GaPQC

GEORGIA PERINATAL QUALITY COLLABORATIVE

Laying the Groundwork for a Maternal Cardiac Program
&
Overview of GaPQC Cardiac Education Resources

August 1, 2023

Updates

- Next Maternal Webinar: September 5th

  Topic: GaPQC Maternal Data, Quality Improvement Review, HTN Program Update

- HTN and Cardiac Q2 203 Data Submission – DUE July 31st

- Cardiac Data Collection Plan Update

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 4th trimester by 20%.

Key Drivers

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

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 maternal 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. *

- ❑ 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.** S3

- ❑ 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.** *S5

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State Maternal Health Innovation and Data Capacity Program

Aug. 1, 2023

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HOPE FOR GEORGIA MOMS

Healthy Outcomes and Positive Equitable Experiences

HOPE for Georgia Moms

- HRSA Grant awarded and administered by NGHS
- One of 9 states in U.S. to receive grant, only health system
- Grant award: 2022-2027 for $5 million
- Addressing gaps and needs in
  - Direct clinical care
  - Workforce training
  - Maternal health data enhancements
  - Community engagement
- Focus on Innovation and Equity in all strategies

HOPE FOR GEORGIA MOMS

Our Focus on Georgia

GA Maternal Health Task Force

- Advisory Council for Strategy and Implementation across GA
- Key stakeholders from academia, state health dept, hospitals, community, and payors
- Leverage knowledge and experience of the task force members to create innovative strategies
- Draft 5-year Strategic Plan

Maternal Health Data in GA

- Collaborate with GaPQC, MMRC, Title V, and Regional Perinatal Centers
- Improve AIM data collection and reporting across health systems
- Create Maternal Health Registry and data dashboards
- Support data surveillance for HRSA through Maternal Health Annual Report

Maternal Cardiac Program

- Pilot Maternal Cardiac Program at NGHS
- Conduct cost and implementation evaluation
- Implement Remote Patient Monitoring (RPM) and telehealth to reach rural populations
- Disseminate pilot results to health systems across GA

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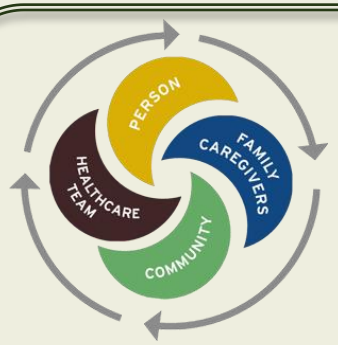
HOPE FOR GEORGIA MOMS

GEORGIA MATERNAL HEALTH TASK FORCE

Executive Directors, Chief Medical Officers, Physicians, Persons with Lived Experience

- Anthem Blue Cross and Blue Shield
- Albany Area Primary Health Care
- Association of Women's Health, Obstetric, Neonatal Nurses (AWHONN) GA chapter
- Black Mamas Matter
- CareSource
- Center for Rural Health & Health Disparities, Mercer University
- District 2 Public Health Department
- Emory University School of Medicine, Grady Hospital
- GA Council for Recovery
- Ga OBGyn Society
- Georgia Department of Public Health, Maternal Health Division (Title V)
- Georgia Emergency Dept Services
- Georgia Health Policy Center, Georgia State University
- Georgia Hospital Association (GHA)
- Georgia Perinatal Quality Collaborative (GaPQC)
- GME Family Medicine faculty, NGHS
- Good News Clinic
- Healthy Mothers, Healthy Babies
- Hispanic Alliance of Georgia
- Institute for Perinatal Quality Improvement
- Liberty Medical Center
- March of Dimes
- Maternal Mortality Review Committee (MMRC)
- Morehouse School of Medicine
- Patient Advocate from MoMMA's Voices
- Peace for Moms
- Postpartum Support International
- Preeclampsia Foundation
- Prevent Child Abuse GA
- ROSE - Reaching Our Sisters Everywhere
- South GA Healthy Start
- United Healthcare
- United Way of Hall County

Action Workgroups for Maternal Health Task Force



1

Care Coordination & Resource Alignment

2

Maternal Health Data

3

Maternal Health Policy

4

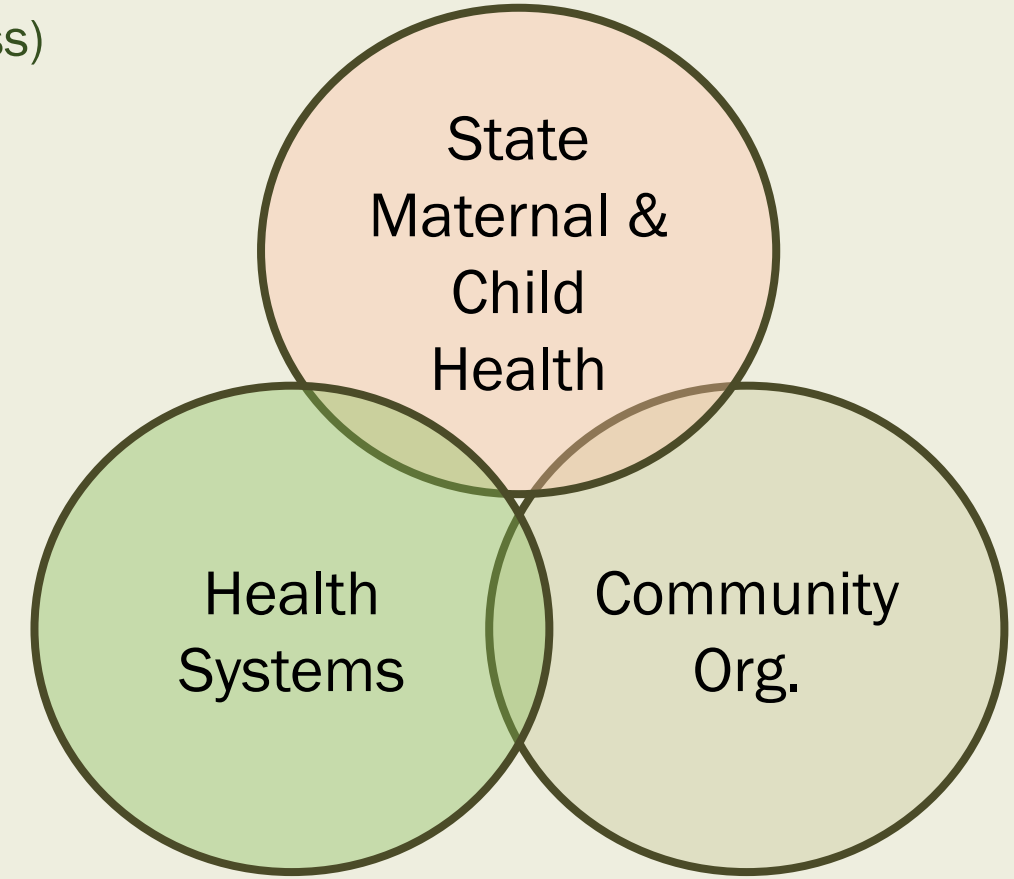
Education & Community Engagement

Health Equity

HOPE FOR GEORGIA MOMS

Joint Path Forward for Georgia

- HOPE for Georgia Moms website (in progress)
  - Maternal Health Task Force
  - Providers
  - Public
- Your input to identify
  - Key stakeholders
  - Trainings & resources
  - Needs and gaps
- Support for
  - Strategic planning
  - Maternal health programming
  - Data capacity and reporting
  - Research

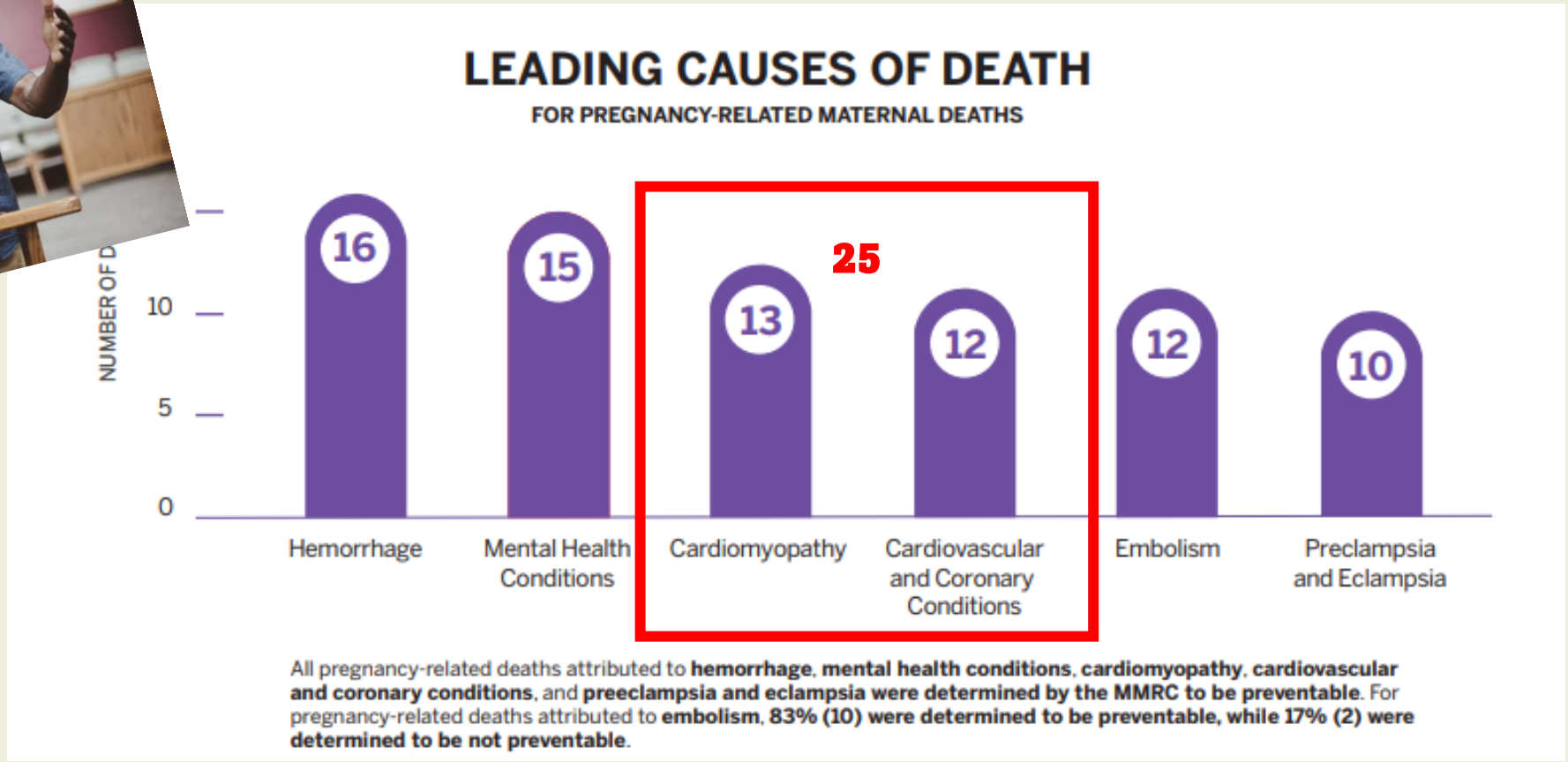


HOPE FOR GEORGIA MOMS

Healthy Outcomes and Positive Equitable Experiences

Maternal Cardiac Program at NGHS

Georgia Maternal Mortality 2018-2020



Getting Started- Who You Need at the Table

- Physician Champion from OB
- Physician Champion from Cardiology
- Physician Champion from ED
- Nursing Leadership
- IT (cannot stress this enough!!)
- Project Management

Tips for Engagement

- Leverage the data
  - share maternal mortality statistics w/ Cardiac conditions being large contributor of maternal death
  - share information on conditions that contribute to long-term cardiac risk (Preeclampsia, gestational hypertension, etc.)
- Share the AIM Bundle and your engagement in GaPQC
  - many QI initiatives specifically ask if your hospital participates in a state perinatal collaborative

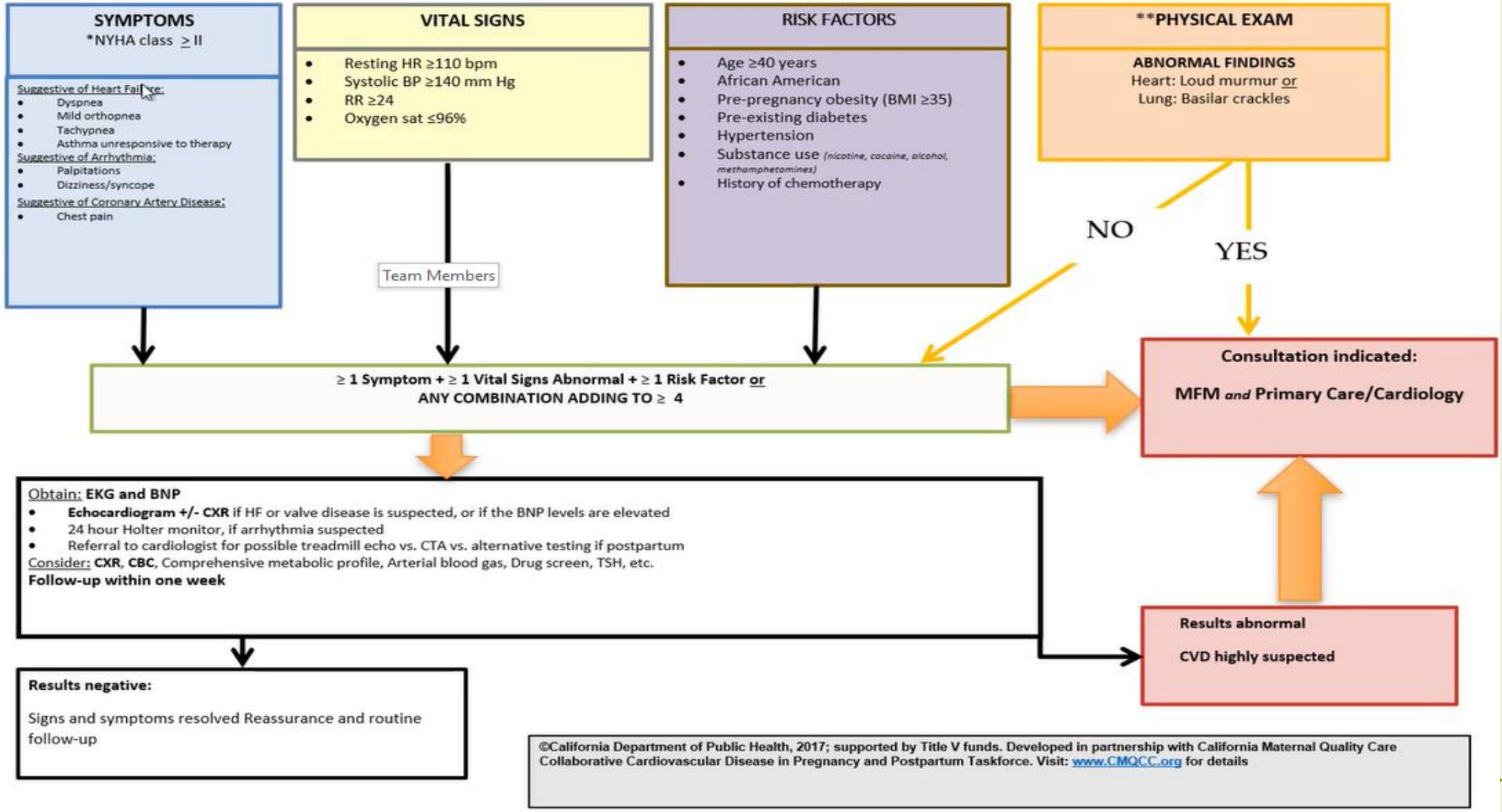
Contributing Factors to CVD Morbidity/Mortality:

- Delayed/inadequate response to clinical warning signs (61%)
- Ineffective or inappropriate treatment (39%)
- Misdiagnosis (37.5%)
- Failure to refer or consult (30%)

Clinical Pearl

Addressing Pregnancy related CVD requires early identification and coordinated care

ALGORITHM 2. (No Red Flags and/or no personal history of CVD, and hemodynamically stable)



CMQCC
California Maternal
Quality Care Collaborative

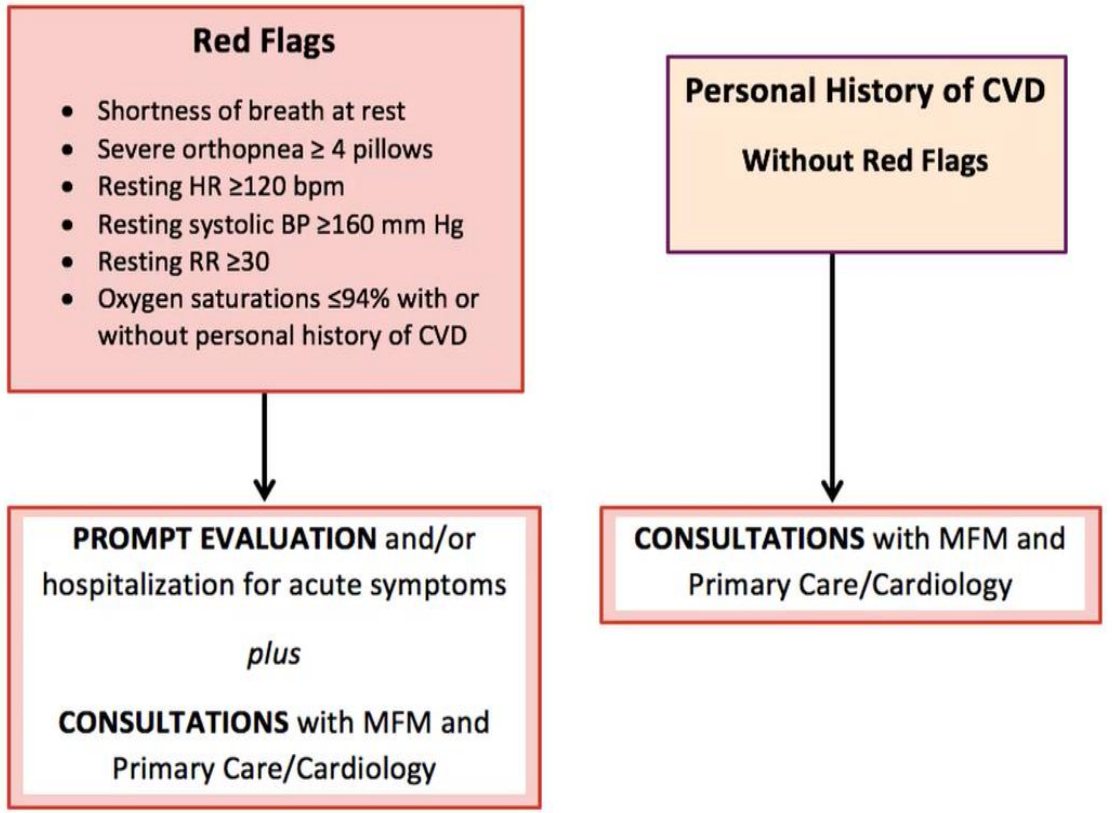
CMQCC Cardiovascular Disease Toolkit

ALGORITHM VALIDATED IN 64 CVD DEATHS

Detection rate 93% in symptomatic cases
Identified as **screen-positive** or high risk for CVD

Hameed, AB, Morton, CH and A Moore. Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum Developed under contract #11-10006 with the California Department of Public Health, Maternal, Child and Adolescent Health Division. Published by the California Department of Public Health, 2017.

CVD Assessment Algorithm for Pregnant and Postpartum Women



https://safehealthcareforeverywoman.org/aim/patient-safety-bundles/maternal-safety-bundles/cardiac-conditions-in-obstetrical-care/

Integration of Risk Assessment into EPIC

Does the patient have shortness of breath with activity?
1=Yes | 0=No

Does the patient have shortness of breath at rest?
4=Yes | 0=No

Does the patient have mild difficulty breathing when lying flat?
1=Yes | 0=No

Do the patient sleep on 4 or more pillows?
4=Yes | 0=No

Does the patient have rapid respirations?
1=Yes | 0=No

If patient has asthma, is it unresponsive to therapy?
1=Yes | 0=No or N/A

Does the patient have palpitations?
1=Yes | 0=No

Does the patient have dizziness or syncope?
1=Yes | 0=No

Does the patient have chest pain?
1=Yes | 0=No

Does the patient have a cough?
1=Yes | 0=No

Is the patient's resting HR greater than or equal to 110 to 119 bpm?
1=Yes | 0=No

Is the patient's HR greater than or equal to 120bpm?
4=Yes | 0=No

Is the patient's resting systolic BP greater than or equal to 140 mmHg?
1=Yes | 0=No

Is the patient's resting systolic BP greater than or equal to 160 mmHg?
4=Yes | 0=No

Are the patient's respirations greater than or equal to 24?
1=Yes | 0=No

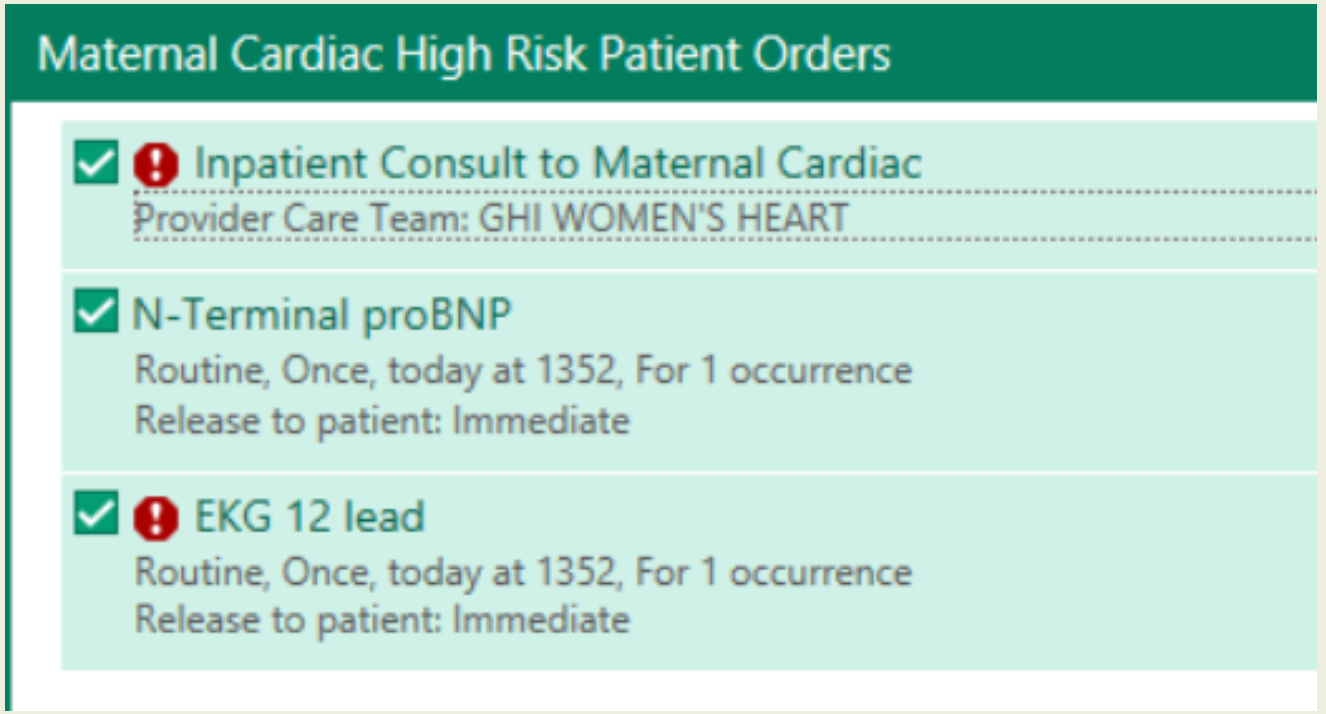
Are the patient's respirations greater than or equal to 30?
4=Yes | 0=No

Is the patient's O2 sat 95-96%?
1=Yes | 0=No

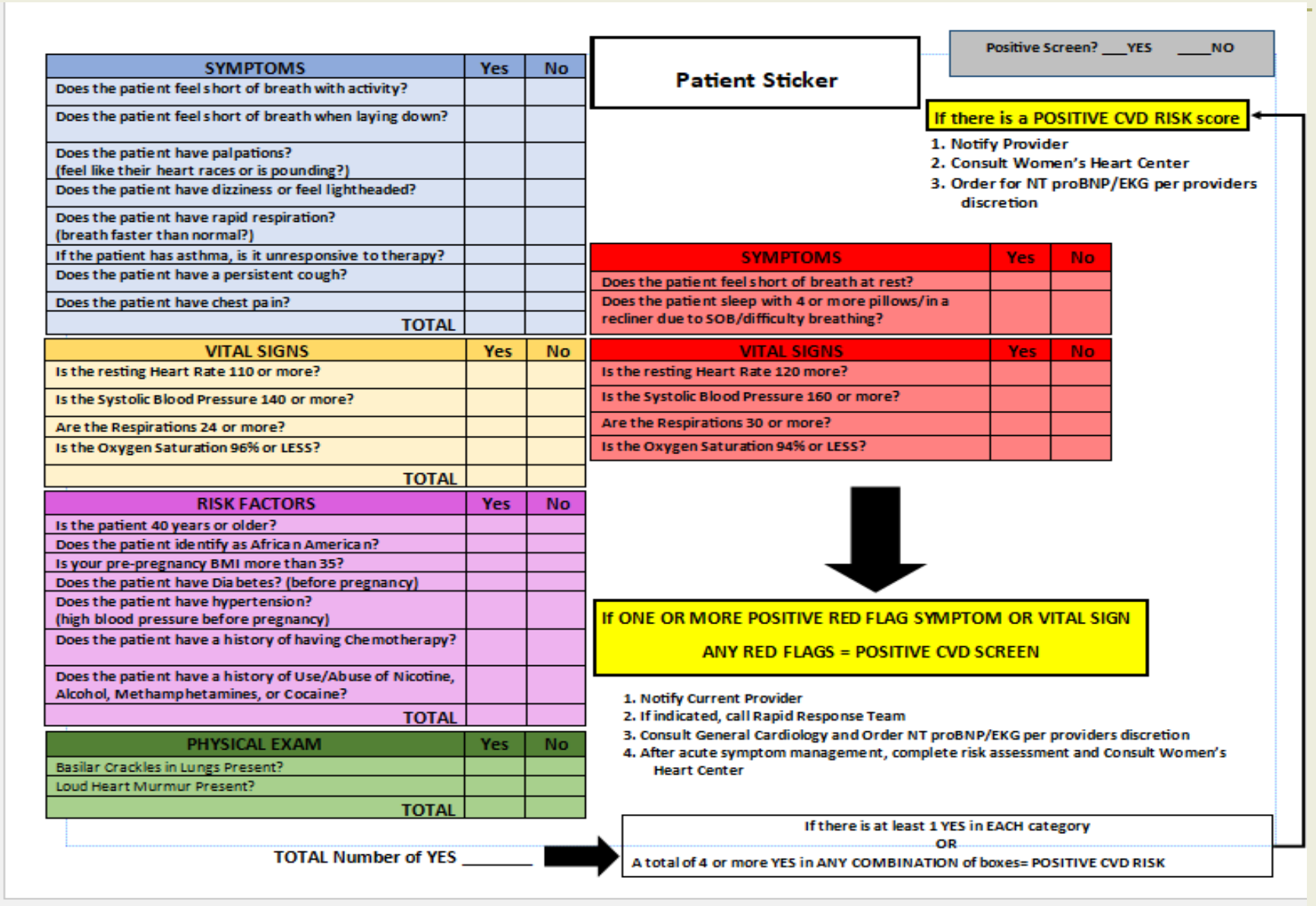
Is the patient's O2 sat less than 95% with or without personal hx of CVD?
4=Yes | 0=No

BPA in EPIC

- BPA Approved by Providers and all IT and Order Set Steering Committees
- Fires when providers open order
- Has option to order or Decline based on clinical evaluation



Paper CVD Risk Assessment



SYMPTOMS	Yes	No
Does the patient feel short of breath with activity?		
Does the patient feel short of breath when laying down?		
Does the patient have palpations? (feel like their heart races or is pounding?)		
Does the patient have dizziness or feel lightheaded?		
Does the patient have rapid respiration? (breath faster than normal?)		
If the patient has asthma, is it unresponsive to therapy?		
Does the patient have a persistent cough?		
Does the patient have chest pain?		
TOTAL		

VITAL SIGNS	Yes	No
Is the resting Heart Rate 110 or more?		
Is the Systolic Blood Pressure 140 or more?		
Are the Respirations 24 or more?		
Is the Oxygen Saturation 96% or LESS?		
TOTAL		

RISK FACTORS	Yes	No
Is the patient 40 years or older?		
Does the patient identify as African American?		
Is your pre-pregnancy BMI more than 35?		
Does the patient have Diabetes? (before pregnancy)		
Does the patient have hypertension? (high blood pressure before pregnancy)		
Does the patient have a history of having Chemotherapy?		
Does the patient have a history of Use/Abuse of Nicotine, Alcohol, Methamphetamines, or Cocaine?		
TOTAL		

PHYSICAL EXAM	Yes	No
Basilar Crackles in Lungs Present?		
Loud Heart Murmur Present?		
TOTAL		

TOTAL Number of YES _____

Patient Sticker

Positive Screen? ___YES ____NO

If there is a POSITIVE CVD RISK score

1. Notify Provider
2. Consult Women's Heart Center
3. Order for NT proBNP/EKG per providers discretion

SYMPTOMS	Yes	No
Does the patient feel short of breath at rest?		
Does the patient sleep with 4 or more pillows/in a recliner due to SOB/difficulty breathing?		

VITAL SIGNS	Yes	No
Is the resting Heart Rate 120 more?		
Is the Systolic Blood Pressure 160 or more?		
Are the Respirations 30 or more?		
Is the Oxygen Saturation 94% or LESS?		

If ONE OR MORE POSITIVE RED FLAG SYMPTOM OR VITAL SIGN

ANY RED FLAGS = POSITIVE CVD SCREEN

1. Notify Current Provider
2. If indicated, call Rapid Response Team
3. Consult General Cardiology and Order NT proBNP/EKG per providers discretion
4. After acute symptom management, complete risk assessment and Consult Women's Heart Center

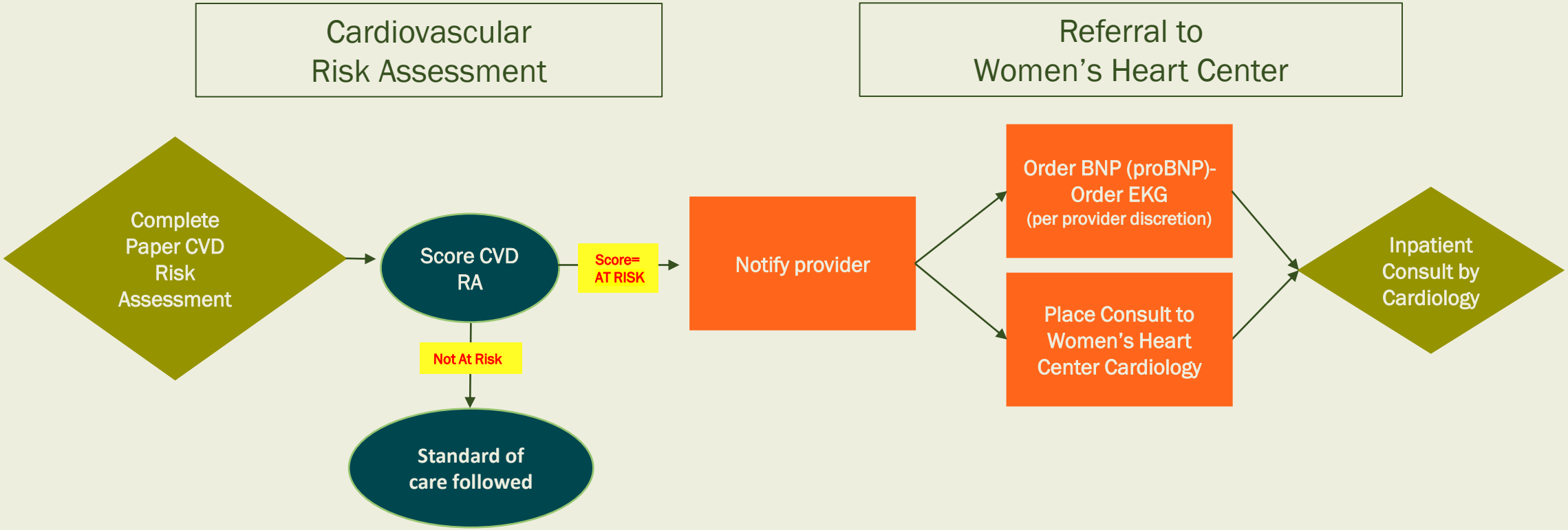
If there is at least 1 YES in EACH category

OR

A total of 4 or more YES in ANY COMBINATION of boxes= POSITIVE CVD RISK

** In the Paper Version, the BPA order panel is available for ease of use

Patient Workflow w/Paper CVD Risk Assessment



1. The pilot paper risk assessment will be completed by BRS M/B unit at 8am w/ vital signs
2. If the CVD Risk Assessment triggers a result that = AT RISK, provider will be notified by RN.
3. The provider will:
    a) Place consult to Women's Heart Center Cardiology and BNP and EKG
    b) Our providers have agreed to have a protocol w/signature required
4. WHC consult placed along with secure chat to APP
5. Lab and EKG results will result to the ordering provider and be visible by Cardiology team
6. Paper form will be scanned into EPIC w/chart and copy stored securely for data entry and tracking
7. CPS will enter data into excel and provide report of # screened and # referred monthly

Questions?

GaPQC Cardiac Education Resources for Clinicians and Patients

Aortopathies

RECOMMEND AVOIDANCE OF PREGNANCY	•Marfan Syndrome, Loeys-Dietz, or Other Hereditary Thoracic Artery Disease: Aortic Dilation >45 mm •Bicuspid aortic valve: Aortic Dilation > 50 mm •Turner: Aortic Size Index >25 mm/m2 •Vascular Ehlers-Danlos •Severe coarctation •Prior aortic dissection
PATHOPHYSIOLOGY	•Hormonal and hemodynamic changes of pregnancy increase risk of aortic dissection. •Dissection can occur at any point in pregnancy with highest risk in third trimester and postpartum
CLINICAL PRESENTATION	Aortic Dissection-Surgical Emergency • Abrupt, acute onset pain in the chest or back (90%). • Symptoms correlate with the involved segments of the aorta. • Red flags: Aortic dimension reaches threshold (Aortic size is the major determinant of risk -10% risk if aortic root diameter > 40mm), personal/family hx aortic dissection, rapid enlargement >5mm/year
IMAGING	•Transthoracic echocardiogram (TTE) •Computed Tomographic Angiography (CTA) or Magnetic Resonance Angiography (MRA) to evaluate entire aorta. Can use gadolinium as benefit outweighs risk. •Transesophaheal Echocardiography (TEE) when needed to assess valvular pathology.
ANTEPARTUM	•TTE every 4-12 weeks during pregnancy and 6 months postpartum •If unable to visualize aortic dilatation, recommend serial monitoring with MRI (without gadolinium) •Beta-blockers during pregnancy •Serial monitoring for fetal growth •Strict blood pressure control (goal BP <120/80 mmHg) •Multidisciplinary team at tertiary center recommended Type B- conservative managment; TEVAR considered in select cases; Serial TTE q 4-12w **OTHER COMORBIDITIES:** Vascular EDS: Uterine rupture Loeys-Dietz: Mitral regurgitation Marfan Syndrome: Mitral regurgitation, Heart failure, Arrythmias Turner Syndrome: Hypertension, DM, Bicuspid aortic valve, Coarctation Bicuspid aortic valve: Aortic stenosis or regurgitation
MAINSTAY OF TREATMENT	• Avoid Hypertension • Beta blockers to maintain strict BP control
OBSTETRIC MEDICATIONS TO AVOID OR USE CAUTION	**Use with Caution:** •Magnesium Sulfate •Oxytocin (no bolus, Use as dilute solution in IV infusion) **Contraindicated:** •Terbutaline •Methylergonovine (Methergine) •Carboprost tromethamine (Hemabate), avoid if vascular disease or aortic aneurysm •Epinephrine, avoid with aortic disease, coronary dissection
BLOOD PRESSURE AND HEART RATE PARAMETERS	•2 large bore IV •Continuous monitoring of heart rate and blood pressure •Use of beta-blockers (Esmolol or Labetalol infusion) •Heart rate: <60 beats per minute •Systolic blood pressure: 100-120 mmHG •If maximal beta-blockade, can use IV Nitroglycerin or Nicardipine to lower blood pressure
TIMING OF DELIVERY	If dissection: Type A >28 weeks>> CD first, then repair; if <28 wks repair alone
MODE OF DELIVERY	Vaginal delivery (Assisted-second stage if aorta ≤ stable during pregnancy; Cesarean delivery: dilated aorta > 40mm, OB reasons, prior dissection repair, increasing size aorta during pregnancy. Delivery must be at place with CV surgery available; also consider antibiotics for risk of endocarditis
INTRAPARTUM	Strict BP and HR control, continue beta-blockers; Avoid pain, monitor for sx of aortic dissection
ANESTHESIA	•Slow dose epidural (Avoid CSE/Spinal) •Avoid rapid drop in blood pressure and sympathetic blockade •Evaluate for dural ectasia
POSTPARTUM	- Aortic dissection risk persists pp; - monitor for signs/sx; - continue B-blockers; clinical aortic f/u for 2-6 months (high-risk- weekly; low-risk- monthly)
REGIONAL ANESTHESIA-EPIDURAL and CSE/SPINAL	Optimal pain management; caution due to high prevalence of dural ectasia; >70% LDS and Marfans can have lumbosacral dural ectasia> increase CSF volume, risk of CSF leak w/ dural puncture

Pulmonary Artery Hypertension

RECOMMEND AVOIDANCE OF PREGNANCY	ALL
PATHOPHYSIOLOGY	As PVR increases, PAP increases leading to RV failure and decreased CO leading to hypotension (this is when pts become symptomatic- CO drops and present w/SOB w/minimal exertion). Right atrial pressure (RAP) increases (due to "blown" tricuspid valve with regurgitation from RV back into RA). RV ischemia and dysfunction leads to fluid retention (impaired venous return) and DEATH!
CLINICAL PRESENTATION	Secondary causes: ASD, VSD, or PDA. Disease progression: exertional chest pain, peripheral edema, anorexia and/or early satiety, RUQ pain, ***EXERTIONAL SYNCOPE***- prodrome to SUDDEN DEATH! - NOT RESUSCITATABLE!
IMAGING	- Need FULL 4-chamber TEE, need bubble study- look for "tunneled" ASD, also image first 2-3 cm IVC, image hepatic vein; need immediate right heart catheterization after diagnosis; limited right heart echo 1 week prior to delivery w/ volume assessment and imaging of IVC
ANTEPARTUM	- Manifests at 16-28w; esp. 24-28w; Hospitalize immediately if symptomatic! Can be deadly! Also consider chronic pulmonary emboli;
MAINSTAY OF TREATMENT	- Maintain afterload (Do NOT fluid overload) - Minimize PVR - Maintain adequate blood volume & venous return - avoid myocardial depressants (B-blockers) - Aggresive diuresis postpartum- NET negative 5-7 L by 72h pp
FLUID MANAGEMENT	Worsen b/c of fluid retention and overload with right heart dysfunction; Goal of management postpartum: aggressive diuresis. Use caution with diuresis if heart failure develops.
OBSTETRIC MEDICATIONS TO AVOID OR USE CAUTION	Terbutaline, avoid myocardial depressants (B-blockers), avoid oversedation (NO strong opioids). **AVOID carboprost (Hemabate)- it increases pulmonary artery pressure by over 100%!!!**
TIMING OF DELIVERY	32 - 36 weeks
MODE OF DELIVERY	Controversial: VAGINAL Assisted second stage (valsalva may decrease preload), may need scheduled Cesarean Section to allow optimization with multidisciplinary teams
ANESTHESIA	Slow dose epidural (Avoid CSE/Spinal), Avoid rapid drop in blood pressure and sympathetic blockade
POSTPARTUM	Admit to CCU/ ICU/ strict I's &O's q4hrs x 72 hours/ start IV diuretic (IV lasix) immediately q 4h >> goal uop net negative 2 L by the time the epidural/spinal wears off then net neg 5-7L by 72 hours (c/s will take up to 5 days); limited R heart echo daily & once RV functioning properly and adequate diuresis, consider d/c home/ see in cardiology with R heart echo. HIGHEST RISK OF DEATH- PPD 3 - if not diuresed adequately as above >>> FULMINANT PULMONARY EDEMA >>> which can lead to DEATH!!!
REGIONAL ANESTHESIA-EPIDURAL	YES- MANDATORY- carefully titrate neuraxial anesthesia onset; avoid pain
REGIONAL ANESTHESIA-CSE/SPINAL	NO- avoid- rapid drop in bp; avoid rapid sympathetic blockade

Mitral Stenosis

RECOMMEND AVOIDANCE OF PREGNANCY	Severe
PATHOPHYSIOLOGY	Increase in cardiac output leads to worsening of left sided stenotic lesions. 2 ways to decompensation and DEATH- 1. Increased blood volume leads to increase in left atrial pressure >> A.Fib and/or pulmonary edema >>DEATH! 2. Simultaneously fixed preload to LV leads to an inability to generate CO leading to cardiogenic shock and DEATH!
CLINICAL PRESENTATION	Rheumatic heart dz; Predictors of cardiac events: prior cardiac events, prior us of medication, pulmonary hypertension
IMAGING	echo to establish severity of stenosis and size of the left atrium; EKG to exclude atrial fibrillation, echo at least once/trimester (q 4-8 w for >mild MS or symptomatic)
ANTEPARTUM	Worsens from 23-34 weeks and then again immediately to 4 weeks postpartum. Complete TTE with full anatomic and hemodynamic assessment of the valves. Even worsening stenosis or heart failure usually responds well to medication and surgery not indicated. However, Severe rheumatic MS presents a significant risk of maternal adverse outcome during pregnancy. In asymptomatic women with severe rheumatic MS (mitral valve area ≤1.5 cm2, Stage C) and favorable valve morphology who are considering pregnancy, PMBC results in an increase in mitral valve area and reduction in transmitral gradient, which makes the patient more resilient to the hemodynamic load of pregnancy. Monitor BNP and pro-BNP levels correlate to mitral valve area as well as pulmonary artery pressure (normal BNP in pregnancy 30-60pg/mL, anything above 100 is concerning pro-BNP >300 concerning)
MAINSTAY OF TREATMENT	- Maintain normal HR- Avoid A.Fib - Prevent & monitor for pulmonary edema - Manage pulmonary edema - PP monitoring for pulmonary edema; Exercise restriction; Consider anticoagulation
FLUID MANAGEMENT	Avoid fluid overload; start diuretics to treat pulmonary edema
OBSTETRIC MEDICATIONS TO AVOID OR USE CAUTION	Terbutaline; tocolytics that can cause tachycardia
BLOOD PRESSURE AND HEART RATE PARAMETERS	Avoid tachycardia; avoid decreases in SVR/hypotension; Start beta blockers to maintain goal HR <100 (nodal blockade goal HR <80bpm; AVOID A-fib; Cardiovert new-onset A-fib; treat RVR
MODE OF DELIVERY	assisted vaginal delivery with regional anesthesia to avoid pain and increase in HR; cesarean only for obstetric indications
INTRAPARTUM	intra-arterial bp monitoring in labor/CD and 5-lead ECG; conitnuous pulse ox w/ waveform; labor in upright position
ANESTHESIA	Slow dose epidural (Avoid CSE/Spinal), Avoid rapid drop in blood pressure and sympathetic blockade
POSTPARTUM	5-lead ECG with continuous pulse oximeter w/ waveform (monitoring closely for pulmonary edema); If pulmonary edema develops> diurese, supplemental O2, remain upright position; if necessary, intubate for controlled ventilation with PEEP
REGIONAL ANESTHESIA-EPIDURAL	Yes- avoid pain
REGIONAL ANESTHESIA-CSE/SPINAL	No- avoid- rapid drop in bp; avoid rapid sympathetic blockade
GENERAL ANESTHESIA	Be prepared for intubation and controlled ventilation with PEEP

CARDIO-OB

Quick Reference Guide

GaPQC
GEORGIA PERINATAL QUALITY COLLABORATIVE

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CARDIO-OB

Quick Reference Guide

	Cardiomyopathy/Heart Failure	Pulmonary Artery Hypertension	Pregnancy-Associated MI (PAMI)/SCAD	Aortopathies	Mitral Stenosis	Aortic Stenosis
RECOMMEND AVOIDANCE OF PREGNANCY	Severe systemic left ventricular dysfunction (LVEF < 30%, NYHA III or IV)	ALL		•Marfan Syndrome, Loeys-Dietz, or Other Hereditary Thoracic Artery Disease: Aortic Dilation >45 mm •Bicuspid aortic valve: Aortic Dilation >50 mm •Turner: Aortic Size Index <25 mm/m2 •Vascular Ehlers-Danlos •Severe coarctation •Prior aortic dissection	Severe	Severe Symptomatic
PATHOPHYSIOLOGY	Impaired Systolic Function or Systolic Dysfunction (left ventricle) caused by: Left Ventricular Hypertrophy creates reduced elasticity and compliance of LV, leading to decrease filling and emptying and therefore decrease cardiac output. Commonly caused by untreated HTN, Valve disease (esp Aortic Stenosis), Ischemic heart disease (CAD/MI), Arrythmias (A Fib or tachycardia). Can have "Preserved EF" (compensated) or "Decreased EF"(decompensated). Can be genetic, caused by alcoholism, drug use, previous myocarditis or chemotherapy.	As PVR increases, PAP increases leading to RV failure and decreased CO leading to hypotension (this is when pts become symptomatic- CO drops and present w/SOB w/minimal exertion). -Right atrial pressure (RAP) increases (due to "down" tricuspid valve with regurgitation from RV back into RA). RV ischemia and dysfunction leads to fluid retention (impaired venous return) and DEATH!	**PAMI**- Higher incidence of HF, malignant arrythmias and cardiogenic shock. Main mechanism is NOT atherosclerotic dz, higher incidence of LM involvement and multivessel SCAD, higher incidence of instability, Higher rate of CABG, higher rate of mortality. **SCAD**- Most common cause of MI in pregnancy. Hormonal changes in estrogen and progesterone lead to vessel wall changes. Formation of intramural hematoma, separation occurring in the outer third of the tunica media and IMH occupying the dissection and compressing the true lumen, leading to coronary insufficiency and MI. Risk factors, PMD, multiparity, Marfan's, Ehlers Danlos, OCPs, infertility treatment, autoimmune disease, >30% precipitating factor such as intense exercise, valsalva, retching, lifting heavy objects.	-Hormonal and hemodynamic changes of pregnancy increase risk of aortic dissection. -Dissection can occur at any point in pregnancy with highest risk in third trimester and postpartum	Increase in cardiac output leads to worsening of left sided stenotic lesions. 2 ways to decompensation and DEATH: 1. Increased blood volume leads to increase in left atrial pressure => A Fib and/or pulmonary edema -> DEATH! 2. Simultaneously fixed preload to LV leads to an inability to generate CO leading to cardiogenic shock and DEATH!	Increase in cardiac output leads to worsening of left-sided stenotic lesions. Cardiac output increases-> left ventricular pressure increases-> symptomatic heart failure, arrythmia, syncope. As SVR decreases, DBP decreases leading to decreased coronary perfusion to thickened myocardium -> ISCHEMIA. Myocardial ischemia leads to decreased LV function and decreased cardiac output->> more ISCHEMIA leading to DEATH!
CLINICAL PRESENTATION	Any history of arrythmia, valve disease or CAD/MI. Elevated BP readings or diagnosis of hypertension. Most normal pregnancy symptoms mimic those of cardiomyopathy/ HF. Consistent complaints or worsening complaints of decreased exercise tolerance, swelling, fatigue, dyspnea, orthopnea, palpitations, dizziness, syncope. Greatest risk during delivery and PP to develop acute HF or PE (05-25% chance). EF <40% associated with 20-60% adverse events. Severe ventricular systolic dysfunction: Prior PPCM w/residual reduced LVEF systolic dysfunction. Fontan w/ reduced systemic ventricular systolic dysfunction and/or heart failure. PREGNANCY SPECIFIC RISK FACTORS: Advanced Maternal Age, Multifetal Gestation, African American, poor nutrition, Smoking.	Secondary causes- ASD, VSD, or PDA. Disease progression- exertional chest pain, peripheral edema, anorexia and/or early satiety, RUQ pain, ***EXERTIONAL SYNCOPE***- prodrome to SUDDEN DEATH! - NOT RESUSCITATABLE!	Fibromuscular dysplasia (FMD) or other arteriopathies limp to 54% coronary artery tortuosity can be a clue SCAD highest risk during first month postpartum (6x/in 12 w of delivery	**Aortic Dissection Surgical Emergency** • Abrupt, acute onset pain in the chest or back (90%). • Symptoms correlate with the involved segments of the aorta. • Red flags: Aortic dilation reaches threshold (Aortic size is the major determinant of risk -10% risk if aortic root diameter > 40mm), personal/family hx aortic dissection, rapid enlargement >5mm/year	Rheumatic heart dz. Predictors of cardiac events: prior cardiac events, prior us of medication, pulmonary hypertension	30% risk cardiac event with severe AS. Fixed and limited cardiac output, through restricted valve area. Avoid hypotension and decrease preload. Red flags: previous valve intervention, ventricular dysfunction, worsening NYHA, NYHA III/IV, hx arrhythmia, hx non-vagal syncope, elevated BNP, new cardiac symptoms, worsening ventricular function, increasing pulmonary pressures, new severe valve regurgitation, more than expected increase in valve gradient, increasing BNP, coexistent dilated ascending aorta
IMAGING	TTE, EKG, Chest X-Ray.	Need FULL 4 chamber TEE, need bubble study- look for "tunneled" ASD, also image first 2-3 cm IVC, image hepatic vein, need immediate right heart catheterization after diagnosis. Invasive right heart echo 1 week prior to delivery w/ volume assessment and imaging of IVC	TTE for wall motion abnormalities, consider LHC	-Transthoracic echocardiogram (TTE). -Computed Tomographic Angiography (CTA) or Magnetic Resonance Angiography (MRA) to evaluate entire aorta. Can use gadolinium as benefit outweighs risk. -Transesophageal Echocardiography (TEE) when needed to assess valvular pathology.	echo to establish severity of stenosis and size of the left atrium. EKG to exclude atrial fibrillation, echo at least once/trimester (q 4-8 w for -mild MS or symptomatic)	echo to evaluate size of aortic valve opening, gradient across valve and EF (Severe- valve area <1cm2, peak gradient >75 mmHg, or EF <55%
ANTEPARTUM	Baseline EKG and TTE, consider HOLTER. Baseline Pro BNP (~450 pg/mL abnormal) and BNP (abnormal - 100 pg/mL). Monitor BNP levels each trimester. Anticoagulation with valve disease and arrhythmias. If symptomatic and valve disease, use BB, lasix, CCB and verapimil. If still symptomatic consider early delivery. If asymptomatic and no valve disease with EF>50% DO NOT USE BB, use hydralazine, lasix and nitrates. If asymptomatic and no valve disease with EF >50% USE BB, verapamil, and lasix	Manifests at 16-28wk esp. 24-28wk. Hospitalize immediately if symptomatic! Can be deadly! Also consider chronic pulmonary emboli;	**SCAD-** 1. Clinically stable, no high-risk anatomy>> conservative management, monitor inpatient 5-5d. 2. Clinically stable w/left main or severe proximal 2-vessel dissection>> consider CABG, conservative rx may be reasonable. 3. Active/ongoing ischemia/hemodynamic instability >> Consider PCI if feasible, or urgent CABG	-TTE every 4-12 weeks during pregnancy and 6 months postpartum -If unable to visualize aortic dilatation, recommend serial monitoring with MRI (without gadolinium) -Beta-blockers during pregnancy -Serial monitoring for fetal growth -Strict blood pressure control (goal BP <135/85 mmHg) -Multidisciplinary team at tertiary center recommended Type B- conservative management. TEVAR considered in select cases. Serial TTE q 4-12w **OTHER COMORBIDITIES:** Vascular EDS: Uterine rupture Loeys-Dietz: Mitral regurgitation Marfan Syndrome-Mitral regurgitation, Heart failure, Arrythmias Turner Syndrome: Hypertension, BAV, Bicuspid aortic valve, Coarctation Bicuspid aortic valve: Aortic stenosis or regurgitation	Women from 22-34 weeks and then again immediately to 4 weeks postpartum. Complete TTE with full anatomic and hemodynamic assessment of the valves. Even worsening stenosis or heart failure usually responds well to medication and surgery not indicated. However, Severe rheumatic MS presents a significant risk of maternal adverse outcome during pregnancy. In asymptomatic women with severe rheumatic MS (mitral valve area < 1.5 cm2, Stage C) and favorable valve morphology who are considering pregnancy, PMBC results in an increase in mitral valve area and reduction in transmitral gradient, which makes the patient more resilient to the hemodynamic load of pregnancy. Monitor BNP and pro-BNP levels correlate to mitral valve area as well as pulmonary artery pressure (normal BNP in pregnancy 50-60pg/mL, anything above 100 is concerning pro-BNP >500 concerning)	Complete TTE with full anatomic and hemodynamic assessment of the valves. Dizziness with activity restriction for CHF Cardiology consultation Anesthesia consult Murmurs need follow up. Vital Signs. Surgery for severe AS with worsening NYHA class III/IV
MAINSTAY OF TREATMENT	Normal HR (avoid bradycardia- tx w/ ephedrine and glycopyrrolate prn) - Maintain afterload (avoid hypo/hypertension) - Maintain contractility -Beta Blockers (Metoprolol Succinate and Carvedilol) Digoxin (need fetal surveillance) and hydralazine - Prevent, monitor and manage pulmonary edema - Monitor for ischemia/arrythmia - Minimize PVR. Anticoagulant therapy	Maintain afterload (Do NOT fluid overload) - Minimize PVR - Maintain adequate blood volume & venous return - avoid myocardial depressants (B-blockers) - Aggresive	Early invasive strategy for ACS vs. conservative medical mgmt. Most resolved within 1 month. Risk of cardiac arrest present	• Avoid Hypertension • Beta blockers to maintain strict BP control	Maintain normal HR- Avoid A Fib - Prevent & monitor for pulmonary edema - Manage pulmonary edema - PP monitoring for pulmonary edema. Exercise restriction. Consider anticoagulation	Maintain afterload - Normal HR (avoid tachycardia) - Diuretics (s/b preload reduction) & B-blockade, exercise restriction. Prevent & monitor for Ischemia - Maintain normovolemia -PP monitoring for hypotension/ischemia. Valve surgery during pregnancy is high risk, with a 50% to 60% fetal mortality rate and up to 18% maternal mortality rate reported. It should be reserved only for patients with severe, intractable symptoms unresponsive to bed rest and maximally tolerated medical therapy.
FLUID MANAGEMENT	Maintain afterload - Maintain normovolemia Will worsen condition, judicious use only.	Worsen h/e of fluid retention and overload with right heart dysfunction; Goal of management postpartum: aggressive diuresis. Use caution with diuresis if heart failure develops.			Avoid fluid overload- start diuretics to treat pulmonary edema	Judicious Use. Maintain preload. Maintain normovolemia. AVOID hypotension. Pulse Pressure , wide PP - high preload. STV variation, does a pressure need fluids or pressor. Pulse OX waveform Degree of Stenosis- strict IVF management especially in the labor process to maintain fluid balance.
OBSTETRIC MEDICATIONS TO AVOID OR USE CAUTION	*Non-dihydropyridine calcium channel blockers, *diltiazem, *verapamil, *carboprost (Hemabate). *Ibuprofen *AZITHROMycin *Celexa (doses greater than 40 mg) *Does Magnesium Sulfate decrease SVR in a way that could complicate Peripartum Cardiomyopathy or Heart Failure? Some research suggests that nifedipine and magnesium together could worsen heart failure. Use with caution.	Terbutaline, avoid myocardial depressants (B-blockers), avoid oversedation (NO strong opioids). AVOID carboprost (Hemabate)- it increases pulmonary artery pressure by over 100%!!!	Carboprost (Hemabate), methylergonovine (Methergine)	**Use with Caution** •Magnesium Sulfate •Oxytocin (no bolus, Use as dilute solution in IV infusion) **Contraindicated** •Terbutaline •Methylergonovine (Methergine) •Carboprost tromethamine (Hemabate), avoid if vascular disease or aortic aneurysm •Epinephrine, avoid with aortic disease, coronary dissection	Terbutaline tocolytics that can cause tachycardia	Terbutaline, carboprost (Hemabate)
BLOOD PRESSURE AND HEART RATE PARAMETERS	BetWeen 110/70 to ~140/90 mmHg. HR 60-110 AVOID- vasodilation, blood loss, hypotension, Valsalva, excess catecholamines, exercise, hypervolemia		BP goals <120/80, B-blocker use for HR control	2 large bore IV •Continuous monitoring of heart rate and blood pressure •Use of beta-blockers (Esmolol or Labetalol infusion.) -Heart rate- 60 beats per minute -Systolic blood pressure 100-120 mmHG -If maximal beta-blockade, can use IV Nitroglycerin or Nicardipine to lower blood pressure	Avoid tachycardia- avoid decreases in SVR/hypotension. Start beta blockers to maintain goal HR ~100 (Lopdal blockade goal HR ~80bpm, AVOID A-flu. Cardiovert new-onset A-flu treat RVR	**AVOID hypotension.** MAP >65 Abnormal 30% of baseline systolic **AVOID** excessive blood loss, Valsalva, bradycardia/tachycardia, hypervolemia Individualized in pts with comorbid HTN. Treat hypotension with phenylephrine. **Maintain normal HR**
TIMING OF DELIVERY	37-39 weeks not after 40 weeks	32 - 36 weeks	Determined by gestational age, obstetric considerations and clinical status of mother	If dissection Type A <28 weeks>> CD first, then repair; if >28 wks repair alone		
MODE OF DELIVERY	Assisted vaginal delivery with regional anesthesia to avoid pain and increase in HR; cesarean only for obstetric indications	Controversial- VAGINAL Assisted second stage (valsalva may decrease preload), may need scheduled Cesarean Section to allow optimization with multidisciplinary teams	Assisted vaginal delivery with regional anesthesia to avoid pain and increase in HR; cesarean only for obstetric indications	Vaginal delivery (Assisted-second stage if aorta = stable during pregnancy) Cesarean delivery: dilated aorta > 40mm, OB reasons, prior dissection repair, increasing size aorta during pregnancy. Delivery must be at place with CV surgery available, also consider antibiotics for risk of endocarditis	Assisted vaginal delivery with regional anesthesia to avoid pain and increase in HR; cesarean only for obstetric indications	labor or C/S in Main OR w/ CV surg on standby, arterial line, avoid exertion/Valsalva = assisted second stage
INTRAPARTUM	Monitoring for Pulmonary Edema, AVOID VALSAVA, use of telemetry can be helpful.			Strict BP and HR control, continue beta-blockers. Avoid pain, monitor for sx of aortic dissection	Intra-arterial bp monitoring in labor/CD and 5-lead EOG- continuous pulse ox w/ waveform, labor in upright position	intra-arterial bp monitoring in labor/CD and 5-lead EOG
ANESTHESIA	Slow dose epidural (Avoid CSE/Spinal), Avoid rapid drop in blood pressure and sympathetic blockade	Slow dose epidural (Avoid CSE/Spinal), Avoid rapid drop in blood pressure and sympathetic blockade		-Slow dose epidural (Avoid CSE/Spinal) -Avoid rapid drop in blood pressure and sympathetic blockade -Evaluate for dural ectasia	Slow dose epidural (Avoid CSE/Spinal), Avoid rapid drop in blood pressure and sympathetic blockade	Slow dose epidural (Avoid CSE/Spinal), Avoid rapid drop in blood pressure and sympathetic blockade

Maternal Cardiac

For patients with SEVERE symptoms and/or personal hx of CVD

WARNING

Red Flags

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥ 120 bpm
- Resting systolic BP ≥ 160 mm Hg
- Resting RR ≥ 30
- Oxygen saturations ≤ 94% with or without personal history of CVD

Personal History of CVD without Red Flags

Prompt Evaluation and/or Hospitalization for acute sysmptoms

Consultations with MFM and Primary Care/Cardiology

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For more information, scan the QR code.

For patients with MILD symptoms, no red flags, no hx of CVD, and hemodynamically stable

Maternal Cardiac

WATCH

Symptoms

NYHA class ≥ II

Suggestive of Heart Failure:
- Dyspnea
- Tachypnea
- Mild orthopnea
- Asthma unresponsive to therapy

Suggestive of Arrhythmia:
- Palpitations
- Dizziness/syncope

Suggestive of Coronary Artery Disease:
- Chest pain
- Dyspnea

Vital Signs

- Resting HR ≥ 110
- Systolic BP ≥ 140
- RR ≥ 24
- Oxygen sat ≤ 96%

Physical Exam

Abnormal Findings
Heart: Loud murmur or
Lung: Basilar crackles

Risk Factors

- Age ≥ 40 years
- African American
- Pre-pregnancy obesity (BMI ≥ 35)
- Pre-existing diabetes
- Hypertension
- Substance use (nicotine, cocaine, alcohol, methamphetamines)
- History of chemotherapy

NO

YES

≥ 1 Symptom ±≥ Vital Signs Abnormal ±≥ 1 Risk Factor or Any Combination Adding to ≥ 4

Consultation indicated:

MFM and Primary Care/Cardiology

Obtain: **EKG and BNP**
- **Echocardiogram +/-CXR** if HF or valve disease is suspected, or if the BNP levels are elevated
- 24 hour Holter monitor, if arrhythmia suspected
- Referral to cardiologist for possible treadmill echo vs. CTA vs. alternative testing is postpartum

Consider: CXR, CBC, Comprehensive metabolic profile, Arterial blood gas, Drug screen, TSH, etc.
Follow-up withing one week

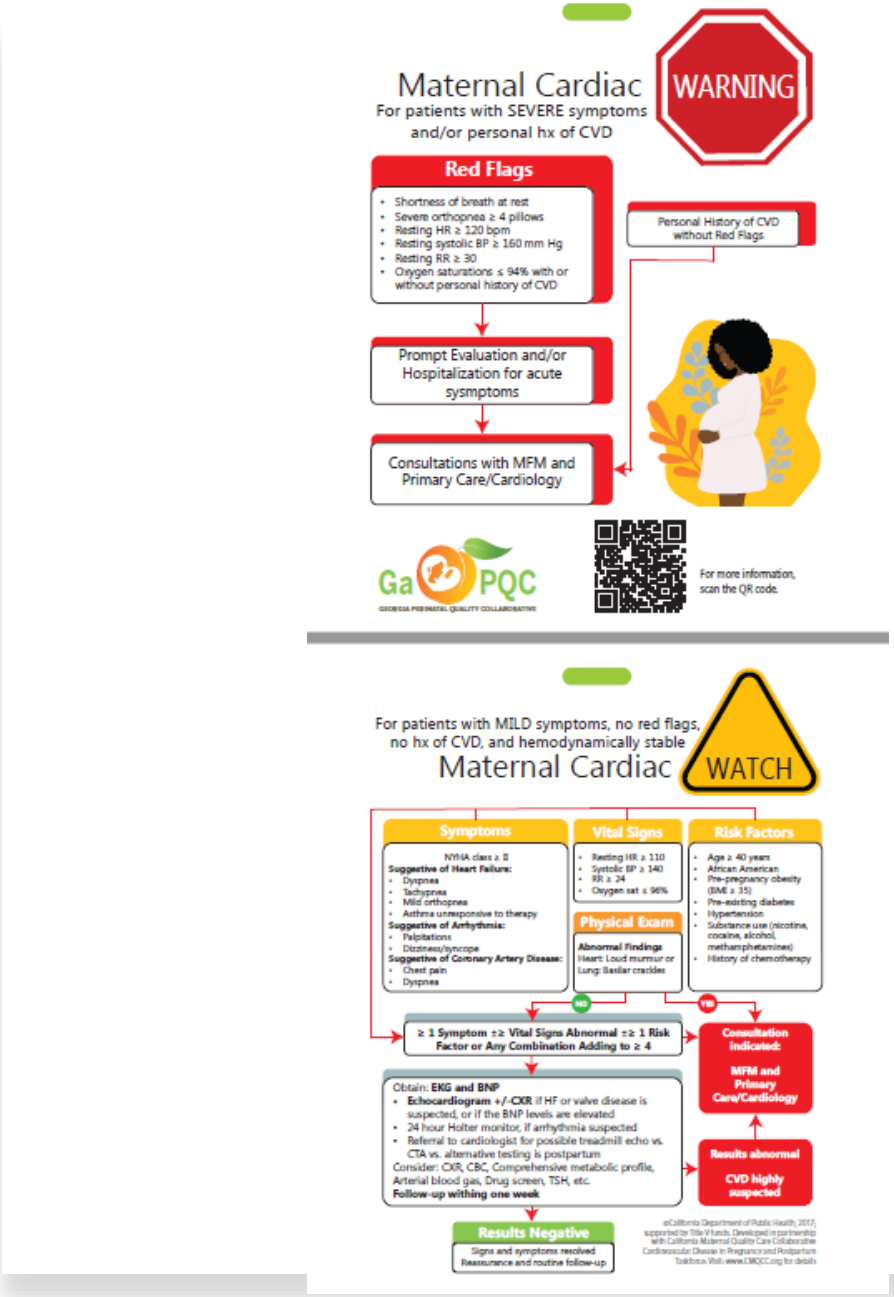
Results abnormal

CVD highly suspected

Results Negative

Signs and symptoms resolved
Reassurance and routine follow-up

Badge Buddy


Maternal Cardiac
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Personal History of CVD without Red Flags
Prompt Evaluation and/or Hospitalization for acute sysmptoms
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For patients with MILD symptoms, no red flags, no hx of CVD, and hemodynamically stable
Maternal Cardiac
WATCH
Symptoms
Vital Signs
Risk Factors
Physical Exam
≥ 1 Symptom ±≥ Vital Signs Abnormal ±≥ 1 Risk Factor or Any Combination Adding to ≥ 4
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Results abnormal CVD highly suspected
Results Negative
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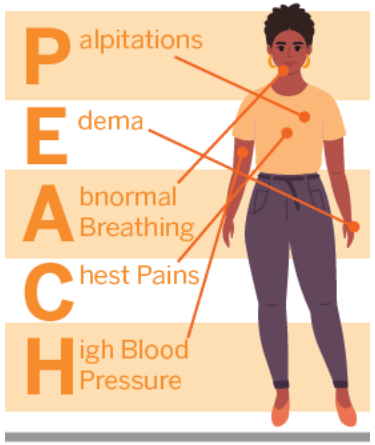
PEACH

Pregnant and Postpartum Heart Disease Warning Signs



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Georgia cares about the heart health of pregnant and postpartum people. Look out for the **PEACH** heart warning signs that something might be seriously wrong.

Pregnancy can impact your heart health for up to a year after the pregnancy ends. Not all doctors will know that you were pregnant. Remember to say ***"I was pregnant this past year and now I am having..."***

Use this QR code to get more information about heart health warning signs.

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Where to download the GaPQC Cardiac Education Resources?

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