



Cardiac Lecture Series #2: Cardiac Warning Signs

November 1, 2022



Updates



- Next Maternal Webinar December 6th
Topic: *Cardiomyopathy* | Speaker: Charisma Manley, MD
- GaPQC Perinatal Improvement Coordinator – [Amy Stratton](#)
- Quality Improvement Support – [Shane Reed](#)
- Cardiac Initiative Onboarding
- GaPQC Data Transition to Survey 123



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Cardiac Warning Signs

Natalie Poliektov, DO, MS
Emory Gyn/Ob PGY-3

November 1, 2022
2:00 - 3:00 PM



Department of Gynecology
and Obstetrics

Disclosures

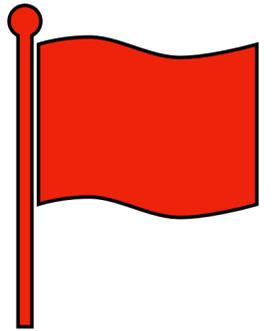
External Industry Relationships	Company	Role
Equity, stock or options in biomedical industry companies or publishers	None	None
Board of Directors or officer	None	None
Royalties from Emory or from external entity	None	None
Industry funds to Emory for my research	None	None
Other	None	None

Learning Objectives

1. Understand cardiovascular changes in pregnancy

2. Recognize the red flags of cardiac pathology

3. **Confidently** manage pregnant and postpartum cardiac patients



Outline

Background and
significance

Review
cardiovascular
physiology in
pregnancy

Discuss general
management

Case
presentations

Background

Cardiovascular disease affects 1-4% of pregnancies in the U.S. each year



Congenital

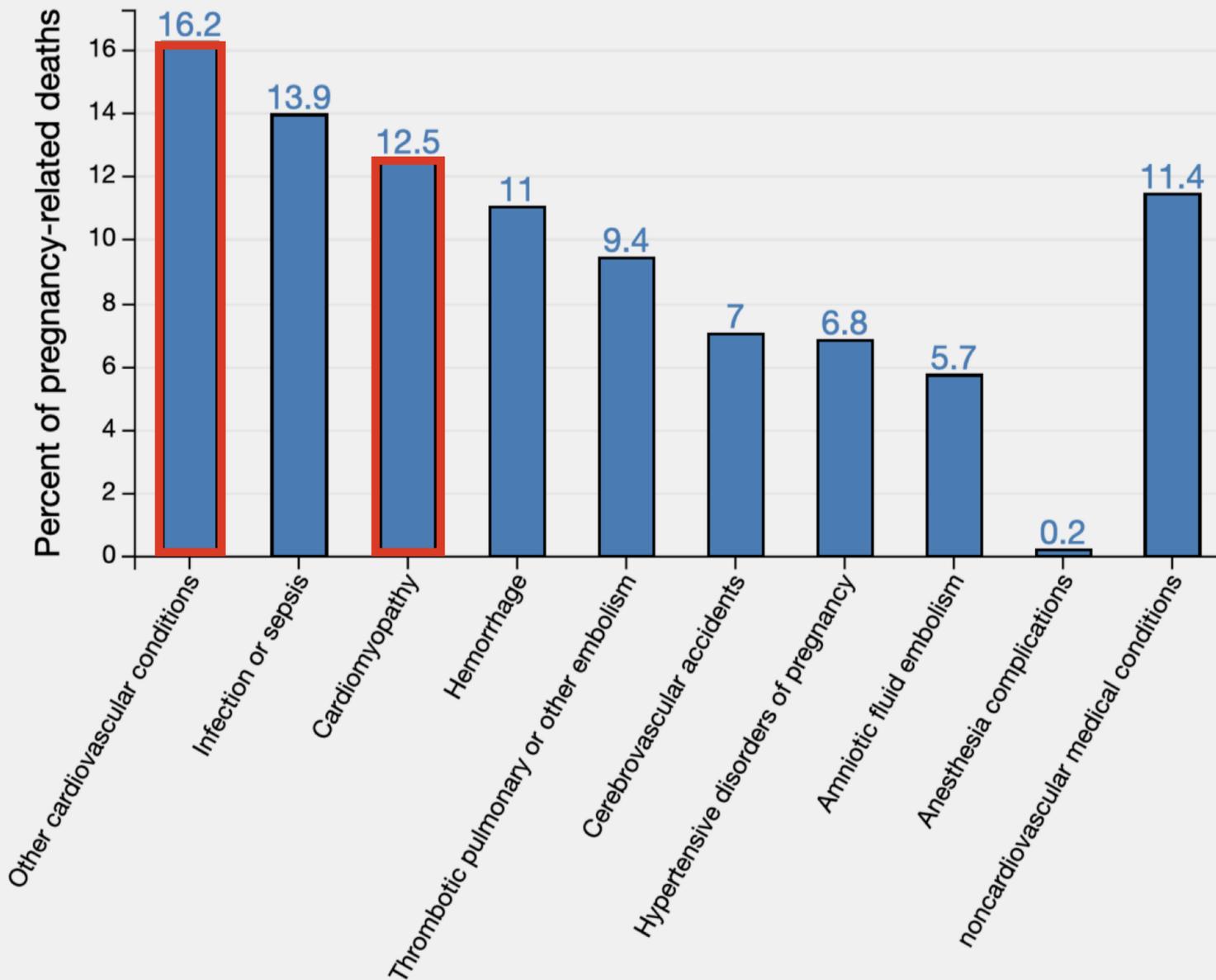
Acquired

- Cardiac valve disorders
- Cardiomyopathies
- Arrhythmias
- Coronary artery disease
- Pulmonary hypertension
- Aortic dissection

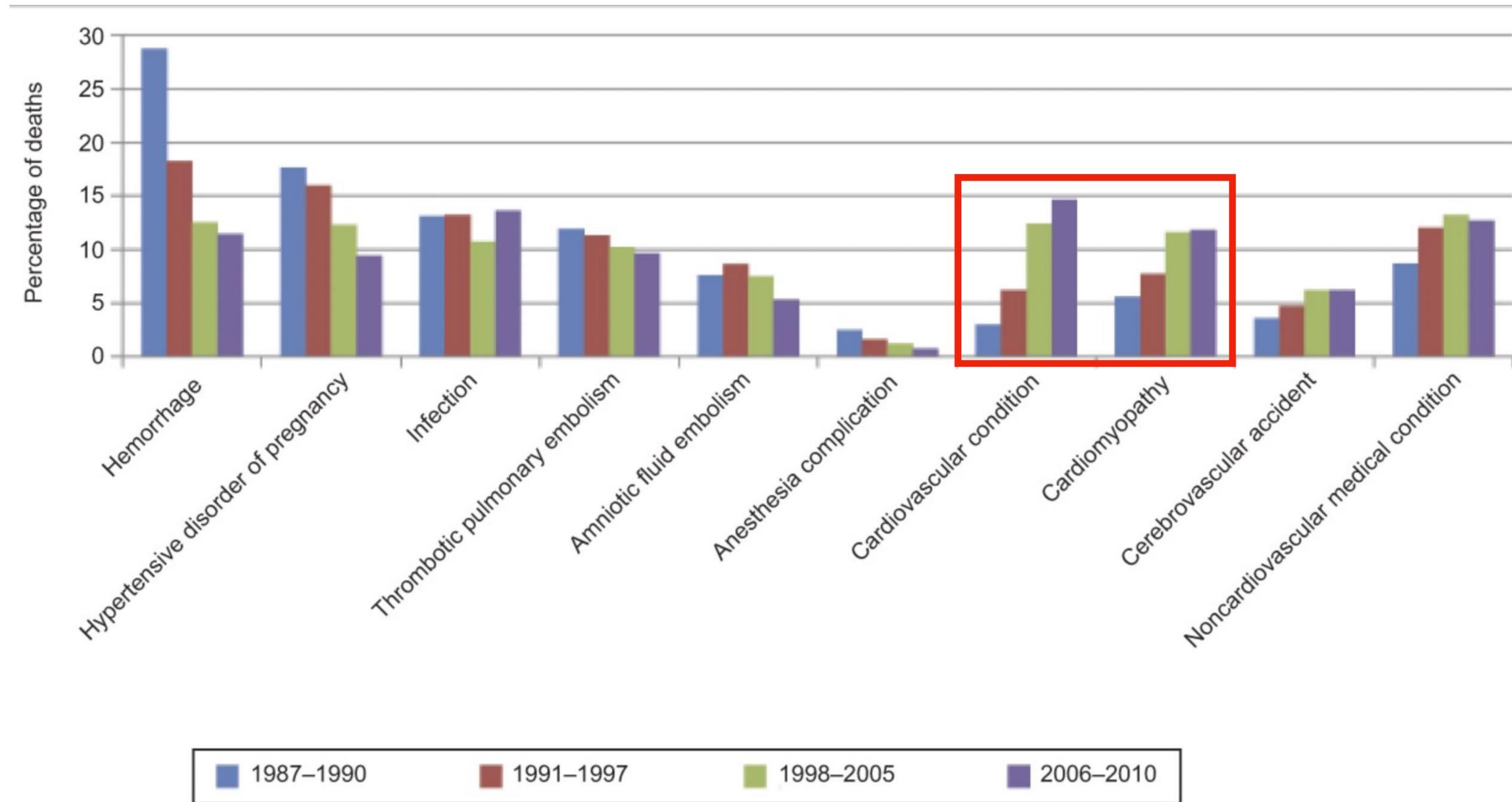
The most common cause of maternal death



Causes of pregnancy-related death in the United States: 2016-2018



Maternal mortality trends over time



Risk factors for CVD-related maternal mortality



Race/ethnicity



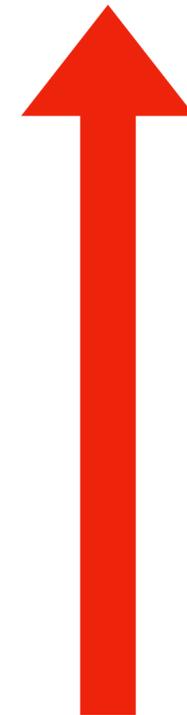
Age



Hypertension



Obesity

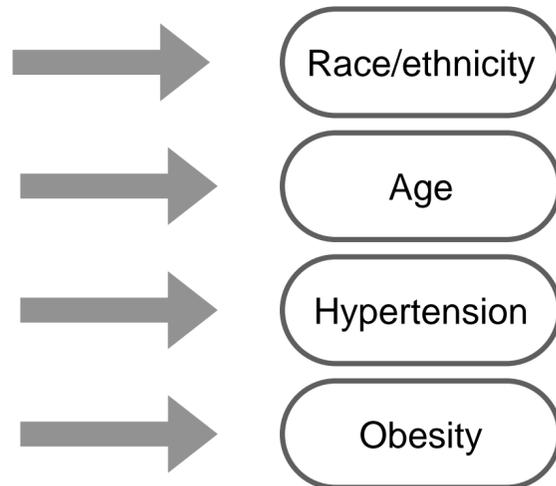


Risk factors for CVD-related maternal mortality

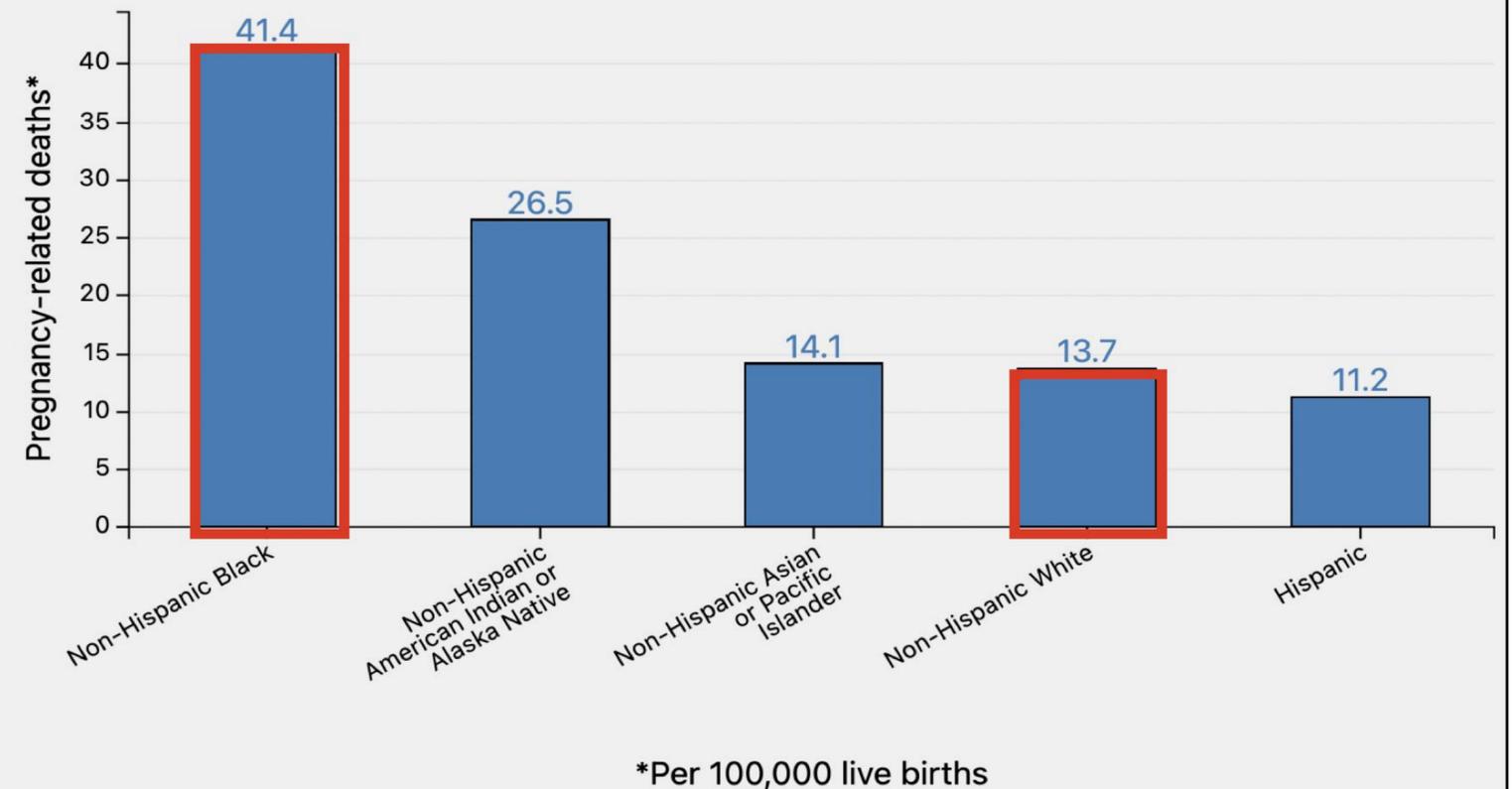


Black women
>3x higher risk
of maternal
mortality

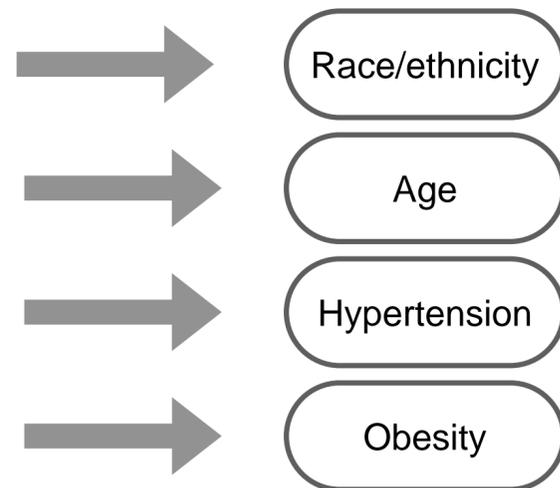
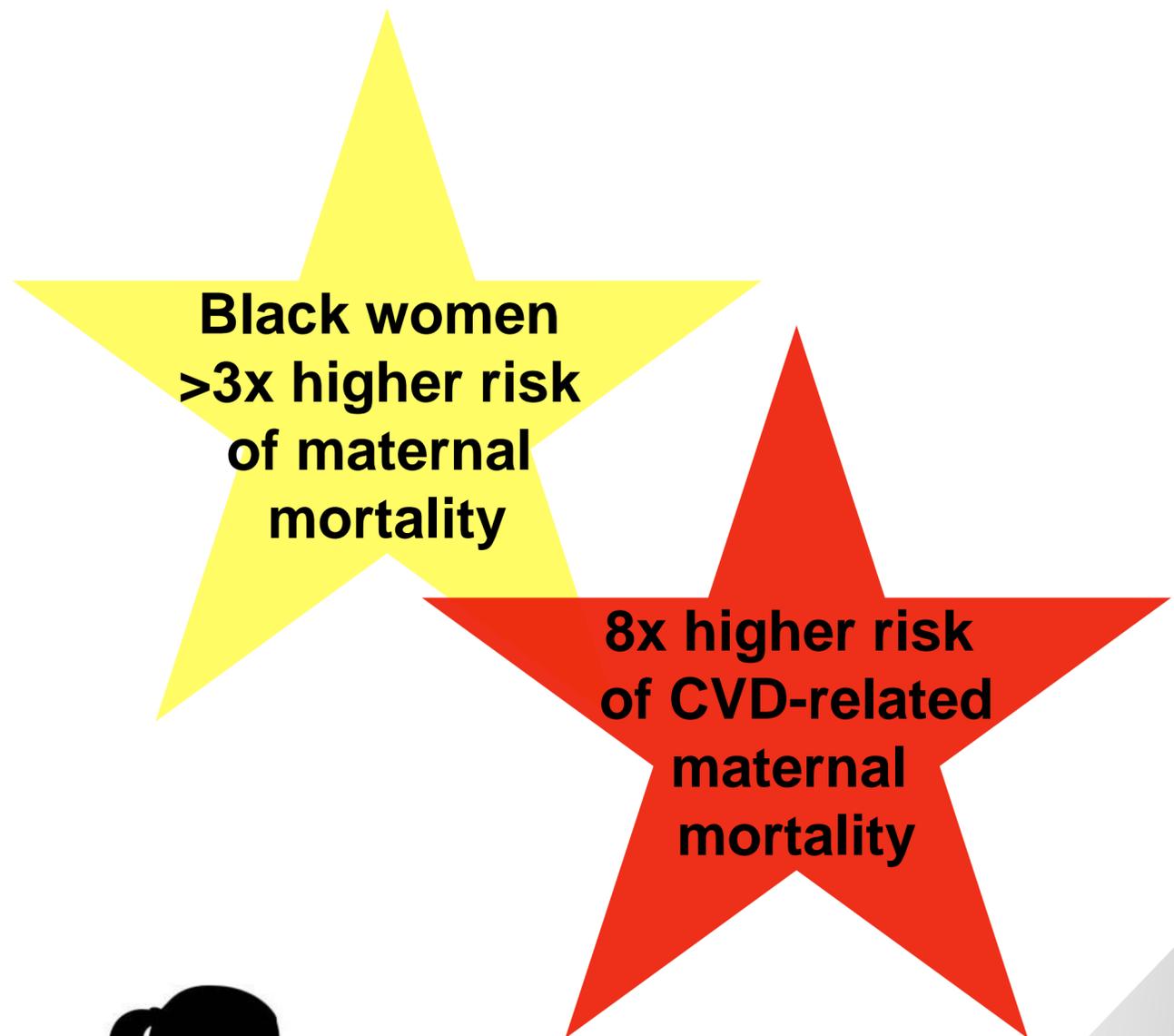
8x higher risk
of CVD-related
maternal
mortality



Pregnancy-Related Mortality Ratio by Race/Ethnicity:
2016-2018



Risk factors for CVD-related maternal mortality



THE NUMBERS

(2015-2017)

68.9

PREGNANCY-ASSOCIATED DEATHS

PER 100,000 LIVE BIRTHS

25.1

PREGNANCY-RELATED DEATHS

PER 100,000 LIVE BIRTHS

87%

WERE PREVENTABLE

PREGNANCY-RELATED

2.3x

BLACK WOMEN

NON-HISPANIC

MORE LIKELY TO DIE FROM PREGNANCY-RELATED CAUSES THAN

WHITE WOMEN

NON-HISPANIC



THE LEADING CAUSE OF DEATHS (PREGNANCY-RELATED)

- Cardiovascular / Coronary
- Cardiomyopathy
- Hemorrhage
- Infection
- Cerebrovascular Accidents

PREGNANCY ASSOCIATED DEATHS BY TIMING OF DEATH IN RELATION TO END OF PREGNANCY IN GEORGIA

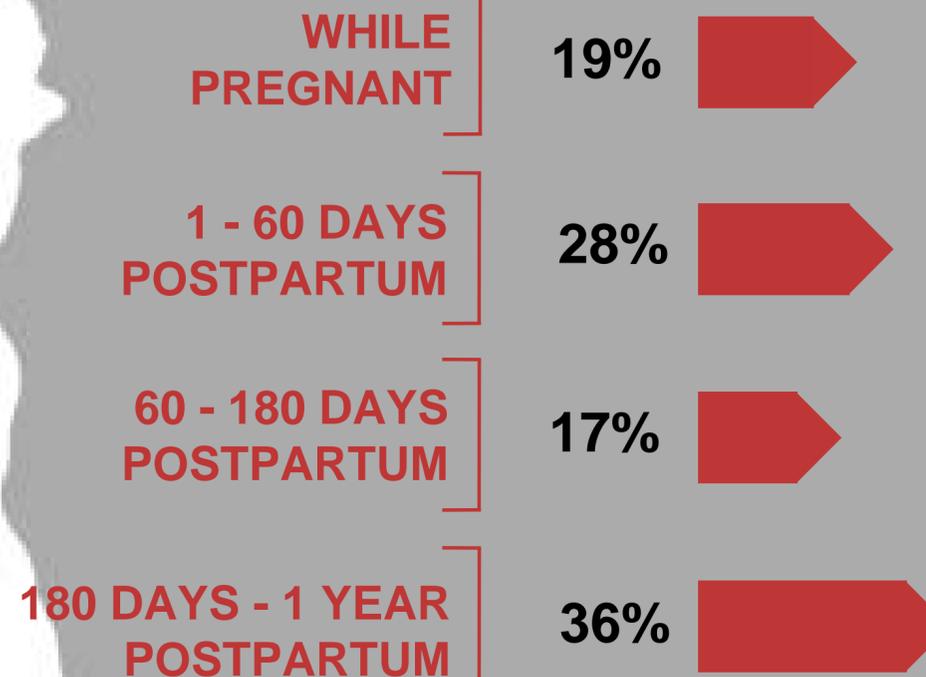
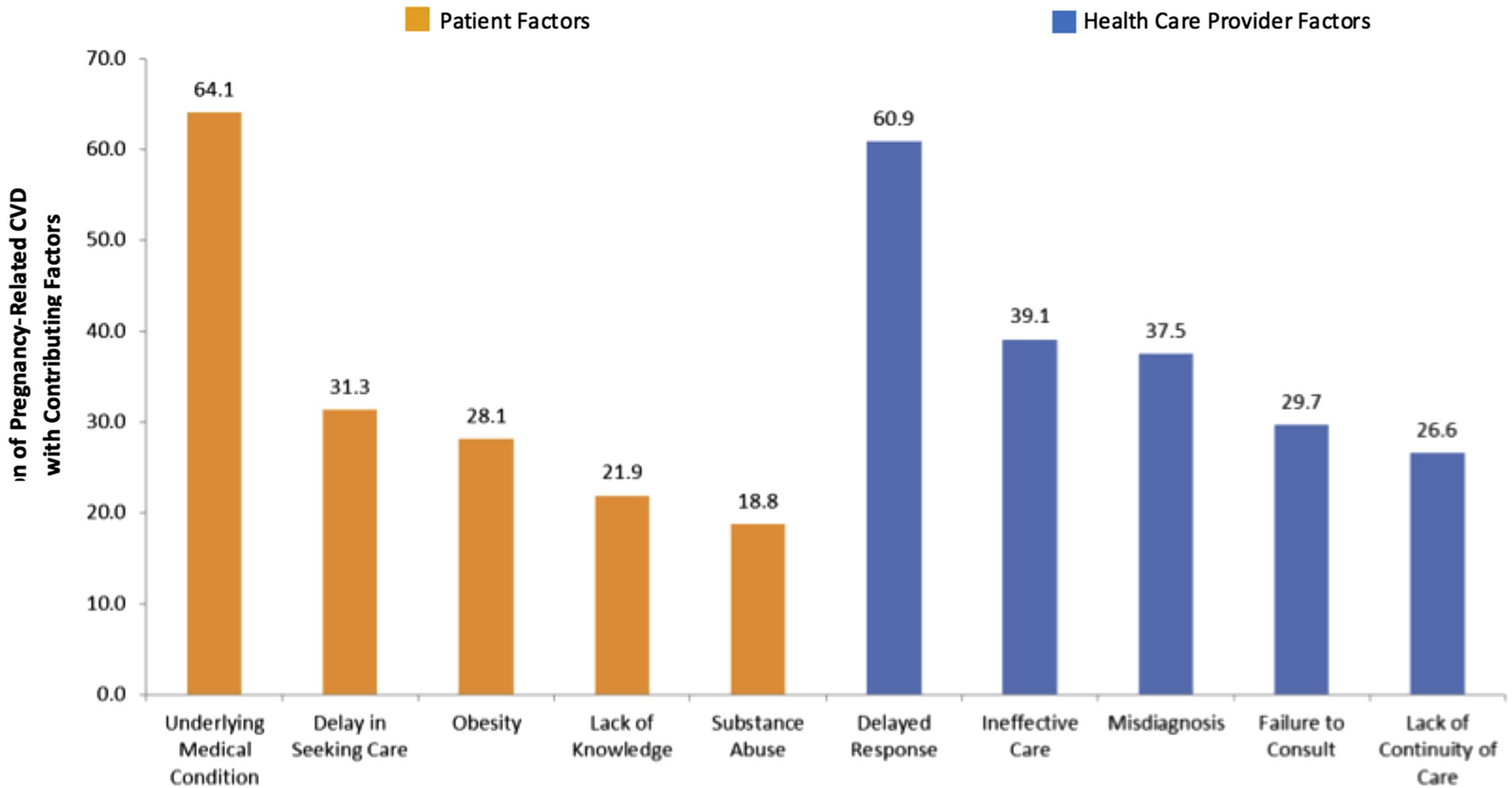


FIGURE 2

Factors contributing to pregnancy-related cardiovascular deaths, California 2002-2006



Review of Cardiovascular Physiology

Hemodynamic

	First Trimester	Second Trimester	Third Trimester	Stage 1 Labor	Stage 2 Labor	Early Postpartum
Cardiac output	↑ 5–10%	↑↑ 35–45%		↑ 30%	↑↑ 50%	↑↑↑ 60–80% immediately, then rapidly decreases within the first hour
Heart rate	↑ 3–5%	↑ 10–15%	↑ 15–20%	During uterine contractions: ↑ 40–50%		↓ 5–10% within 24 hours; continues to decrease throughout the first 6 weeks
Blood pressure	↓ 10%	↓ 5%	↑ 5%	During uterine contractions: ↑ SBP 15–25% ↑ DBP 10–15%		↓ SBP 5–10% within 48 hours; may increase again between days 3–6 due to fluid shifts

Moussa 2019

Pregnancy lowers threshold for isolated rhythm disturbances

Hematologic

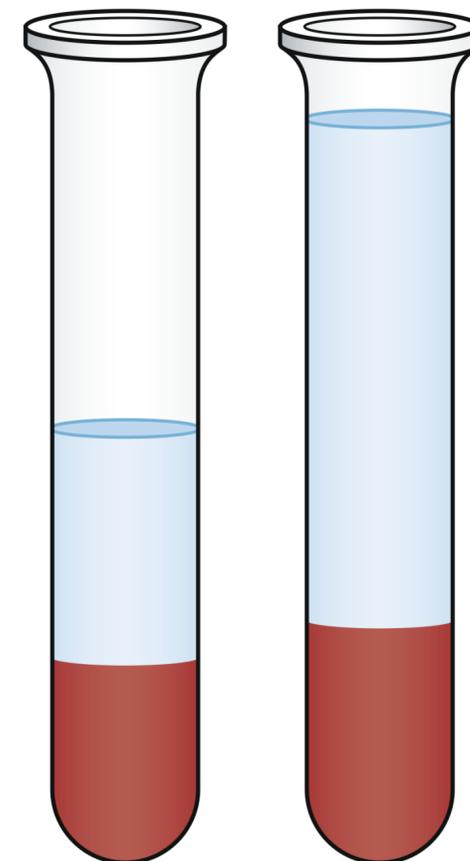
Increased blood volume:
(1100-1600 mL!)

↑ RBC mass
↑↑ plasma volume



Dilutional anemia

**Postpartum:
~ 500 mL autotransfusion**



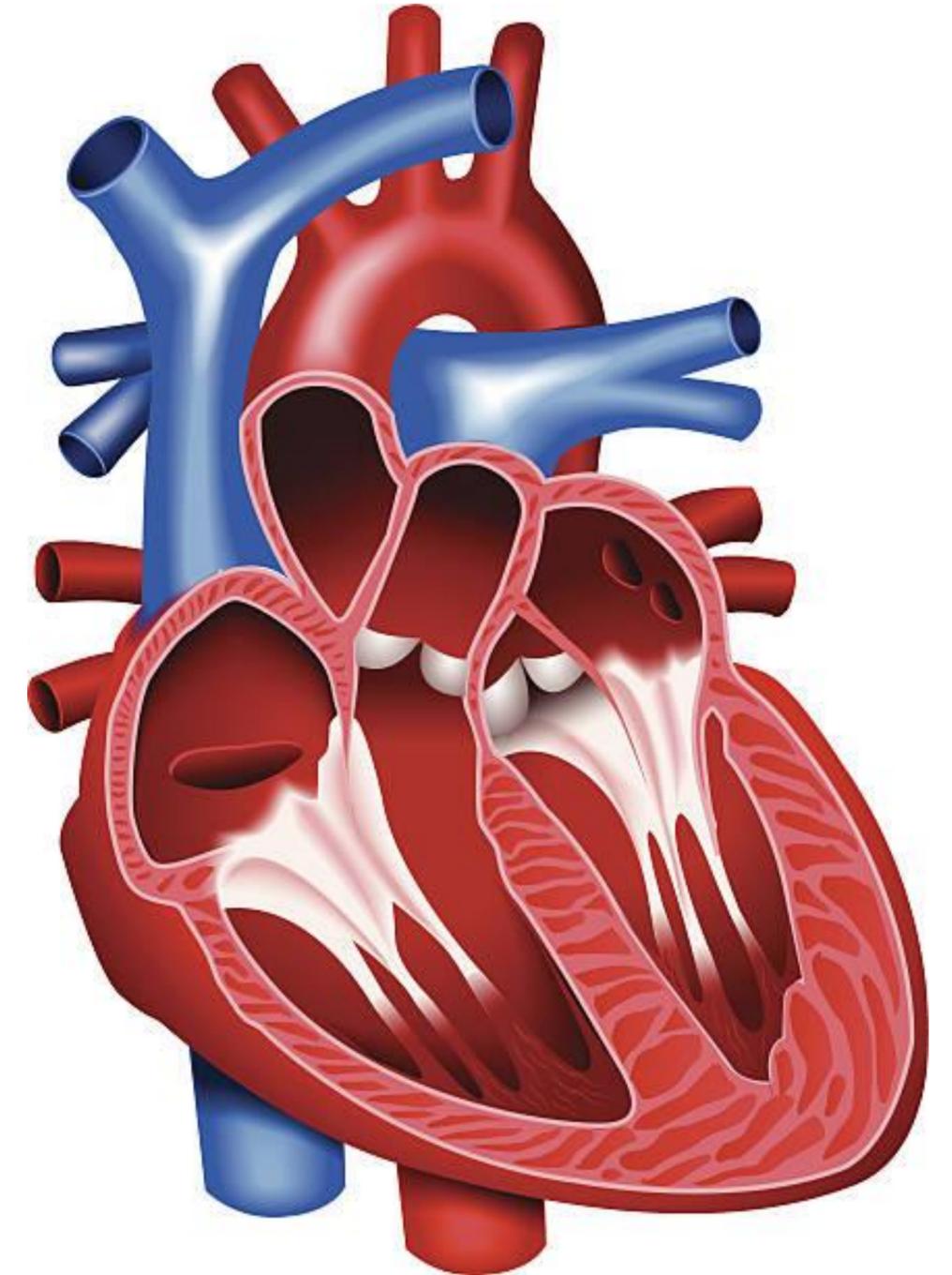
Structural

LV mass ↑ 50% and RV mass ↑ 40%

LV EDV ↑ 10%

EF = or ↓

20% of women have diastolic dysfunction at term

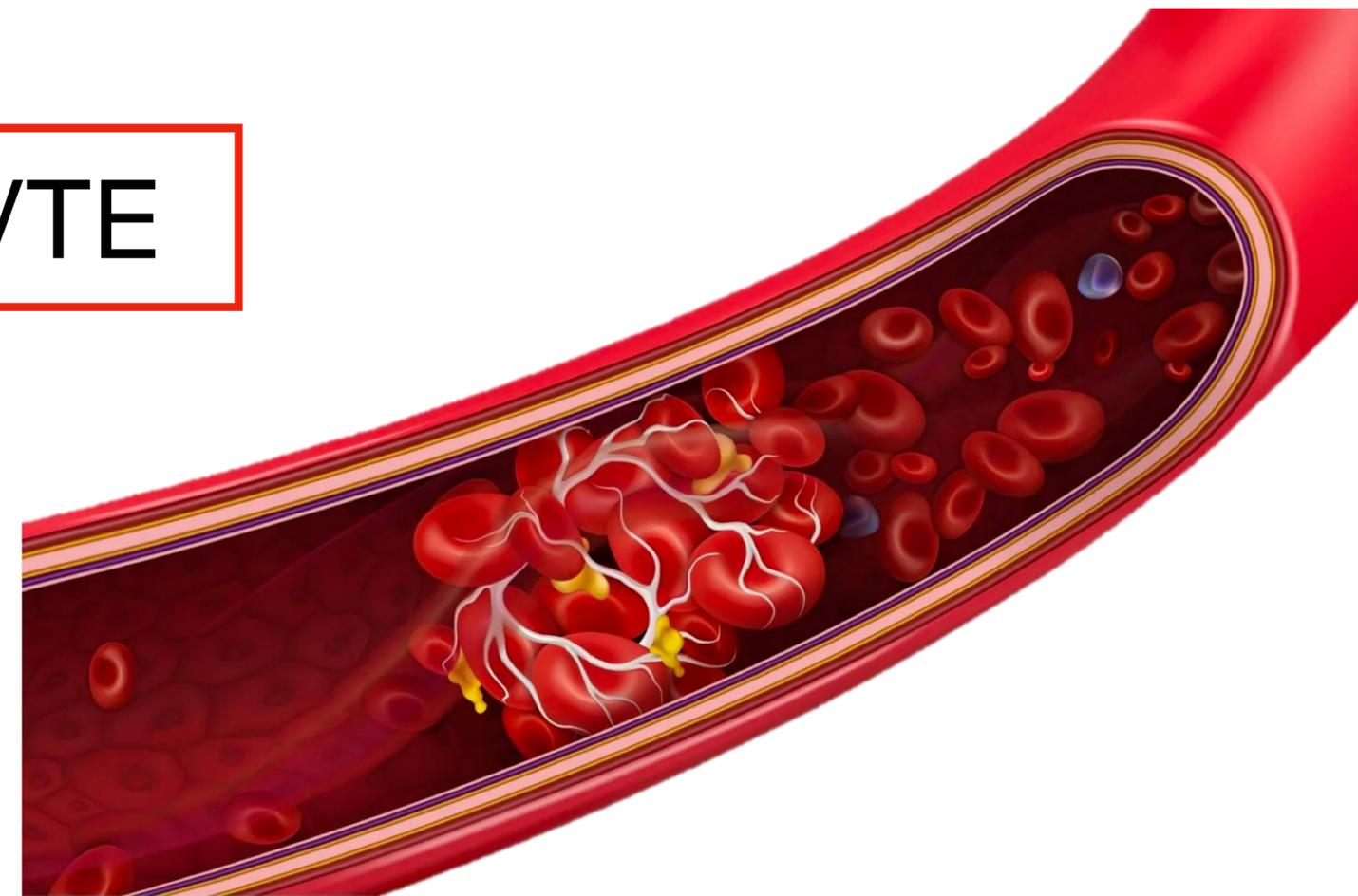


Coagulation

Hyper-coagulability, venous stasis, ↓ mobility,
compression of IVC/pelvic veins



Increased risk of VTE



Routine Obstetric Management of the Cardiac Patient

Stratify into risk category

CARPREG

Prior cardiac event (heart failure, transient ischaemic attack, stroke before pregnancy or arrhythmia).
Baseline NYHA functional class >II or cyanosis.
Left heart obstruction (mitral valve area <2 cm ² , aortic valve area <1.5 cm ² , peak LV out flow tract gradient >30 mmHg by echocardiography).
Reduced systemic ventricular systolic function (ejection fraction <40%).

mWHO

Conditions in which pregnancy risk is WHO I	WHO III
Uncomplicated, small or mild - pulmonary stenosis - patent ductus arteriosus - mitral valve prolapse	Mechanical valve
Successfully repaired simple lesions (atrial or ventricular septal defect, patent ductus arteriosus, anomalous pulmonary venous drainage).	Systemic right ventricle
Atrial or ventricular ectopic beats, isolated	Fontan circulation
	Cyanotic heart disease (unrepaired)
	Other complex congenital heart disease
	Aortic dilatation 40-45 mm in Marfan syndrome
	Aortic dilatation 45-50 mm in aortic disease associated with bicuspid aortic valve
Conditions in which pregnancy risk is WHO II or III	Conditions in which pregnancy risk is WHO IV (pregnancy contraindicated)
WHO II (if otherwise well and uncomplicated)	Pulmonary arterial hypertension of any cause
Unoperated atrial or ventricular septal defect	Severe systemic ventricular dysfunction (LVEF <30%, NYHA III-IV)
Repaired tetralogy of Fallot	Previous peripartum cardiomyopathy with any residual impairment of left ventricular function
Most arrhythmias	Severe mitral stenosis, severe symptomatic aortic stenosis
WHO II-III (depending on individual)	Marfan syndrome with aorta dilated >45 mm
Mild left ventricular impairment	Aortic dilatation >50 mm in aortic disease associated with bicuspid aortic valve
Hypertrophic cardiomyopathy	Native severe coarctation
Native or tissue valvular heart disease not considered WHO I or IV	
Marfan syndrome without aortic dilatation Aorta <45 mm in aortic disease associated with bicuspid aortic valve	
Repaired coarctation	

ZAHARA

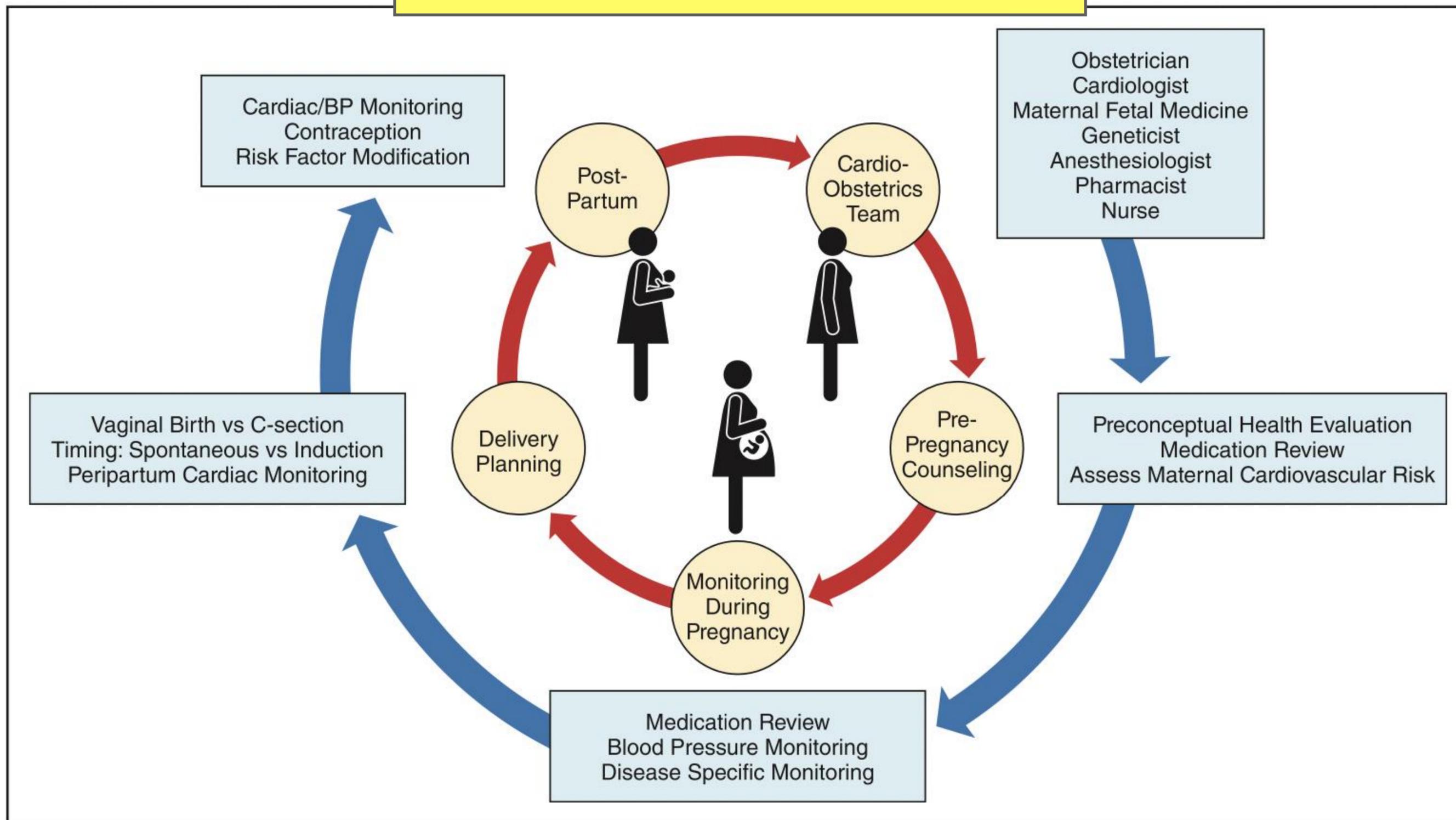
ZAHARA predictors ⁵⁷
History of arrhythmia event.
Baseline NYHA functional class >II.
Left heart obstruction (aortic valve peak gradient >50 mm Hg).
Mechanical valve prosthesis.
Moderate/severe systemic atrioventricular valve regurgitation (possibly related to ventricular dysfunction).
Moderate/severe sub-pulmonary atrioventricular valve regurgitation (possibly related to ventricular dysfunction).
Use of cardiac medication pre-pregnancy.
Repaired or unrepaired cyanotic heart disease.

NYHA

Class	Symptoms with activity	Symptoms at rest	Functional impairment
I	None	None	Normal
II	Mild	None	Slight
III	Moderate	None	Marked
IV	Severe	Present	Severe

Fatigue, palpitations, chest pain, dyspnea, syncope

“Cardio-Obstetrics Team”

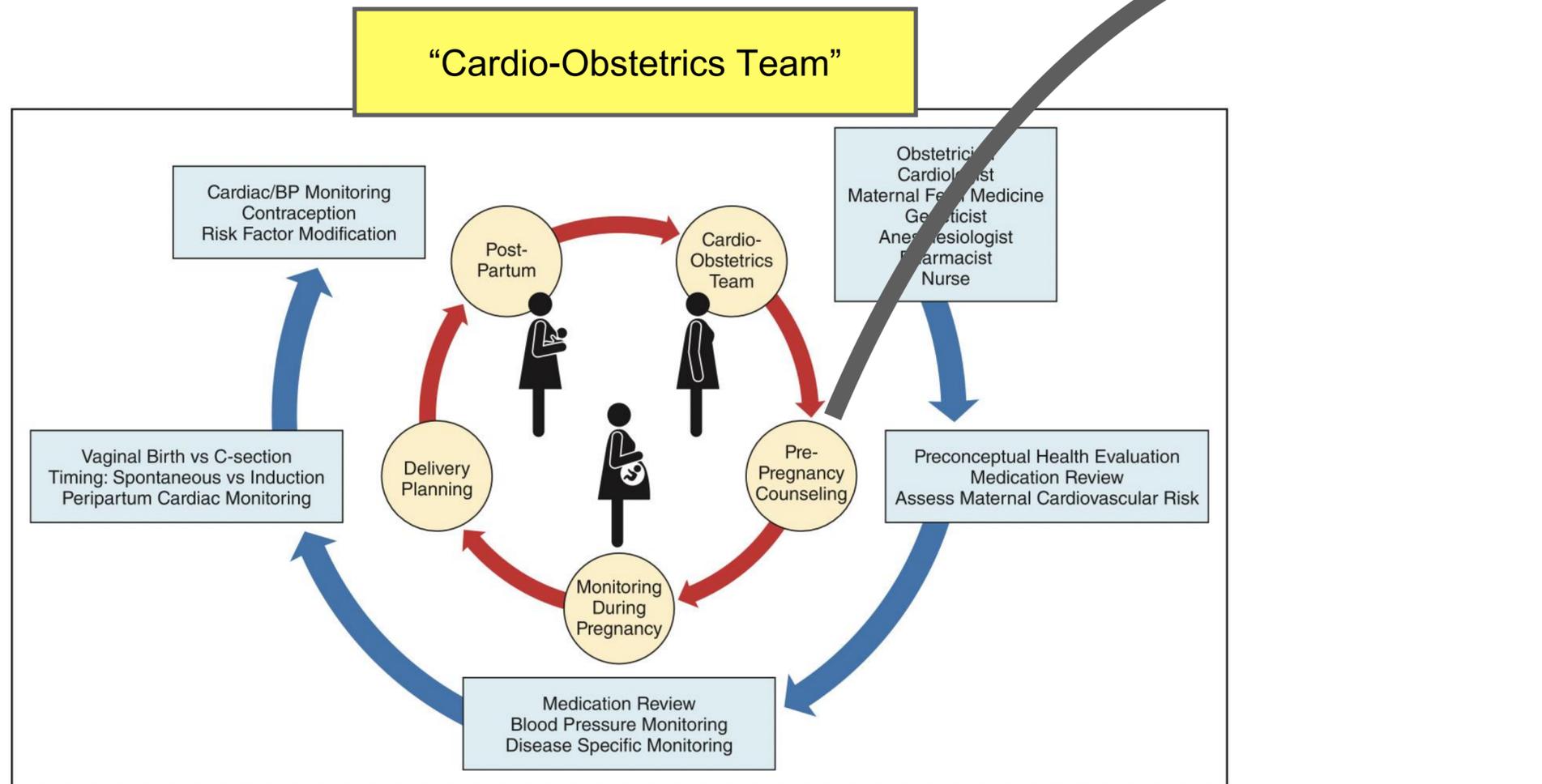


Preconception

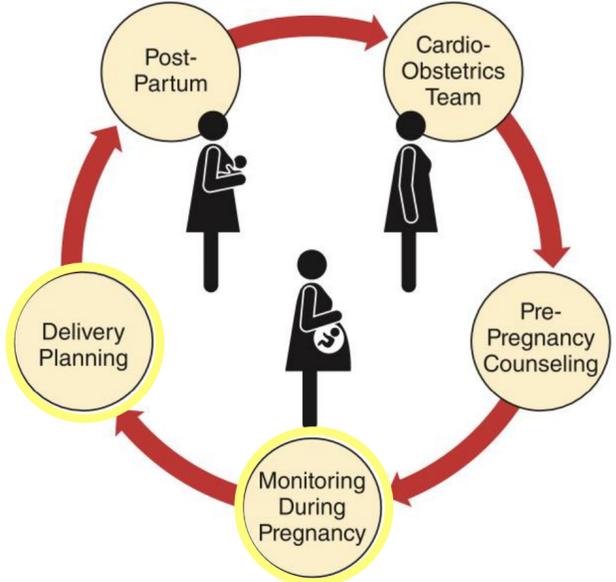
Optimize chronic medical conditions

Discontinue teratogenic drugs

Offer reliable contraception



Antepartum



OB / MFM

Cardiology

Manage chronic conditions

Anesthesia consult

Genetic counseling

Fetal echo/growth scans

***Detailed
delivery plan***

Baseline EKG, echo, labs

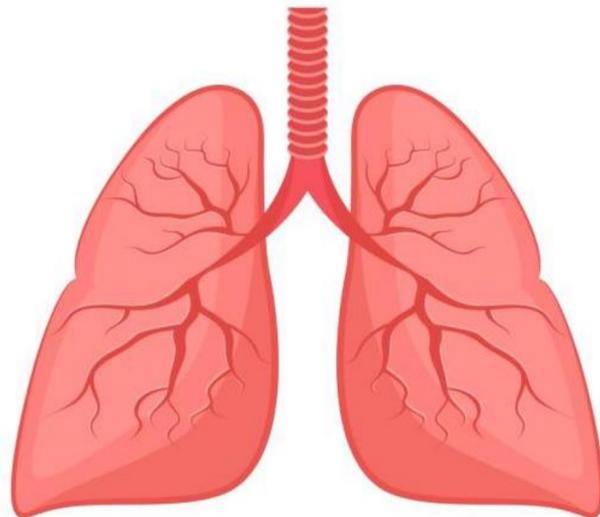
Follow up echos as indicated

**Recommendations regarding
exercise/activity**

Intrapartum

Most common intrapartum cardiac complications are pulmonary edema or arrhythmias

Fluid balance



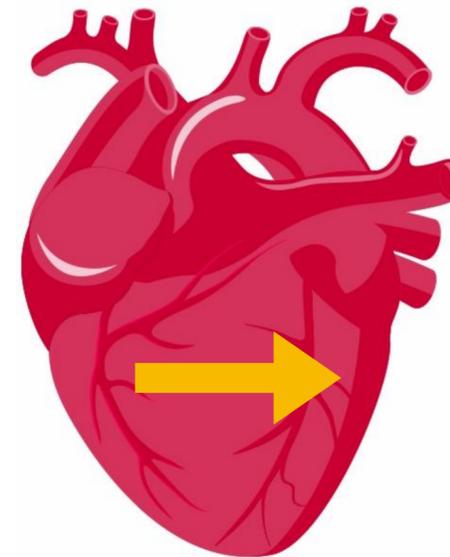
Moderate-severe valvular disease

Telemetry



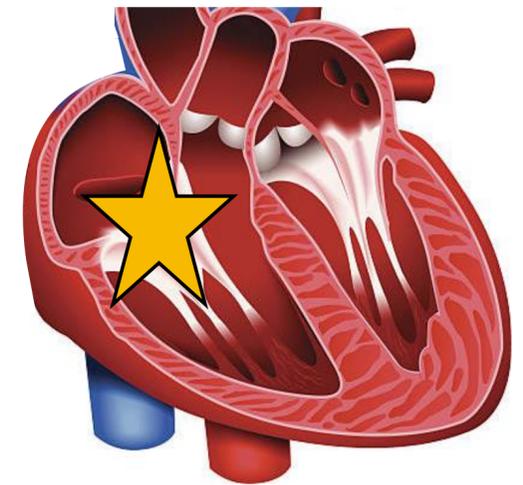
History of arrhythmia or symptomatic LV dysfunction

Filtered vascular lines



Unrepaired right-to-left shunts

Endocarditis prophylaxis



Previous endocarditis, cyanotic, prosthetic valves

Obstetric meds with cardiac influences

Drug	CV Side Effects	Considerations
Corticosteroids	Fluid retention, HTN, electrolyte disturbances	Use with caution in HF, HTN
Oxytocin	Arrhythmias, hypotension	Titrate carefully and avoid rapid IV bolus
Magnesium	Hypotension, vasodilation, syncope	Titrate carefully in pre-load dependent
Terbutaline	Tachycardia, hypotension, arrhythmias, myocardial ischemia	Avoid in preload-dependent or at risk of arrhythmias
Methergine	Coronary artery vasospasm, HTN, arrhythmias	Avoid in CAD or at risk of arrhythmias, aortopathies
Hemabate	HTN, palpitations, tachycardia	Avoid in PAH, pulmonary edema or cyanotic ACHD
TXA		Caution in uncorrected thrombosis-associated CVD

Immediate Postpartum

Increased risk of maternal morbidity and mortality

High risk for complications for first 7 days after delivery up to 6 months postpartum



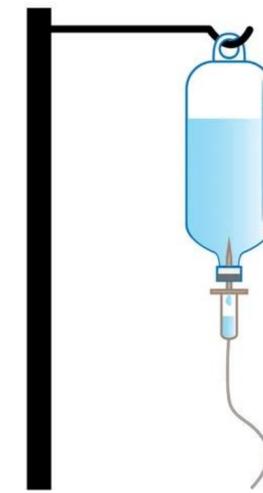
Symptoms



Vitals

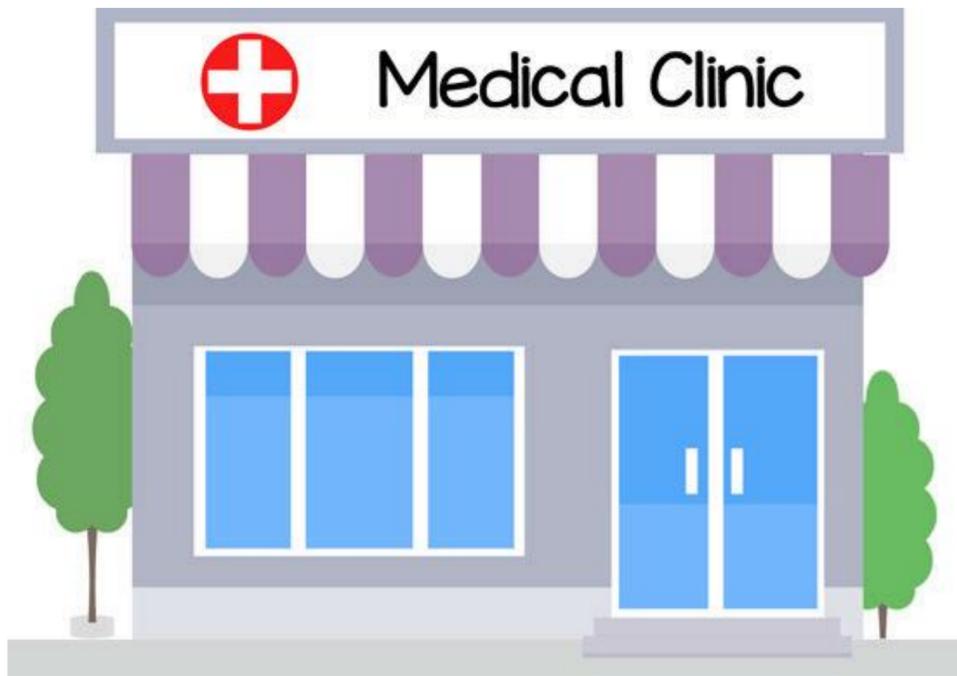


Exam



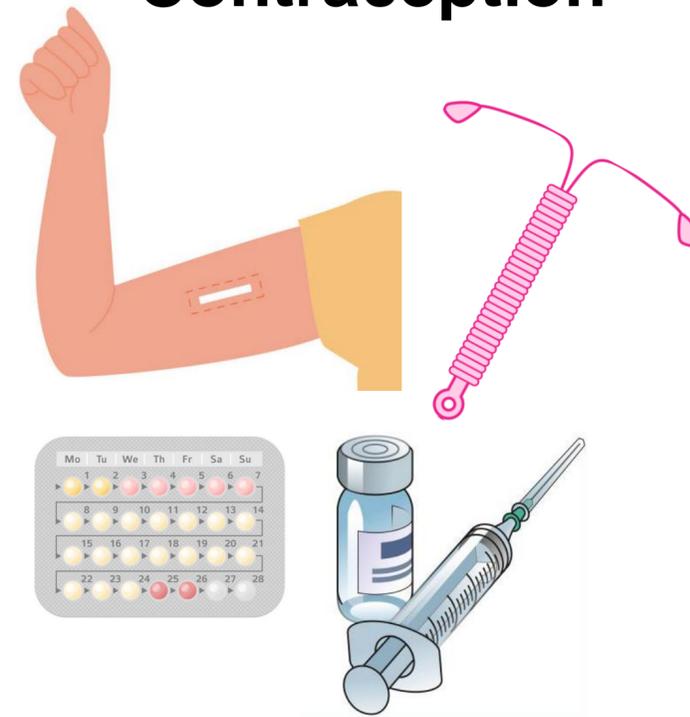
Limit IVF

At-home Postpartum



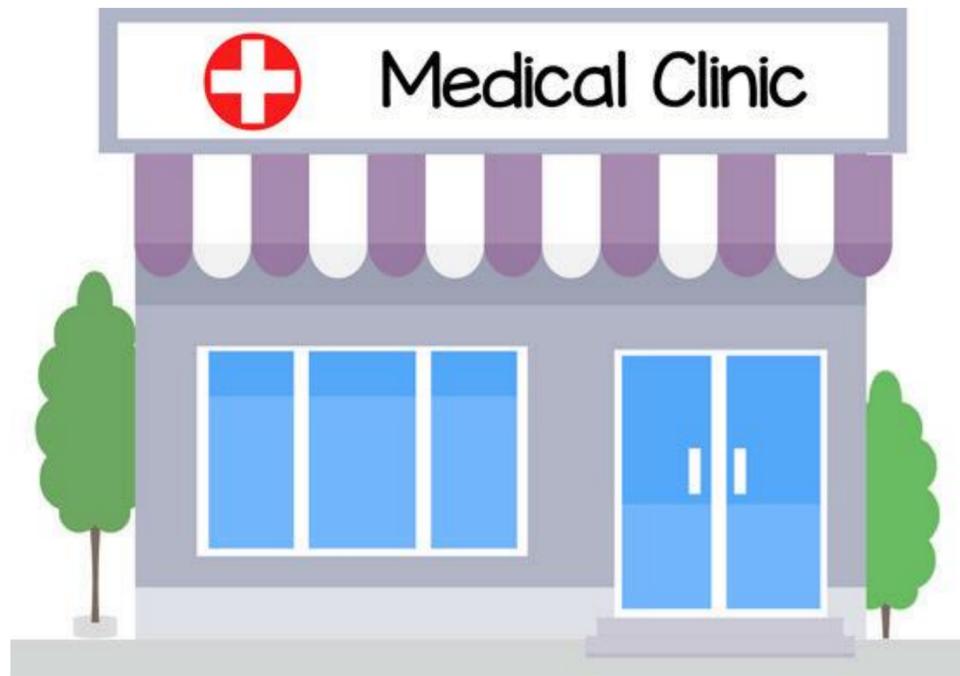
7-14 day clinic appointment

Contraception

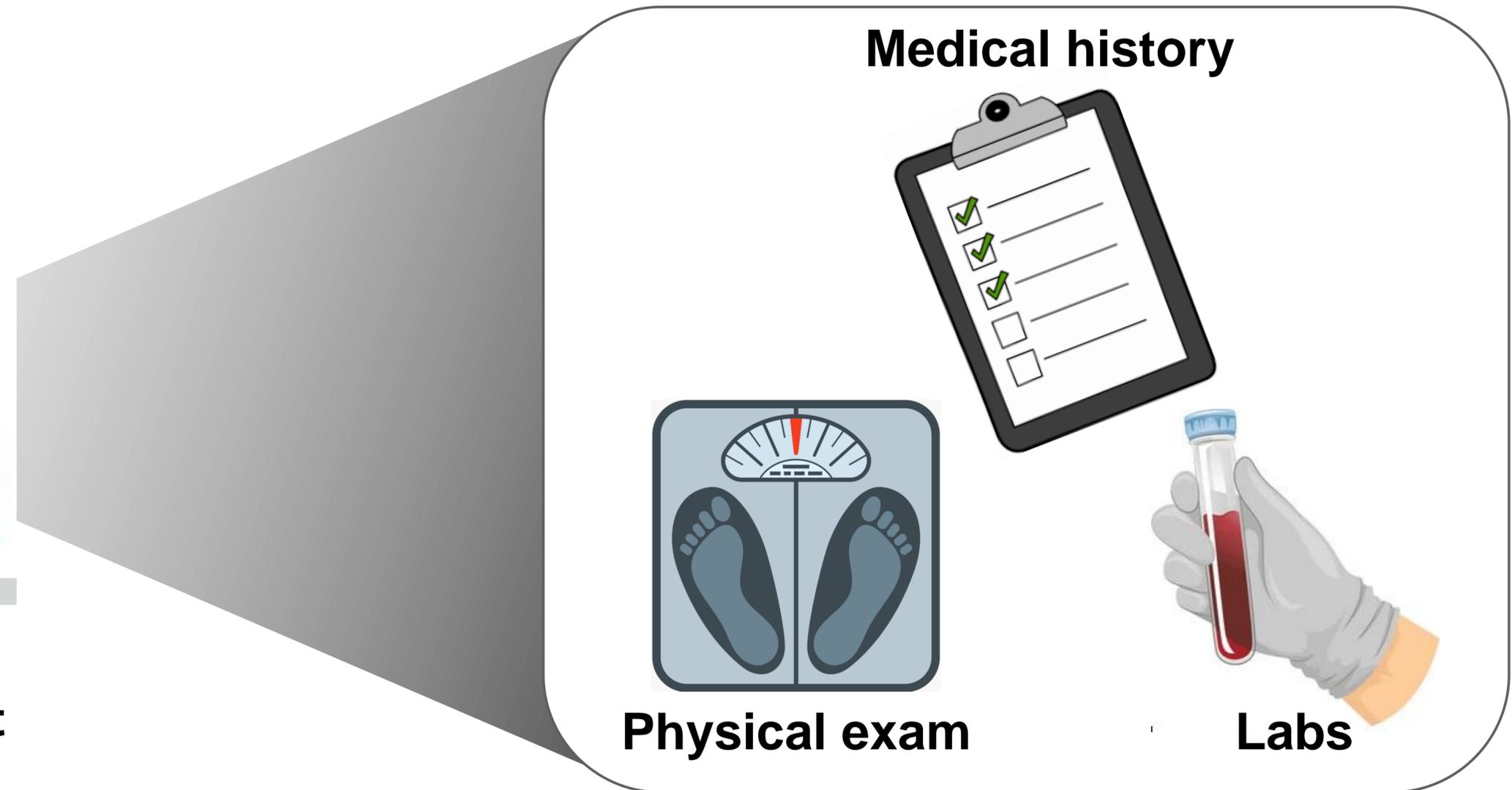


Breastfeeding

At-home Postpartum



3-mo comprehensive cardiovascular appointment



Medical history



Physical exam



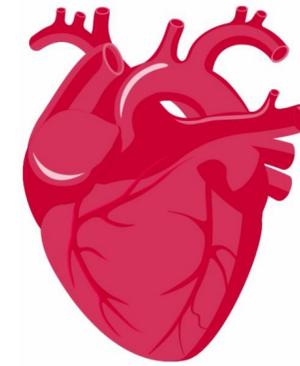
Labs

Future CVD risk can be reduced 4-13% with healthy lifestyle changes

Workup of Cardiac Complaints



Arrhythmia



HF

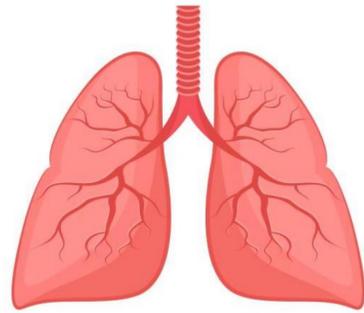


Dissection



MI

Many signs and symptoms of heart disease overlap with those of normal pregnancy and postpartum



Shortness of breath



Fatigue



Murmur/S3



Lightheaded



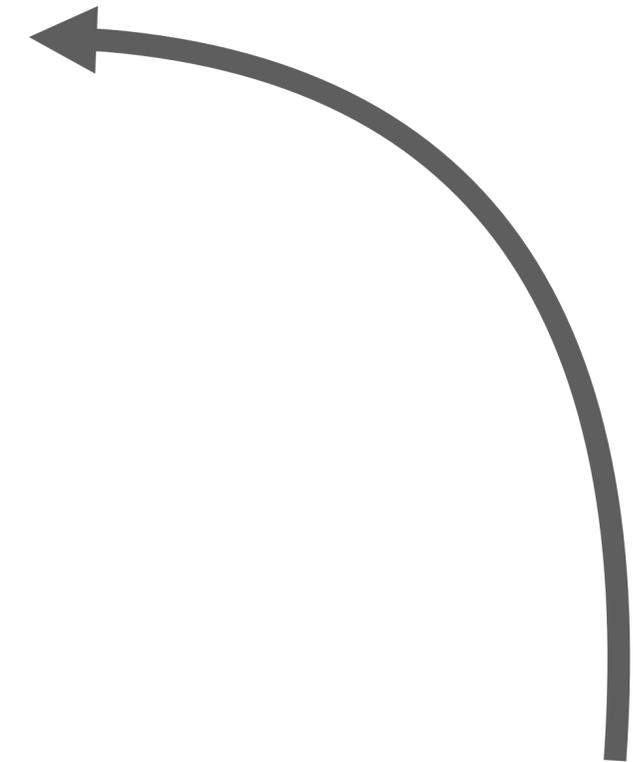
Orthopnea



↓ exercise



Edema



Many signs and symptoms of heart disease overlap with those of normal pregnancy and postpartum

Table 2. How to Differentiate Common Signs and Symptoms of Normal Pregnancy Versus Those That Are Abnormal and Indicative of Underlying Cardiac Disease

	ROUTINE CARE	CAUTION*†	STOP†‡
	Reassurance	Nonemergent Evaluation	Prompt Evaluation Pregnancy Heart Team
History of CVD	None	None	Yes

Table 2. How to Differentiate Common Signs and Symptoms of Normal Pregnancy Versus Those That Are Abnormal and Indicative of Underlying Cardiac Disease

	ROUTINE CARE	CAUTION*†	STOP†‡
	Reassurance	Nonemergent Evaluation	Prompt Evaluation Pregnancy Heart Team
Self-reported symptoms	None or mild	Yes	Yes
Shortness of breath	No interference with activities of daily living; with heavy exertion only	With moderate exertion, new-onset asthma, persistent cough, or moderate or severe OSA§	At rest; paroxysmal nocturnal dyspnea or orthopnea; bilateral chest infiltrates on CXR or refractory pneumonia
Chest pain	Reflux related that resolves with treatment	Atypical	At rest or with minimal exertion
Palpitations	Few seconds, self-limited	Brief, self-limited episodes; no lightheadedness or syncope	Associated with near syncope
Syncope	Dizziness only with prolonged standing or dehydration	Vasovagal	Exertional or unprovoked
Fatigue	Mild	Mild or moderate	Extreme



Worsened exercise tolerance
Difficulty performing ADLs
Worsening chest pain/palpitations/dizziness
New onset cough or wheezing
Worsening LE edema
Inability to lay flat (how many pillows)
Unusual weight gain
History of cardiac/pulmonary conditions
History of substance/cigarette use
Seen any providers since giving birth

Table 2. How to Differentiate Common Signs and Symptoms of Normal Pregnancy Versus Those That Are Abnormal and Indicative of Underlying Cardiac Disease

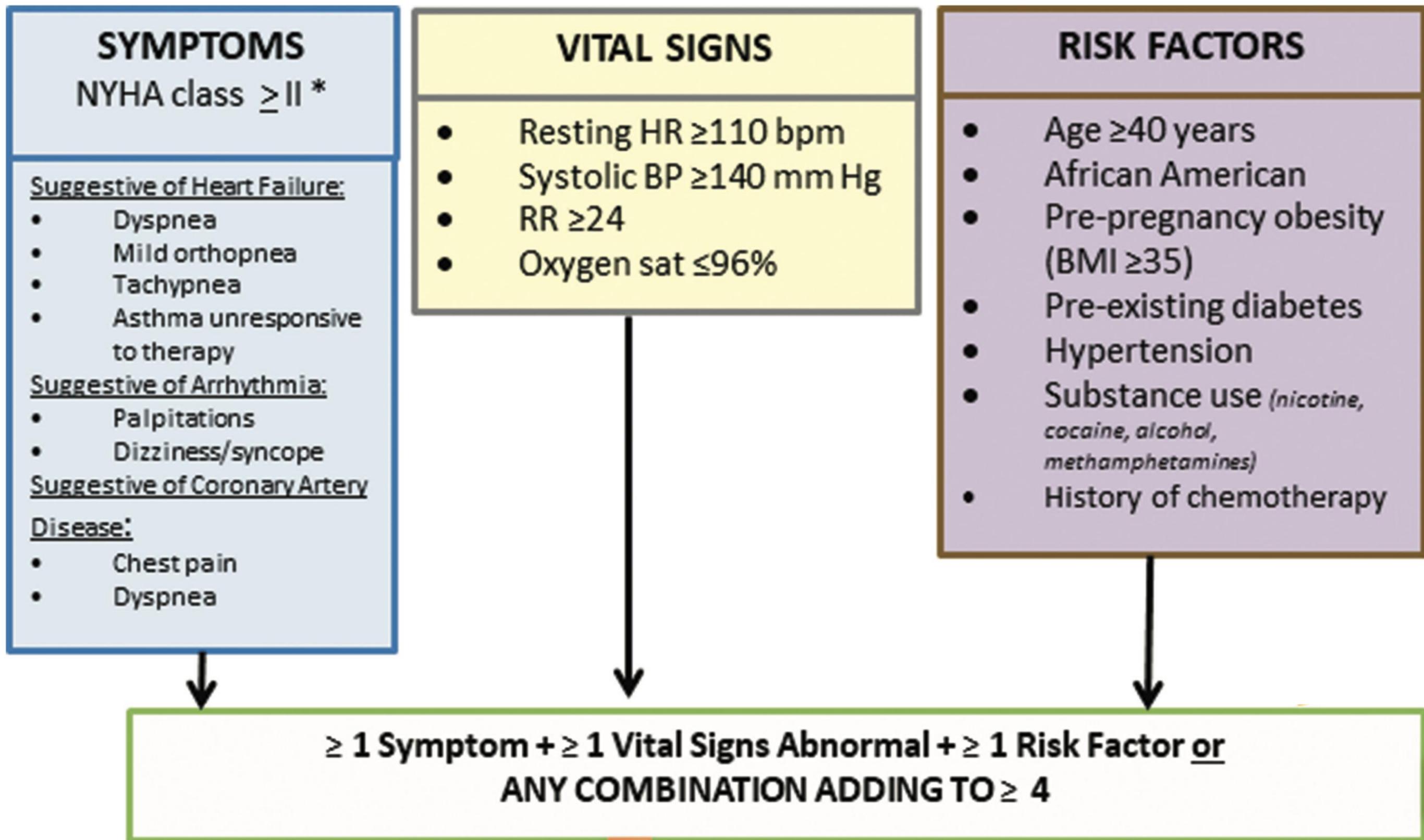
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	ROUTINE CARE	CAUTION*†	STOP†‡
	Reassurance	Nonemergent Evaluation	Prompt Evaluation Pregnancy Heart Team
Vital signs	Normal		
HR (beats per minute)	<90	90–119	≥120
Systolic BP (mm Hg)	120–139	140–159	≥160 (or symptomatic low BP)
RR (per minute)	12–15	16–25	≥25
Oxygen saturation	>97%	95–97%	<95% (unless chronic)

Table 2. How to Differentiate Common Signs and Symptoms of Normal Pregnancy Versus Those That Are Abnormal and Indicative of Underlying Cardiac Disease

	ROUTINE CARE	CAUTION*†	STOP†‡
	Reassurance	Nonemergent Evaluation	Prompt Evaluation Pregnancy Heart Team
Physical examination	Normal		
JVP	Not visible	Not visible	Visible >2 cm above clavicle
Heart	S3, barely audible soft systolic murmur	S3, systolic murmur	Loud systolic murmur, diastolic murmur, S4
Lungs	Clear	Clear	Wheezing, crackles, effusion
Edema	Mild	Moderate	Marked



**≥ 1 Symptom + ≥ 1 Vital Signs Abnormal + ≥ 1 Risk Factor or
ANY COMBINATION ADDING TO ≥ 4**



Obtain: EKG and BNP

Table 2. Normal Electrocardiographic Changes Associated With Pregnancy

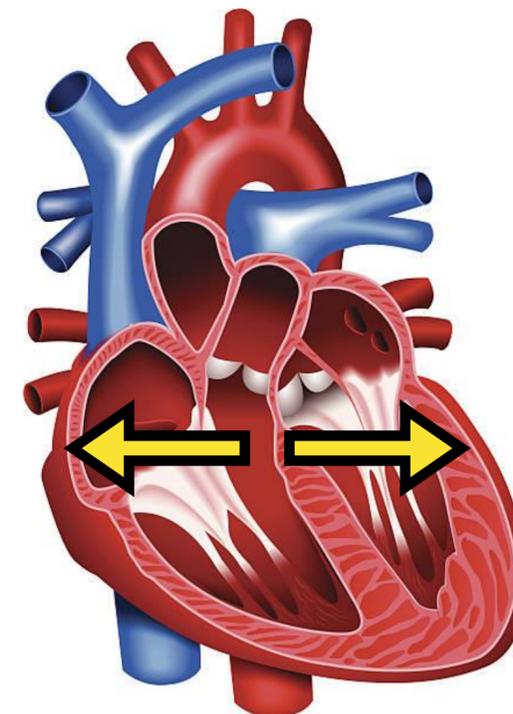
Left axis shift is seen, with the greatest shift in the third trimester caused by elevation of the diaphragm.

Shortening of the PR, QRS, and QT intervals may accompany the increase in resting heart rate.

Nonspecific ST abnormalities, including segment depression or flattened and inverted T waves in lead III, occur frequently.

Canobbio 2017

Brain Natriuretic Peptide



California Department of Public Health, 2017, CMQCC

**≥ 1 Symptom + ≥ 1 Vital Signs Abnormal + ≥ 1 Risk Factor or
ANY COMBINATION ADDING TO ≥ 4**



Obtain: EKG and BNP

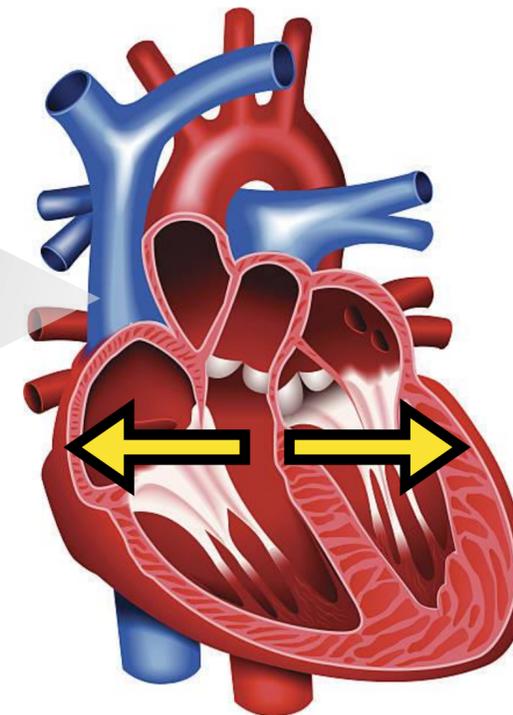
Normal level is < 10 pg/mL

Normal in pregnancy is < 20 pg/mL

Adverse maternal cardiac events
associated with BNP > 100 pg/mL

Negative predictive indicator:
 < 100 pg/mL, HF is **unlikely**

Brain Natriuretic Peptide



**≥ 1 Symptom + ≥ 1 Vital Signs Abnormal + ≥ 1 Risk Factor or
ANY COMBINATION ADDING TO ≥ 4**

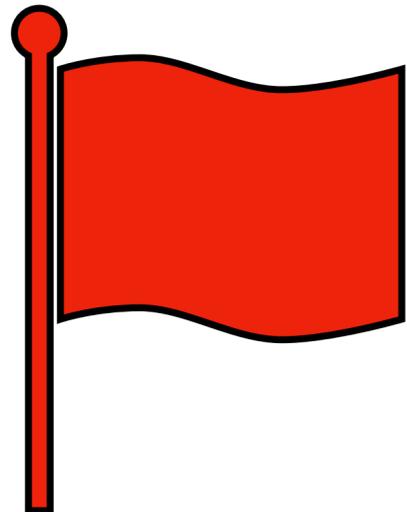


Obtain: EKG and BNP

- 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 if postpartum

Consider: CXR, CBC, Comprehensive metabolic profile, Arterial blood gas, Drug screen, TSH, etc.

Follow-up within 1 week



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 $\leq 94\%$ with or without personal history of CVD

PROMPT EVALUATION and/or
hospitalization for acute symptoms

plus

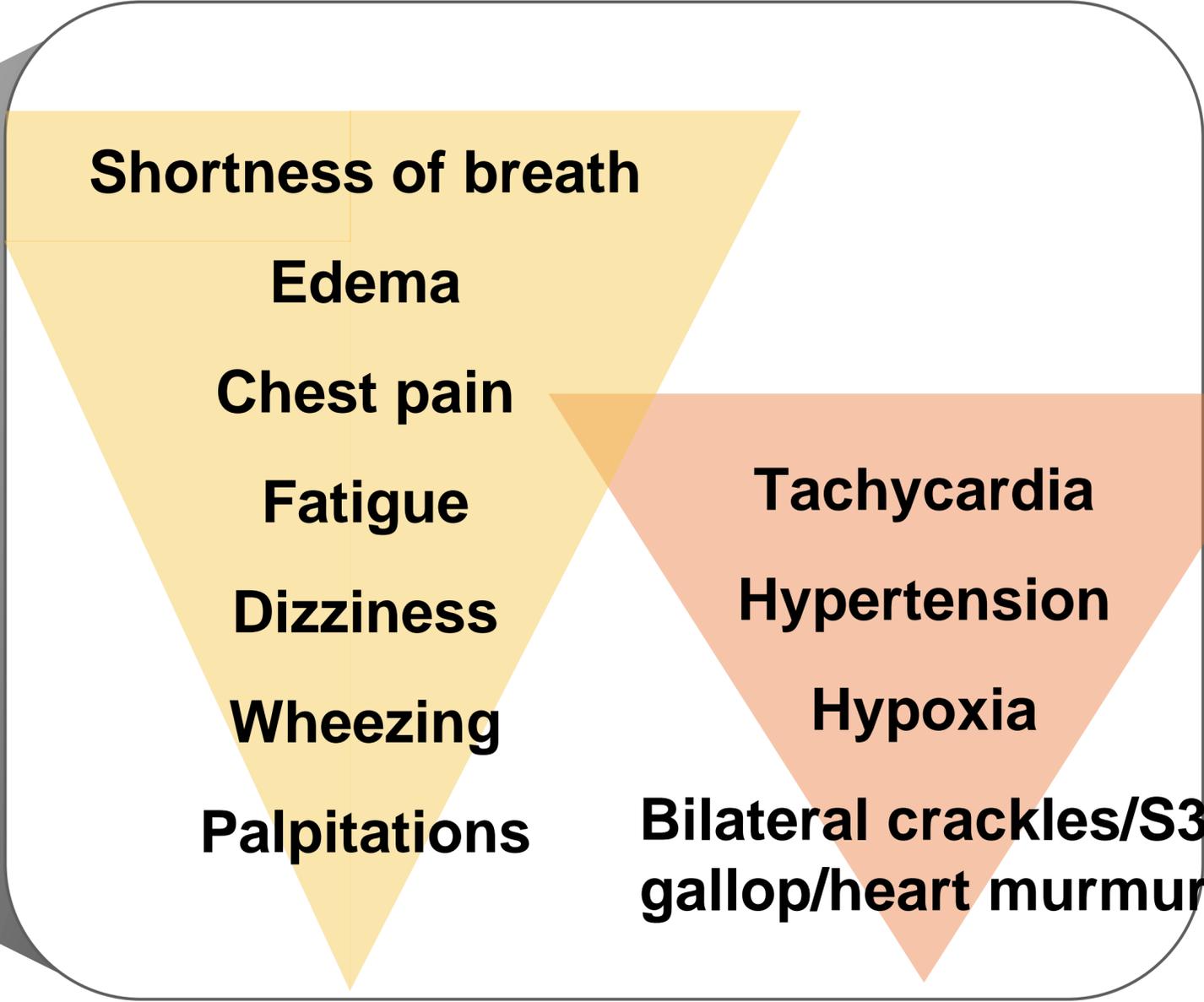
CONSULTATIONS with MFM and
Primary Care/Cardiology

Personal History of CVD
Without Red Flags

CONSULTATIONS with MFM and
Primary Care/Cardiology



Mortality



Pregnancy-related cardiovascular deaths in California: beyond peripartum cardiomyopathy

Afshan B. Hameed, MD; Elizabeth S. Lawton, MHS; Christy L. McCain, MPH; Christine H. Morton, PhD; Connie Mitchell, MD, MPH; Elliott K. Main, MD; Elyse Foster, MD

Case Presentations

Case 1

30 yo G1P0 at 35w0d with history of bicuspid aortic valve presents to ED with chest pain, palpitations, lightheadedness and orthopnea for the past 3 days.

Case 1

Vitals: T 37.0, HR 115, RR 22, BP 130/75

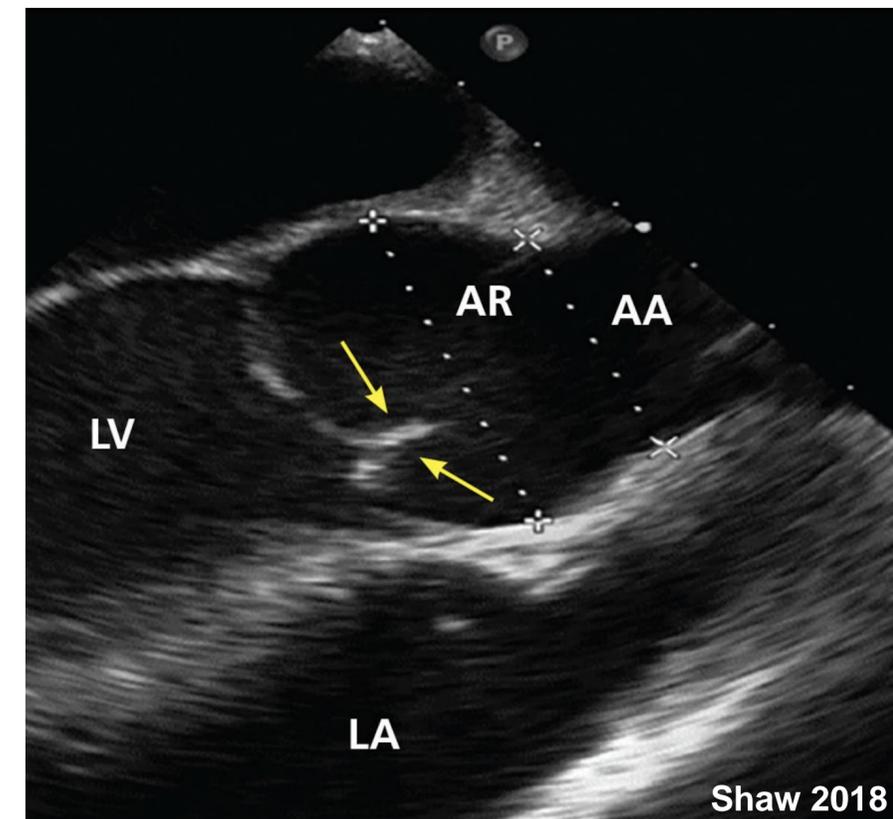
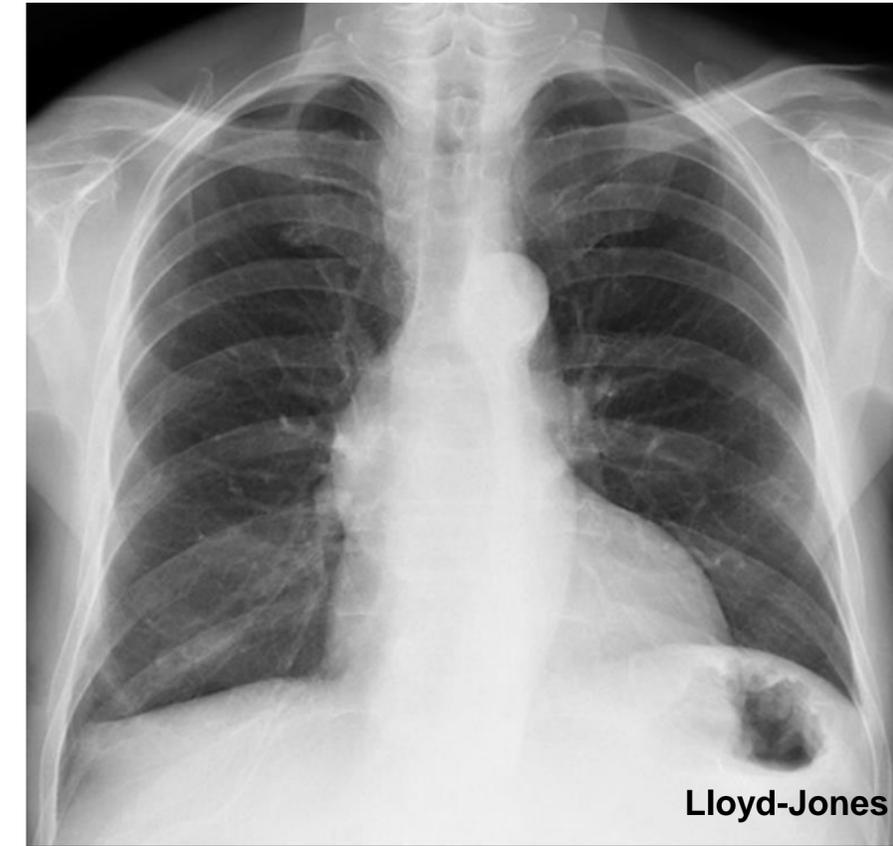
Exam: systolic click, harsh systolic murmur, inaudible S2

Labs: BNP 26 pg/mL, Hgb 10.0 g/dL

EKG: sinus tachycardia, LVH

CXR: enlarged thoracic aorta

Echo: EF 55-60%, bicuspid aortic valve with severe AS, dilated aortic root 45 mm



Case 1

She was admitted to the antepartum service, was started on a β blocker and was counseled to avoid strenuous activity. She later underwent an uncomplicated forceps-assisted vaginal birth at 37w0d under epidural anesthesia.

Bicuspid Aortic Valve

**Most common congenital cardiac malformation!
Leading congenital cause of aortic valve stenosis**

Incidence

1-2% of general population, 3:1 male:female

Inheritance

Autosomal dominant with reduced penetrance and variable expressivity

Etiology

Fusion of two leaflets of aortic valve during embryogenesis

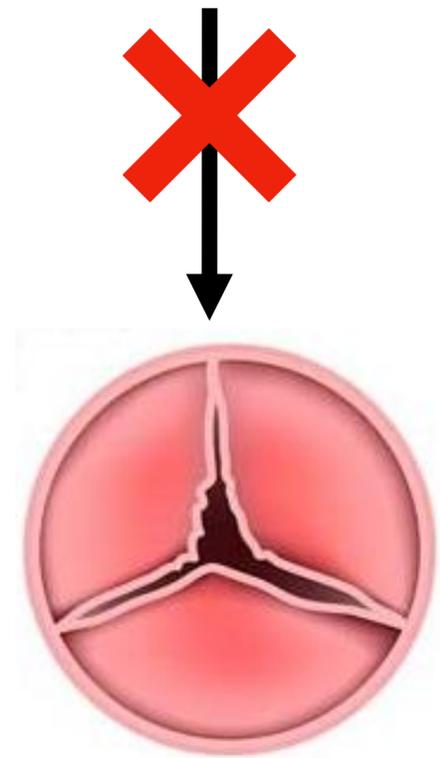
Associations

Aortopathies, genetic syndromes, other CHD

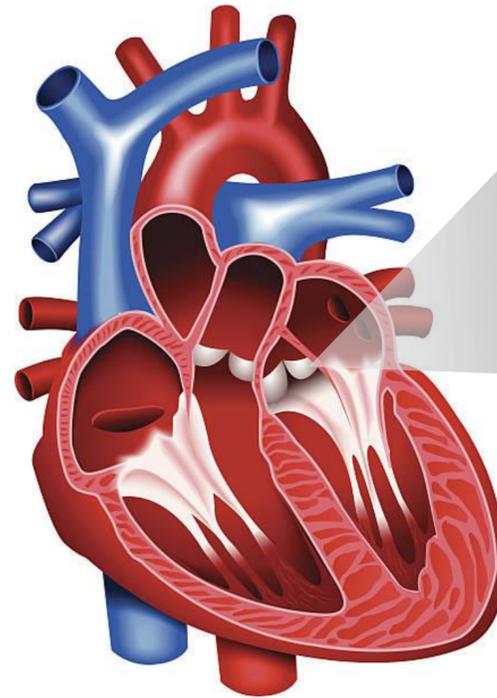
Treatment

β blockers, exercise restriction, surgery

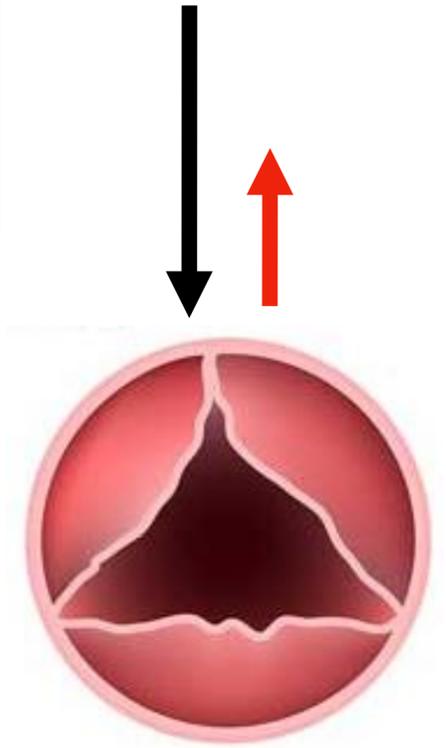
Valvular Disease



**Valve narrowed
and prevents
forward flow**



Tricuspid
Pulmonic
Mitral
Aortic



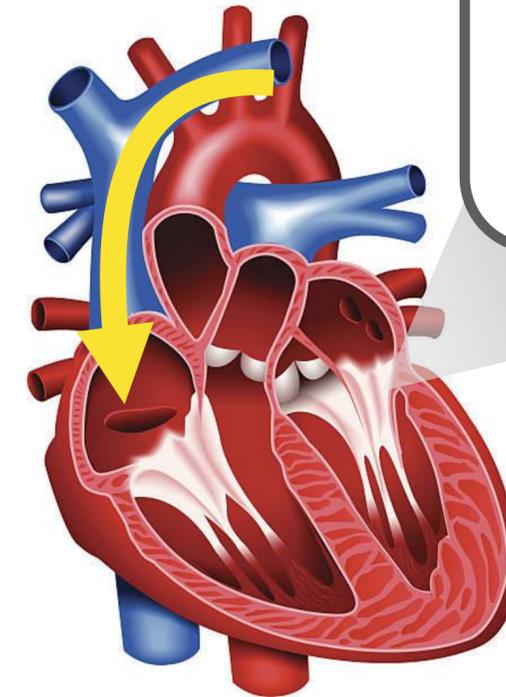
**Valve leaky
and allows
backward flow**

Stenotic

Regurgitant

Valvular Disease

- Left-sided stenotic lesions highest risk
 - **Preload-dependent**
 - Treatment: β blockers, activity restriction, +/- diuretics, anticoagulation



Tricuspid
Pulmonic
Mitral
Aortic

Caution:

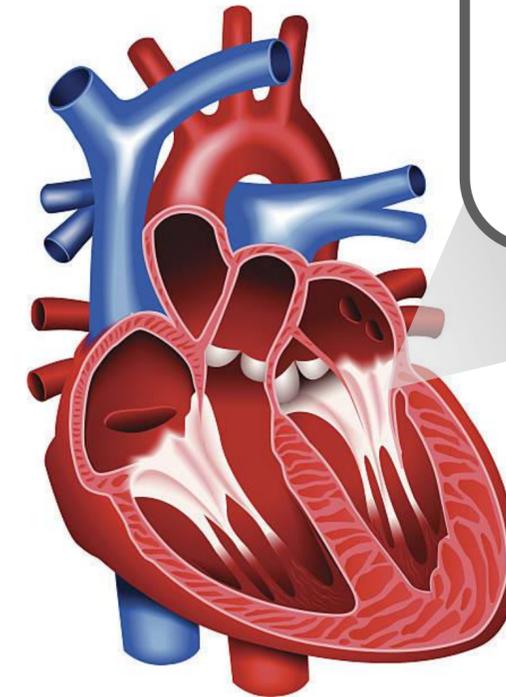
Hemorrhage
Anesthesia
Valsalva

Stenotic

Regurgitant

Valvular Disease

- Regurgitant lesions typically well-tolerated
 - Decreased SVR
 - Risk for pulmonary edema postpartum



Tricuspid
Pulmonic
Mitral
Aortic

Stenotic

Regurgitant

Case 2

40 yo G2P2002 PPD 6 s/p NSVD at 39w1d with history of chronic hypertension, class 2 obesity, and T2DM presents with 10-lb weight gain in 1 week, dyspnea, b/l LE edema.

Case 2

Vitals: T 37.0, HR 120, RR 34, BP 100/60

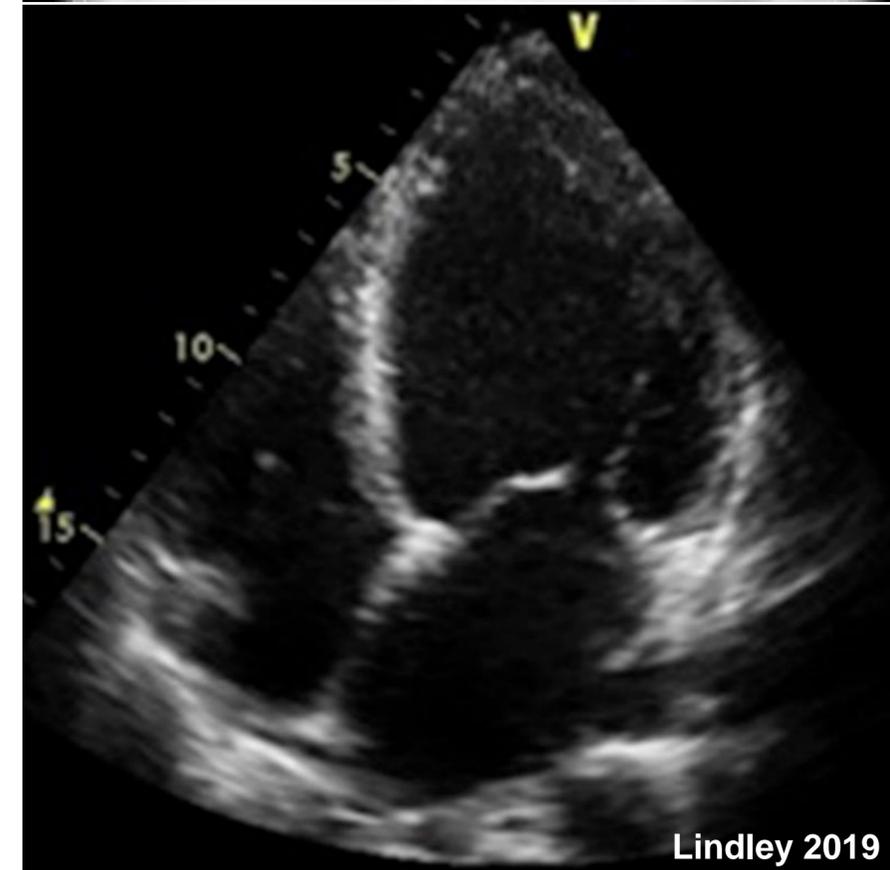
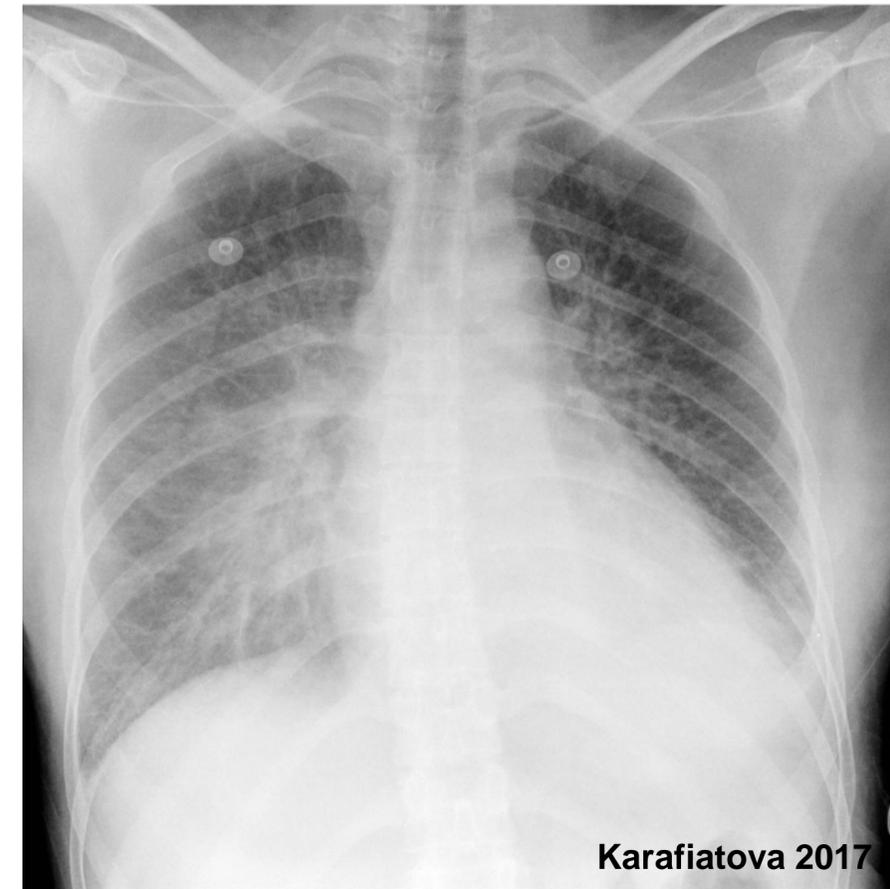
Exam: Pallor, JVD, 2+ pitting edema

Labs: BNP 7,062 pg/mL

EKG: wnl

CXR: cardiomegaly, pulmonary edema

Echo: LV enlargement, decreased contractility, EF 27%



Case 2

She received aggressive diuresis with IV Lasix and was started on daily Lasix, Metoprolol and Lovenox. 6 months after initial diagnosis, repeat echo showed EF 50%.

Peripartum Cardiomyopathy

New-onset systolic dysfunction (EF < 45%) without a reversible cause that presents in last month of pregnancy or up to 5 months postpartum

Incidence

25-100 per 100,000 live births in U.S.

Risk factors

Multiparity, AMA, multifetal gestation, PIH, African American race

Etiology

Myocarditis, immune, hemodynamic stress, cytokines, familial

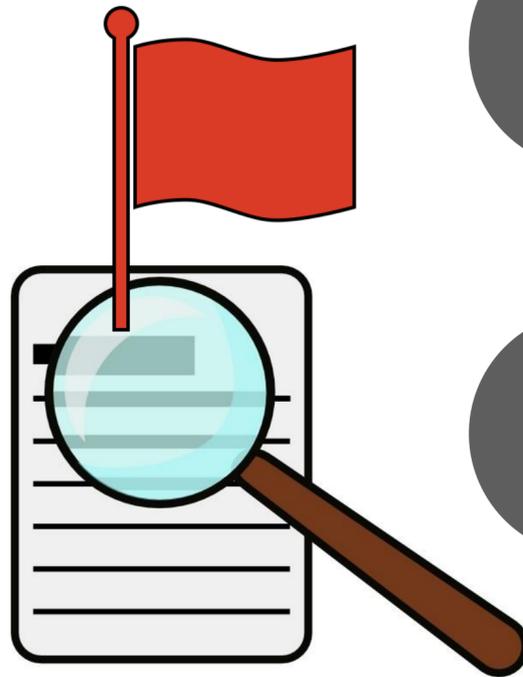
Treatment

Diuretics, β blockers, ACEi/ARB, anticoagulation, LVAD, salt/water restriction

Prognosis

Depends on LV function at diagnosis and within 6 months; 72-90% full recovery

Takeaways



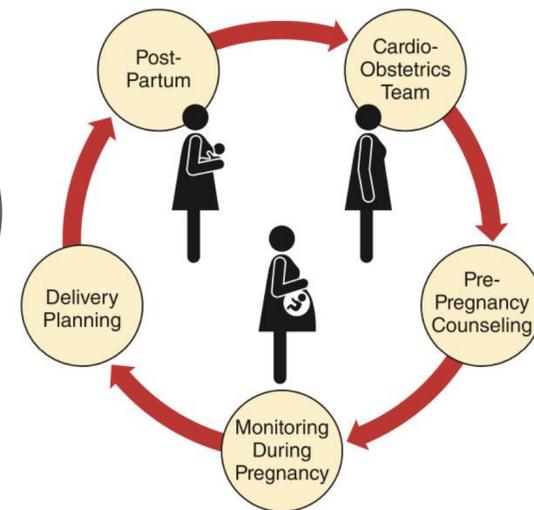
1. CVD in pregnancy is common, rising, and deadly

2. Many signs of cardiac disease overlap with normal pregnancy

3. Multi-disciplinary management is key

4. Pregnancy is a window into future health

Women of color disproportionately affected



Initiatives



“GaPQC’s AIM will reduce harm related to existing and pregnancy related cardiac conditions through the 4th trimester by 20%”

1. Readiness
2. Recognition and Prevention
3. Response
4. Reporting and Systems Learning
5. Respectful, Equitable, and Supportive Care



Cardiac Conditions in
Obstetrical Care



Signs & Symptoms of Heart Disease

Heart disease is the leading cause of death among women in the U.S. who are pregnant or gave birth in the last 5 months (postpartum).

During Pregnancy and Postpartum

Symptoms to watch for in late pregnancy and up to five months postpartum:



If you have any of these symptoms and they don't go away:

- ♥ Contact your OB, midwife, family medicine doctor, or your primary care provider
- ♥ Describe your symptoms clearly and explain how sick you feel
- ♥ If your symptoms arise postpartum, be sure to tell the provider that you recently had a baby
- ♥ If your provider says your symptoms are normal, ask what symptoms should cause you to call or come back



Go to the Emergency Department

If you have persistent chest pain or severe shortness of breath, or otherwise feel extremely sick. If possible, take someone with you.

NOTE: While some of these symptoms are common in late pregnancy, they may be a sign of heart disease especially if they are severe and do not go away after treatment.

Any woman can develop heart disease in pregnancy or postpartum, but you are at **higher risk** if you:

- ♥ Have prior heart disease
- ♥ Are over 40 years old
- ♥ Have preeclampsia or high blood pressure (hypertension)
- ♥ Are African-American (4X greater risk and 8-10X more likely to die of heart disease)
- ♥ Are obese



Bottom line

- * Trust your instincts when you feel something is wrong
- * When you see a healthcare provider, bring your partner, friend or family member who can support you and help explain these symptoms are not normal for you
- * Seek a second opinion if you don't feel listened to or your symptoms are not taken seriously

Get online support and information: www.myheartsisters.com | www.womenheart.org

CMQCC
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QUALITY CARE COLLABORATIVE
www.cmqcc.org



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DID YOU HAVE COMPLICATIONS DURING PREGNANCY?

♥ You may be at a higher risk for heart disease over your lifetime

Which pregnancy complications can increase your risk for heart disease as you age?



HIGH BLOOD PRESSURE

5-10% of all pregnant women



GESTATIONAL DIABETES

7-14% of all pregnancies



PRETERM BIRTH

11.5% of babies were born preterm in 2012.

Can include:

- ♥ Gestational hypertension
- ♥ Preeclampsia (once known as Pregnancy Induced Hypertension (PIH) and Toxemia)
- ♥ Eclampsia
- ♥ HELLP syndrome



Mothers who had gestational diabetes are more likely to have the condition again in a future pregnancy.



Babies born before 37 completed weeks of pregnancy are preterm, or premature.

If you had **PREECLAMPSIA**, you have **2x** the risk of **stroke, heart muscle damage, or blood clot** and **4x** the risk of developing **high blood pressure** for the rest of your life!

If you had **GESTATIONAL DIABETES**, you are **50%** more likely to develop **Type II diabetes** within 5 years, putting you at higher risk for heart disease.

Women with **PRETERM BIRTH AND PREECLAMPSIA** have an **8-10x** higher chance of **death** from heart disease.

If you had complications in pregnancy, you can lower your risk:

New Mothers

- See your health care provider 3-6 months after birth to check your overall physical health. Discuss your pregnancy and any complications you experienced.
- Get a copy of your pregnancy and post-delivery medical records to share with your providers for the rest of your life. Don't wait – records may be destroyed.
- Breastfeed as long as possible. Women whose total lifetime breastfeeding is 6-12 months were 10% less likely to develop heart disease (and it's good for baby too).

If you had one of these complications, speak with your provider when planning your next pregnancy to optimize your health.



It's a **MYTH** that **ALL** pregnancy related high blood pressure and gestational diabetes complications go away after the baby is born!

Get more information and stay heart healthy.
www.cmqcc.org

Mothers With Kids Over One Year

- Get annual checkups and be screened for heart disease. At this visit, your provider should check your overall physical condition.
 - Ask your provider what your test results mean and how you can lower your heart disease risk.
- | | | |
|---|-------------------------------|-----------------------------------|
| These screening numbers show desirable results. | Blood Pressure < 120/80 mm hg | Fasting Blood Glucose < 100 mg/dl |
| | Total Cholesterol < 200 mg/dl | Body Mass Index < 25 kg/m2 |
- Try a mobile app to automatically retrieve and store your medical records, so you always have them handy.
 - Eat healthy! A diet low in salt, fat, cholesterol and sugar can help you lower your risk for obesity, diabetes and heart disease.
 - Maintain a healthy weight. Body Mass Index (BMI) is an estimate of body fat based on height and weight. Less than 25 is healthy.
 - Get active for 30 minutes a day, or as recommended by your provider.
 - If you smoke, make a plan to quit. Your provider may have resources to support you.
 - Take medications as directed. Sometimes a healthy diet and exercise is not enough to lower your risk for heart disease, so your provider may prescribe medications to help.



SISTER TO SISTER
The Women's Heart Health Foundation

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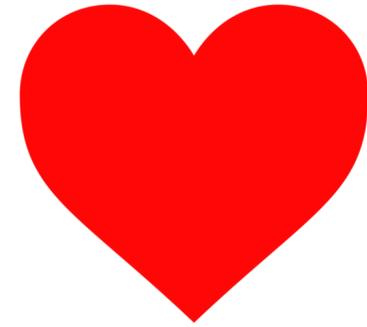
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Thank you!

Questions?



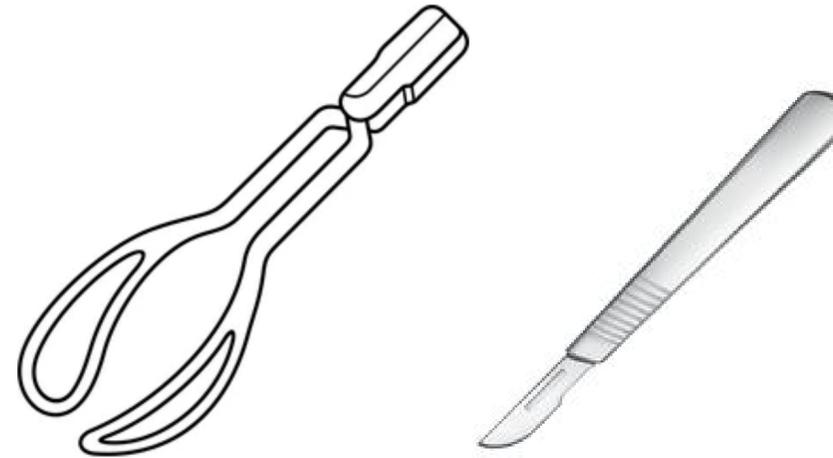
Delivery planning



Most full-term spontaneous labor or IOL at 39 weeks

Planned delivery if mWHO III-IV

Scheduled pre-term delivery in highest risk



Most tolerate NSVD

Operative vaginal delivery if need to avoid valsalva

CS if Ehlers Danlos, AR dilation, aortic dissection, *most* PAH, severe HF



Regional anesthesia

Slowly titrate if risk with hypotension