



# Maternal Webinar Series: "Maternal Cardiovascular Health in the 4<sup>th</sup> Trimester"

September 3, 2024



# Maternal Updates



- Next GaPQC Maternal Webinar Tuesday, November 5th at 2:00 PM EST Kristi Gabel – Guest Speaker – "Measuring & Communicating Blood Loss During OB Hemorrhage and the Why Behind It"

Data
 Q1 Jan – March – submission due by April 30<sup>th</sup>
 Q2 April – June – submission due by July 31<sup>st</sup>
 Q3 July –Sept. – submission due by October 31<sup>st</sup>
 Q4 Oct. – Dec. – submission due by January 31<sup>st</sup>

- 2025 GaPQC Annual Conference Mark Your Calendar & SAVE THE DATE Thursday and Friday, April 24<sup>th</sup> & 25<sup>th</sup> 2025– Emory Conference Center
- AIM TAP Webinar Series

October 17<sup>th</sup> at 3:00 PM EST – Postpartum Discharge Transition Registration: <u>AIM TAP Webinar - Postpartum Discharge Transition</u>

# PERINATAL QUALITY I MPROVEMENT

#### THE BIRTH EQUITY MODULES COURSE INCLUDES FOUR MODULES:





5. Once you complete the check-out process, check your work email inbox. You will receive an email with

#### • 100 Seats

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Please complete ALL Modules ASAP

- instructions on how to access the modules through the online education platform, EasyGenerator
- Notes: • The promo code will expire on September 23, 2024.

Visit PQI's Store at <u>https://www.perinatalqi.org/store/</u>
 Add Birth Equity Modules Course, v1.2a to your cart.

Proceed through checkout using your work email address
 Enter the promo code GAPQCBEMS100% at checkout.

- You must complete the modules by September 30, 2024.
- This offer is only available to professionals in Georgia.





#### **NEEDS YOUR HELP!**

To reduce severe morbidity & mortality related to maternal cardiac conditions in eorgia & support optimal care in pregnancy & postpartum.

#### WHO WE ARE?

aPQC is a network of perinatal stakeholders working together to improve the quality of care and outcomes for eorgia mothers and babies.

aPQC leads statewide implementation of quality improvement initiatives through technical assistance, quality improvement training, education, and data support to hospitals.



CARDIAC CONDITIONS IN OBSTETRICAL CARE

https://georgiapqc.org/cardiac-conditions

#### GaPQC's CARDIAC INITIATIVE

Cardiac conditions were the leading cause of pregnancy related deaths in eorgia between the years of 20 20 .

eorgia will be the first state in the country to implement the Alliance for Innovation on Maternal Health s (AIM) Cardiac Conditions in Obstetrical Care patient safety bundle. The aPQC partners with AIM to support best practices that make birth safer, improve maternal health outcomes and save lives.

https://www.georgiapqc.org

🔁 gapqc@dph.ga.gov







Enrollment Form

#### Hospital Name\* Learning Collaborative Please provide your contact information Email Name Phone Credentials Active Improvement Team Please complete the rest of the form Include on GaPQCEmails Phone **Initative Champions** Email Name Credentials Physician or Advance Practice Provider Champion Project Champion Data Lead Additional Multidisciplinary Champions

Specialty (e.g. Cardiology, Emergency Medicine, Anesthesiology, Labor and Delivery, etc.)	Name	Email	Include on GaPQC Emails Phone	Credentials

By signing below, I acknowledge my understanding of the goals and expectations of Georgia Perinatal Quality Collaborative and commit to full participation in the mutually agreed upon initiative(s).

 Physician or Advance
 Signed:
 Date:

 Practice Provider
 Name:
 Date:

 Project Champion
 Signed:
 Date:

 Name:
 Date:
 Date:

\*Please check this box if you would like to join the Learning Collaborative as an individual and not as a representative of a hospital

Email your completed enrollment form to: Lisa Ehle Maternal Quality Improvement Lisa.Ehle@dph.ga.gov





# **Resources and Opportunities**







#### GRAND ROUNDS MATERNAL MORTALITY: IS CARDIOVASCULAR-DISEASE-RELATED MATERNAL MORTALITY PREVENTABLE?



#### PRESENTER

Afshan B. Hameed, MD, FACOG, FACC Professor, OB/GYN, Division of Maternal Fetal Medicine Professor, Division of Cardiology Medical Director, Obstetrics Medical Director, Quality and Safety University of California, Irvine

WEDNESDAY, OCTOBER 2 7 - 8 A.M. WALTERS AUDITORIUM AND ZOOM CLICK HERE OR SCAN QR CODE TO JOIN ZOOM SESSION Intended Audience Physicians Nurses Administrators

Clinical Staff

Breakfast will be served

#### LEARNING OBJECTIVES

- · Understand why CVD goes unrecognized in pregnancy.
- Learn how CVD can be recognized earlier to institute management strategies.
- Learn if a cardio-obstetrics team is required.

ACCESS UPCOMING CME SESSIONS AT https://events.nghs.com/group/cme MISSED OUT ON GRAND ROUNDS? Go to Georgia Heart Institute Grand Rounds - YouTube to watch recorded sessions and take the survey to claim CME credits.

PHYSICIAN CREDITS AWARDED

The North-ast Georgia Medical Centre's Health System, Inc. is accredited by the Medical Association of Georgia to provide continuing medical education for physicians. The North-aste Georgia Medical Centre & Health System, Inc. designates this live activity for a maximum of 1.0 AMA FRA Category 1 credit\*, Physicians should only claim credit Centre measured with the earth of their predictional the activity.

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Breakfast will be served

#### CLICK HERE OR SCAN QR CODE TO JOIN ZOOM SESSION





Share your thoughts about improving programs that help pregnant women, mothers, and children in Georgia.

Title V Maternal and Child Health Services Block Grant Public Health Survey



Title V legislation requires Georgia to conduct a comprehensive needs assessment every five years. It's a quick survey that will help shape maternal and child health programs in Georgia.



Use the QR code to access the survey.

For questions or more information about the survey, email us at **titlevsurvey@dph.ga.gov** 



https://rsph.co1.qualtrics.com/jfe/form/SV\_41oOFMXs33bTAeq



Use the QR code to access the survey.





#### Lived Experience Integration into QI Community of Learning



The Lived Experience Integration into Quality Improvement (QI) Community of Learning (COL) offers guidance for QI teams on how to effectively build a patient engagement culture, and perform work that integrates patients and those with lived experience into Patient Support Bundle implementation and QI work.

Our Philosophy     Our Culture Change     Get Prepared	Cohort	Session Dates
Include • Recruiting Patients • Onboarding	Cohort 1 (PQCs)	Sept 3 - Sept 24
Feedback Tools     Reporting & Data	Cohort 2 (Hospitals)	Oct 7 - Oct 28
2024 cohorts today!	Cohort 3 (PQCs)	Jan 14 - Feb 4
www.mommasvoices.org/col	Cohort 4 (Hospitals)	Feb 25 - March 18



Wortheast Georgia Health System Center for simulation and innovation

675 White Sulphur Road, Building B Gainesville, GA 30501

#### Join Us for the Obstetric Patient Safety (OPS) Workshop - 3rd Edition

#### Hospitals in Georgia,

send your obstetric and emergency department staff for a comprehensive learning experience. Don't miss this opportunity to improve patient safety and outcomes. Enhance your skills in managing obstetric emergencies through simulation and debriefing.

Learning	<ul> <li>Identify high-risk factors for obstetric emergencies.</li> </ul>	Workshop	June 5	September 18 and 19
Outcomes	•Demonstrate effective management of pregnant and postpartum individuals during obstetric emergencies.	Dates:	July 25	October 24
	<ul> <li>Engage in role-playing simulations with a multidisciplinary team.</li> </ul>		August 19	December 4 and 5

#### For Registration and Inquires Contact: Tasha Murchison at <u>Tasha.Murchison@nghs.com</u>

The Association of Women's Health, Obstetric and Neonatal Nurses is accredited with distinction as a provider of nursing continuing professional development by the American nurses Credentialing Center's Commission on Accreditation. Accredited status does not imply endorsement by AWHONN or the ANCC of any commercial products displayed or discussed in conjunction with an educational activity. AWHONN is approved by the California Board of Registered Nursing, Provider #CEP580.

Physicians, this activity was planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of AffinityCE and AWHONN. AffinityCE is accredited by the ACCME to provide continuing medical education for physicians. AffinityCE designates this live activity for a maximum of 10.75 AMA PRA Category 1 Credits<sup>TM</sup>. Physicians, physician assistants, and nurse practitioners should claim only the credit commensurate with the extent of their participation in the activity.

<sup>1</sup> This program is supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) as part of an award totaling \$5,170,233 with zero percentage financed with non-governmental sources. The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by HRSA, HHS, or the U.S. Government

#### **Key Driver Diagram:** Maternal Cardiac Conditions

#### GOAL:

To reduce severe morbidity & mortality related to maternal cardiac conditions in Georgia.

#### SMART AIM:

By 02/6/2026, National Wear Red Day, to reduce harm related to existing and pregnancy related cardiac conditions through the 4<sup>th</sup> trimester by 20%.

#### **Key Drivers**

Readiness: EVERY UNIT -Implementation of standard processes for optimal care of cardiac conditions in pregnancy and post-partum.

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#### Recognition & Prevention:

**EVERY PATIENT - Screening** and early diagnosis of cardiac conditions in pregnancy and post-partum.

Response: EVERY UNIT - Care management for every pregnant or postpartum woman with cardiac conditions in pregnancy and post-partum.

#### Reporting/System Learning:

EVERY UNIT - Foster a culture of safety and improvement for care of women with cardiac conditions in pregnancy and post-partum.

Respectful, Equitable, and Supportive Care — EVERY UNIT/PROVIDER/TEAM MEMBER - Inclusion of the patient as part of the multidisciplinary care team.

INTERVENTIONS
Train all obstetric care providers to perform a basic Cardiac Conditions Screen.
Establish a protocol for rapid identification of potential pregnancy-related cardiac conditions in all practice settings
to which pregnant and postpartum people may present.
Develop a patient education plan based on the pregnant and postpartum person's risk of cardiac conditions.
Establish a multidisciplinary "Pregnancy Heart Team" or consultants appropriate to their facility's designated
Maternal Level of Care to design coordinated clinical pathways for people experiencing cardiac conditions in
pregnancy and the postpartum period. S1
Establish coordination of appropriate consultation, co-management and/or transfer to appropriate level of materna
or newborn care.
Develop trauma-informed protocols and training to address health care team member biases to enhance quality of
care
Develop and maintain a set of referral resources and communication pathways between obstetric providers,
community-based organizations, and state and public health agencies to enhance quality of care. $st$

- Obtain a focused pregnancy and cardiac history in all care settings, including emergency department, urgent care, and primary care.
- In all care environments assess and document if a patient presenting is pregnant or has been pregnant within the past year. S2
- Assess if escalating warning signs for an imminent cardiac event are present.
- Utilize standardized cardiac risk assessment tools to identify and stratify risk.
- Conduct a risk-appropriate work-up for cardiac conditions to establish diagnosis and implement the initial management plan.
- Facility-wide standard protocols with checklists and escalation policies for management of cardiac symptoms.
- Facility-wide standard protocols with checklists and escalation policies for management of people with known or suspected cardiac conditions.
- Coordinate transitions of care including the discharge from the birthing facility to home and transition from postpartum care to ongoing primary and specialty care.
- Offer reproductive life planning discussions and resources, including access to a full range of contraceptive options in accordance with safe therapeutic regimens. \*
- Provide patient education focused on general life-threatening postpartum complications and early warning signs, including instructions of who to notify if they have concerns, and time and date of a scheduled postpartum visit.
- For pregnant and postpartum people at high risk for a cardiac event, establish a culture of multidisciplinary planning, admission huddles and post-event debriefs.
- Perform multidisciplinary reviews of serious complications (e.g. ICU admissions for other than observation) to identify systems issues. S4
- Monitor outcomes and process data related to cardiac conditions, with disaggregation by race and ethnicity due to known disparities in rates of cardiac conditions experienced by Black and Indigenous pregnant and postpartum people. Process Measures – 1-5
- Screen for structural and social drivers of health that might impact clinical recommendations or treatment plans and provide linkage to resources that align with the pregnant or postpartum person's health literacy, cultural needs, and language proficiency.
- Engage in open, transparent, and empathetic communication with pregnant and postpartum people and their identified support network to understand diagnoses, options, and treatment plans.
- Include each pregnant or postpartum person and their identified support network as respected members of and contributors to the multidisciplinary care team. \*55

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#### Jennifer Lewey, MD, MPH

Co-Director, Pregnancy and Heart Disease

Program Director, Penn Women's Cardiovascular Health Program

Assistant Professor of Medicine (Cardiovascular Medicine) at the Hospital of the University of Pennsylvania Clinical Associate of Medicine Assistant Professor of Obstetrics and Gynecology



### Georgia Perinatal Quality Improvement Maternal Webinar Maternal cardiovascular health in the 4<sup>th</sup> trimester

Jennifer Lewey, MD, MPH

Oct 1, 2024

## Conflicts of interest

- Research funding from National Institutes of Health
- Co-founder of Peripartum Cardiomyopathy Registry (unfunded)
- Consultant fees from Amgen, Inc. (unrelated to topic discussed today)



## Objectives

- Review leading causes of pregnancy-associated mortality in the U.S.
- Review the causes and evaluation of cardiac symptoms in the postpartum period
- Improve confidence in screening for postpartum complications
  - Cardiomyopathy
  - Coronary syndrome
  - Clot (pulmonary embolism)

Clinical pearls highlighted throughout the talk



# Cardiovascular disease is a leading cause of pregnancy-related deaths in the US



SOURCE: Petersen EE et al. MMWR, 2019

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# Cardiovascular disease impacts Black birthing individuals to a greater degree





SOURCE: Petersen EE et al. MMWR, 2019

# Learnings from Maternal Mortality Review Committees







84% deaths are considered preventable

53% deaths occur ≥ 7 days after delivery Most individuals who die from CVD have no prior CVD diagnosis

SOURCE: Pregnancy-Related Deaths: Data from Maternal Mortality Review Committees in 36 US States, 2017–2019, CDC 2022



# Physiologic changes of pregnancy can unmask underlying cardiovascular disease



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- Cardiac output increases 30-50% and peaks in the 2<sup>nd</sup> trimester
- Increase in CO is driven by increases in SV and HR
- Plasma volume peaks ~ 32 weeks gestation
- Decrease in SVR is greatest in first 2 trimesters

SOURCES: Davis M, J Am Coll Cardiol 2021; Sanghavi M, Circulation, 2014



### Case 1: 35-year-old woman with shortness of breath

- History of hypertension, obesity, and OSA
- Presents with dyspnea on exertion for 1 week
- Dry cough, orthopnea, asymmetric leg swelling
- In the ED
  - Afebrile
  - BP 156/94 mmHg, HR 110 bpm, O2 98% on 2L
  - Exam: increased work of breathing, faint bibasilar crackles, L > R lower extremity edema, no cardiac murmurs and JVP not visualized



CT scan showed possible bilateral pneumonia, no pulmonary embolism

![](_page_18_Picture_10.jpeg)

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- OB history: 6 weeks postpartum
- ► NT-proBNP: 4,125 pg/mL

![](_page_19_Picture_10.jpeg)

Echo showed severe LV dilation, LVEF 20%, and reduced RV function

![](_page_19_Picture_12.jpeg)

![](_page_20_Picture_0.jpeg)

# Taking a pregnancy history is important in all patients capable of pregnancy

![](_page_20_Picture_2.jpeg)

## Peripartum cardiomyopathy diagnostic criteria

- New onset heart failure with EF < 45%</p>
- Diagnosed towards the end of pregnancy or in the months following delivery
- No other cause of cardiomyopathy

LV size is often dilated, but not always

 Circulation

 Volume 145, Issue 18, 3 May 2022; Pages e895-e1032

 https://doi.org/10.1161/CIR.00000000001063

 AHA/ACC/HFSA CLINICAL PRACTICE GUIDELINE

 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

European Heart Journal (2018) 39, 3165–3241 European Society of Cardiology doi:10.1093/eurheartj/ehy340

ESC GUIDELINES

2018 ESC Guidelines for the management of cardiovascular diseases during pregnancy

![](_page_21_Picture_10.jpeg)

# Timing of peripartum cardiomyopathy diagnosis

![](_page_22_Figure_1.jpeg)

#### Timing of diagnosis according to race

N=220 women with PPCM treated at Penn Medicine, 1986-2016

- Most often presents early postpartum
- Diagnosis may occur up to 6 months after delivery
- Diagnosis (> 4 weeks after delivery) is associated with lower recovery rate
- Black patients disproportionately experience delayed diagnosis

![](_page_22_Picture_8.jpeg)

SOURCES: Lewey J, Hypertension, 2020

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BNP level is a widely available blood test that helps identify heart failure.

This is also true in postpartum patients.

![](_page_23_Picture_2.jpeg)

### BNP levels help identify heart failure in pregnancy and postpartum

Levels stable in pregnancy

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- May increase in setting of preeclampsia
- Obesity limits sensitivity of the test
  - Similar to non-pregnant population

#### **BNP** levels throughout pregnancy

![](_page_24_Figure_6.jpeg)

![](_page_24_Picture_8.jpeg)

# Most patients improve LV function, but serious adverse events still occur

IPAC Registry (n=100)

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- ▶ 72% improved LVEF  $\ge$  50%
- 13% experience serious adverse outcomes
- Black patients had lower rates of *recovery* compared to non-Black patients
- Other cohorts show lower rates of recovery and vary by population and geography

# Association of one-year LVEF outcome with LVEF at time of diagnosis

![](_page_25_Figure_7.jpeg)

N=100 patients with PPCM prospectively enrolled in IPAC registry (Investigations of Pregnancy Associated Cardiomyopathy)

Penn Medicine 26

SOURCE: McNamara D et al, J Am Coll Cardiol 2015; Sliwa K et al, Eur Heart J 2020

## Early goal directed medical treatment is critical to promote recovery

Medication	During pregnancy	Postpartum: lactating	Postpartum: Not lactating	Notes
Diuretics	Yes	Yes	Yes	As needed, avoid volume depletion
Beta blockers	Yes	Yes	Yes	More data with metoprolol, but others can be used
Spironolactone	No	Yes	Yes	
ACEI, ARB, or ARNI	No	Some (captopril, enalapril, <i>maybe</i> Entresto)	Yes	Small amounts are transferred into breastmilk. Entresto data very recent, with safety at low dose.
SGLT2 inhibitors	No	No	Yes	
Hydral/isosorbide	Yes	Yes	Yes	Use in pregnancy often limited by BP

![](_page_26_Picture_2.jpeg)

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![](_page_26_Picture_3.jpeg)

## Bromocriptine inhibits prolactin release and may improve outcomes

- Dopamine receptor agonist
- Suppresses prolactin release
- Previously used for lactation suppression but concern for thromboembolic risk
- Mechanistic support for use in PPCM from mouse models
- Early studies in humans showed promising efficacy

![](_page_27_Figure_6.jpeg)

![](_page_28_Picture_0.jpeg)

![](_page_28_Picture_1.jpeg)

Peripartum Cardiomyopathy Network website Randomized Evaluation of Bromocriptine in Myocardial Recovery Therapy (REBIRTH) for Peripartum Cardiomyopathy

- ► Randomize 200 women (EF ≤ 40%) at 50+ centers across North America to 8 weeks of bromocriptine therapy or placebo
- Funded by National Institutes of Health
- PI: Dr. Dennis McNamara at UPMC
- Local sites: Dr. Lakshmi Sridharan at Emory

![](_page_28_Picture_8.jpeg)

# Peripartum Cardiomyopathy Registry (PPCM-R)

- Educational resources for patients and clinicians
- Patient-focused online research registry to study long-term outcomes and disparities in diagnosis

![](_page_29_Picture_3.jpeg)

![](_page_29_Picture_4.jpeg)

![](_page_29_Picture_5.jpeg)

![](_page_29_Picture_6.jpeg)

![](_page_29_Picture_7.jpeg)

![](_page_29_Picture_8.jpeg)

Not all postpartum heart failure is caused by peripartum cardiomyopathy.

Approach to diagnosis and treatment is similar, regardless of the cause

![](_page_30_Picture_2.jpeg)

#### 35-year-old F, 2 weeks s/p full-term vaginal delivery

- No PMH, no CVD family history, non-smoker
- OB: G4P4, no history of preeclampsia
- Symptoms: chest pressure lasting 20 min while sitting on couch; recurred and woke her from sleep

#### Chest pain differential diagnosis

- Pulmonary embolism
- Acute coronary syndrome
- Aortic dissection
- Myocarditis/pericarditis
- Stress-induced cardiomyopathy
- Non-cardiac causes
  - Respiratory infection
  - GERD
  - Musculoskeletal

![](_page_31_Picture_15.jpeg)

#### 35-year-old F, 2 weeks s/p full-term vaginal delivery

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  - GERD
  - Musculoskeletal

Elevated risk in postpartum period

![](_page_32_Picture_16.jpeg)

![](_page_33_Figure_1.jpeg)

![](_page_33_Picture_2.jpeg)

Cardiac catheterization is the gold standard test for diagnosis of acute coronary syndrome.

This is also true in postpartum patients.

![](_page_34_Picture_2.jpeg)

There is spontaneous coronary artery dissection (SCAD) involving the entire LAD.

TIMI 1 flow into the 1st/2nd diagonals, and TIMI 0 flow after a large septal perforator just distal to the 2nd diagonal artery. The distal LAD fills via left-to-left collaterals.

![](_page_35_Picture_3.jpeg)

![](_page_35_Picture_4.jpeg)

## Spontaneous coronary artery dissection (SCAD)

- Hematoma forms within the wall of the coronary artery
- Compresses the true lumen, decreases myocardial blood flow

![](_page_36_Figure_3.jpeg)

![](_page_36_Picture_4.jpeg)

![](_page_36_Picture_5.jpeg)

SOURCE: Hayes SN, Circulation, 2018; Hayes SN, J Am Coll Cardiol, 2020

## SCAD is an important cause of acute coronary syndrome in younger women and is diagnosed on cardiac catheterization

- 90% of SCAD cases are in women
- Mean age 48 years
- Traditional CV risk factors not present
- Pregnancy is a heightened risk state

Population with acute coronary syndrome	Proportion of ACS cases due to SCAD
All patients	1% to 4%
Women ≤ 50 years	35%
Pregnant women	43%

![](_page_37_Picture_7.jpeg)

## SCAD is a leading cause of pregnancy-associated MI

- Pregnancy associated MI is uncommon (3–8 per 100,000 pregnancies) but may be underdiagnosed
- SCAD in pregnancy/postpartum is more severe than SCAD that does not occur in pregnancy
  - STEMI, multivessel and proximal vessel involvement

![](_page_38_Figure_4.jpeg)

Majority of cases occur postpartum, especially in weeks after delivery

![](_page_38_Picture_6.jpeg)

SOURCE: Tweet MS, J Am Coll Cardiol, 2017

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## Pursue conservative management of SCAD when feasible

- risk of PCI failure; CABG may be appropriate for high-risk cases
- Healing occurs in majority of cases within weeks to months

![](_page_39_Figure_3.jpeg)

![](_page_39_Picture_4.jpeg)

SOURCE: Hassan S, J Am Coll Cardiol Interv, 2019

# Postpartum individuals can also have MI from atherosclerosis or other causes

- 36-year-old woman with HTN, high cholesterol and family history of premature CAD
- OB: G1P1, 3 months postpartum, breastfeeding
- Presenting with escalating exertional chest pain, now occurring at rest
- Labs troponin negative
  - Total cholesterol 292
  - Triglycerides 54
  - LDL-C 181
  - HDL-C 100

Previously undiagnosed familial hypercholesterolemia

![](_page_40_Picture_10.jpeg)

![](_page_40_Picture_11.jpeg)

## Case 3: Shortness of breath and chest pain postpartum

#### 36-year-old F, 5 days s/p vaginal delivery

- History of asthma on inhalers
- OB: G6P4, induced at 34 weeks for severe preeclampsia
- Symptoms: dyspnea, squeezing chest pain, palpitations
- Exam: HR 150 bpm, normal BP and O2 sat. BNP and Troponin levels are normal

![](_page_41_Figure_6.jpeg)

CTA Chest showed acute pulmonary embolism

![](_page_41_Picture_8.jpeg)

### Pulmonary embolism in the postpartum period

- Incidence: 0.6 to 1.8 venous thromboembolic events (VTE) per 1,000 deliveries
- Risk increases during pregnancy and peaks early postpartum

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D-dimer levels increase throughout pregnancy and cannot be reliably used

![](_page_42_Figure_4.jpeg)

For Serena Williams, Childbirth Was a Harrowing Ordeal. She's Not Alone.

![](_page_42_Picture_6.jpeg)

SOURCE: Donnelly JC, Sem in Perinat, 2013; Goodacre S, BJOG, 2019

![](_page_42_Picture_8.jpeg)

# Other cardiovascular diseases in the postpartum period

#### Aortic dissection

- ► Rare but 8-fold ↑ risk vs. non-pregnant individuals
- Highest risk postpartum
- Risk factors: connective tissues diseases (Marfan's), HTN
- 40% of patients with CTD are unaware of diagnosis prior to dissection

#### Other causes

- Other cardiomyopathies
- Arrhythmias and sudden cardiac death
- Valvular heart disease
- Congenital heart disease
- Pulmonary hypertension

![](_page_43_Picture_13.jpeg)

## Case 4: Headache and shortness of breath postpartum

- G1P1 with obesity
- Induced vaginal delivery at 37 weeks due to preeclampsia
- Discharged on furosemide 20 mg for 5 days
- Readmitted on postpartum day 5 with headache and shortness of breath
  - CXR shows mild pulmonary edema
  - Echocardiogram normal LV function

![](_page_44_Picture_7.jpeg)

![](_page_44_Picture_8.jpeg)

Postpartum patients may be seen in care settings that are not accustomed to treating pregnancy complications.

We can all be advocates.

![](_page_45_Picture_2.jpeg)

# Strategies to improve postpartum blood pressure monitoring

- Texting is acceptable and feasible strategy to monitor postpartum BP
- Compared to office visits, telemonitoring with clinician oversight
  - Improves BP monitoring
  - Reduces racial disparities in BP monitoring
  - Improves postpartum OB visits
  - Reduces HTN readmissions

# Heart Safe Motherhood

![](_page_46_Figure_8.jpeg)

![](_page_46_Picture_9.jpeg)

# Blood pressure control after hypertensive disorder of pregnancy

- Optimal blood pressure goals in the weeks after delivery is an active area of study
- Early diagnosis of chronic hypertension is important to mitigate long-term cardiovascular complications

![](_page_47_Picture_3.jpeg)

![](_page_47_Picture_4.jpeg)

# Cardiac symptoms to not miss

#### **Shortness of breath**

- Dyspnea at rest
- Worse than prior pregnancies
- Needing to stop when climbing a flight of stairs
- Dyspnea or edema that worsens after delivery
- Objective: increased work of breathing, tachycardia, low O2 saturation

#### **Chest pain (discomfort)**

- Exertional chest pain that improves with rest
- Sudden pain at rest lasting more than 5 minutes
- Associated symptoms
  - General feeling of being unwell, diaphoresis, nausea, heart racing, light-headedness
  - Escalating symptoms
- Different from heartburn symptoms
- Is anxiety causing pain or pain causing anxiety?
   Can be difficult to tell

![](_page_48_Picture_15.jpeg)

![](_page_48_Picture_16.jpeg)

**CMQCC Toolkit** Improving health care response to CV disease in pregnancy and postpartum

#### CV risk algorithm and suggested work-up

![](_page_49_Figure_2.jpeg)

SOURCE: CMQCC Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum https://www.cmqcc.org/resources-toolkits/toolkits/improving-health-care-response-cardiovascular-disease-pregnancy-and

#### Penn Medicine 50

## Conclusion

- Cardiomyopathy is the leading cause of maternal deaths postpartum
- BNP is a helpful tool to diagnose heart failure
- Abnormal EKG and positive troponin is acute coronary syndrome until proven otherwise
- Blood pressure telemonitoring programs may improve clinical outcomes

![](_page_50_Picture_5.jpeg)

# Thank you!

Contact me anytime with questions:

jennifer.lewey@pennmedicine.upenn.edu Cell: 617-895-7444

We are developing some quick reference guides for clinicians and would love feedback. Please reach out if you are interested!

![](_page_51_Picture_4.jpeg)

![](_page_52_Picture_0.jpeg)

![](_page_52_Picture_1.jpeg)

## CVD Assessment Algorithm For Pregnant and Postpartum Women

#### **Red Flags** Personal History of CVD Shortness of breath at rest Severe orthopnea $\geq$ 4 pillows Without Red Flags Resting HR ≥120 bpm Resting systolic BP ≥160 mm Hg Resting RR ≥30 Oxygen saturations ≤94% with or without personal history of CVD **PROMPT EVALUATION** and/or **CONSULTATIONS** with MFM and hospitalization for acute symptoms Primary Care/Cardiology plus **CONSULTATIONS** with MFM and Primary Care/Cardiology

©California Department of Public Health, 2017; supported by Title V funds. Developed in partnership with California Maternal Quality Care Collaborative Cardiovascular Disease in Pregnancy and Postpartum Taskforce. Visit: <a href="http://www.CMQCC.org">www.CMQCC.org</a> for details

![](_page_53_Picture_0.jpeg)

#### **CMOCC** California Maternal Quality Care Collaborative

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

![](_page_53_Figure_3.jpeg)

©California Department of Public Health, 2017; supported by Title V funds. Developed in partnership with California Maternal Quality Care Collaborative Cardiovascular Disease in Pregnancy and Postpartum Taskforce. Visit: <a href="http://www.CMQCC.org">www.CMQCC.org</a> for details

## WHO modified risk stratification

**Risk of ma** morbidity and

Dick of maternal	WHO class	Type of heart disease
orbidity and mortality	WHO I	Mild pulmonary stenosis Repaired ASD, VSD, PDA
	WHO II	Repaired Tetralogy of Fallot Most arrhythmias
	WHO II-III	Mild LV impairment (EF > 45%) Hypertrophic cardiomyopathy BAV with aortic size < 45 mm
	WHO III	Mechanical valve Moderate LV dysfunction (EF 30-45%) PPCM with recovery (EF $\ge$ 50%)
Pregnancy contraindicated	WHO IV	Severe mitral stenosis Severe symptomatic aortic stenosis Pulmonary arterial hypertension Severe LV dysfunction (EF <30%) PPCM without recovery (EF < 50%)

SOURCE: Regitz-Zagrosek V, Eur Heart J, 2018

# Is breastfeeding safe for patients with peripartum cardiomyopathy?

![](_page_55_Picture_1.jpeg)

# Safety of breastfeeding in PPCM

Safety of breastfeeding

- Metabolic demands are considered safe for most patients
- Not associated with worse outcomes in observational studies
- Health benefits for baby and mother

Concerns about breastfeeding

- Precludes the use of newer GDMT (SGLT2 inhibitors, possibly Entresto)
- Precludes the use of bromocriptine, which may aid in recovery

Stronger argument to stop breastfeeding in patients with severe cardiomyopathy, who have lowest likelihood of recovery. Shared decision making is key.

![](_page_56_Picture_9.jpeg)

# Many women are exposed to the potential vascular insults of late pregnancy, but few develop heart failure

The NEW ENGLAND JOURNAL of MEDICINE
ORIGINAL ARTICLE
ed Genetic Predisposition in Peripartum

![](_page_57_Picture_2.jpeg)

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![](_page_57_Picture_3.jpeg)

ORIGINAL RESEARCH ARTICLE

Genetic and Phenotypic Landscape of Peripartum Cardiomyopathy

# Is genetic predisposition a second hit for some women?

![](_page_57_Figure_7.jpeg)

![](_page_57_Picture_8.jpeg)

## Half of pregnancy-related deaths occur after delivery

Exhibit 2

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Timing of U.S. Maternal and Pregnancy-Related Deaths, 2011–2015

![](_page_58_Figure_3.jpeg)

Many cardiac events occur postpartum and after hospital discharge when patients may not be following up with OB providers

Data: Centers for Disease Control and Prevention Pregnancy-Related Mortality Surveillance data from: Emily E. Petersen et al., "Vital Signs: Pregnancy-Related Deaths, United States, 2011–2015, and Strategies for Prevention, 13 States, 2013–2017," Morbidity and Mortality Weekly Report 68, no. 18 (May 10, 2019): 423–29.

![](_page_58_Picture_7.jpeg)

![](_page_59_Picture_0.jpeg)

![](_page_59_Picture_1.jpeg)

# **Questions?**

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