



THE UNIVERSITY OF
TENNESSEE
HEALTH SCIENCE CENTER.

Peripartum Cardiomyopathy

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Objectives

- Recognize why cardiovascular disease is a leading cause of maternal mortality
- Distinguish normal pregnancy physiology from pathologic cardiac symptoms
- Understand key testing in pregnant/postpartum patients with suspected heart disease
- Discuss intrapartum and postpartum management

Background

History of Peripartum Cardiomyopathy

- Heart failure associated with pregnancy first recognized in literature in the 1800s by Dr. Rudolf Virchow
- First large case series published in New Orleans in 1937.
 - Still poorly defined
- 1971 Demakis et al specifically defined the syndrome as occurring in peripartum period and first introduced the term “peripartum cardiomyopathy” (PPCM).
 - Based on data of 27 patients
- 1999 – with use of echocardiography, the criterion of ejection fraction (EF) percentage was added



> [Circulation](#). 1971 Dec;44(6):1053-61. doi: 10.1161/01.cir.44.6.1053.

Natural course of peripartum cardiomyopathy

J G Demakis, S H Rahimtoola, G C Sutton, W R Meadows, P B Szanto, J R Tobin, R M Gunnar

What is it?



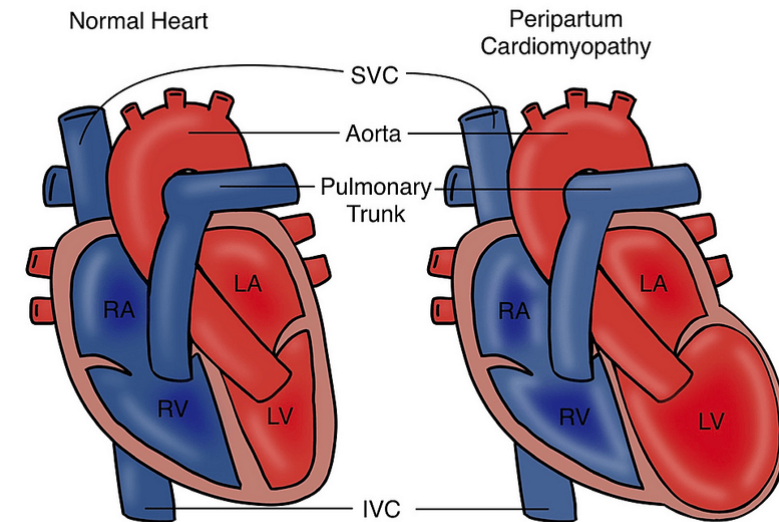
- Peripartum cardiomyopathy (PPCM) definition:
 - Nonischemic cardiomyopathy presenting late in pregnancy or in the first months postpartum, in women with no known cardiac disease before pregnancy
 - Heart failure caused by left ventricular systolic dysfunction defined as an ejection fraction <45% with or without left ventricular dilatation
 - Can be up to 5-6 months postpartum

Why does it matter?

- Heart failure is a leading cause of maternal mortality and morbidity in the United States.
 - PPCM accounting for up to 70% of heart failure cases during pregnancy.
 - Mortality rates can reach 20%
- Overall rate of death or cardiac transplantation is 5-10% by 1 year postpartum



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Epidemiology and trends - PPCM

- U.S. incidence estimated 25–100 per 100,000 live births
- Diagnosed PPCM has increased over the last 2 decades
- ~1 in 1,181 live births in 2004 to ~1 in 849 in 2011
 - A nationwide study of 64 million births found 34,219 cases of PPCM, with an estimated incidence of 1 in 968 live births.
 - Of those, >50% occurred in Southern United States



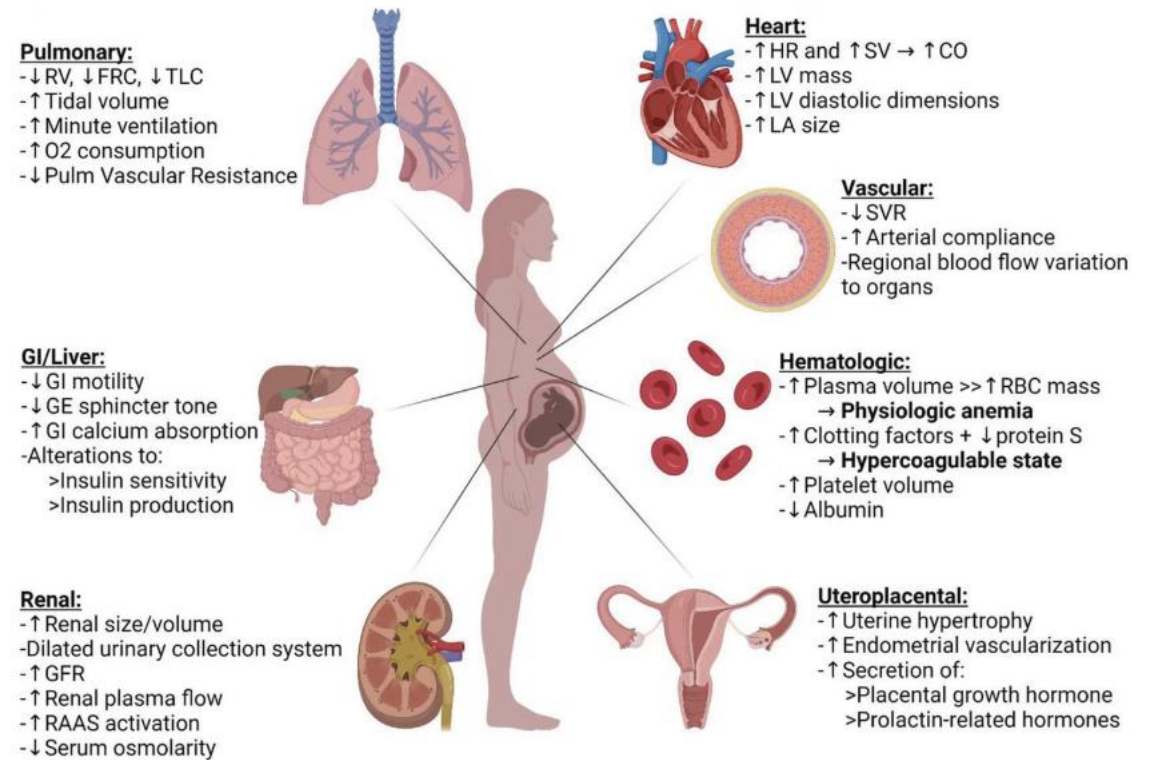
Risk factors

- Age >40 → dramatically increased risk
- Hypertension in pregnancy → increase incidence of myocardial infarction (MI) (13-fold) and heart failure (HF) (8-fold)
- Pre-pregnancy obesity → increased cardiac mortality risk
 - High association in cases with moderate-to-severe obstructive sleep apnea
- Non-Hispanic Black race → 3.4× higher mortality risk
- Multiple gestation

Physiology

Physiologic changes in pregnancy

- Increase cardiac output
- Increase plasma volume (40–50%)
- Decrease systemic vascular resistance
- HR increases 10–20%
- BP decreases early → rises in 3rd trimester



https://link.springer.com/chapter/10.1007/978-3-031-34103-8_3/figures/1

Intrapartum and postpartum changes

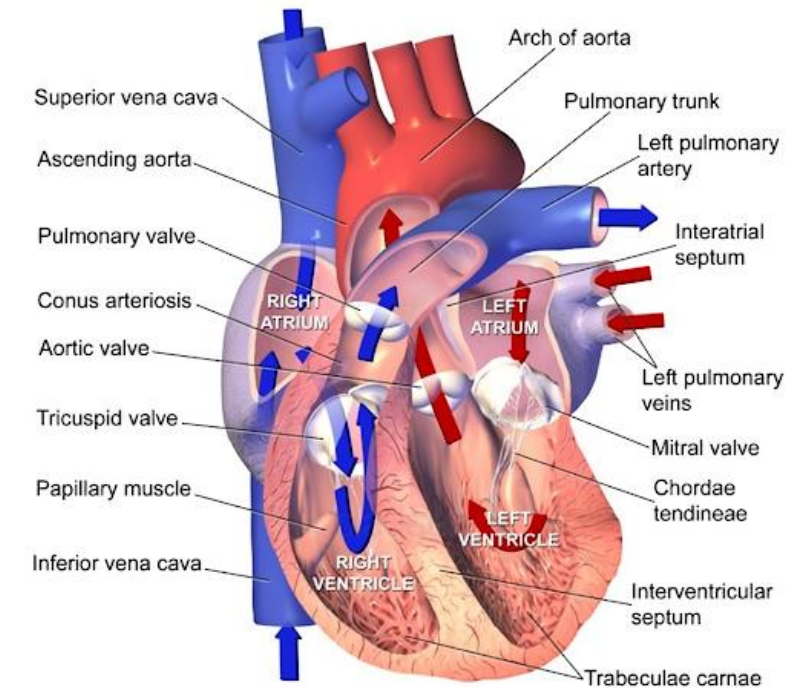
- Labor → increase cardiac output (up to 80%)
- Immediate postpartum
 - Autotransfusion (~500-750mL)
 - Rapid fluid shifts
- BP increases day 3-6 postpartum
- Hemodynamics normalize by 6 months

Table 1. Cardiovascular Changes in a Normal Pregnancy*

	First Trimester	Second Trimester	Third Trimester	Stage 1 Labor	Stage 2 Labor	Early Postpartum	3–6 months Postpartum
Cardiac output	↑5–10%	↑↑35–45%		↑30%	↑↑50%	↑↑↑60–80% immediately, then rapidly decreases within the first hour	Return to prepregnancy values
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	Return to prepregnancy values
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	Return to prepregnancy values
Plasma volume	↑	↑↑40–50%		↑	↑↑	↑↑↑500 mL due to autotransfusion	Return to prepregnancy values

Structural cardiac changes

- LV volume increases ~10%
- LV mass increases ~50%
- RV mass ↑ ~40%
- Up to 20% have diastolic dysfunction at term
- Changes reversible postpartum



Sectional Anatomy of the Heart

Hematologic and metabolic changes

- Physiologic anemia (hemodilution)
- Hypercoagulable state
- ↑ thromboembolism risk
- Insulin resistance and atherogenic lipid profile
 - Increases future cardiovascular disease risk

Signs and symptoms

Symptoms: normal vs. pathologic

- Overlap exists → key diagnostic challenge
 - Mild dyspnea, mild edema, fatigue, benign flow murmur
- Concerning features/red flags:
 - Chest pain
 - Syncope
 - Persistent tachycardia
 - Hypoxia
 - Pulmonary findings
- Must maintain high suspicion

Symptoms: normal vs. pathologic

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
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

Symptoms: normal vs. pathologic

Vital signs

HR (beats per minute)

Systolic BP (mm Hg)

RR (per minute)

Oxygen saturation

Normal

<90

120–139

12–15

>97%

90–119

140–159

16–25

95–97%

≥120

≥160 (or symptomatic
low BP)

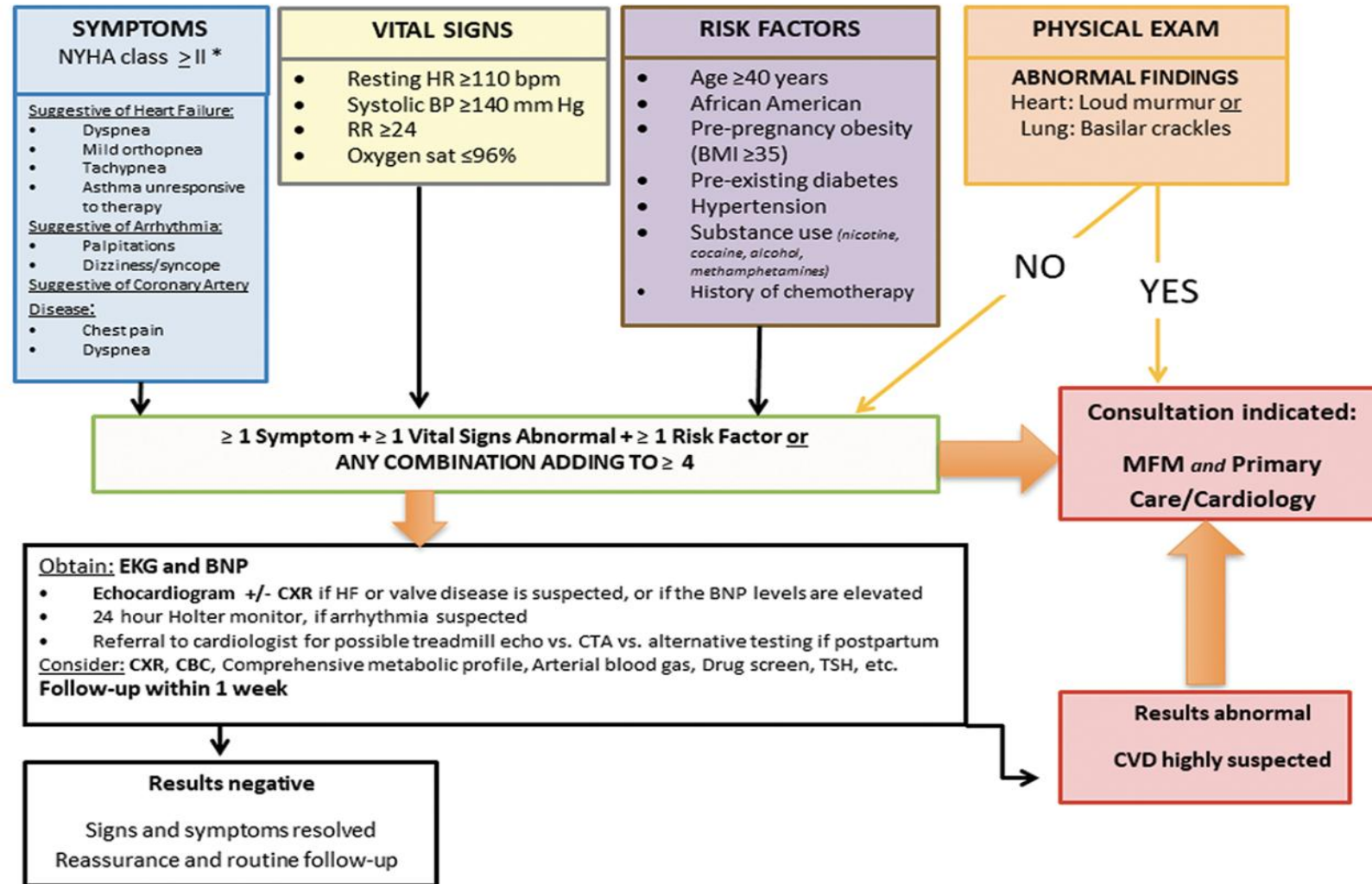
≥25

<95% (unless chronic)

Screening framework

- Ask:
 - Is this symptom physiologic or pathologic?
 - Are there abnormal vitals?
 - Are risk factors present?
 - Is the exam abnormal?
 - Red flags present?
- If concern exists:
 - EKG
 - BNP
 - Echocardiogram when indicated
 - CXR
 - Troponin if chest pain
 - Cardiology/MFM involvement

California Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum toolkit algorithm



Diagnosis

Initial workup of suspected cardiac disease in pregnancy

- History and PE
- Vitals and pulse oximetry
- EKG
- BNP/NT-proBNP when heart failure suspected
- Troponin when chest pain or ACS concern
- CXR
- Echocardiogram
- Consider CT/MRI/Holter depending on presentation

Brain natriuretic peptide (BNP)

- Helpful when heart failure is suspected
- Levels change with:
 - Increase with cardiac stretch (HF, volume overload)
 - Renal disease → falsely elevates (especially NT-proBNP)
 - Obesity → falsely lowers BNP
- Use trends + clinical context (not isolated value)
- BNP may rise somewhat in normal pregnancy, but usually stays in normal range (can increase 2x during pregnancy, but still be in normal range)
- Normal or low BNP is useful in excluding cardiac decompensation
- Serial BNP may help in high-risk women or known cardiac disease
- BNP vs. NT-proBNP

Echocardiography: when to get it

- Known or suspected congenital heart disease
- Valvular disease
- Aortic disease
- Cardiomyopathy
- Pulmonary hypertension
- Unexplained hypoxemia
- History of cardiotoxic chemotherapy

***Key test for peripartum cardiomyopathy

Management & Outcomes

PPCM -management

- Cardiology, MFM, Anesthesia consultation recommended
- Manage like heart failure with reduced EF
 - Fluid restriction
 - Telemetry
 - Monitoring signs and symptoms
- Shock or end-organ compromise requires transfer to high-level care
- Vaginal delivery is reasonable in many patients
- Breastfeeding should not be discouraged

PPCM - Management

- Peripartum
 - **Loop diuretics (furosemide)**
 - Treat pulmonary edema and volume overload
 - Use lowest effective dose to avoid placental hypoperfusion
 - **Beta-blockers**
 - Metoprolol preferred
 - Improves survival and decreases arrhythmias
 - **Hydralazine + nitrates**
 - Reduce afterload when ACE inhibitors cannot be used
 - **Digoxin**
 - May improve symptoms and provide rate control in atrial arrhythmias
 - **Anticoagulation**
 - Consider if **LVEF $\leq 35\%$** , LV thrombus or atrial fibrillation
- LMWH preferred during pregnancy

PPCM - Management

- Guideline-directed medical therapy
 - ACE inhibitors/ARBs (i.e. lisinopril, enalapril, losartan, valsartan, etc.)
 - Beta blockers (i.e. carvedilol, metoprolol, etc.)
 - Mineralocorticoid receptor antagonists (i.e. spironolactone)
 - Sodium-glucose cotransporter 2 inhibitors (i.e. dapagliflozin)

PPCM – predicted outcomes

- North American Registry Investigations of Pregnancy-Associated Cardiomyopathy
 - Women with an initial ejection fraction less than 30% had:
 - less myocardial recovery
 - higher rates of left ventricular assist device implantation, cardiac transplantation, and death.
 - ~90% of women with an initial ejection fraction of more than 30% had complete myocardial recovery.
- Recurrence risk
 - Patients with recovered EF > 50% → 20-29% recurrence
 - Patients with recovered EF <50% → 46-56% recurrence

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Questions?

