

## GUEST EDITOR'S PAGE



# The Pregnant Patient and the Cardiologist

## Should We Embrace Our Fears?

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*"I am not afraid of storms for I am learning how to sail my ship."*

—Louisa May Alcott<sup>1</sup>

**W**hen you are the on-call physician and receive a new consult for a pregnant patient with complex cardiovascular disease, you can experience an immediate reaction of intense fear. You pause; suddenly you are responsible for 2 patients. You must restructure your common pathophysiology pathways and adapt your knowledge to care for a different physiologic state that modifies your approach to hemodynamics, management, and therapies. It is a thrilling but at times terrifying feeling. The only way to mitigate this fear is to train, read, and learn how to navigate cardiovascular diseases during pregnancy.

### IS CARDIOVASCULAR DISEASE A PROBLEM IN PREGNANCY?

Regrettably, approximately 700 pregnant people die each year in the United States as a result of pregnancy or delivery complications.<sup>2</sup> Since the Centers for Disease Control and Prevention has reported pregnancy related deaths, there has been a steady increase from 7.2 deaths per 100,000 live births in 1987 to 17.3 deaths per 100,000 live births in 2018 (Figure 1). From 2016 to 2018, cardiovascular diseases accounted for 35.5% of these deaths. Cardiomyopathy represented 12.5%, hypertensive disorders of pregnancy (ie, pre-eclampsia, eclampsia) 6.8%, and other cardiovascular conditions 16.2%. There is an overall increase of hypertension, diabetes mellitus, and prevalence of chronic heart disease in the general

population that place the patient at a higher risk for complications during pregnancy.

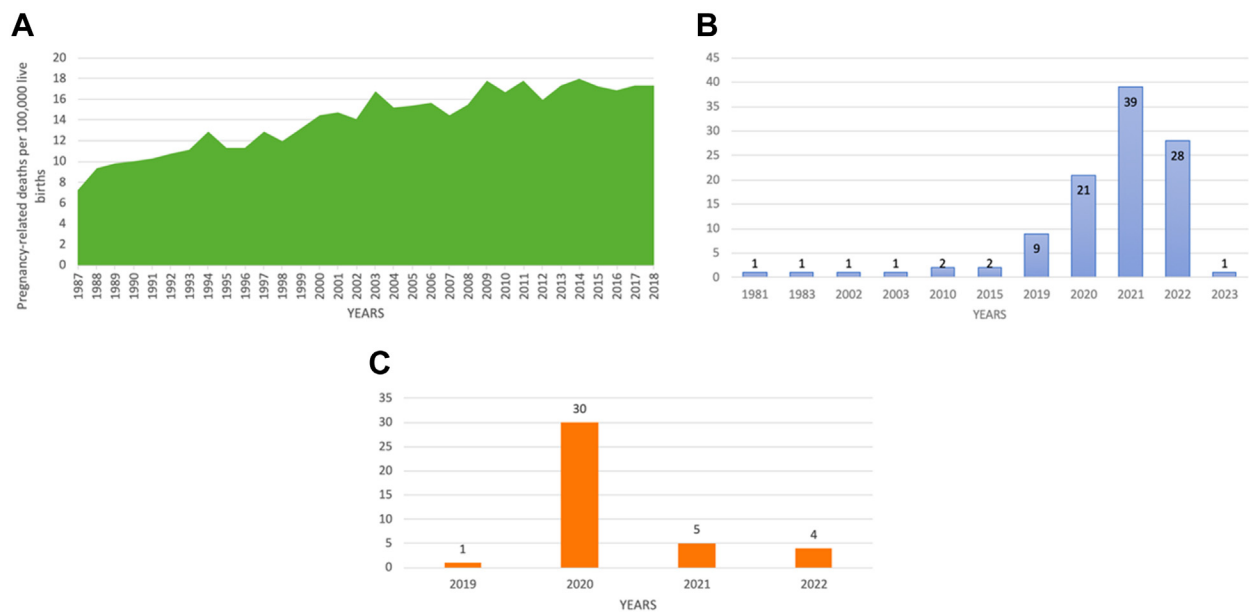
In 2020, the highest maternal mortality rate in the United States was in Arkansas (40.4 per 100,000 live births), followed by Kentucky (39.7 per 100,000 live births) and Alabama (36.2 per 100,000 live births). The lowest maternal mortality rate was in the state of California (10.2 per 100,000 live births).<sup>3</sup> Hence, we need to focus our attention to serve this crucial need in our community.

### HOW CAN WE IMPROVE OUTCOMES?

1. Interest in the problem
2. Dedicated experts in the area
3. Leadership and government support

The approach to improving this issue needs to be patient centered, in which there is a multidisciplinary team, as well as a focus on research, teaching, health policy creation, and health system improvement with the help of leadership (Figure 2). The creation of multidisciplinary teams focusing on caring for this population is a growing concept; fostering and cultivating a medical team experience and knowledge consequently should improve outcomes. These multidisciplinary teams have been created spontaneously in the past few years to address the need. One of the missing parts of the puzzle is validation of the true benefit of the multidisciplinary teams to confirm the hypothesis. The team and allocated resources need to be created with the input not only of the physicians and subspecialists (maternal and fetal medicine, anesthesia, cardiology, and pediatrics), but also by immersing ourselves in understanding the potential pitfalls for patients, community health workers, doulas, social workers, and nurses. This puzzle is more than just a medical problem; it transcends to a socioeconomic, racial, and ethnic

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**FIGURE 1** Publication Trends in Cardio-Obstetrics

(A) Trends in pregnancy-related deaths in the United States from 1987 to 2018 according to the CDC. (B) Number of PubMed publications with the term "cardio-obstetrics." (C) Number of publications in *JACC: Case Reports* related to pregnant people.

disparity that needs lawmakers' attention and governmental muscle to be fixed.

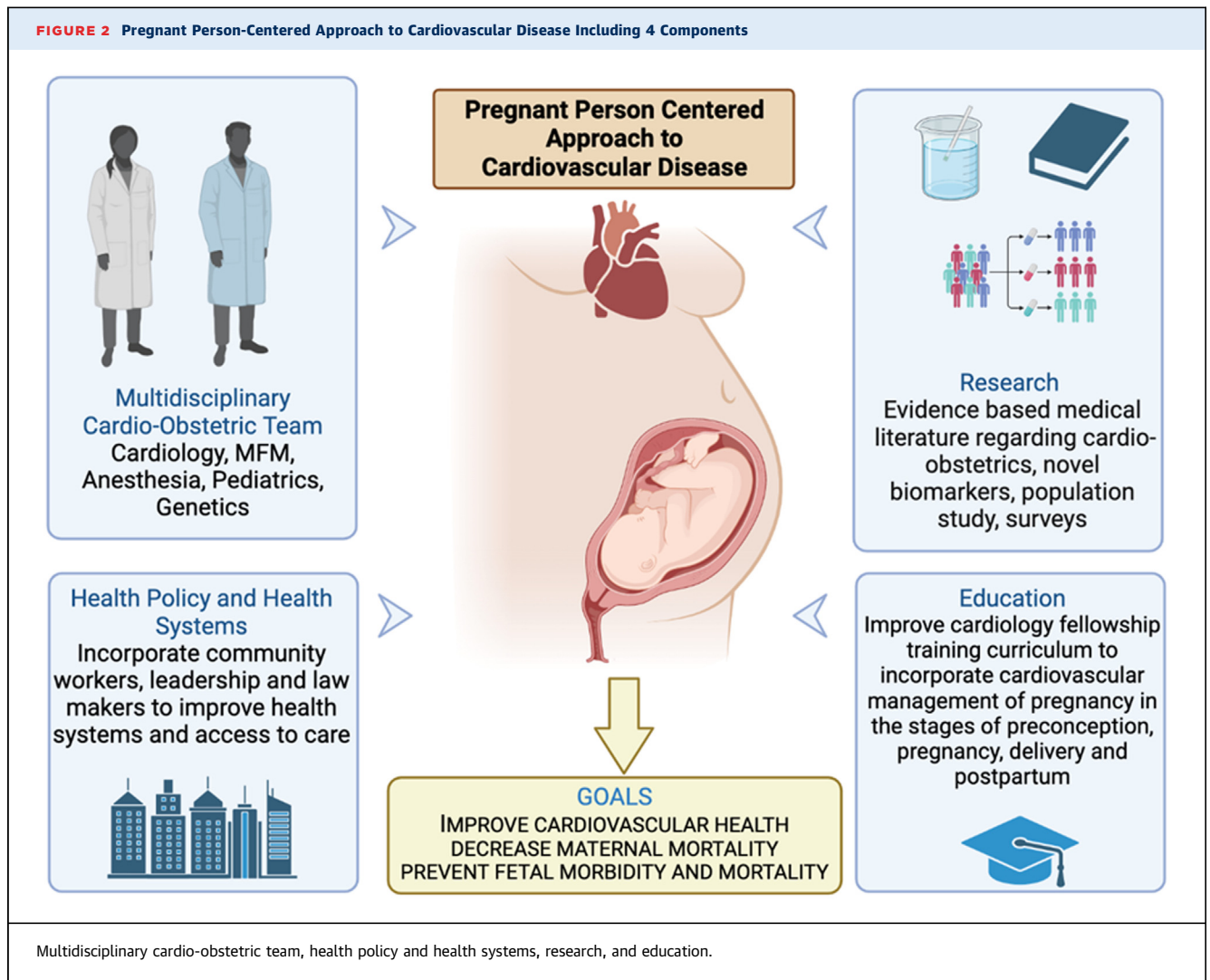
### IS THIS TRULY AN AREA OF GROWING INTEREST IN THE MEDICAL LITERATURE?

A clear evidence of response to cardiovascular morbidity and mortality during pregnancy is the increase in the medical literature related to this issue. Much has been written in recent years regarding the need to create combined multidisciplinary programs to address cardiovascular disease in the pregnant patients. When using the MESH term search in PubMed, the first time the term "cardio-obstetrics" was used was in 1981 with one publication, and has then increased to 39 publications in the year 2021 (Figure 1). *JACC: Case Reports* began contributing to this body of literature in 2019 (Table 1). There is clearly a desperate need to understand multidisciplinary approaches related to pregnancy and cardiovascular diseases, the editors of *JACC: Case Reports* have acknowledged this need to decrease disparities in care for this complex patient population, and there has been a concomitant increase in the number of cases reports related to pregnancy. In 2022, *JACC: Advances* has contributed 10 publications related to

cardio-obstetrics. The American College of Cardiology has also created a work group to foster education and network creations to tackle this problem.

### CARDIO-OBSTETRICS EDUCATION IN CARDIOVASCULAR DISEASE TRAINING

There is a lack of training focusing on cardio obstetrics in general cardiology fellowship. According to the Core Cardiovascular Training Statement (COCATS) 4 training expectation, identifying and managing high-risk cardiovascular conditions during pregnancy and understanding medication safety during pregnancy are the key focuses on cardio-obstetrics within the current curriculum. The COCATS 4 training statement addresses care for pregnant patients with adult congenital heart disease (ACHD).<sup>4</sup> It outlines the need for multidisciplinary care for these patients and collaboration with obstetrics, cardiac anesthesia, and other specialties to manage the preconception, conception, and the post-partum period in patients with ACHD. Fellows in training should have didactic, as well as clinical inpatient and ambulatory, exposure to these patients. Unfortunately, the COCATS 4 falls short of providing guidance for care of the pregnant patients without ACHD.



There has been an increase in the number of cardiovascular complications during pregnancy. In addition to patients with ACHD surviving to their childbearing years, there are also patients who present with pregnancy-associated cardiovascular conditions, such as hypertension, pre-eclampsia, eclampsia, and gestational diabetes. From a training standpoint, there is no clear curriculum for fellows in training.

Learning to take a comprehensive obstetrics history routinely to screen for cardiovascular risk enhancing conditions is essential for cardiovascular trainees caring for pregnant people. Additionally, learning the appropriate level of monitoring and testing indicated before conception, during pregnancy, and in the post-partum period should be a key element in cardiovascular training. The post-partum care includes understanding that a subset of these patients will require long-term follow-up to

screen for the prevention and treatment of cardiovascular disease. With the development of multidisciplinary programs, there will be greater opportunities for our trainees to have expanded exposure to the systematic approach to care for pregnant people. With multiple perspectives and factors taken into consideration, there is a greater chance to prevent cardiovascular complications and develop experts in the field.

#### EXPANDING CARDIO-OBSTETRICS LEGISLATION AND ADVOCACY

Historically, there has been under-recognition and support for patients in the post-partum period. Given the urgent need for surveillance and medical attention during this time, it is imperative to protect access to health care in this vulnerable population. In 2021, the American Rescue Plan was passed which included

**TABLE 1 Publications by Collection From JACC: Case Reports Related to Pregnancy and Cardiovascular Disease from 2019 to 2023**

<b>Cardiomyopathy</b>
Peripartum Cardiomyopathy Presenting With Incessant Ventricular Arrhythmias
Cardiac Function in Women With Peripartum Cardiomyopathy: The Tip of the Iceberg
Exercise Ventricular Reserve Among Women With a History of Peripartum Cardiomyopathy
A Rare Presentation of Cardiomyopathy in Pregnancy
Recurrent and Life-Threatening Peripartum Cardiomyopathy: Diagnosis, Delivery Considerations, and Management
Mechanical Circulatory Support for the Management of Complex Peripartum Cardiomyopathy
Two Hearts at Risk: Emergency Alcohol Septal Ablation in a Pregnant Woman With Decompensated HOCM
Syncope in a Pregnant Woman: Infiltrative Cardiomyopathy and Presumed Cardiac Sarcoidosis
Pregnancy in Familial Left Ventricular Noncompaction-Associated Cardiomyopathy
Acute Postpartum Heart Failure With Preserved Systolic Function
<b>Coronary artery disease</b>
A 27-Year-Old Woman With Postpartum Papillary Muscle Rupture
Rare Case of Post-Partum Spontaneous Papillary Muscle Rupture in a 15-Year-Old
Acute Coronary Syndrome After Ondansetron Administration in a Pregnant Woman: Kounis Syndrome?
<b>Electrophysiology</b>
Successful Subcutaneous Defibrillator Implantation in a Pregnant Patient With Long QT Syndrome
<b>Pulmonary vascular disease</b>
High-Risk Pulmonary Embolism During Labor: JACC Patient Care Pathways
Catheter-Directed Thrombolysis for Submassive Pulmonary Embolism in the Third Trimester of Pregnancy
Primary Presentation of Pulmonary Hypertension in the Peripartum: Preparing for Patients With Eisenmenger Physiology
<b>Valvular disease</b>
Bicuspid Aortic Valve and Ascending Aortic Aneurysm in a Twin Pregnancy
A "Grave" Case of Mitral Regurgitation: Cardio-Obstetric Approach to Severe Mitral Regurgitation With Cardiogenic Shock
Tricuspid Stenosis in Pregnancy: A Valve-in-Valve Conundrum
Transcatheter Pulmonary Valve Performance During Pregnancy and the Postpartum Period
Transcatheter Mitral Valve-In-Valve Implantation: An Option for Failed Bioprosthetic Mitral Valve Stenosis During Pregnancy
Transcatheter Pulmonary Valve Prosthesis and Pregnancy: Stable Hemodynamics and No Valve-Related Adverse Events*
Subaortic Stenosis With Elevated Aortic Gradients in a Pregnant Patient
Management of Severe Coarctation of the Aorta During Pregnancy
Emergency Aortic Valve Replacement in a 12-Week Pregnant Patient
<b>Cardio-oncology</b>
Primary Lung Adenocarcinoma Presenting as Cardiac Tamponade in a Pregnant Woman
Prenatal Pericardiocentesis and Postnatal Sirolimus for a Giant Inoperable Cardiac Rhabdomyoma
Successful Triplet Pregnancy Post-Allogeneic Stem Cell Transplant in a Patient With Doxorubicin-Induced Cardiomyopathy
<b>Congenital and structural heart disease</b>
Atrial Septal Defect Closure Device-Related Infective Endocarditis in a 20-Week Pregnant Woman
Pregnancy in a Patient With Tetralogy of Fallot and Borderline Pulmonary Arterial Hypertension
Pulmonary Embolism After Vaginal Delivery in a Fontan Patient
Successful TPV Implantation in a Pregnant Patient With Right Ventricle to Pulmonary Artery Conduit Obstruction
<b>Other cardio-obstetrics topics</b>
New-Onset Uncontrolled Hypertension and Renal Failure in a Young Woman
A Postpartum Type A Dissection
Blastocyst or Blastomycosis? A Rare Presentation of Disseminated Blastomycosis With Cardiac Involvement in Pregnancy
Infective Endocarditis in a Third Trimester Pregnant Woman: Team Work Is the Best Option
<b>Genetic counseling in inherited cardiomyopathies</b>
Obstetrics and Gynecological History: A Missed Opportunity for Cardiovascular Risk Assessment
A Cardio-Obstetric Approach to Management of the Complex Pregnant Cardiac Patient
A Dangerous Dilemma: Thrombus in Transit During Pregnancy

12 months of post-partum Medicaid coverage, which was a key step in addressing access to care during this critical period. This legislation was due to expire in 2027; however, with the passage of the fiscal year 2023 Omnibus Spending Bill, there is a renewed commitment to maintaining access to care in the

12-month post-partum period.<sup>5</sup> This permanent renewal puts to rest concerns for interruption in access to health care resources after 60 days and expresses a commitment on the part of government agencies to mitigating often preventable cardiac complications.

As part of this initiative, there is increased funding dedicated to supporting decreases in maternal mortality. There was an expansion of the Centers for Disease Control and Prevention Safe motherhood programs, increase in state maternal health innovations programs, and investments in funding from the National Institutes of Health for women's health research with a focus on racial and ethnic minority groups. Ongoing advocacy efforts to protect pregnant people from cardiovascular complications are also being spearheaded by national medical societies, including the American College of Cardiology and American Heart Association. These efforts are geared toward increasing funding for research on cardiovascular conditions such as valvular heart disease and other congenital conditions that often go unrecognized and undiagnosed before pregnancy. Through ongoing research and funding, we can anticipate further advances to minimize cardiovascular complications associated with pregnancy.

### FUTURE PERSPECTIVES

It is clear that we are obliged to identify the barriers to care and to modulate the risk factors that increase the maternal mortality risk, while we simultaneously educate medical health providers with a robust body

of literature and infiltrate these important topics into training curriculums. We must increase the body of research evidence and provide evidence-based clinical and programmatic examples of success. This work will allow us to create effective programs and policies to benefit a vulnerable pregnant population.

### CONCLUSIONS

Maternal health reflects a world rife with inequalities in access to quality health services and a need for evidenced-based clinical data to guide change. Pregnancy-related mortalities are individual tragedies, that have long-lasting impact on families, communities and countries. They should not be taken lightly.

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