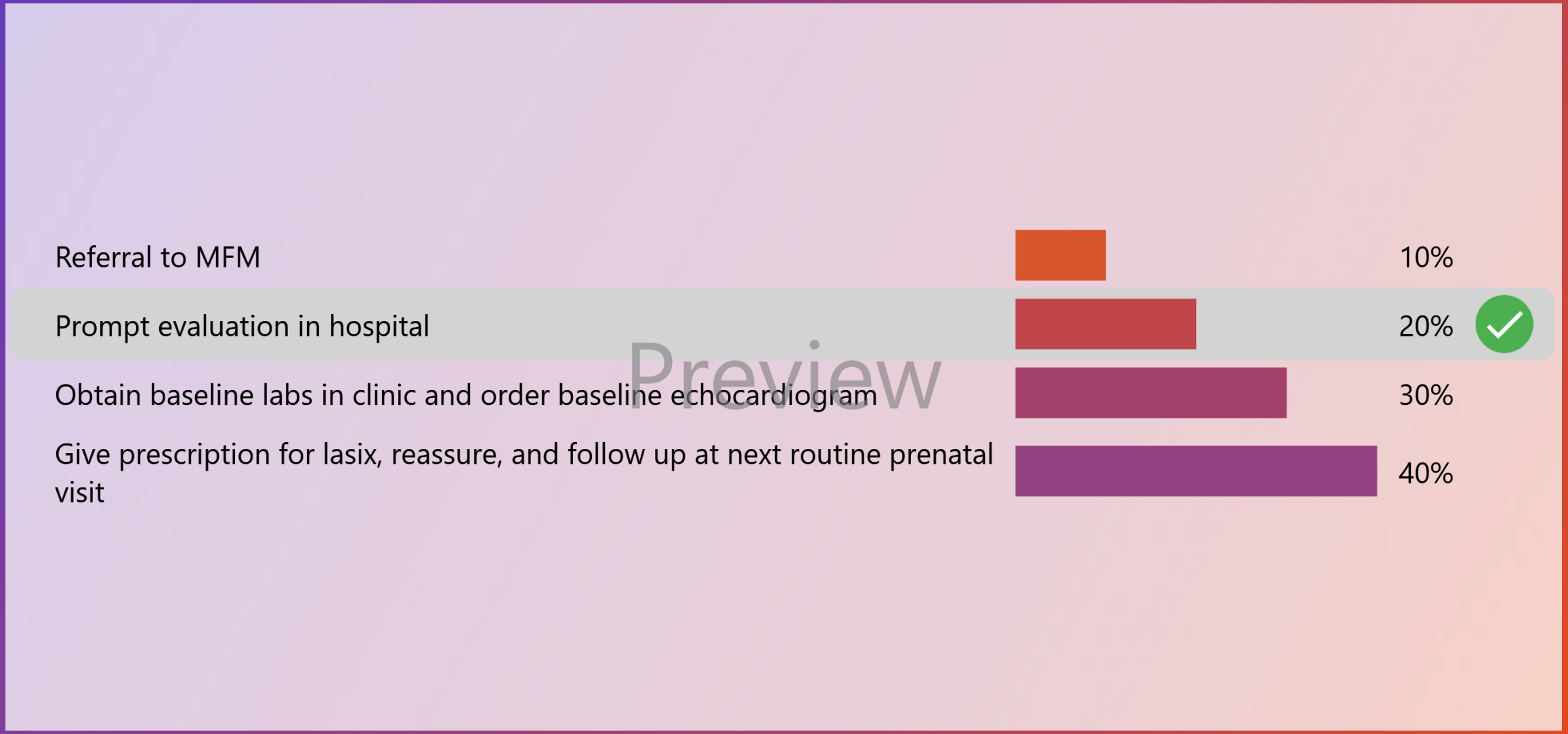

Time left: -

Votes: 0

SlideLizard

35 AAF G4P4 @ 12 wk with a h/o aortic stenosis s/p biologic valve replaced 15 years ago. She reports conversational SOB. She is normotensive & resting HR is 115 bpm, O2 sat 95% RA. Best next step?

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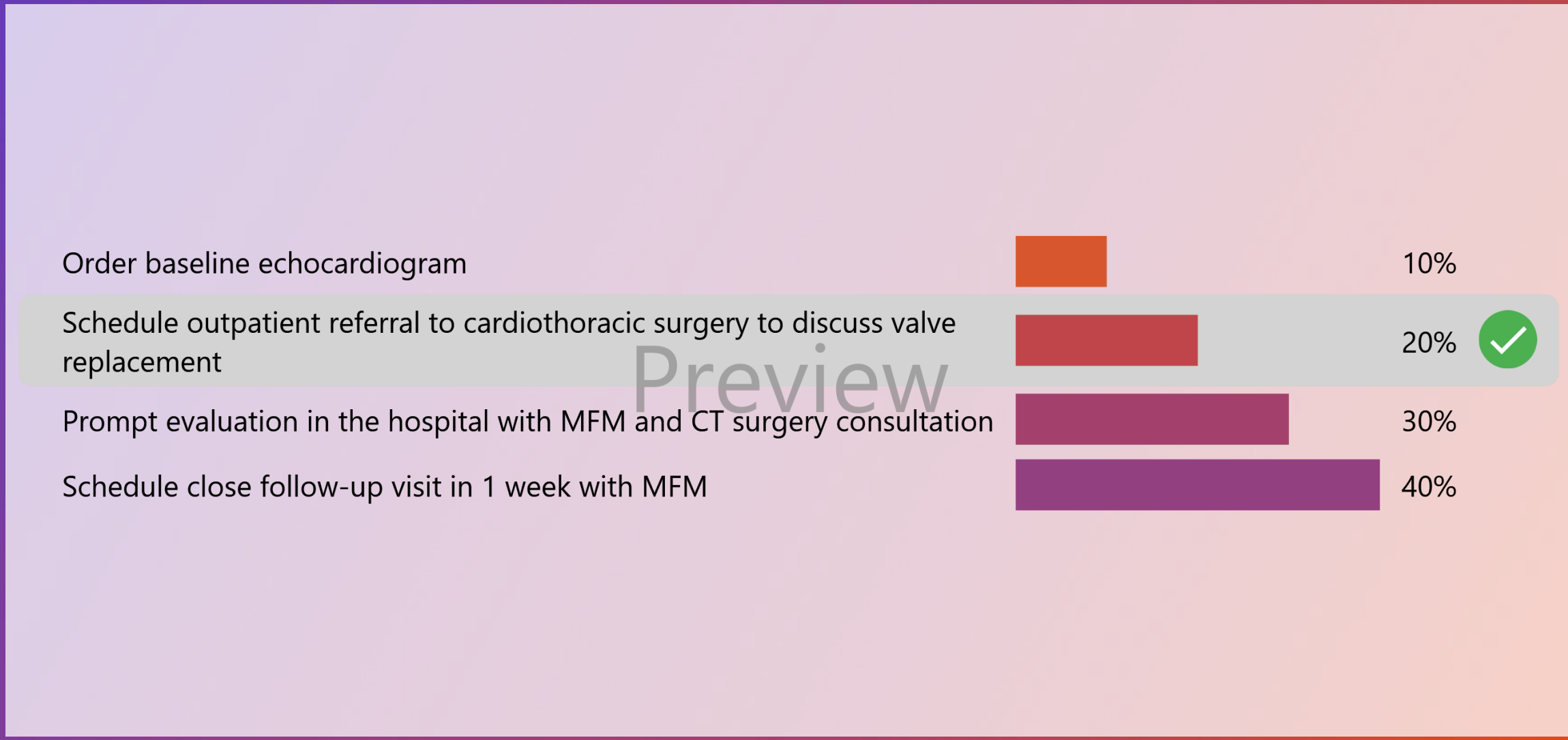

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Cardio-OB App

Cardio OB

Scan this QR code to access the app!

Thank you!!!

Download and print materials for free
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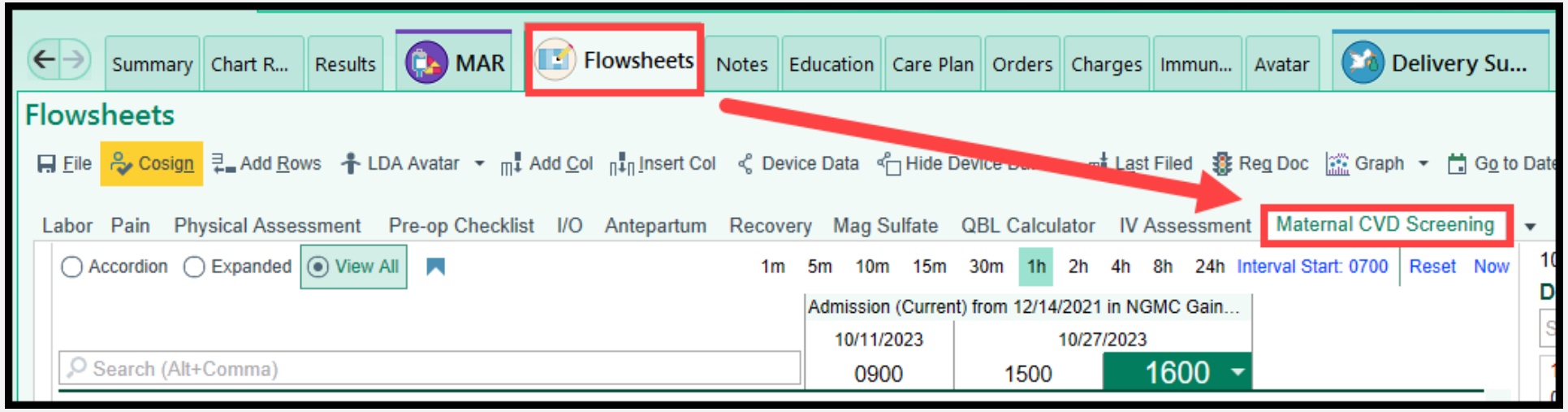
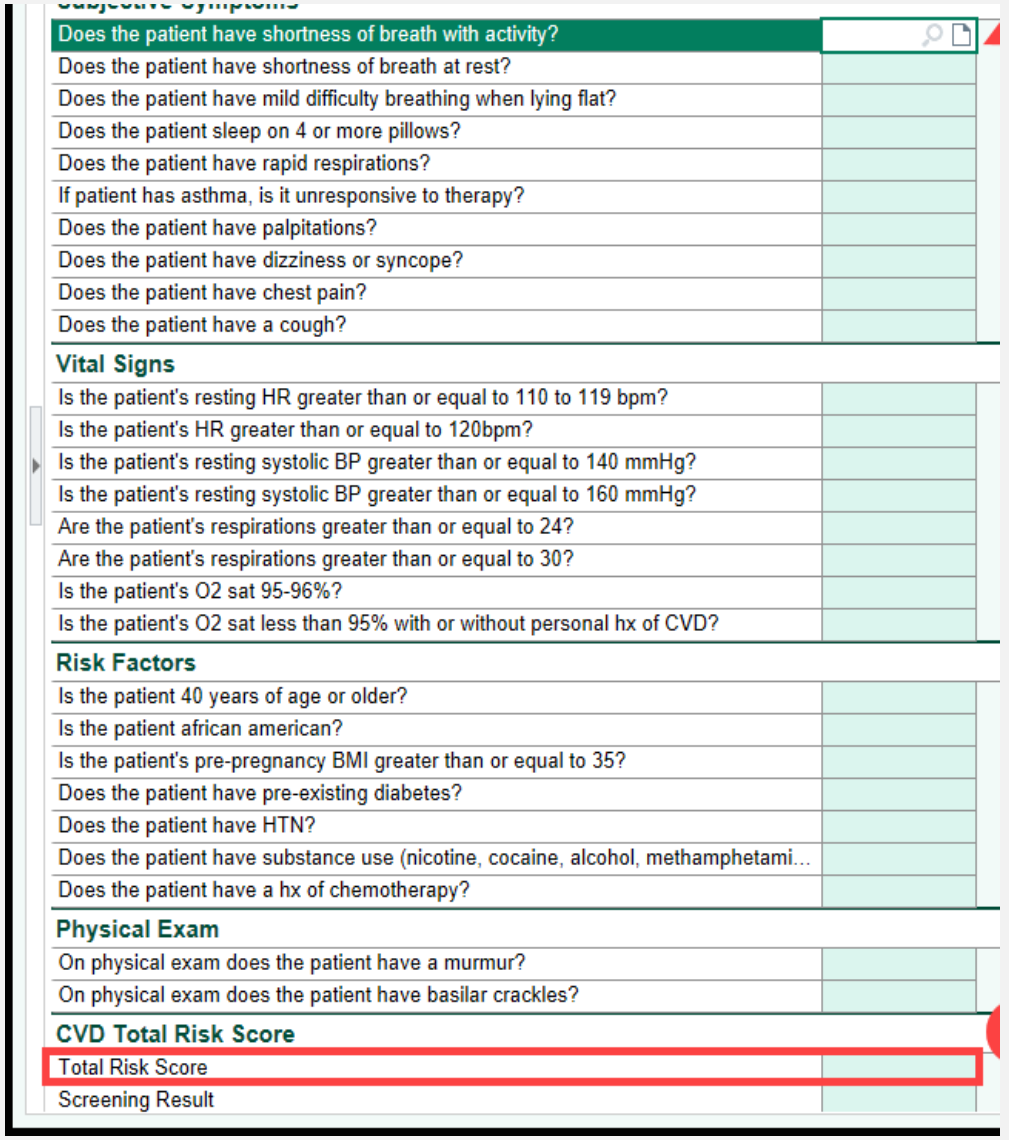
Building CVD Risk Assessment in EPIC

1. Open the patient's chart
2. Open the Flowsheet activity and select “Maternal CVD Screening”

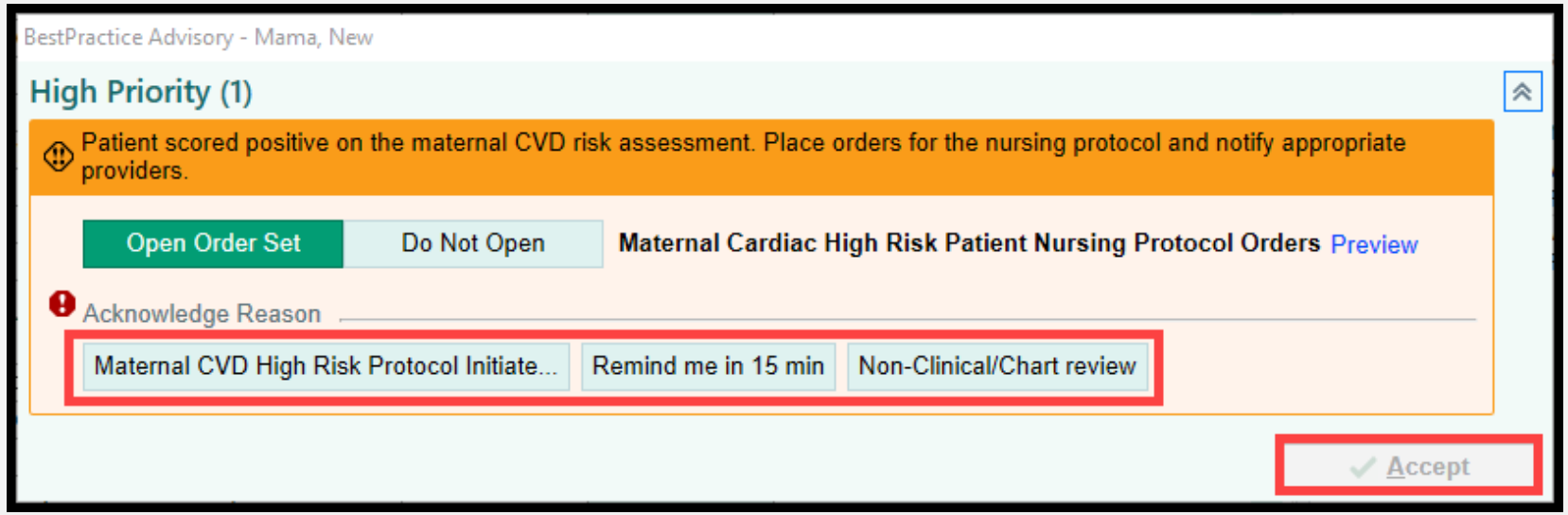


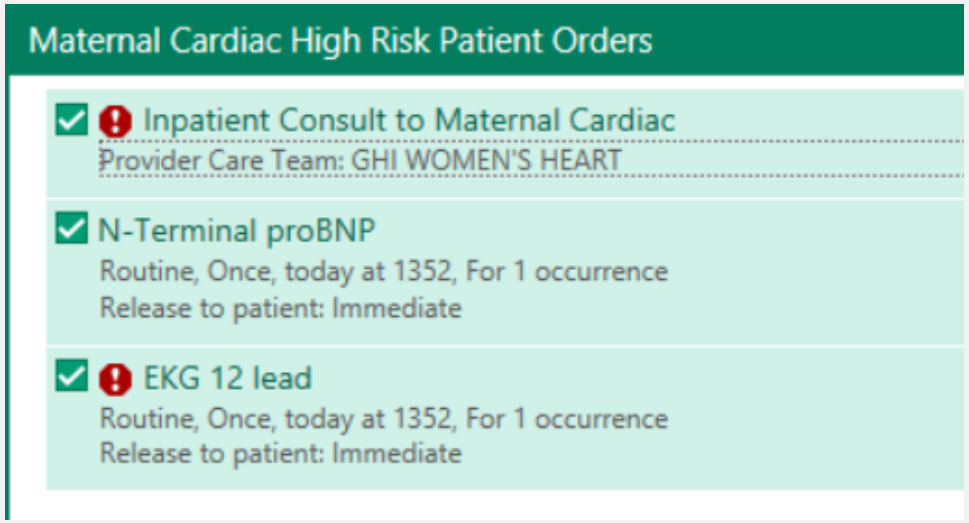
Building CVD Risk Assessment in EPIC

1. Answer all questions on the screening template.
2. Select the **File** button
3. The screen will calculate by the answers
4. If a total risk score does not calculate make sure all questions are answered.
5. If the CVD Risk Assessment calculates “At RISK” then a BPA will fire to the Nurse and Provider



Building BPA in EPIC
Nursing BPA



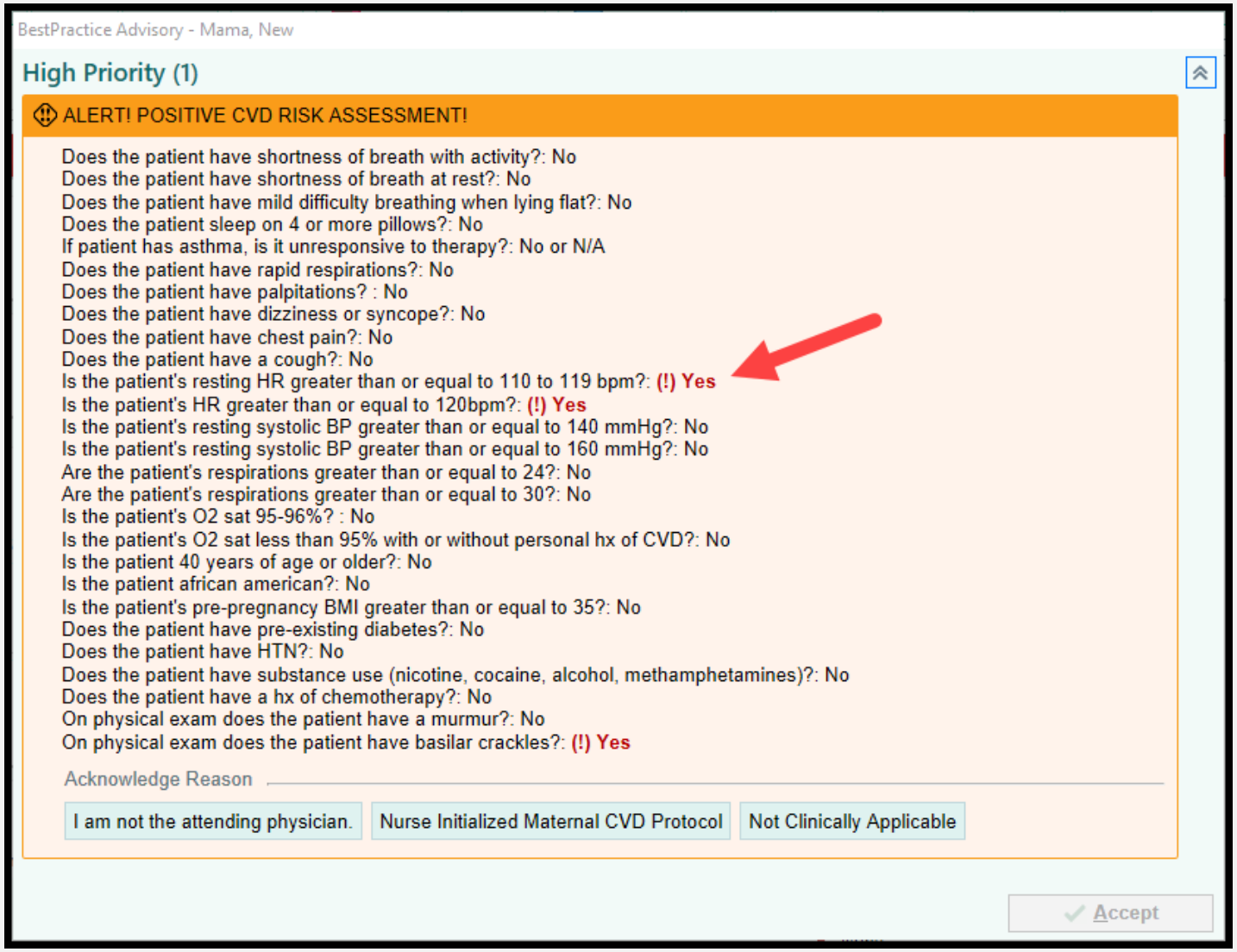


1. If the patient's screen calculates "At Risk"- a BPA will open
2. When the BPA opens, the RN will select an acknowledge reason and Open Order Set
   - The Nursing protocol will open right from BPA
3. Click **Accept**
4. The order set includes:
   a. Consult to Women's Heart Center Cardiology
   b. proBNP
   c. EKG

Building BPA in EPIC
Provider BPA

- If a patient's screen calculates "At Risk" on the Maternal CVD Screening tool- a BPA will open when the provider opens the patient's chart
- Provider will select an acknowledge reason and click "Accept"

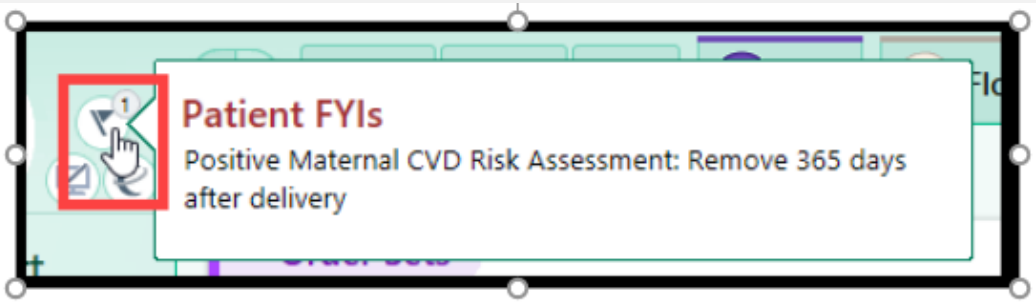
Note: The positive answer from the screening tool will show in red.

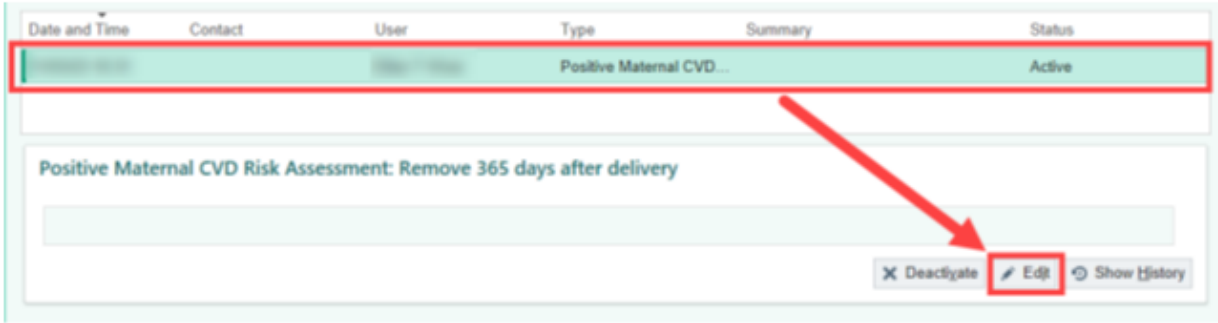


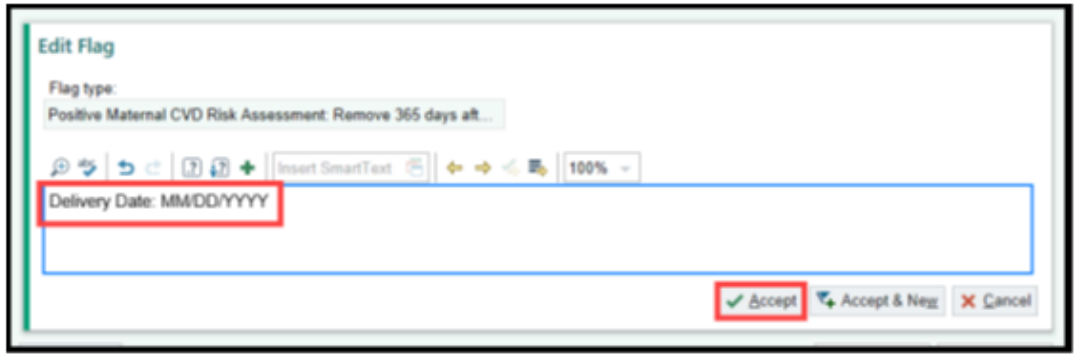
Maternal CVD Risk FYI Flag

If the patient triggers **“At risk”** an FYI flag will be added in the top right-hand corner of the storyboard.

- The flag indicates that the patient has a Positive CVD Risk Assessment and will increase awareness throughout other applications in EPIC
- Once the patient has delivered, the patient’s delivery date needs to be added to flag.







Follow the steps below to update the flag

1. Select the flag in the patient’s storyboard
2. Click on the flag and select EDIT
3. Enter **Delivery Date: Month/Date/Year** and click **Accept**

Take Away

Take patient complaints seriously

CVD maternal deaths may be prevented with earlier recognition, referral, diagnosis and treatment

Pregnancy provides health care providers opportunities to detect and treat heart disease, improve pregnancy outcomes, and affect future cardiovascular health

Future CVD risk can be reduced with healthy lifestyle changes.

Data collection

- Patient Name
- MRN Number
- Date
- MD/CNM Notified
- Short of Breath - Activity
- Short of Breath - Lying Down
- Palpitations
- Dizziness or Lightheadedness
- Rapid Respirations
- Unresponsive Asthma
- Persistent Cough
- Chest Pain
- Resting Heart Rate 110 or more
- Systolic BP 140 or more
- Respirations 24 or more
- O2 Saturation 96% or Less
- Age over 40
- African American
- Pre-Pregnancy BMI 35 or more
- Diabetes before pregnancy
- Hypertension before pregnancy
- Chemotherapy History
- History of Use - Nicotine/Alcohol/Meth/Cocaine
- Basilar Crackles in Lungs
- Loud Heart Murmur
- Short of Breath - At Rest
- Sleep with pillows or recliner
- Resting Heart Rate 120 or more
- Systolic BP 160 or more
- Respirations 30 or more
- O2 Saturation 94% or less
- Marked At Risk
- RED FLAG TOTAL
- SYMPTOM TOTAL
- VITALS TOTAL
- RISK TOTAL
- PHYSICAL EXAM TOTAL
- TRIGGER RED FLAGS
- TRIGGER TOTAL OVER 4
- TRIGGER ALL CATEGORIES
- POSITIVE CVD RISK
- HDP this pregnancy *(1-GHTN, 2-PreE w/o SF, 3-PreE w/SF, 4-CHTN w/superimposed PreE w/SF, 5- HELLP, 6- Eclampsia)*
- Diabetes this pregnancy *(1- Pregestational Type 1 DM, 2- Pregestational Type 2 DM, 3- GDM)*
- Week of Gestation at Delivery
- Earlier delivery resulting from positive CVD screen
- Screen setting *(1-OB office, 2- OB triage, 3-antepartum admission, 4-postpartum unit, 5- postpartum office visit, 6-ED)*
- Screen timing *(1: Antepartum, 2: < 1 week Postpartum (pp), 3: 1 - 4 wk pp, 4: 1-3 mo pp, 5: 3- 6 mo pp, 6: 6-12 mo pp)*
- Elevated BNP/ NT-proBNP
- ECHO ordered as result of screen
- Positive ECHO findings
- *Cardiomyopathy (1) or Heart Failure (2)* diagnosed as a result of screen
- Inpatient Cardiology consult as a result of screen
- Transfer to ICU/CCU/IMCU because of cardiac condition *(1- ICU, 2-CCU, 3-IMCU)*
- *Readmission (1) or LOS > 5d (2)*due to cardiac condition
- CVD screen date
- Outpatient Cardiology referral as a result of CVD screen
- Referred to Cardiology postpartum
- Follow up Notes
- Race/ethnicity
- Age
- BMI
- Language
- Parity (combine term and preterm)
- Taking baby aspirin
- Taking antihypertensives
- Taking antihypertensives antepartum
- Prescribed insulin antepartum

DATE Screen Completed? _____

Positive Screen? ___YES ____NO

Patient Sticker

SYMPTOMS	Yes	No
Does the patient feel short of breath with activity?		
Does the patient feel short of breath when lying down?		
Does the patient have palpations? (feel like their heart races or is pounding?)		
Does the patient have dizziness or feel lightheaded?		
Does the patient have rapid respirations? (breathe faster than normal?)		
If the patient has asthma, is it unresponsive to therapy?		
Does the patient have a persistent cough?		
Does the patient have chest pain?		
TOTAL		

VITAL SIGNS	Yes	No
Is the resting Heart Rate 110 or more?		
Is the Systolic Blood Pressure 140 or more?		
Are the Respirations 24 or more?		
Is the Oxygen Saturation 96% or LESS?		
TOTAL		

RISK FACTORS	Yes	No
Is the patient 40 years or older?		
Does the patient identify as African-American?		
Is their pre-pregnancy BMI 35 or higher?		
Does the patient have Diabetes? (before pregnancy)		
Does the patient have hypertension? (high blood pressure before pregnancy)		
Does the patient have a history of having Chemotherapy?		
Does the patient have a history of Use/Abuse of Nicotine, Alcohol, Methamphetamines, or Cocaine?		
TOTAL		

TOTAL Number of YES _____

**If there is at least 1 "YES" in EACH of the 3 categories

OR

A total of 4 or more "YES" in ANY COMBINATION = POSITIVE CVD

Red Flag SYMPTOMS	Yes	No
Does the patient feel short of breath at rest?		
Does the patient sleep with 4 or more pillows/in a recliner due to SOB/difficulty breathing?		

Red Flag VITAL SIGNS	Yes	No
Is the resting Heart Rate 120 or more?		
Is the Systolic Blood Pressure 160 or more?		
Are the Respirations 30 or more?		
Is the Oxygen Saturation 94% or LESS?		

**ANY Red Flag = POSITIVE CVD RISK

IF Positive RED FLAG:

1. Notify OB Provider
2. Provider to Consider:
   - Rapid Response Team (if indicated)
   - Consult General Cardiology
   - Enter "Maternal Cardiac High Risk Protocol"
3. After acute symptom management, complete risk assessment and Consult Women's Heart Center (MFM/Cardiology)

PHYSICAL EXAM	Yes	No
Basilar Crackles in Lungs Present?		
Loud Heart Murmur Present?		

**ANY Physical Exam Finding = POSITIVE CVD RISK

If POSITIVE CVD Risk Assessment:

1. Enter "Maternal Cardiac High Risk Protocol"
   - This will order:
     - Women's Heart Center Consult (MFM/Card)
     - NT proBNP
     - EKG

0 = No, 1= Yes (or 1+ specifies)

HDP this pregnancy (1-GHTN, 2-PreE w/o SF, 3-PreE w/SF, 4-CHTN w/ superimposed PreE w/SF, 5- HELLP, 6- Eclampsia)	
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Race/Ethnicity	
Age	
BMI	
Language (0= English, 2=Spanish, 3= Other)	
Parity (combine term and preterm)	
Taking baby aspirin	
Taking antihypertensives	
Taking insulin antepartum	
Additional notes:	

STATE-WIDE RESIDENCY QIPS COLLABORATIVE TIMELINE