



Cardiomyopathy in Pregnancy

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Course Description:

- In all of the United States' public health, pregnancy-related mortality has the widest and most persistent racial and ethnic disparity (inequality). Alarming is the fact that African-American women have a 3 to 4-fold greater risk of maternal mortality than women of other ethnic or racial groups. The disparities stem from social, medical, clinical care and health system factors. Provider and institutional biases are factors impacting these health disparities as well.
- Cardiomyopathy has both intrigued and terrified obstetricians for more than 150 years. It is the leading cause of maternal mortality with cardiovascular disease accounting for one-third of all pregnancy-related deaths! Terrorizing is the fact that only a small fraction of these women had a known diagnosis of heart disease prior to death. However, the majority of women who died had presented with symptoms either during pregnancy or postpartum.

Approximate Time to Complete: 60 minutes



*Click here to download a
print version of this course.*





This course will:

- Help participants develop sound critical judgement regarding the possibility of cardiomyopathy.
- Expand participant's knowledge base on learning theories and instructional implications regarding symptoms of cardiomyopathy.
- Enable participants to develop, implement and evaluate healthcare delivery in practice setting prior to an actual event.
- Enhance participant's ability to put knowledge into active health care delivery.
- Prepare participants to address issues and implement changes in the health care setting as necessary to ensure a safe environment.



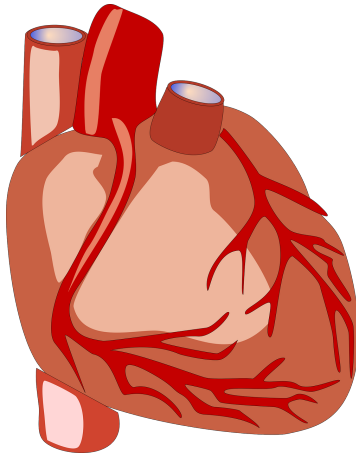
-  Main Contents
-  Table of Contents
-  Cardiomyopathy
-  Cardiovascular Disease (CVD)
-  Case Presentation
-  Racial Disparities - Maternal and Pregnancy-Related Mortality
-  Racial Disparities - CVD Incidence and Comorbidities
-  Racial Disparities - Peripartum Cardiomyopathy (PPCM) Prevalence
-  Racial Disparities - Cont'd
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-  Presentation of Women with CVD
-  American College of Obstetricians & Gynecologists (ACOG) table
-  Contributing Factors to Maternal Morbidity and Mortality with CVD
-  Review of Cardiac Physiology Related to Pregnancy
-  Risk Factors
-  Incidence of Peripartum Cardiomyopathy
-  Defining Peripartum Cardiomyopathy
-  Risk Factors for PPCM
-  Theory on Pathophysiology
-  Physiologic Contributors of PPCM
-  Pearls for Providers
-  Algorithm



-  [Racial Disparities - CVD Incidence and Comorbidities](#)
-  [Racial Disparities - Peripartum Cardiomyopathy \(PPCM\) Prevalence](#)
-  [Racial Disparities - Cont'd](#)
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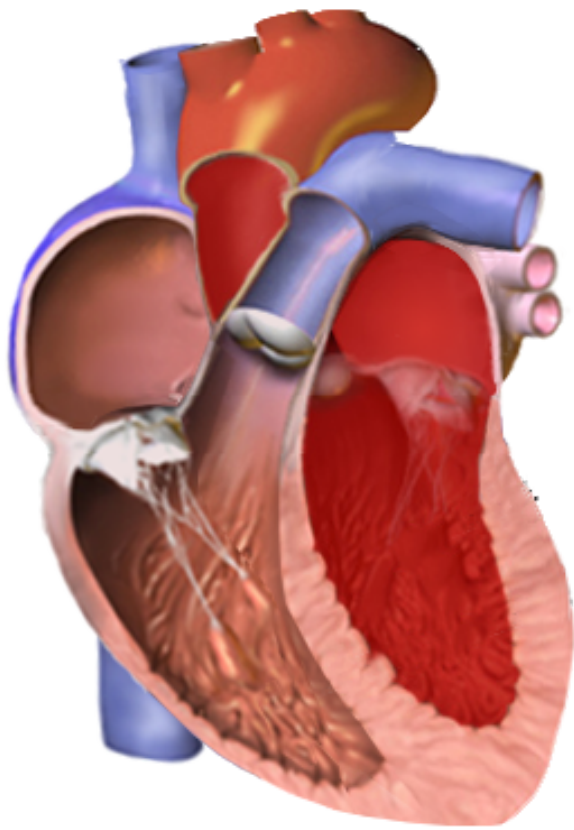


Cardiomyopathy [\[1,2\]](#)

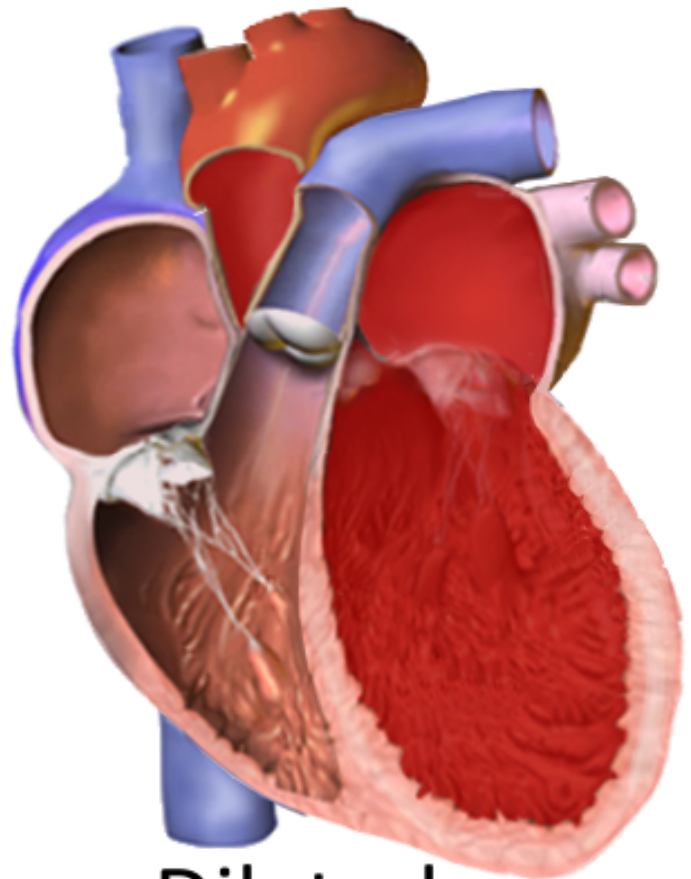


Click the heart for some pictures of common cardiomyopathies.

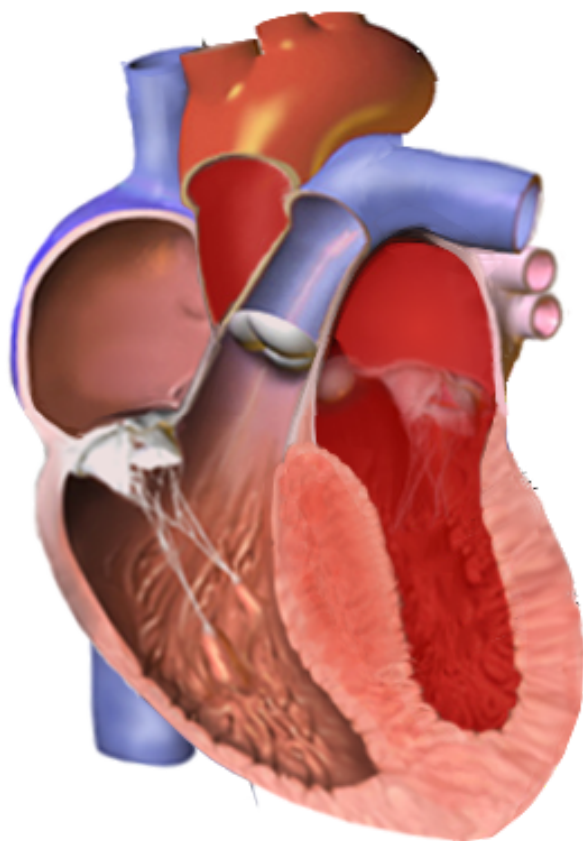
- Cardiomyopathy is a disorder in which the myocardium is either structurally or functionally abnormal in the absence of alternative etiology.
- The most common cardiomyopathies are:
 - Hypertrophic
 - Dilated
- Rare types are:
 - Arrhythmogenic right ventricular
 - Restrictive
 - Takotsubo cardiomyopathy
 - Left ventricular non-compaction cardiomyopathy.



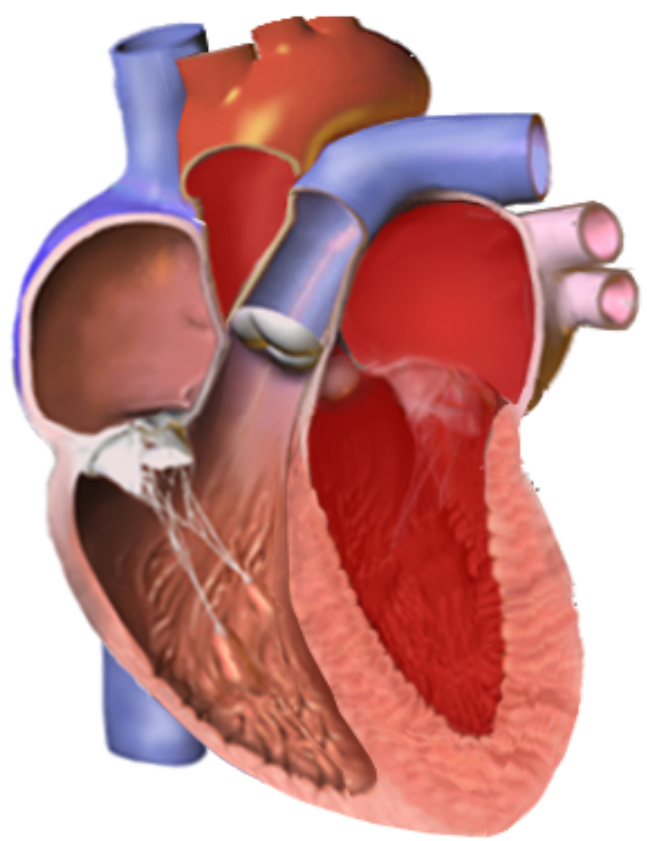
Normal



Dilated



Hypertrophic

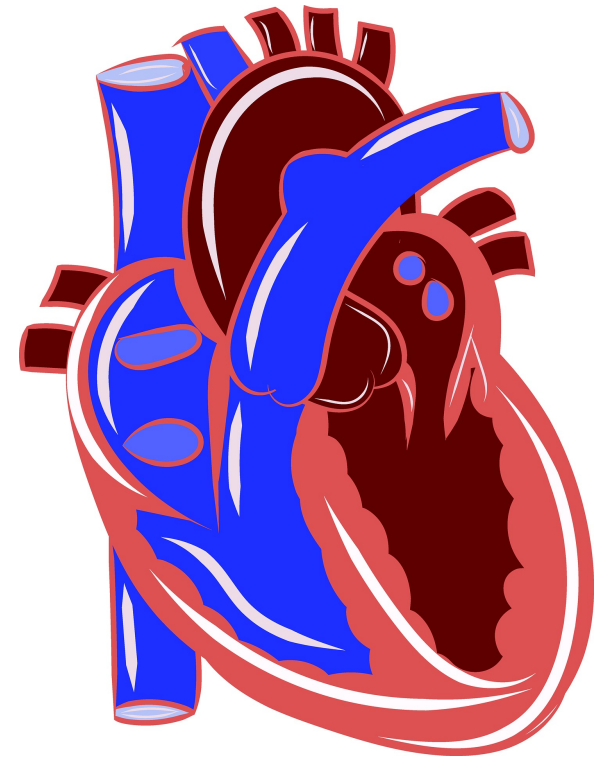


Restrictive

Cardiovascular Disease (CVD) ^[3]

Cardiovascular disease is the leading cause of maternal mortality in the United States.

- It accounts for 1/3 of all pregnancy-related deaths.
- The majority of women who die from cardiovascular disease have no cardiac-related diagnosis at the onset of pregnancy.





Case Presentation

"A 25-year-old obese African-American G2P2 presents to Urgent Care on postpartum day #10 with complaints of fatigue and persistent cough since delivery.

- Afebrile
- BP 110/80 mmHg
- HR 110 bpm
- RR 28 per minute
- O2 saturation 94% on room air

A chest x-ray is obtained that demonstrates bilateral infiltrates."

1 of 3



Click the next arrows to
read the case study





Case Presentation

"The patient is diagnosed with a respiratory infection. Fatigue is attributed to lack of sleep due to the care of a newborn. She is prescribed an antibiotic and is discharged home.

One week later, she presents again with the same symptoms. The woman is now prescribed inhalers due to a presumptive diagnosis of asthma.

Two days later, the patient experiences cardiac arrest at home. Resuscitation attempts are unsuccessful. Autopsy demonstrates cardiomyopathy."

« 2 of 3 »



Click the next arrows to
read the case study





Case Presentation

"The case is representative of numerous deaths that are attributed to cardiovascular disease, particularly in African American women.

Deaths from cardiovascular disease are at least partially attributed to lack of awareness at the level of both the patient and the provider, which contributes to delayed or missed diagnoses." [\[4\]](#)

« 3 of 3 »



Click the next arrow to continue



Racial Disparities - Maternal and Pregnancy-Related Mortality

- African-American women have a 3-4 fold greater risk of maternal mortality than women of other ethnic or racial groups. [\[5\]](#).
- In California, pregnancy-related CVD is more than 8 times higher in African-American women than that for white women [\[6\]](#).
- Pregnancy-related mortality has the widest and most persistent racial and ethnic disparity in all of U.S. public health.



Racial Disparities - CVD Incidence and Comorbidities [5,6]

- Higher rates of pre-existing CVD occurs among African-American women [5].
- Comorbid conditions, such as hypertensive disorders of pregnancy, are more pervasive among African-American women.
 - Hypertensive disorders correlate to all types of CVD.
- It has been reported that African-American women have a lower number of visits for prenatal care and seek care later in pregnancy when compared to women of other racial and ethnic groups [7].



Racial Disparities - Peripartum Cardiomyopathy (PPCM) [8-11]

- All forms of hypertensive disease in pregnancy increase the risk for to PPCM
 - Women with gestational hypertension, chronic hypertension, and mild preeclampsia had 2- to 5-fold increases in odds of PPCM.
 - Women with severe preeclampsia had a 17-fold increase in odds of PPCM
 - Women with eclampsia had a 25-fold increase in PPCM.
- Compared to white women, African American women with PPCM are typically:
 - Younger
 - Have more severe symptoms
 - More commonly present postpartum



Racial Disparities [\[12-19\]](#):

Maternal mortality and morbidity are impacted by racial and ethnic disparities that stem from social, medical, and health system factors.

1 of 5 



Click the next arrows to
read more information.





Racial Disparities [\[12-19\]](#):

The incidence of hypertension and preeclampsia is higher with African-American women, yet these women are less likely to be hospitalized for treatment.

◀ 2 of 5 ▶



Click the next arrows to
read more information.





Racial Disparities [\[12-19\]](#):

Maternal health outcomes are likely impacted by the chronic stress and experiences of racism over the course of life, which may contribute to the higher rates of low birth weight infants and infant mortality.

◀ 3 of 5 ▶



Click the next arrows to read more information.

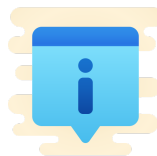




Racial Disparities [\[12-19\]](#):

Birth outcomes have known factors where high stress levels (the allostatic load) both before and after pregnancy impact the outcomes. African-American women are subject to higher loads which is multi-factorial with ‘embodied inequality’ arising from environmental, social, and genetic factors.

◀ 4 of 5 ▶



Click the next arrows to read more information.



Racial Disparities [\[12-19\]](#):

- Social factors that have been shown to impact maternal health include:
 - Malnutrition
 - Illicit substance exposure
 - Intimate partner violence
 - Smoking
 - Infections
 - Racism
 - Inadequate medical care
 - Inadequate dental care
- These social factors highly correlate with socioeconomic status.
- African American women living in underserved areas often lack resources to maintain a healthy lifestyle, which further impacts the negative cycle of poor reproductive and maternal health.
- Even African American women with higher socioeconomic status and education do not necessarily have improved pregnancy outcomes.

◀ 5 of 5



Racial Disparities - Provider and Institutional Bias [[19-23](#)]

- Provider demographics have been shown to be linked to varying levels of racism and bias.
- The doctor-patient interaction is influenced by racial bias (conscious or not), gender bias (conscious or not), social ideas about race and class. These issues can shape and influence treatment disparities.



Click the picture to learn more about provider and institutional bias.

- African American patients are less likely to be offered cardiovascular treatment of proven benefit [7-26].
- African American patients are more likely to have worse outcomes, including higher mortality rates, after cardiac procedures [7-26].





Racial Disparities - Clinical Implications [24-26]

Complaints from patients need to be taken seriously, and clinicians need to maintain a high suspicion for CVD, especially when seeing African-American women who are pregnant or postpartum.

1 of 3 



Click the next arrows to read more information.





Racial Disparities - Clinical Implications [24-26]

- Careful evaluation should occur if an African American woman presents with any of the following symptoms either during pregnancy or in the postpartum period, particularly if the pregnancy is complicated by hypertension or obesity:
 - Extreme shortness of breath, especially when lying down
 - Persistent cough unrelieved with treatment
 - Significant fatigue
 - Palpitations
 - Swelling
 - Chest pain
 - Abnormal vital signs

◀ 2 of 3 ▶



Click the next arrows to read more information.





Racial Disparities - Clinical Implications [24-26]

- Everyone has an opportunity to reduce disparities when diagnosing and treating CVD by implementing standardized protocols:
 - Assessment algorithms



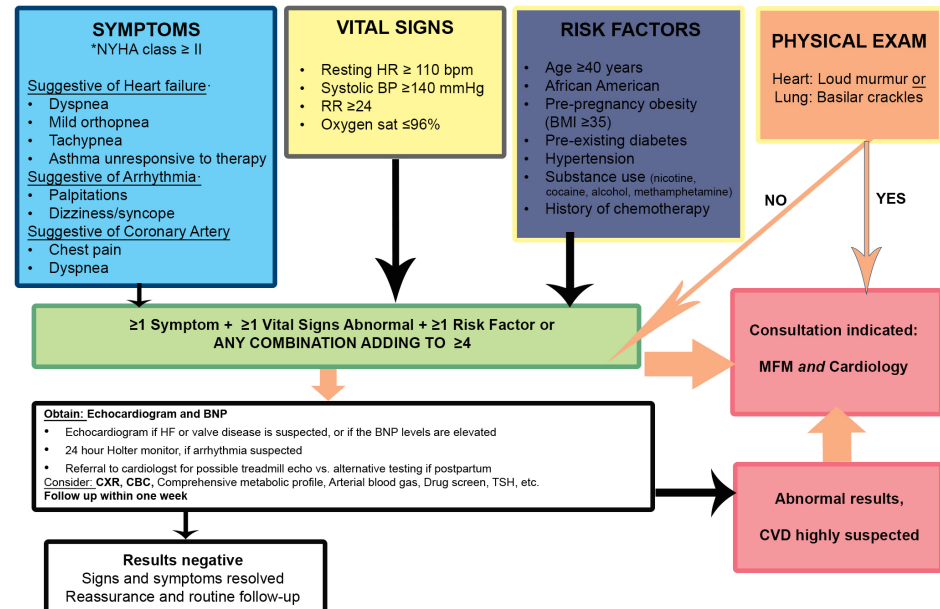
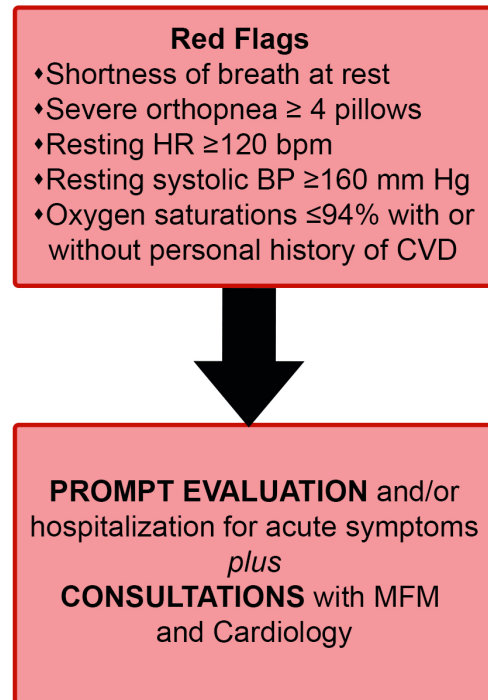
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3 of 3



Algorithm [4]

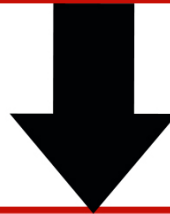


Click the picture for a larger view



Red Flags

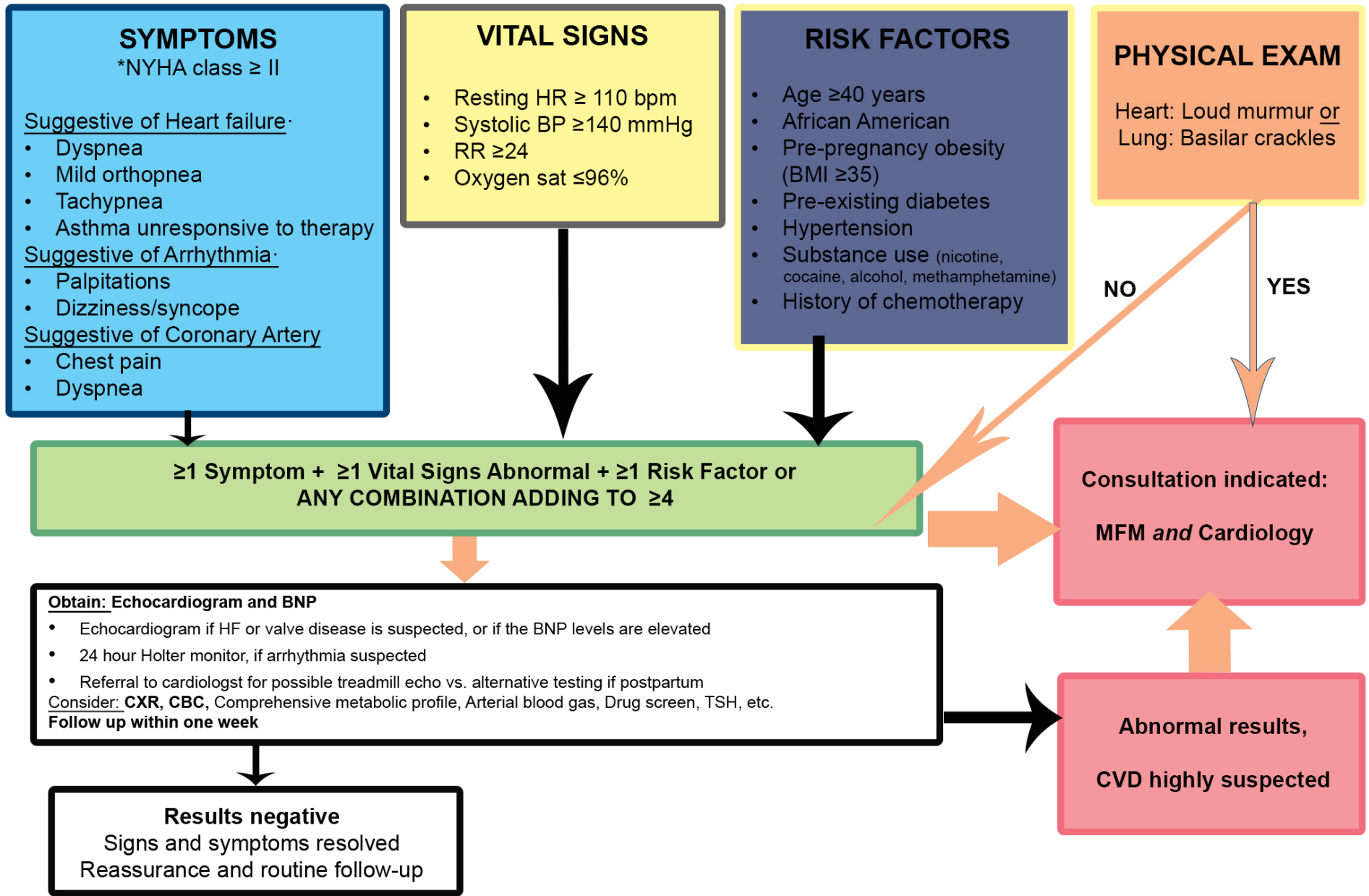
- ♦ Shortness of breath at rest
- ♦ Severe orthopnea ≥ 4 pillows
- ♦ Resting HR ≥ 120 bpm
- ♦ Resting systolic BP ≥ 160 mm Hg
- ♦ Oxygen saturations $\leq 94\%$ with or without personal history of CVD



[4]

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

If no red flags, proceed with this evaluation





Evaluation of Cardiac Patient

Click here to
review the case
study.

- Electrocardiogram (EKG)
- Echocardiogram
- B-type natriuretic peptide (BNP)
- Other tests to consider:
 - Holter monitor
 - Chest X-ray
 - Complete blood count (CBC)
 - Comprehensive metabolic panel (CMP)
 - Arterial blood gas (ABG)
 - TSH
 - Urine drug screen



Click the next arrows on the clipboard
to read more information.

1 of 2 >>





Evaluation of Cardiac Patient

Click here to
review the case
study.

The following Red Flags **MUST** prompt further evaluation and possible hospitalization or Maternal Fetal Medicine consultation [\[4\]](#):

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥ 120 bpm
- Resting systolic BP ≥ 160 mmHg
- Resting RR ≥ 30
- Oxygen saturations $\leq 94\%$ with or without personal history of cardiovascular disease



Click the next arrow to continue

« 2 of 2





- BNP is a neurohormone secreted predominantly by the cardiac ventricles in response to volume expansion or pressure overload.
- BNP acts as the body's defense against volume overload by virtue of its vasodilatory and renin-angiotensin-aldosterone system inhibitory properties that lead to natriuresis and diuresis.
- BNP may help identify asymptomatic women with left ventricular dysfunction.

1 of 6



Click the next arrows to read more information.

B-type Natriuretic Peptide (BNP) a tool



BNP Facts [\[4,40\]](#):

- Half-life is 20 minutes
- BNP level $<100\text{pg/mL}$ is considered normal
- Women tend to have higher levels than men
- Known to be elevated in patients with renal insufficiency or renal failure
- Obesity is associated with lower plasma BNP compared to non-obese
- BNP level under 50pg/mL has a negative predictive value of 96% in excluding heart failure



2 of 6



Click the next arrows to read more information.



BNP and Pregnancy:

- BNP levels remain stable throughout the pregnancy and postpartum period, despite an increase in left ventricular wall mass and end-diastolic dimensions during normal pregnancy [[44](#)].



3 of 6



Click the next arrows to
read more information.

B-type Natriuretic Peptide (BNP) a fool



BNP Facts in Pregnancy [\[44\]](#):

- The median level of BNP was noted to be 19pg/mL during pregnancy versus 10pg/mL in the non-pregnant state from a longitudinal study group of plasma levels.
- Significant elevations are seen in patients with hypertensive disorders including preeclampsia.



4 of 6



Click the next arrows to read more information.

B-type Natriuretic Peptide (BNP) a fool



Preexisting Heart Disease:

- Serial measurements of N-terminal pro-BNP (NT-proBNP) are shown to be predictive of adverse cardiovascular outcomes in women with *preexisting* dilated cardiomyopathy [29].

Click here for more information on
BNP and pregnancy.



4 of 6



Click the next arrows to
read more information.

B-type Natriuretic Peptide (BNP) a fool



Pregnant Women with Symptoms [45]:

- BNP levels correlate with elevated left ventricular filling pressures in symptomatic pregnant women.
- Can help determine both systolic and diastolic left ventricular dysfunction.



5 of 6



Click the next arrows to
read more information.

B-type Natriuretic Peptide (BNP) a fool



In Summary [\[4\]](#):

- BNP may assist clinicians in triaging patients who present symptoms concerning for cardiovascular disease:
 - Simple test
 - Relatively inexpensive
 - Readily available



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Click the next arrow to continue



"A 25-year-old obese African-American G2P2 presents to Urgent Care on postpartum day #10 with complaints of fatigue and persistent cough since delivery.

- Afebrile
- BP 110/80 mmHg
- HR 110 bpm
- RR 28 per minute
- O2 saturation 94% on room air

A chest x-ray is obtained that demonstrates bilateral infiltrates.

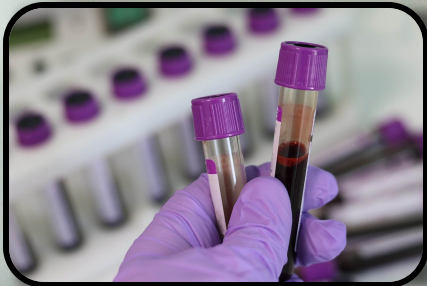
The patient is diagnosed with a respiratory infection. Fatigue is attributed to lack of sleep due to the care of a newborn. She is prescribed an antibiotic and is discharged home.

One week later, she presents again with the same symptoms. The woman is now prescribed inhalers due to a presumptive diagnosis of asthma.

Two days later, the patient experiences cardiac arrest at home. Resuscitation attempts are unsuccessful. Autopsy demonstrates cardiomyopathy."

The case is representative of numerous deaths that are attributed to cardiovascular disease, particularly in African American women.

Deaths from cardiovascular disease are at least partially attributed to lack of awareness at the level of both the patient and the provider, which contributes to delayed or missed diagnoses [\[4\]](#)."

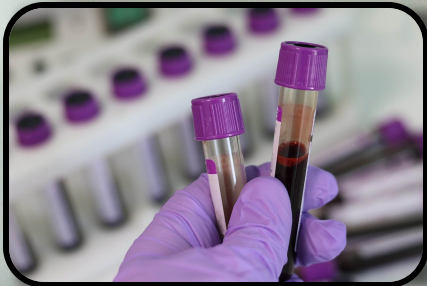


Click the image above to read more information.

B-type Natriuretic Peptide (BNP) [[27-29](#)]

- BNP is a neurohormone that is secreted predominantly by the cardiac ventricles in response to volume or pressure overload.
- BNP level of <100 pg/mL is normal.
- BNP may help identify asymptomatic women with left ventricular dysfunction BNP may help identify asymptomatic or mildly symptomatic women with left ventricular dysfunction.
- BNP acts as the body's defense against volume overload by virtue of its vasodilatory and renin-angiotensin-aldosterone system inhibitory properties that lead to natriuresis and diuresis.



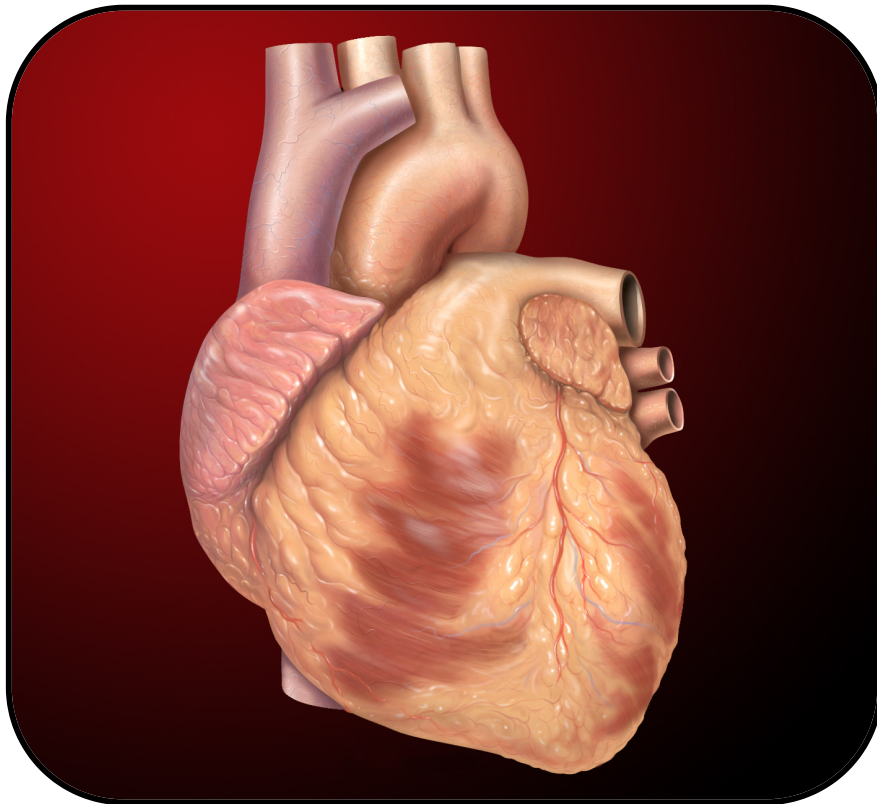


Click the image above to read more information.

B-type Natriuretic Peptide (BNP) [[27](#)-[29](#)]

- BNP levels in pregnancy remain within normal range despite significant volume overload in pregnancy.
- An elevated BNP level should trigger an echocardiogram to evaluate cardiac function.
- Serial measurements of BNP in pregnant women with dilated cardiomyopathy are shown to be predictive of adverse cardiovascular outcomes.





Presentation of Women with CVD:

- Diagnosis of CVD in pregnancy is difficult due to the overlap of symptoms with typical symptoms of pregnancy such as:
 - Shortness of breath
 - Fatigue
 - Exercise limitation
 - Swelling
- Cardiovascular risk assessment should be performed in all pregnant women at their first prenatal visit [\[4\]](#).



How to differentiate common signs and symptoms of normal pregnancy versus those that are abnormal and indicative of underlying cardiac disease*

	ROUTINE CARE Reassurance	CAUTION Nonemergent Evaluation	STOP Prompt Evaluation Pregnancy Heart Team
HISTORY OF CVD	None	None	Yes
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
Fatigue	Mild	Mild or moderate	Extreme
VITAL SIGNS			
Heart Rate	<90	90-119	≥120
PHYSICAL EXAMINATION			
Edema	Mild	Moderate	Marked

*This is an abbreviated list—see Practice Bulletin *Pregnancy and Heart Disease* for complete table of symptoms.



Eliminate preventable maternal mortality
#EveryMomEveryTime

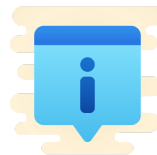
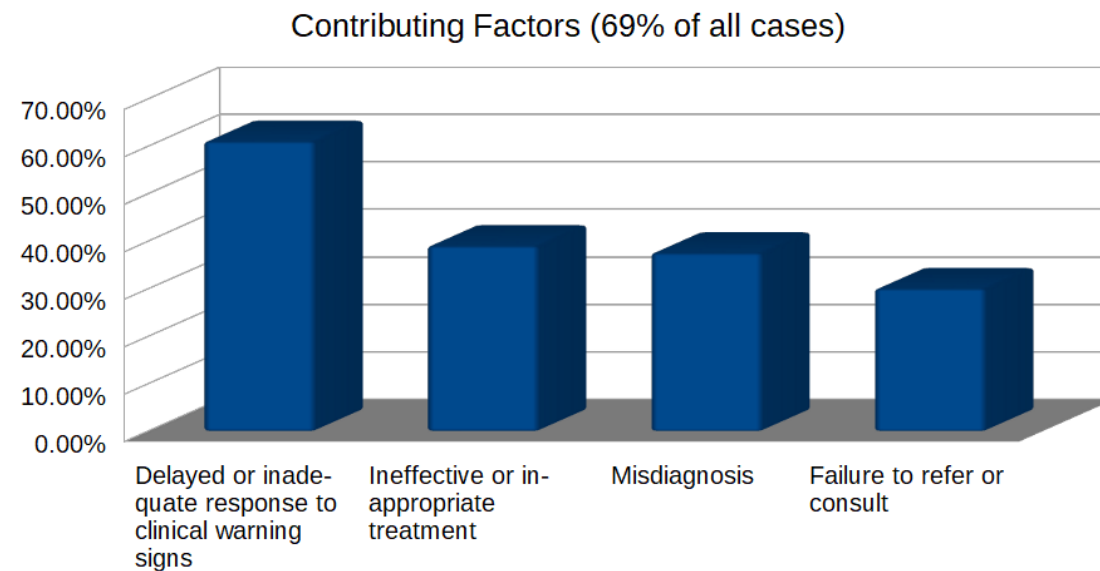
[33]



Another contributing factor to maternal morbidity and mortality with CVD from the health care provider perspective:

Insufficient use of hypertensive medications and misdiagnosis of “new onset asthma” or other respiratory illness

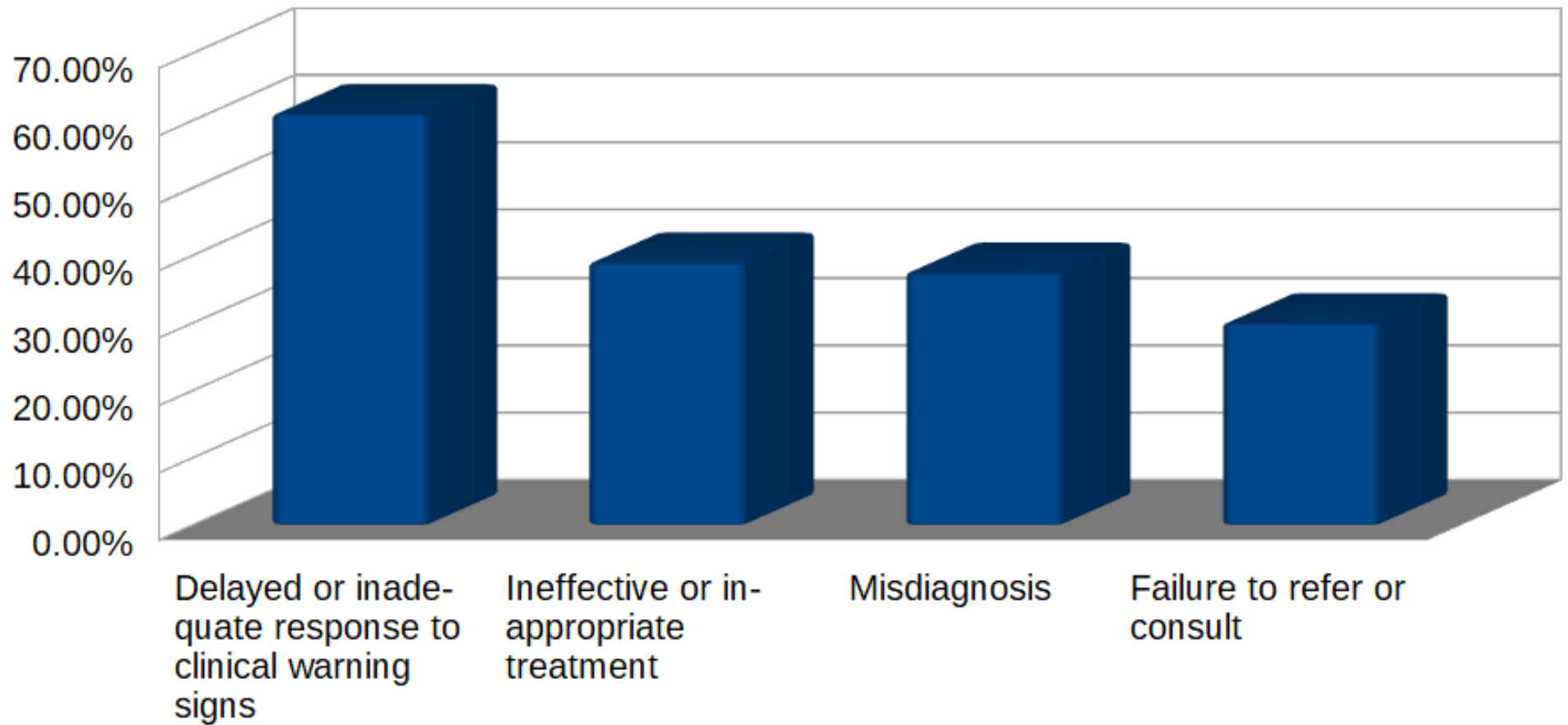
Click here for
a list of
improvement
opportunities.



Click the graph
above for a larger



Contributing Factors (69% of all cases)



Improvement opportunities [\[4\]](#):

- Better recognition of signs and symptoms of CVD in pregnancy:
 - Shortness of breath, fatigue
 - Tachycardia, BP change, and low oxygen saturation
- Improved hypertensive management
- Cautious diagnosis of new onset asthma, asthma exacerbation or other respiratory pathology

Review of Cardiac Physiology in Pregnancy

- Cardiac changes begin at 5-6 weeks gestation
- 30-50% increase in cardiac output
- Decreased systemic vascular resistance
- Decreased systolic and diastolic blood pressure [[1](#),[35](#)].
- Hormones secreted by the corpus luteum likely orchestrate these early cardiovascular changes [[1](#),[35](#)].
- These hormones induce profound changes in systemic vascular resistance and result in significantly decreased systolic and diastolic blood pressures as early as 5 weeks [[1](#),[36](#)].



Click the next arrow to review information on cardiac physiology in pregnancy.



Review of Cardiac Physiology in Pregnancy

- At least half of the total rise in cardiac output during pregnancy has manifested as early as 8 weeks gestation [[37](#),[38](#)].
- Mean BP nadirs at 16-29 weeks gestation [[37](#),[38](#)].
- “From early pregnancy until about 16 weeks of gestation a reduction in peripheral vascular resistance occurs causing stroke volume to be augmented and increase after this time in gestation, typically stroke volume plateaus along with cardiac output [[1](#)].”



Click the next arrow to review information on cardiac physiology in pregnancy.



2 of 3





Review of Cardiac Physiology in Pregnancy

- Left ventricular contractility does not change.
- It is uncharacteristic in a high output cardiac state with hyperdynamic function to maintain normal left ventricular function as it is in pregnancy [[35](#)].
- Pregnancy induced hypervolemia causes cardiac enlargement
- Cardiac remodeling is a normal physiologic response to pregnancy that typically resolves by 3 months postpartum



Click the next arrow to continue



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Risk factors for cardiomyopathy during pregnancy [[1](#),[34](#), [51-53](#)]:

- Multiparity
- Advanced maternal age
- Multifetal pregnancy
- Preeclampsia
- Gestational HTN
- African-American race
- History of preeclampsia, eclampsia, or postpartum hypertension
- Maternal cocaine abuse
- >4 weeks of oral tocolytic therapy with beta adrenergic agonists such as terbutaline



Africa and Haiti

United States



Mouse over each map above for more on cardiomyopathy incidence in each location

Incidence of Peripartum Cardiomyopathy [\[30\]](#):

- Incidence varies widely owing to numerous factors [\[32\]](#):
 - Geographic difficult area
 - Differing definitions
 - Evolving diagnostic criteria
 - Lacking of accurate data

The incidence of peripartum cardiomyopathy in the U.S. has increased from 1 in 4,350 births in the early 1990s to 1 in 2,230 births in the mid-2000's [[31](#)].

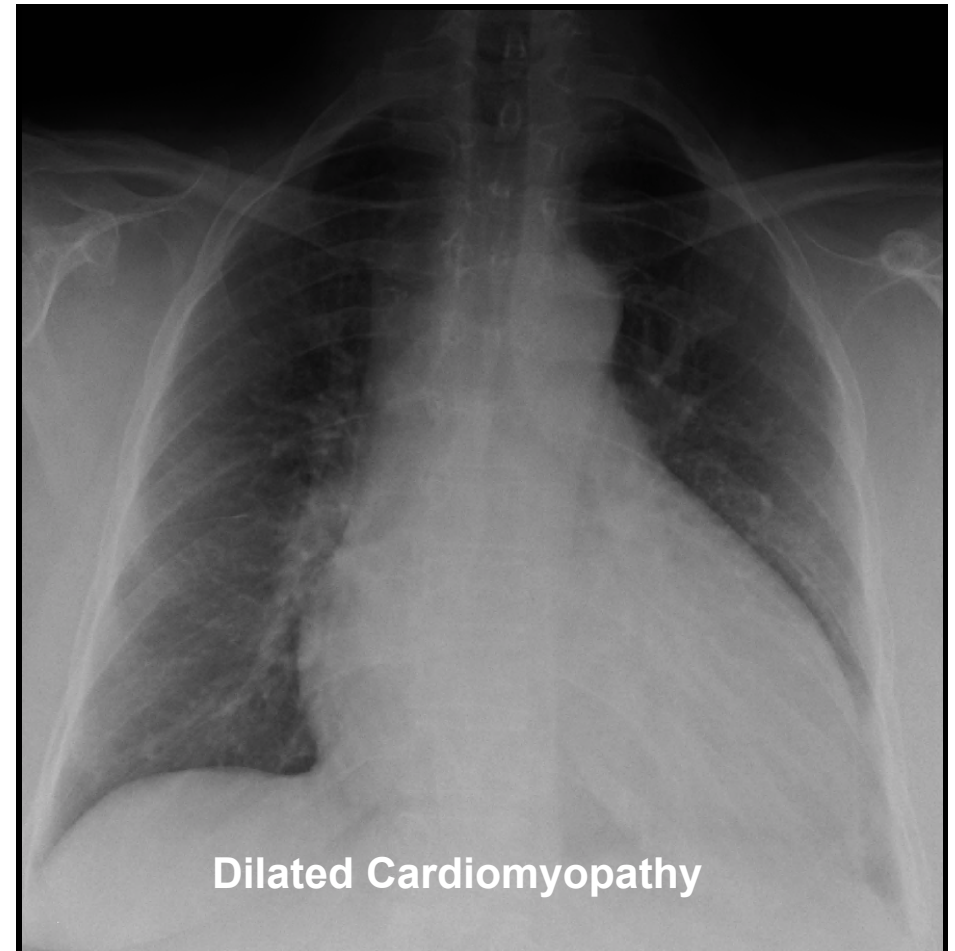
Worldwide, peripartum cardiomyopathy affects approximately 1 per 1,000 pregnancies with geographic hot spots found in Africa--up to 1 per 100 pregnancies-- and Haiti--1 in 300 births [[30](#)]. Genetic predisposition may contribute to geographical variation.

Peripartum cardiomyopathy is defined by:

- Left ventricular dysfunction
- Development of cardiac failure without a known cause
- Occurring in the final month of pregnancy
- Up to 5 months postpartum [\[1\]](#).



Click the xray for more information.



Definition of Cardiomyopathy

Absence of another identifiable cause for the heart failure [\[46\]](#):

- Left ventricular (LV) systolic dysfunction with an ejection fraction (LVEF) of less than 45% [\[46\]](#).
- The LV may or may not be dilated [\[46\]](#).



Risk Factors for PPCM

Advanced maternal age [[39](#)]:

- More than half of PPCM occurs in women >30 years old.
- The incidence of PPCM is 10-fold higher in women >40 years old compared with those <20 years old.



Click the next arrows to read more information.

1 of 4 >>





Risk Factors for PPCM

African American race is strongly associated risk factor for PPCM [10]:

- In the US, there is a 5-15% increased risk for PPCM in African American women, as compared to other races



Click the next arrows to read more information.

◀ 2 of 4 ▶





Risk Factors for PPCM

Hypertensive Disorders of Pregnancy

- Pre-eclampsia significantly increases the risk for development of PPCM.
- The incidence of PPCM, when associated with hypertensive disorders, increases from 5 fold to 30 fold.
 - Pulmonary edema caused by preeclampsia can mimic cardiogenic edema caused by heart failure from peripartum cardiomyopathy.
 - Distinguishing between the two etiologies is imperative to management and outcome.



Click the next arrows to read more information.

◀ 3 of 4 ▶



Risk Factors for PPCM

Multifetal pregnancy:

- 9% of cases of peripartum cardiomyopathy were in women with a multifetal pregnancy.

Common pregnancy complications may increase the risk for PPCM

- Obesity
- Anemia
- Infection

◀◀ 4 of 4



Click the next
arrow to continue



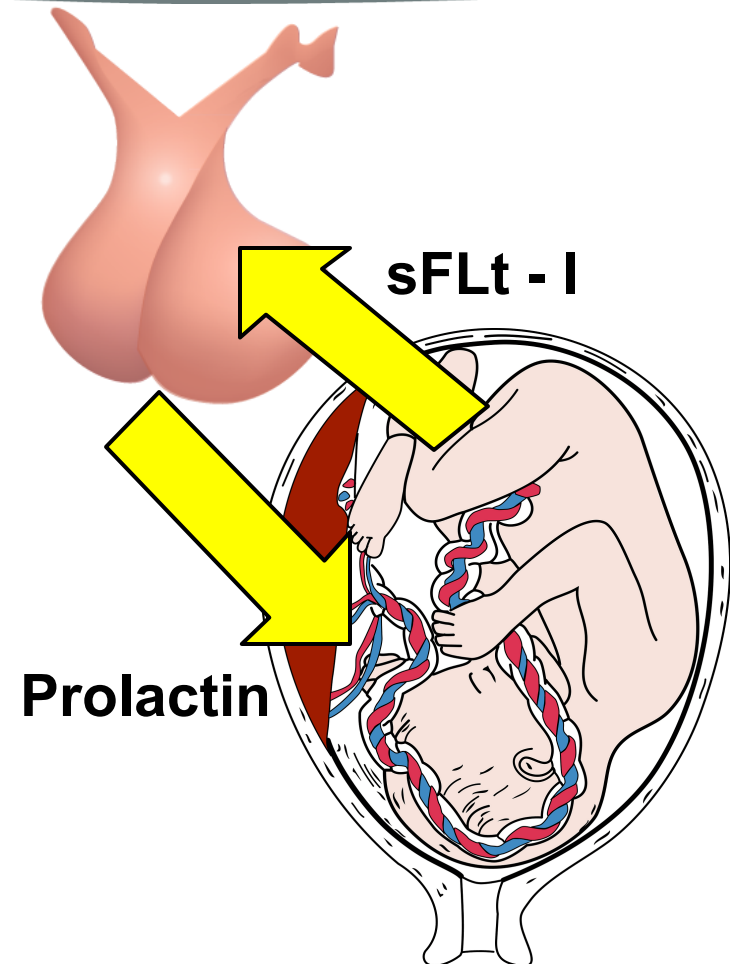
Two hit Hypothesis [1]:

Peripartum cardiomyopathy affects genetically susceptible women who carry one of the following gene mutations

- TTNC1
- TTN
- STAT3



Click the picture to read more information.



Two hit Hypothesis [1]:

Peripartum cardiomyopathy affects genetically susceptible women who carry one of the following gene mutations

- TTNC1
- TTN
- STAT3



Click the picture to read more information.

Term pregnancy is also characterized by prodigious secretions of prolactin by the maternal pituitary and at the same time the placenta secretes high levels of the antiangiogenic molecule, sFLT-1:

- So altered prolactin processing is believed to be involved in the pathogenesis of PPCM.
- A fragment of the prolactin molecule is hypothesized to trigger vasoinhibin-acts which is thought to cause myocardial damage with ventricular dysfunction.
- Pregnancy also results in high levels of vascular endothelial growth factor inhibitory molecule, sFLT1.
 - Levels are further increased by pre-eclampsia and multifetal gestation

Physiologic Contributors of PPCM

Angiogenic Imbalance [\[47\]](#):

- PPCM may be caused by systemic angiogenic imbalance which may explain why preeclampsia and multiple gestations are risk factors for PPCM.
- Angiogenic imbalances may damage the vasculature leading to PPCM issues.

1 of 6 >>





Physiologic Contributors of PPCM

Prolactin [\[48\]](#):

- Altered prolactin processing is believed to be involved in the pathogenesis of PPCM.
- Alterations in prolactin processing may contribute to angiogenic imbalances.

◀ 2 of 6 ▶





Physiologic Contributors of PPCM

Myocarditis [\[49\]](#):

- Viral genomes have been noted in research where the endomyocardium was biopsied.
- However, myocarditis is not always present with PPCM.

◀ 3 of 6 ▶





Physiologic Contributors of PPCM

Abnormal Immune Response [[50](#)]:

- The maternal immunologic response to a fetal antigen has been suggested as an etiology leading to PPCM.

◀ 4 of 6 ▶



Physiologic Contributors of PPCM

Genetic Predisposition:

- PPCM may develop as a result of interaction between pregnancy-related factors and a susceptible genetic background.
- African genomic ancestry may be a risk factor for the development of PPCM and explain the high prevalence of PPCM in Haitian, African, and black women in the U.S.

◀ 5 of 6 ▶



Physiologic Contributors of PPCM

Hemodynamic Factors:

- In pregnancy there is a 40 to 50% increase in blood volume and cardiac output resulting in left ventricular remodeling and hypertrophy. It is possible this remodeling is an exaggerated response with a decrease in left ventricular systolic function in women who develop PPCM.
- The hemodynamic stress of hypertensive disorders of pregnancy may contribute to the develop of heart failure, given that hypertensive disorders of pregnancy are a known risk factor for PPCM.

◀ 6 of 6





Pearls for Providers

The highest risk period for a preexisting cardiac condition to manifest is generally in the late 2nd trimester — 24-28 weeks — or in the postpartum period [[4](#)].

1 of 12 >>



Click the next arrows to read more information.





Pearls for Providers

The first presentation of cardiovascular disease may occur during pregnancy or in the early postpartum time frame [\[4\]](#).



2 of 12



Click the next arrows to read more information.





Pearls for Providers

Cardiovascular risk assessment needs to occur in all pregnant women, with or without symptoms [\[4\]](#).



3 of 12



Click the next arrows to read more information.





Pearls for Providers

Pregnant or postpartum women presenting with symptoms of shortness of breath, cough, or excessive fatigue should be evaluated in the context of risk factors, vital sign abnormalities, and abnormal physical examination findings [\[4\]](#).



4 of 12



Click the next arrows to read more information.





Pearls for Providers

A symptom of heart failure may present as persistent respiratory symptoms and ‘new-onset’ asthma [[4](#)].



5 of 12



Click the next arrows to read more information.





Pearls for Providers

When an chest x-ray shows bilateral infiltrates, this may be due to heart failure rather than pneumonia, correlate these findings clinically [[4](#)].



6 of 12



Click the next arrows to read more information.





Pearls for Providers

Counsel women currently pregnant or postpartum with significant cardiovascular risk factors regarding their future cardiovascular risk [\[4\]](#).

Involving the woman's primary care provider (PCP) early is crucial to ensure a smooth transition postpartum [\[4\]](#).



7 of 12



Click the next arrows to read more information.





Pearls for Providers

Emphasizing awareness of risk factors, sign and symptoms of cardiac disease, and compliance with follow-up are key patient education points [[4](#)].



8 of 12



Click the next arrows to read more information.





Pearls for Providers

Optimally, when a woman has known CVD, she should receive preconception and interconception care by perinatology and cardiology [[4](#)].



9 of 12



Click the next arrows to read more information.



Pearls for Providers

In any patient with CVD, contraception should be discussed throughout pregnancy and a plan should be implemented postpartum. [[4](#)].

◀◀ 10 of 12 ▶▶



Click the next arrows to read more information.





Pearls for Providers

Key elements to a successful outcome includes [\[4\]](#):

- . High index of suspicion
- . Early diagnosis
- . Appropriate referrals
- . Follow up



11 of 12



Click the next arrows to read more information.





Pearls for Providers

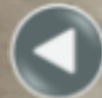
When Red Flags are present immediate evaluation and/or hospitalization is recommended [\[4\]](#):

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥ 120 bpm
- Resting systolic BP ≥ 160 mmHg
- Resting respiratory rate ≥ 30
- Oxygen saturation $\leq 94\%$ with or without personal history of CVD

◀ 12 of 12

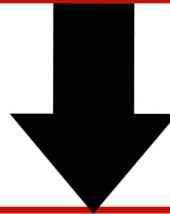


Click the next arrow to continue



Red Flags

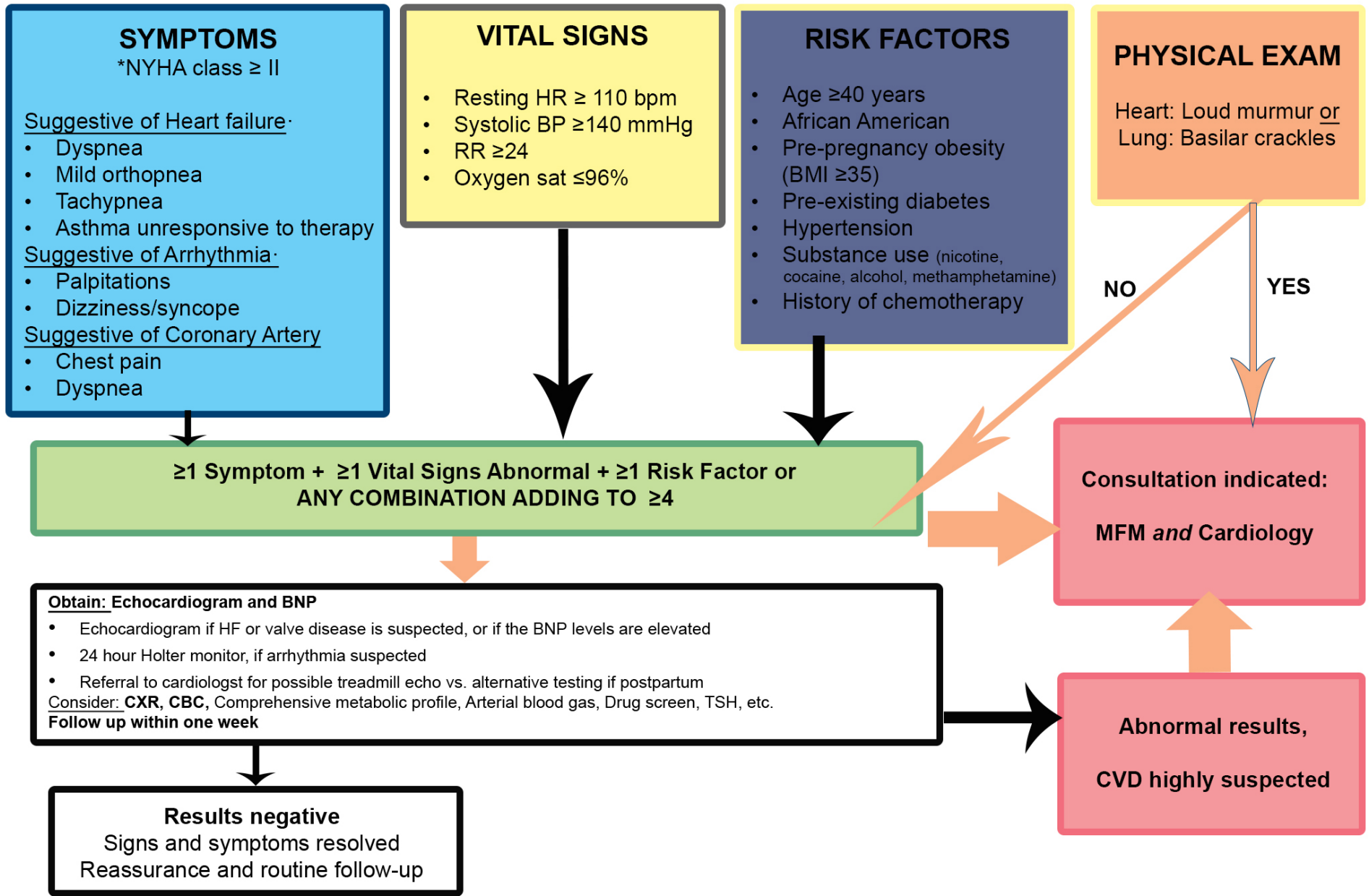
- ♦ Shortness of breath at rest
- ♦ Severe orthopnea ≥ 4 pillows
- ♦ Resting HR ≥ 120 bpm
- ♦ Resting systolic BP ≥ 160 mm Hg
- ♦ Oxygen saturations $\leq 94\%$ with or without personal history of CVD



[4]

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

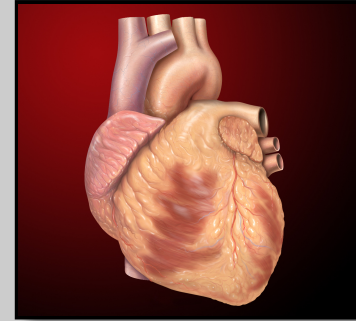
If no red flags, proceed with this evaluation



The diagnosis of PPCM is based on 3 clinical criteria [[50](#), [54-56](#)]:

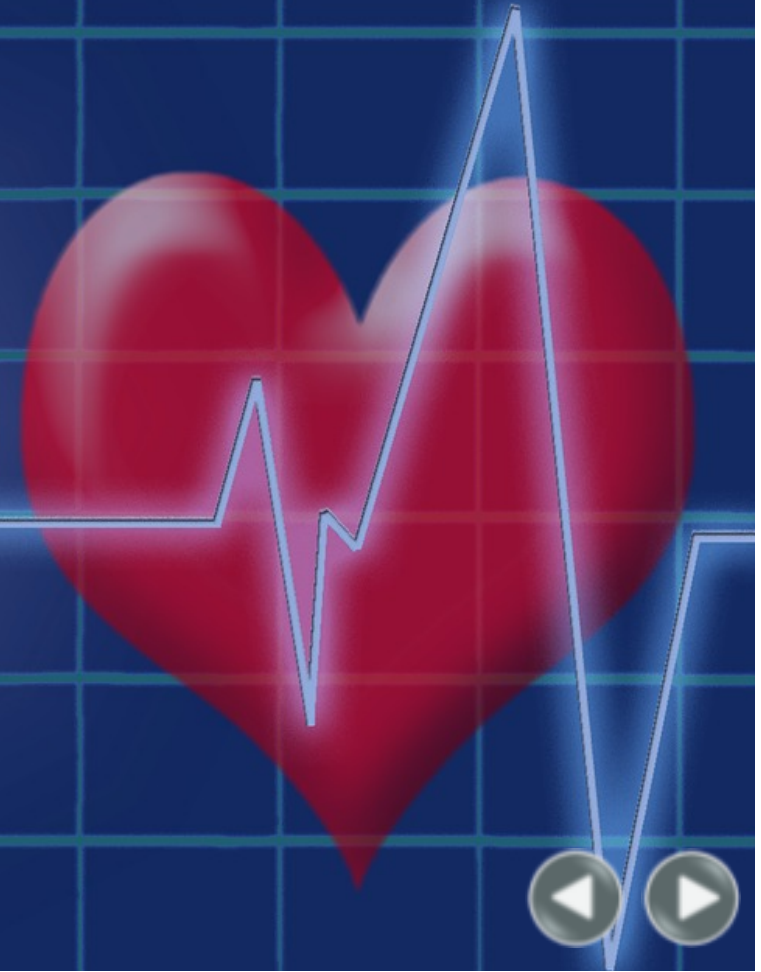
1. Development of heart failure within one month prior to delivery or five months postpartum.
2. Absence of another identifiable cause of heart failure.
3. Left ventricular systolic dysfunction with a left ventricular ejection fraction generally $<45\%$.

- There are no pathognomonic findings in PPCM and it is a diagnosis of exclusion.
- Ordering an electrocardiogram (ECG) and echocardiogram are prudent actions in those suspected of having PPCM.
 - A normal ECG does not rule out PPCM [57].
 - An ECG may be helpful in differentiating between other diagnosis such as a myocardial infarction (MI) or pulmonary embolism (PE).
 - An echocardiogram generally reveals global reduction in left ventricular function with LVEF nearly always $<45\%$; the left ventricle is frequently dilated, but not always.



Click the heart for more information.

- BNP, chest X-ray (with fetal shielding when pregnant), cardiac magnetic resonance (CMR), cardiac catheterization and may be helpful in certain cases.
 - BNP can help evaluate patients suspected of having heart failure when the diagnosis is uncertain [[58](#)].
 - Concern should raise if the BNP level is above 100pg/mL because a BNP <100pg/mL is considered normal.



Summary

Preexisting cardiovascular disease and/or new-onset peripartum cardiomyopathy may initially present during pregnancy or in the postpartum period [\[4\]](#).

- Women with peripartum cardiomyopathy typically present in the 1st week postpartum with 75% of women with peripartum cardiomyopathy presenting in the 1st month [\[47\]](#).
- New-onset cough or shortness of breath are the most frequent complaints of women presenting with pregnant or postpartum women with CVD [\[6\]](#).
- A high index of suspicion for underlying CVD needs to occur by all providers when a woman presents with symptoms, signs and risk factors concerning for heart disease.



Summary

Ask the following questions when a woman presents in the postpartum period with complaints of shortness of breath [\[4\]](#):

- Intolerance of exercise
- Activities of daily living are difficult to complete
- Deteriorating symptoms
- Dizziness
- Palpitations
- Chest pain
- New-onset cough
- Wheezing
- Lower extremity edema or pedal edema
- Fatigue that is not expected (i.e. frequent stops while out walking)
- Orthopnea (if present, ask how many pillows are used)
- Weight gain or inability to lose weight
- History of cardiac or pulmonary conditions
- History of tobacco and/or substance abuse
- Has received care by other providers or Emergency Departments (ED) during the postpartum period





Summary

Common symptoms of pregnancy overlap with those indicative of cardiovascular disease [\[4\]](#):

- Shortness of breath
- Fatigue
- Edema





Summary

Differential diagnosis for postpartum dyspnea [[4](#)]:

- Congestive heart failure (CHF)
- Myocarditis
- Endocarditis
- PE
- Pulmonary hypertension
- Asthma
- Infection



Summary

Key Points [\[4\]](#):

- The postpartum period should involve improved symptoms related to physiologic changes of pregnancy.
- ED visits for dyspnea need to raise suspicion for CVD.
- Concerns for CVD should be raised when postpartum dyspnea or new-onset cough is present.



Summary

Physical examination findings that raise concern for CVD include [\[4\]](#):

- Vital signs:
 - HR ≥ 120 bpm
 - BP ≥ 160 mm Hg
 - RR ≥ 30
 - Oxygen saturation (O_2 Sat) $\leq 94\%$
- Lung exam:
 - Crackles
 - Wheezing
- Cardiac exam:
 - Loud murmur
 - Jugular venous distention (JVD)
- Extremities:
 - Edema
 - Taunt shiny skin



Summary

Evaluation of postpartum dyspnea [4]:

- Chest Radiograph
 - Frequently normal in asthma
- EKG
 - May be normal in cardiomyopathy, except for sinus tachycardia
 - Should be obtained on an emergency basis if the patient has abnormal vital signs or is very symptomatic
 - Normal LV ejection fraction does not exclude heart failure
 - Normal RV function does not exclude pulmonary embolism



Summary

Evaluation of postpartum dyspnea [4]:

- Labs
 - CBC
 - Basic Metabolic Panel (BMP)
 - Thyroid Function Test
 - BNP (concern raises when the BNP level is above 100pg/mL)
 - D-dimer - May normally be elevated in pregnancy, however, may be considered for negative predictive value
 - Toxicology screen
- Venous doppler ultrasound and/or computed tomography (CT) pulmonary angiogram for PE
- Cardiology consultation as needed





Summary

Key points [\[4\]](#):

- New-onset asthma is rare in adults.
- Bilateral crackles on lung examination are most likely associated with CHF.
 - Improvement of dyspnea with bronchodilators does not confirm the diagnosis of asthma, as CHF may also improve with bronchodilators.
- Response to bronchodilators should prompt the consideration of a diagnosis other than asthma.





Summary

Disposition:

- If considering discharge:
 - Repeat vital signs to ensure they are persistently normal, the symptoms have improved, and the patient is stable for discharge.
 - Arrange for early follow-up with PCP or cardiologist as indicated.
- Admission and cardiology consultation may be indicated for:
 - Persistent symptoms or abnormal vital signs, in particular, HR >120 bpm, BP >160 mmHg, RR >30, and O₂ Sat <94%.
 - Lack of response to treatment.
 - Newly-diagnosed cardiomyopathy or pulmonary hypertension.





Click the picture to download this infographic



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



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!



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



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.



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



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.



REMEMBER!

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

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
Total Cholesterol < 200 mg/dl
Fasting Blood Glucose < 100 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.

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



SISTER TO SISTER
The Women's Heart Health Foundation



CMQCC
CALIFORNIA MATERNAL
QUALITY CARE COLLABORATIVE





Click the picture to download this infographic

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:



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.



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.

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:

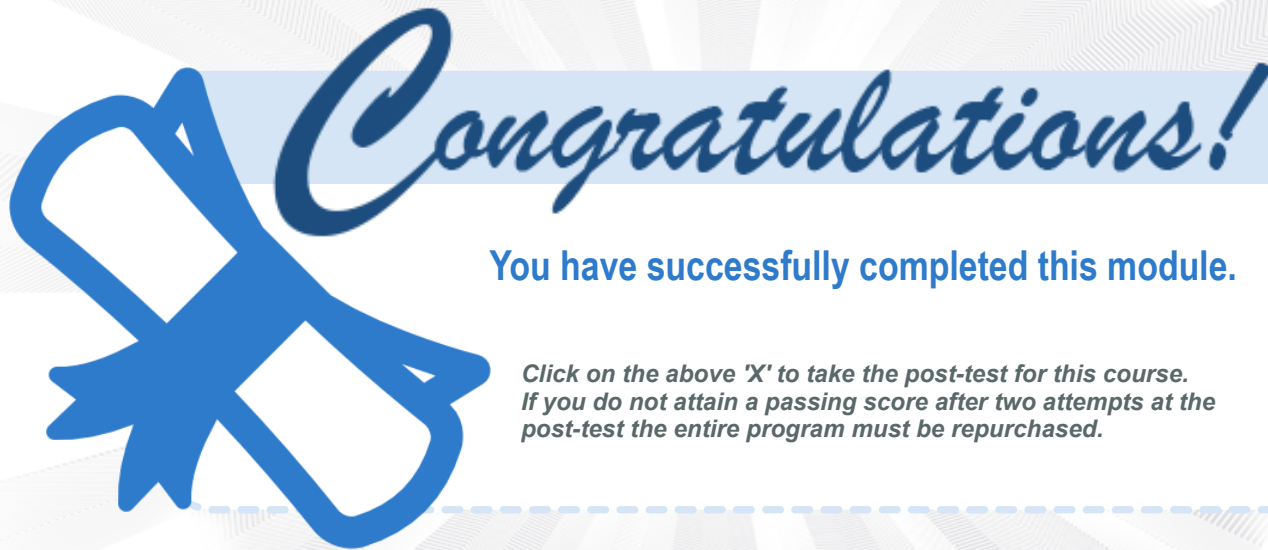
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You have successfully completed this module.

*Click on the above 'X' to take the post-test for this course.
If you do not attain a passing score after two attempts at the
post-test the entire program must be repurchased.*

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