MATERNAL911®

Cardiomyopathy in Pregnancy

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Splash Page

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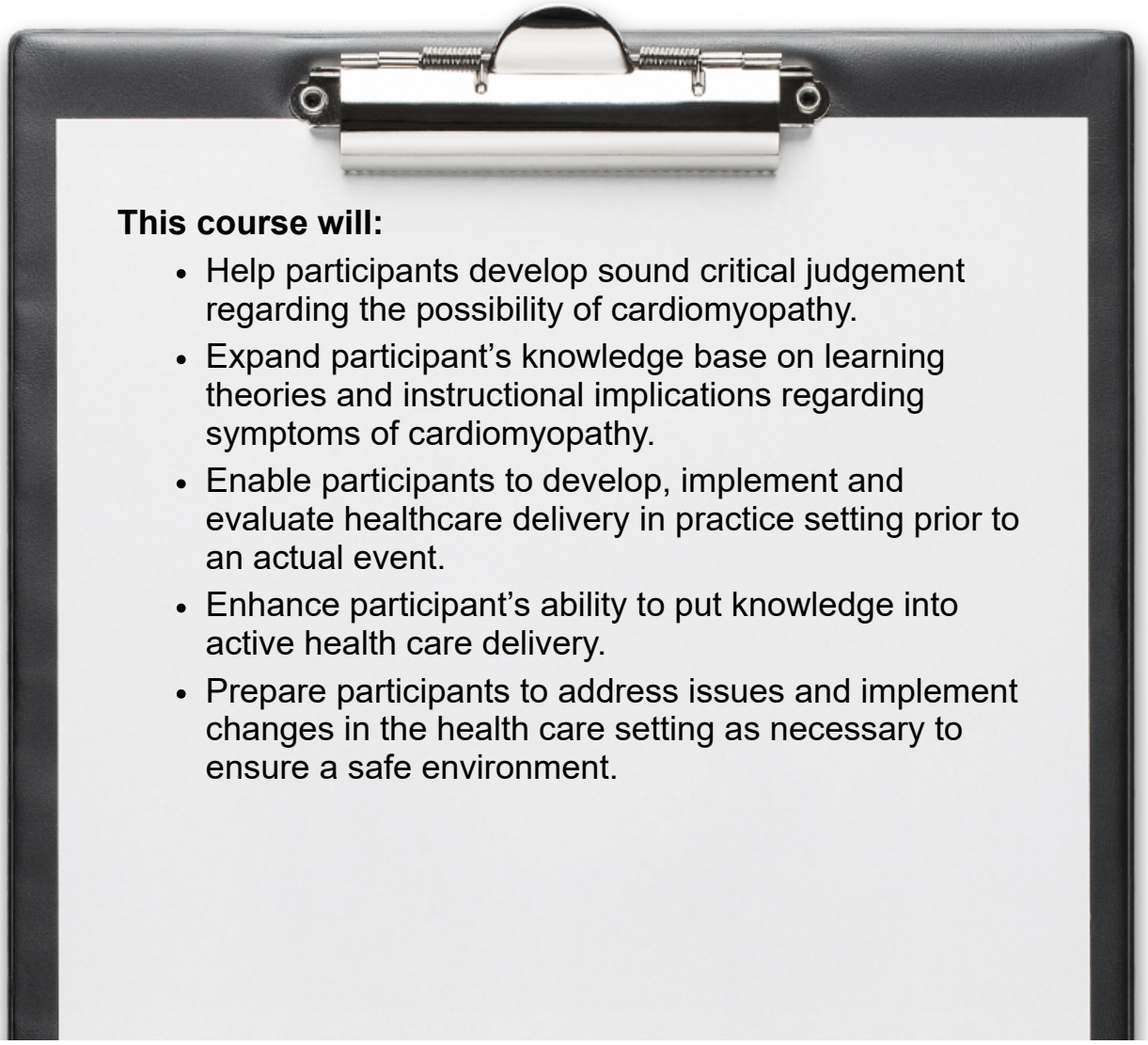
Course Description:

- 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.

Introduction



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.

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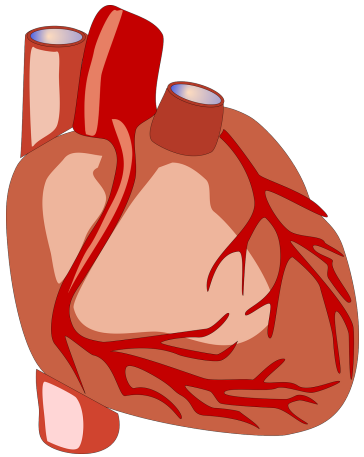
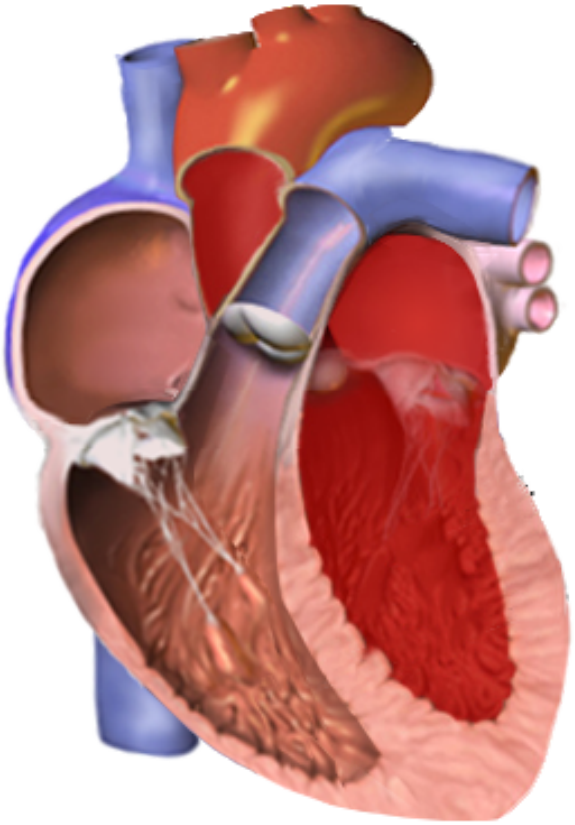
Cardiomyopathy [1,2]

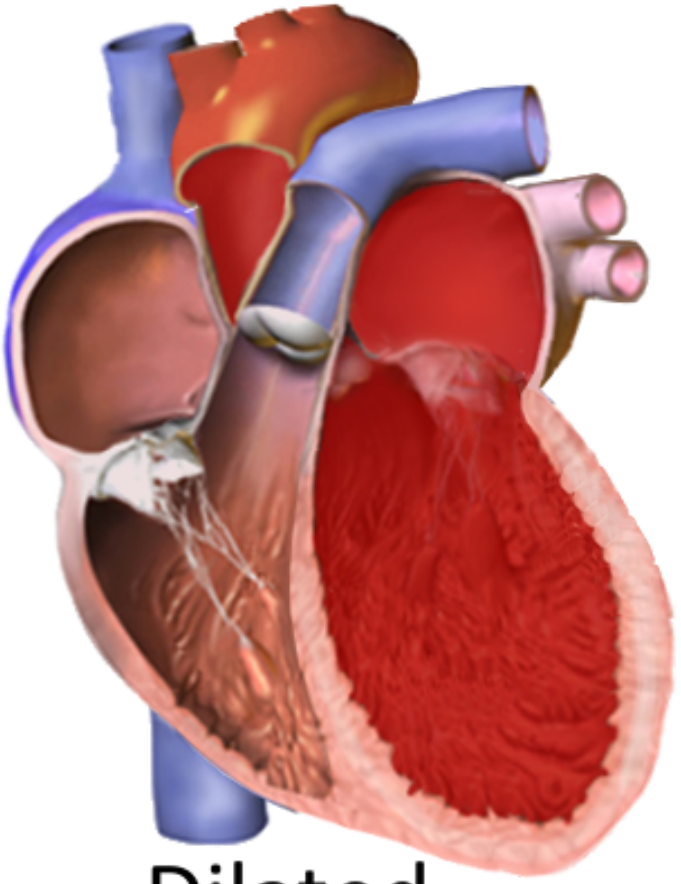


Click the heart for some pictures of common cardiomyopathies.

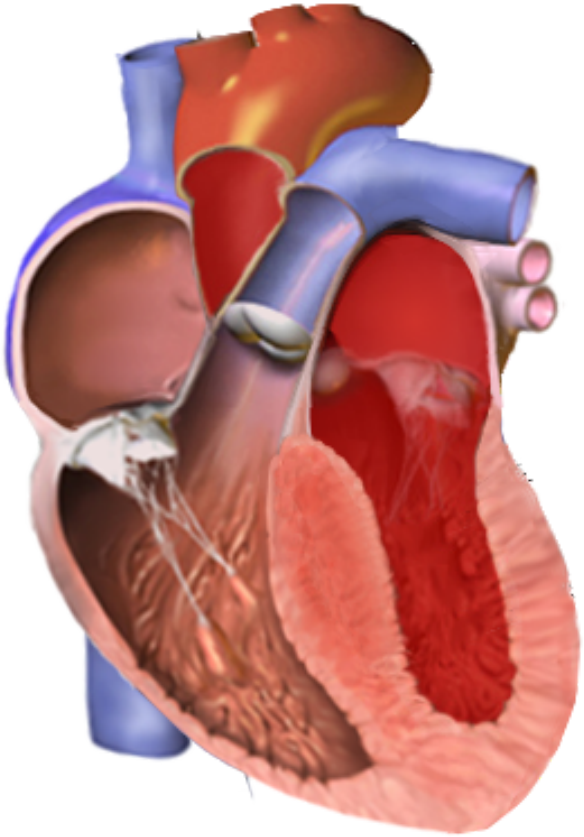
- Cardiomyopathy is a disorder in which the myocardium is either structurally or functionally abnormal in the absence of alternative etiology.
- The most common cardiomyopathies are:
  - Hypertrophic
  - Dilated
- Rare types are:
  - Arrhythmogenic right ventricular
  - Restrictive
  - Takotsubo cardiomyopathy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



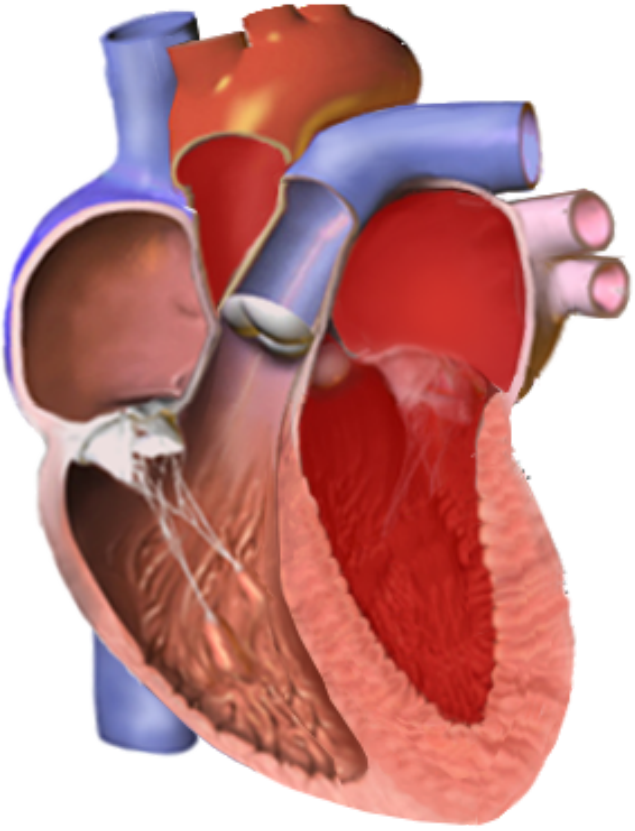
Normal



Dilated



Hypertrophic

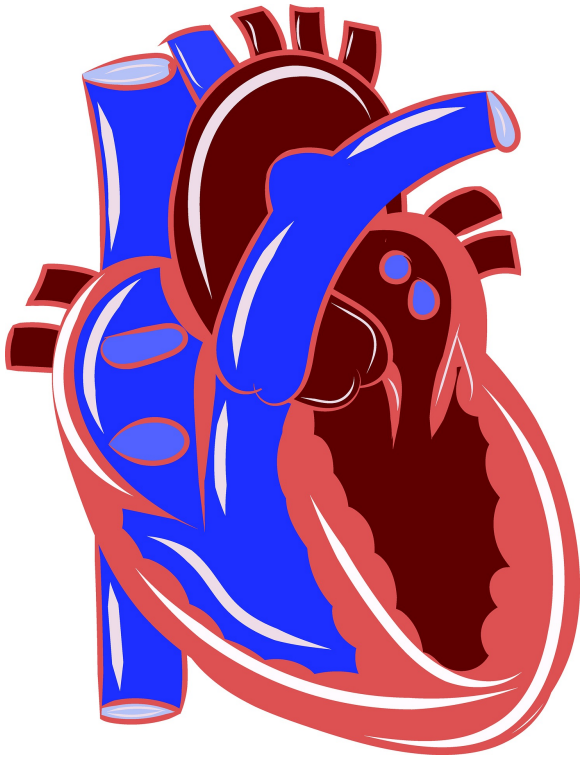


Restrictive

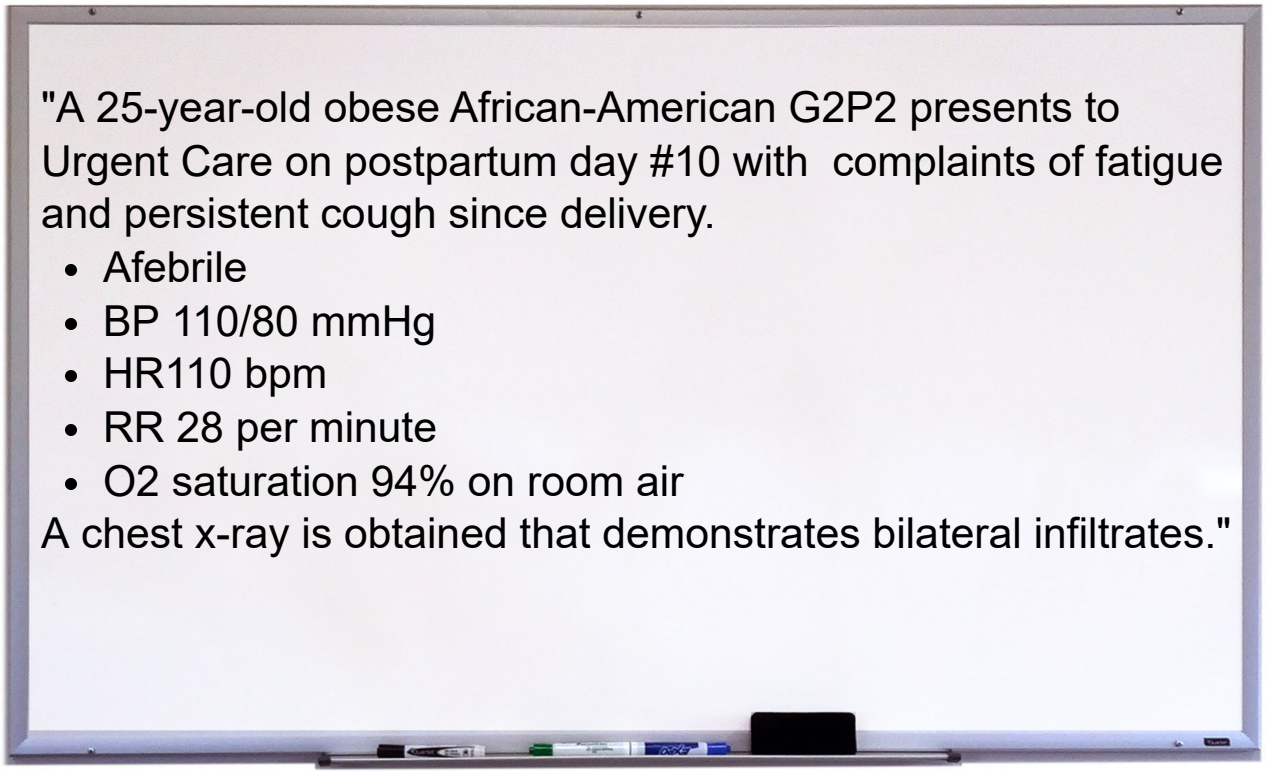
Cardiovascular Disease (CVD) [3]

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.



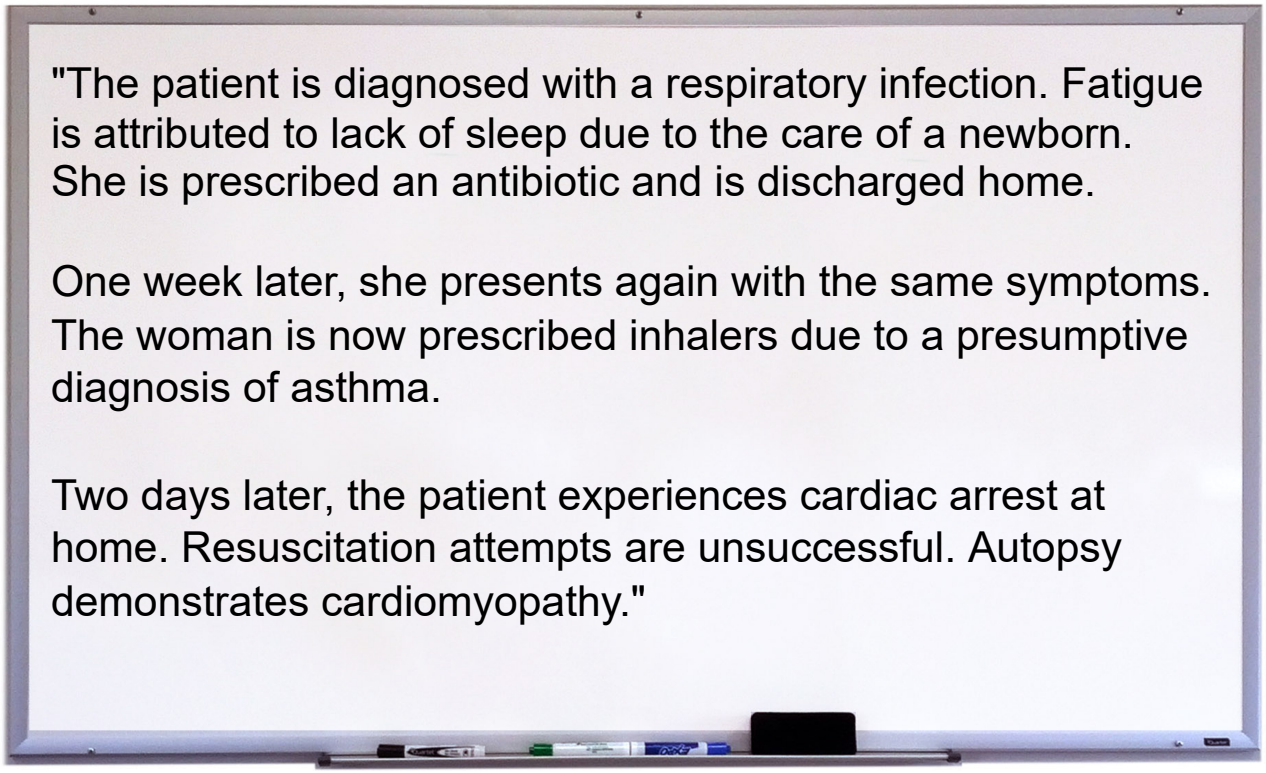
Case Presentation



1 of 3

Click the next arrows to read the case study

Case Presentation



2 of 3

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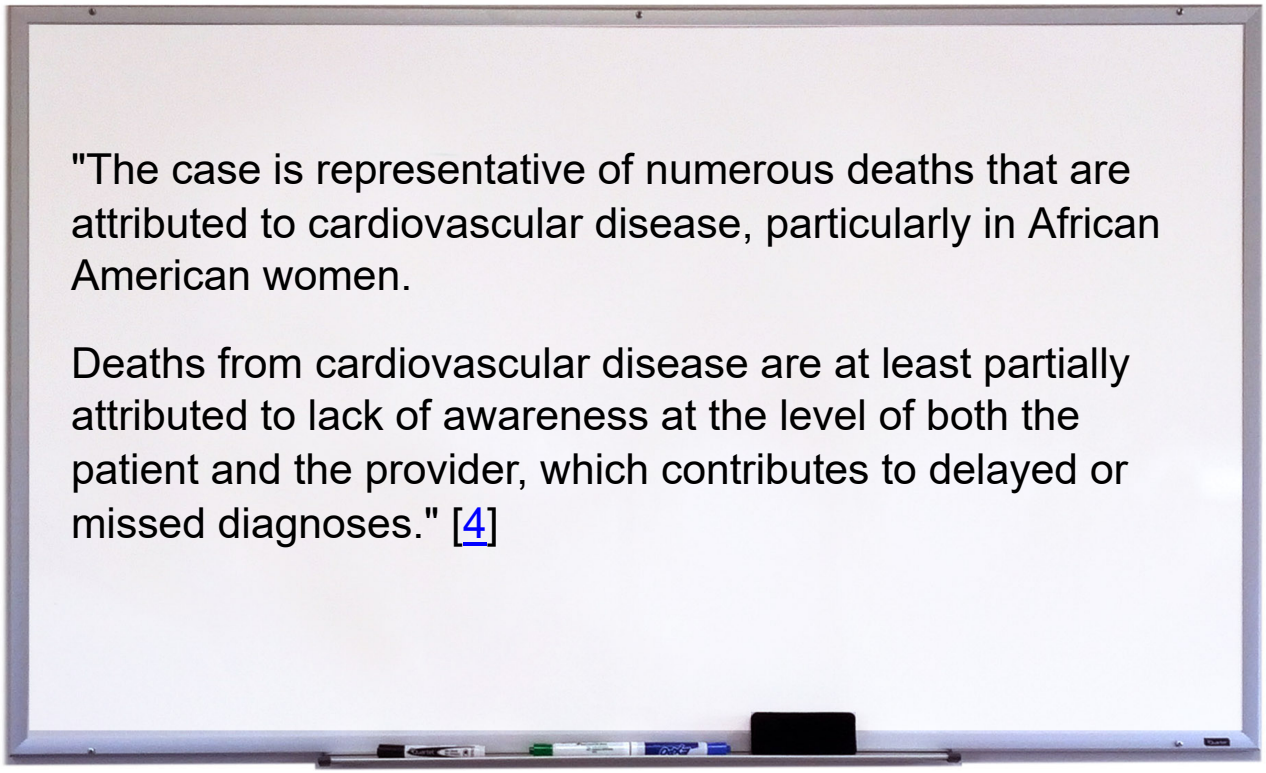
Case Presentation



3 of 3

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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.

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.

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.

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.

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]

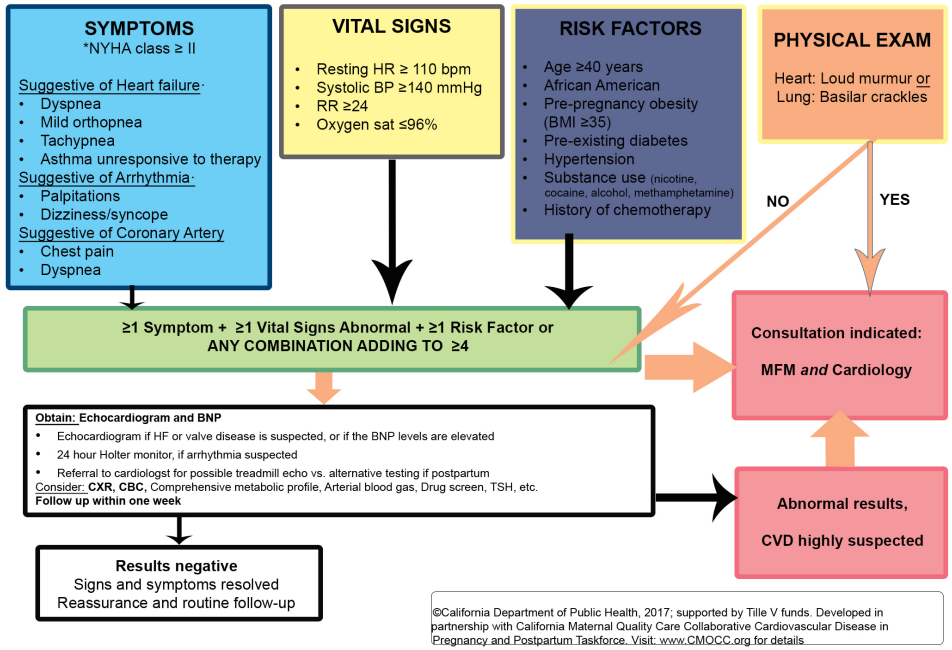
- Everyone has an opportunity to reduce disparities when diagnosing and treating CVD by implementing standardized protocols:
  - Assessment algorithms

Click the next arrow to continue

Algorithm [4]

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

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



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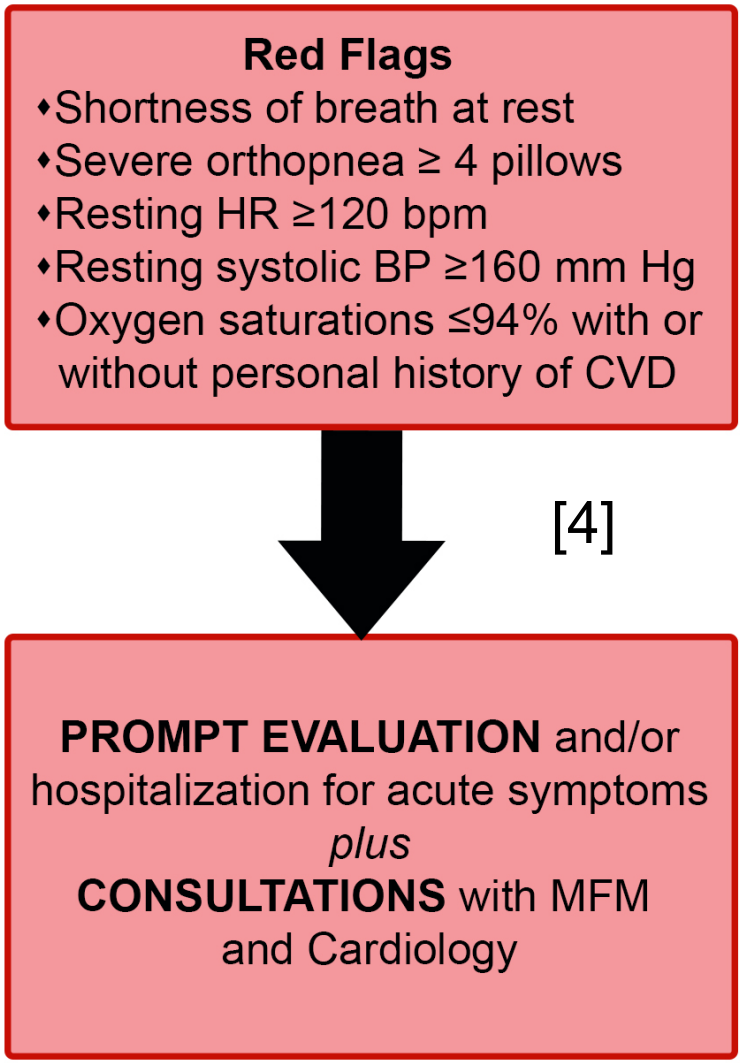
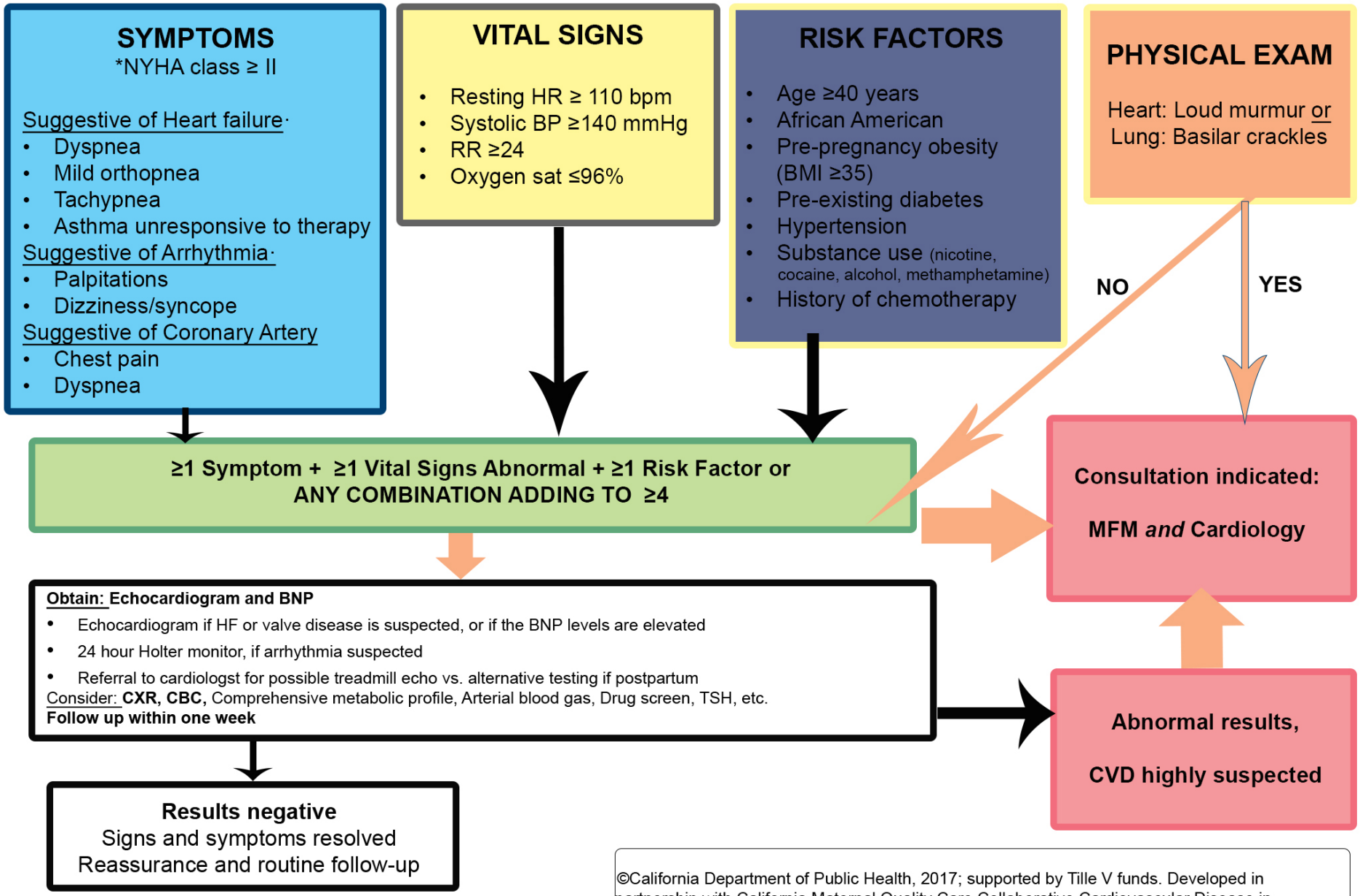

Red Flags
♦Shortness of breath at rest
♦Severe orthopnea ≥ 4 pillows
♦Resting HR ≥120 bpm
♦Resting systolic BP ≥160 mm Hg
♦Oxygen saturations ≤94% with or without personal history of CVD
[4]
PROMPT EVALUATION and/or hospitalization for acute symptoms
plus
CONSULTATIONS with MFM and Cardiology

If no red flags, proceed with this evaluation



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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.

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Evaluation of Cardiac Patient

Click here to review the case study.

Click the next arrow to continue

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 ≥120bpm
- Resting systolic BP ≥160mmHg
- Resting RR ≥30
- Oxygen saturations ≤94% with or without personal history of cardiovascular disease

- 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.

Click the next arrows to read more information.

BNP Facts [4,40]:

- Half-life is 20 minutes
- BNP level <100pg/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

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].

Click the next arrows to read more information.

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.

Click the next arrows to read more information.

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.

Click the next arrows to read more information.

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.

Click the next arrows to read more information.

In Summary [4]:

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

"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
- HR110 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.

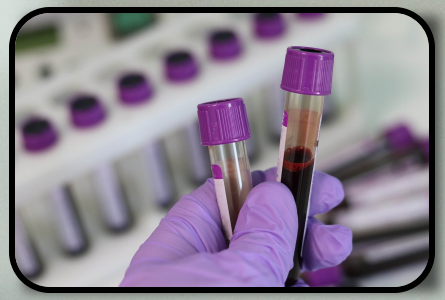
One week later, she presents again with the same symptoms. The woman is now prescribed inhalers due to a presumptive diagnosis of asthma.

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]."

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.

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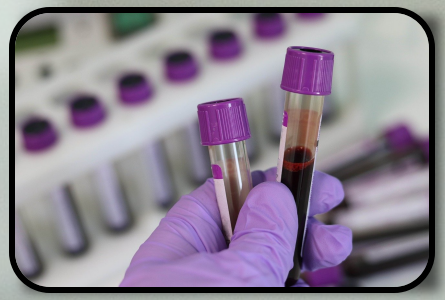
B-type Natriuretic Peptide (BNP) [27-29]

- 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.



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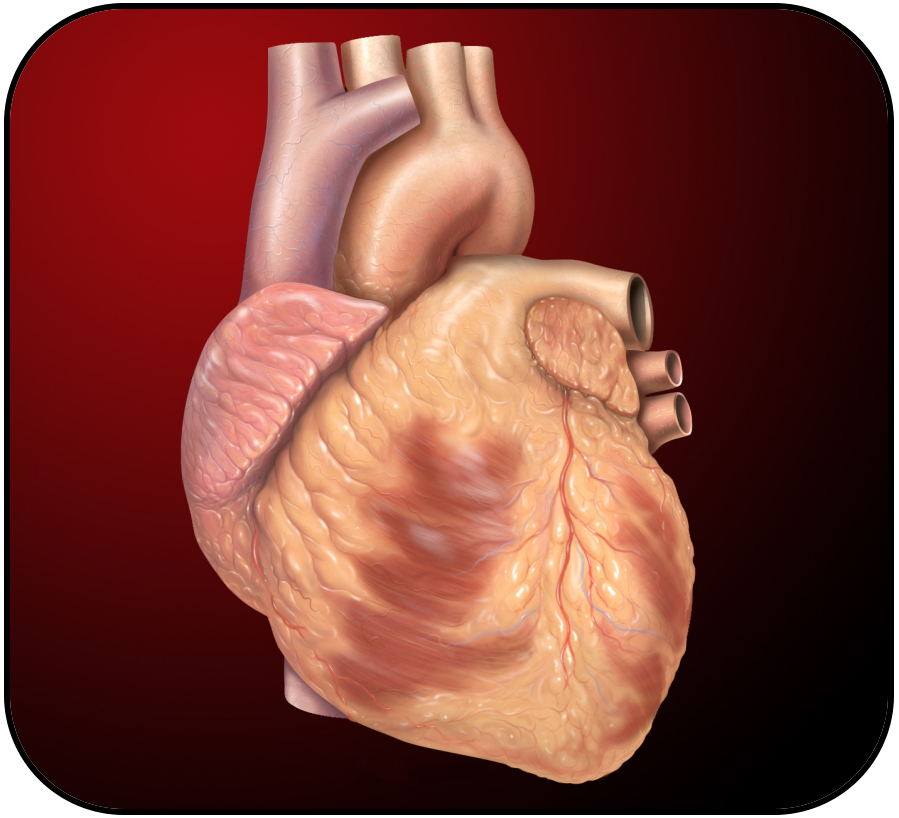

Presentation of Women with CVD:

- 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
- Global cardiovascular risk assessment should be performed in all pregnant women at their first prenatal visit [4].

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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	Normal		
Edema	Mild	Moderate	Marked

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

ACOG

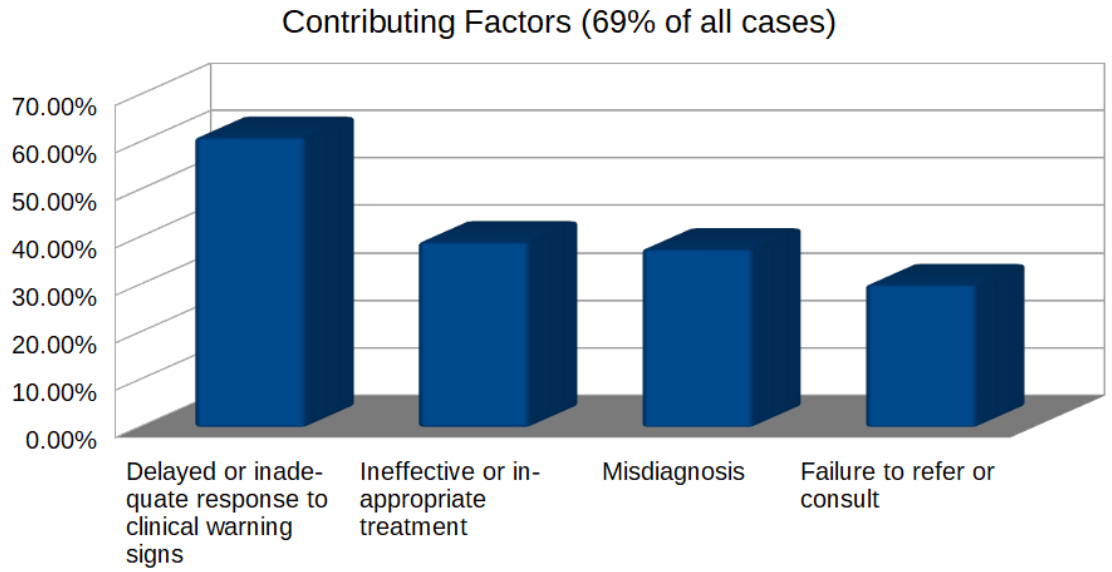
Eliminate preventable maternal mortality
#EveryMomEveryTime

[33]

ACOG table

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.



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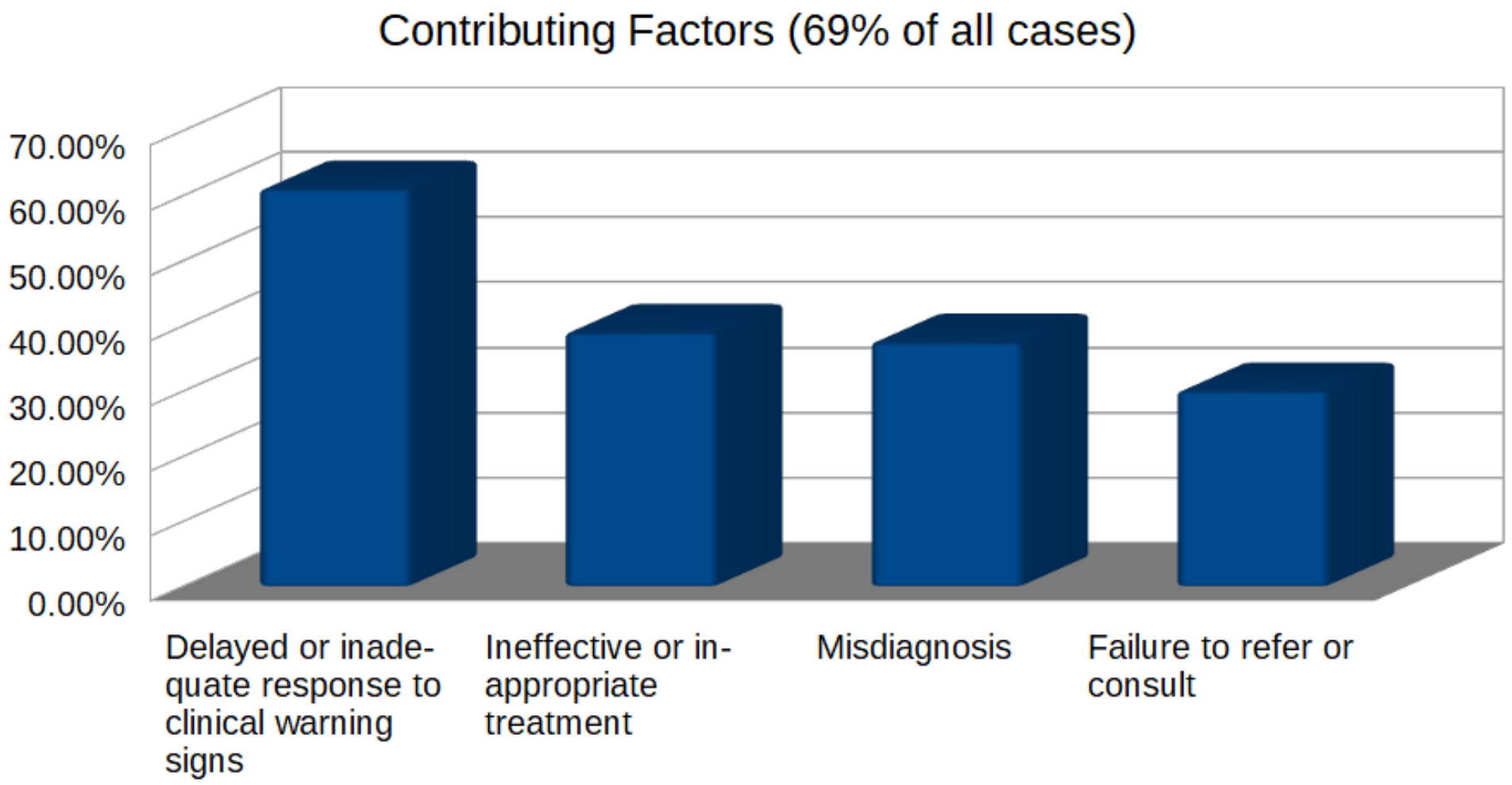

Contributing Factors (69% of all cases)
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Delayed or inade-quate response to clinical warning signs
Ineffective or in-appropriate treatment
Misdiagnosis
Failure to refer or consult

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].

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].

On the other had, mean BP nadirs at 16-29 weeks gestation [37,38].

- These changes persist until the 3rd trimester [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]."

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

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

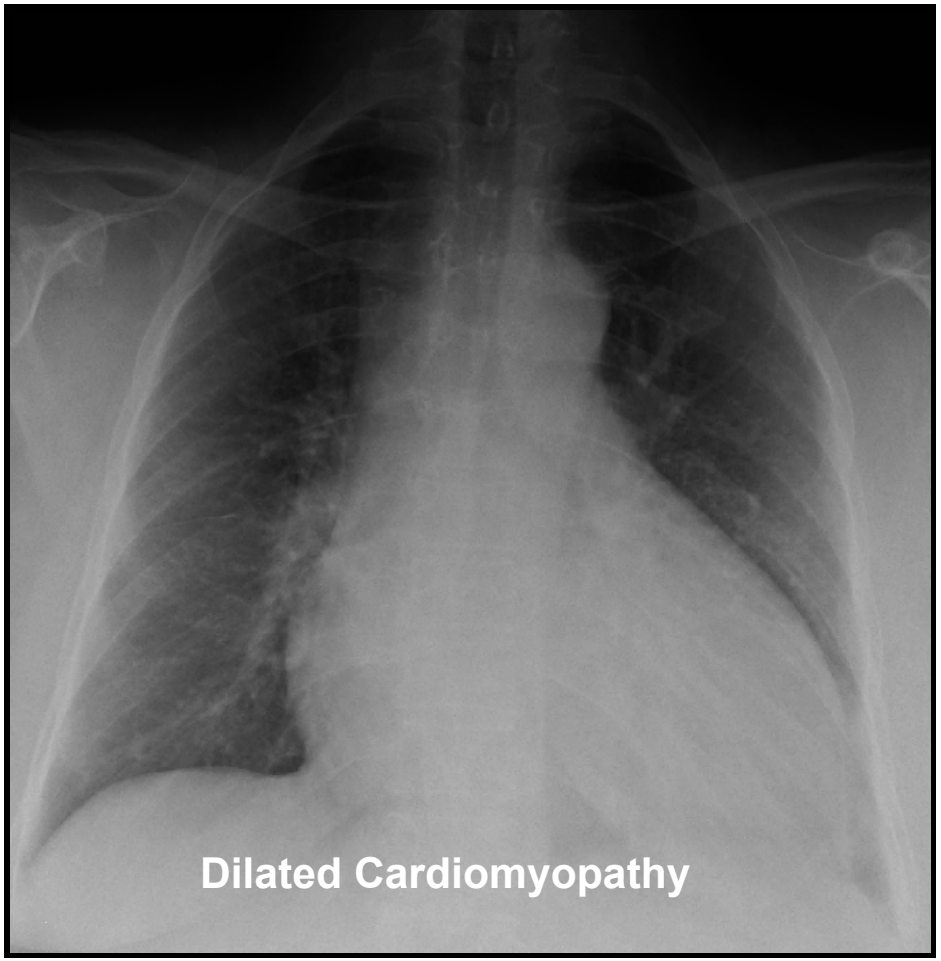
The incidence of peripartum cardiomyopathy in the U.S. has increased from 1 in 4,350 births in the early 1990s to 1 in 2,230 births in the mid-2000's [31].

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.

Risk Factors for PPCM

African America 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.

Risk Factors for PPCM

Hypertensive Disorders of Pregnancy

- Pre-eclampsia significantly increases the risk for development of PPCM.
- he incidence of PPCM, when associated with hypertensive disorders, increases from 5 fold to 30 fold.
  - Permeability 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.

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

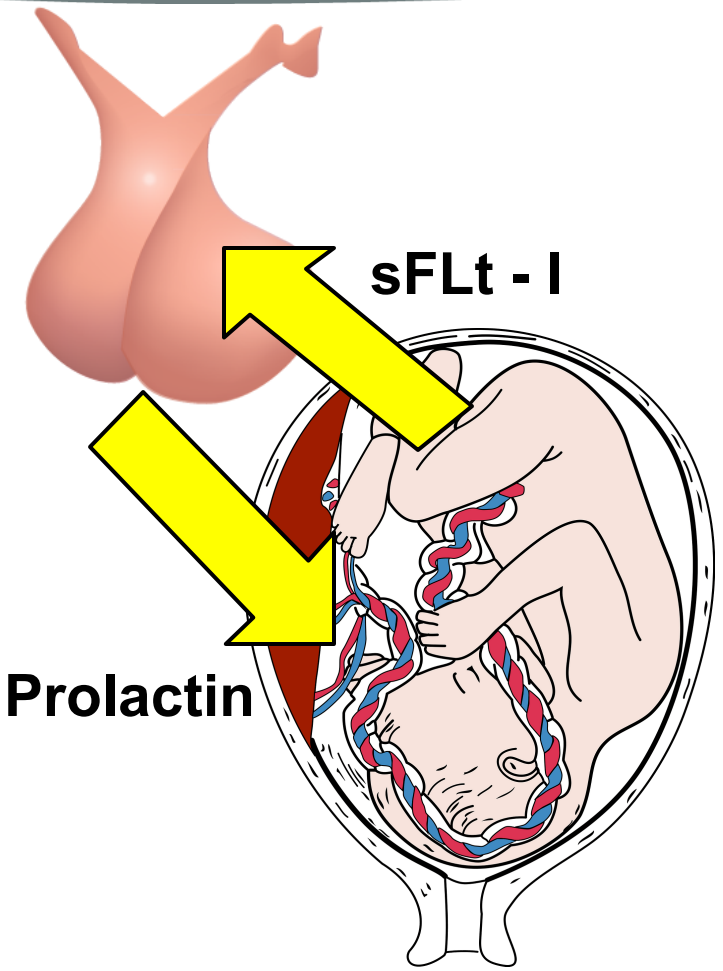
- Obesity
- Anemia
- Infection

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-I:

- There is a fragment of the prolactin molecule that is hypothesized to trigger events of vasoinhibin-acts which is thought to cause myocardial damage with ventricular dysfunction.
- This is made worse by secretions of high levels of vascular endothelial growth factor inhibitory molecule, sFLt-1 which is superabundant in women with preeclampsia, multifetal pregnancy, or both.
- So altered prolactin processing is believed to be involved in the pathogenesis of PPCM.

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 »

Click the next arrows to read more information.

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.

Click the next arrows to read more information.

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.

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.

Click the next arrows to read more information.

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 rick factor for the development of PPCM and explain the high prevalence of PPCM in Haitian, African, and black women in the U.S.

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.

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].

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].

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].

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].

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].

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].

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].

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].

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].

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].

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

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 ≥120bpm
- Resting systolic BP ≥160mmHg
- Resting respiratory rate ≥30
- Oxygen saturation ≤94% with or without personal history of CVD

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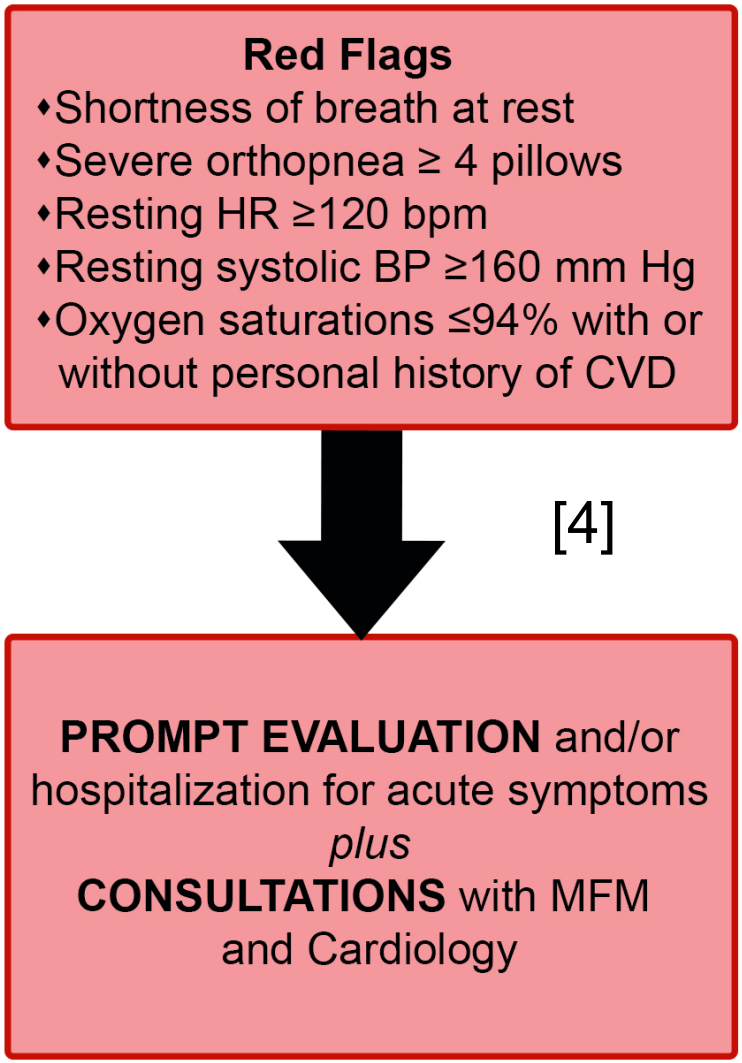
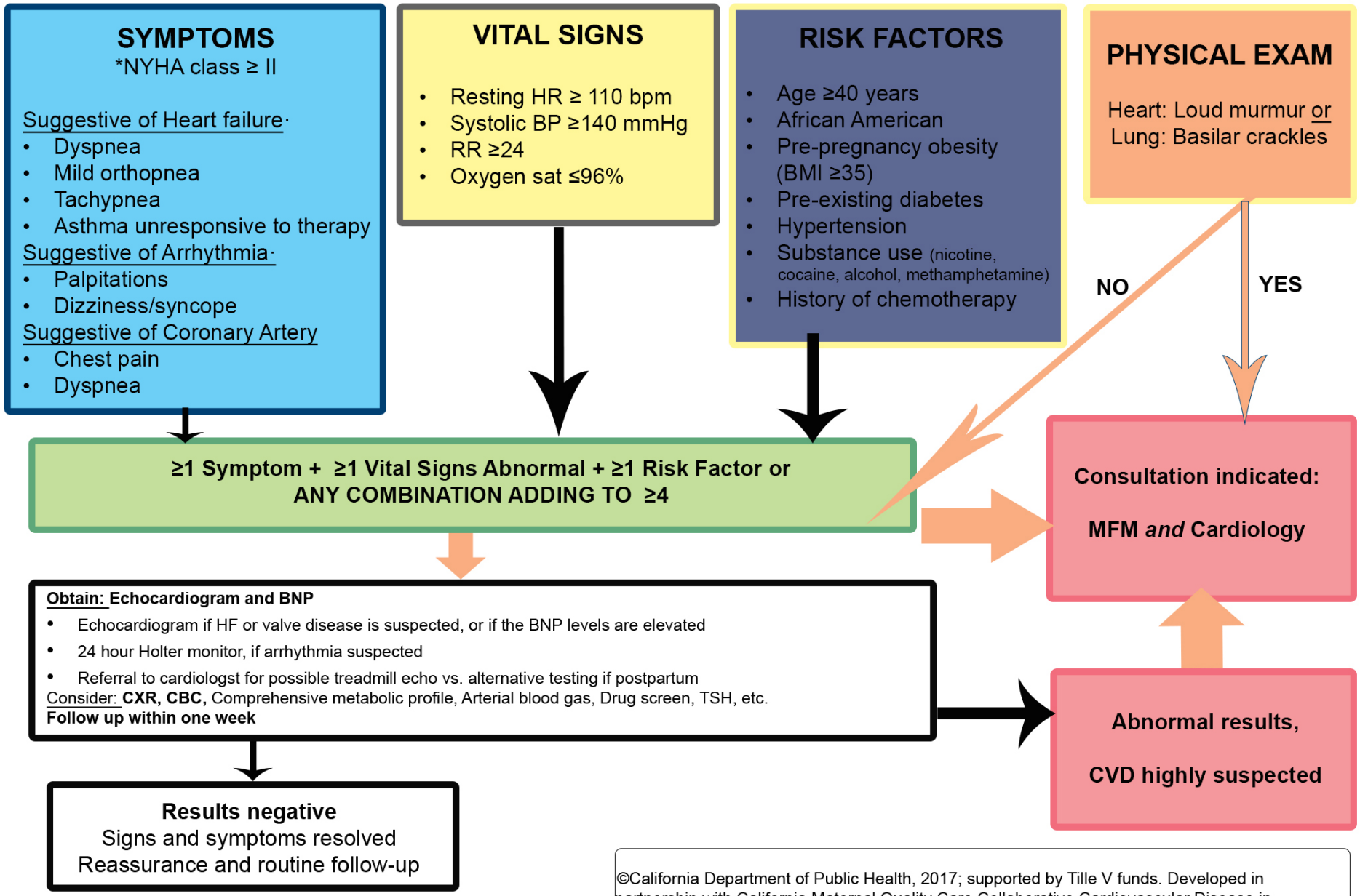

Red Flags
♦Shortness of breath at rest
♦Severe orthopnea ≥ 4 pillows
♦Resting HR ≥120 bpm
♦Resting systolic BP ≥160 mm Hg
♦Oxygen saturations ≤94% with or without personal history of CVD
[4]
PROMPT EVALUATION and/or hospitalization for acute symptoms
plus
CONSULTATIONS with MFM and Cardiology

If no red flags, proceed with this evaluation



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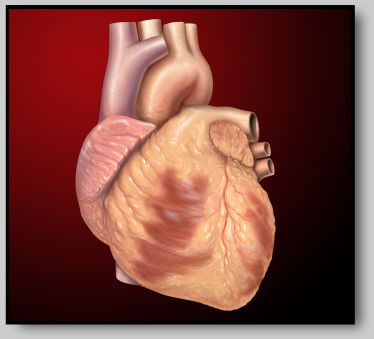
The diagnosis of PPCM is based on 3 clinical criteria [50, 54-56]:

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 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 [66].
  - 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].

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

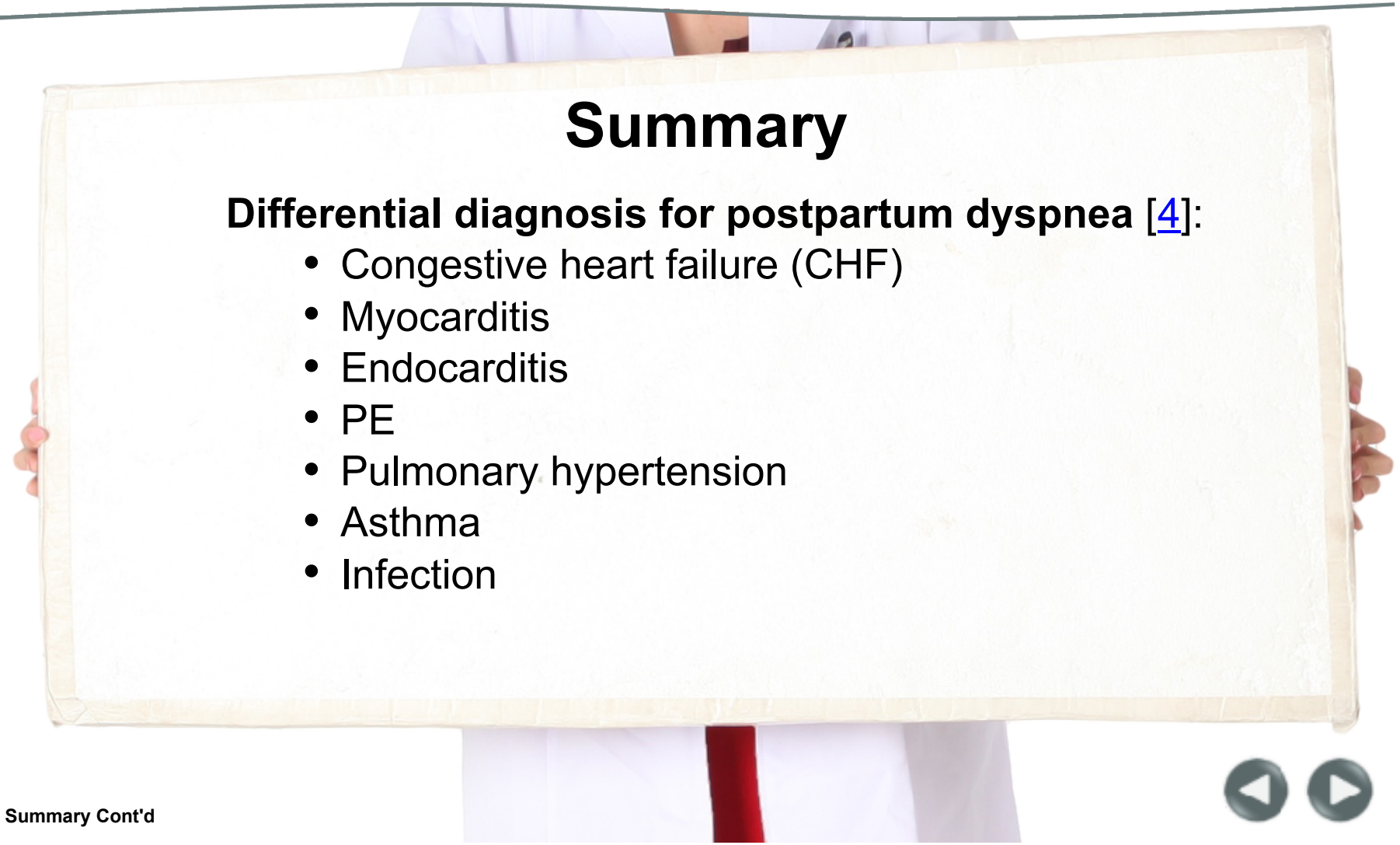
Ask the following questions when a woman presents in the postpartum period with complaints of shortness of breath [4]:

- 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 may be falsely attributed, failing to recognize cardiac 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) ≤ 94%
- Lung exam:
  - Crackles
  - Wheezing
- Cardiac exam:
  - Loud murmur
  - Jugular venous distention (JVD)
- Extremities:
  - Edema
  - Taunt shiny skin

Summary

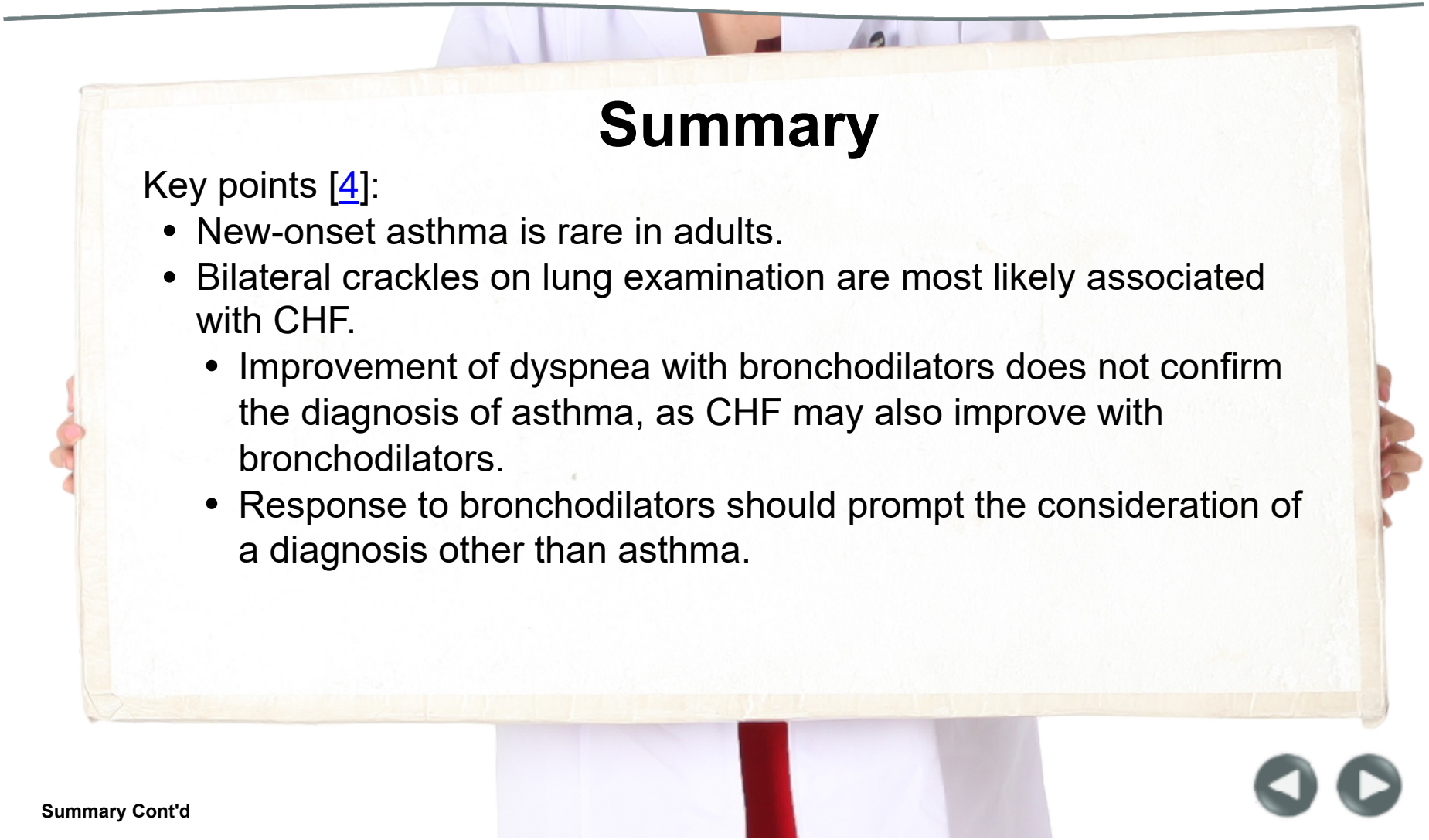
Evaluation of postpartum dyspnea [4]:

- 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
  - 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 O_2 Sat <94%.
  - Lack of response to treatment.
  - Newly-diagnosed cardiomyopathy or pulmonary hypertension.

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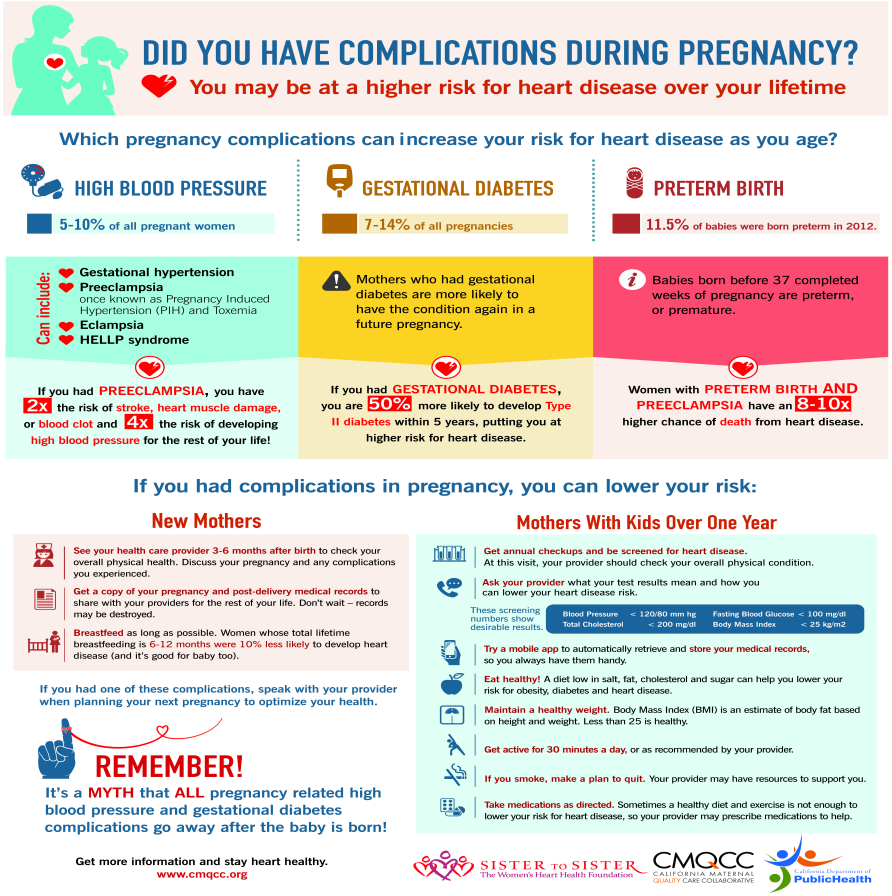

Pregnancy Complications Infographic

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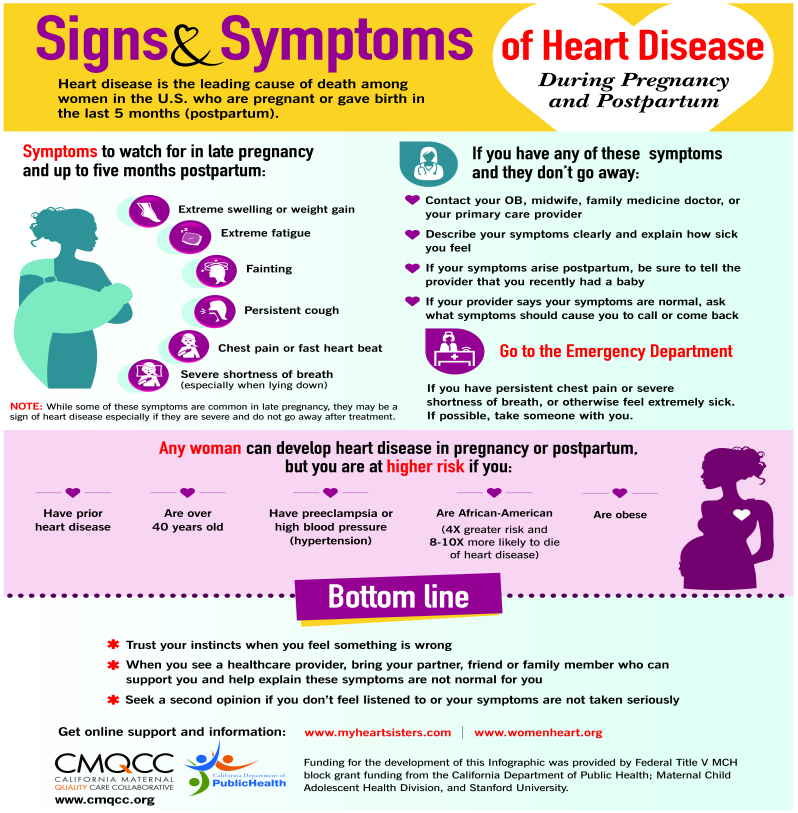

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