

CARDIOVASCULAR PERSPECTIVE**Cardio-Obstetrics****Team-Based Care to Improve Maternal Outcomes****MATERNAL MORTALITY**

Despite global improvements in maternal mortality, the rate of pregnancy-related deaths in the United States has been rising.¹ Pregnant women in the United States have a higher risk of death than in any other industrialized country. The reasons for this are complex. Black women have a 3 to 4× higher risk of maternal mortality than white women,² underscoring alarming trends in the racial-ethnic disparities in this country. Insufficient access to care, socioeconomic inequalities, and variable quality of care all require attention. Additionally, maternal demographics and risk factors have changed over time. At the time of pregnancy, women are older and have more chronic medical conditions, such as obesity, hypertension, and diabetes mellitus.¹ Cardiovascular disease is now a leading cause of maternal death and severe morbidity.²

State-wide maternal mortality review committees have shed light on cardiovascular-related maternal deaths. In Illinois, Briller et al³ found that of 140 maternal deaths from 2002 to 2011, more than a fifth (22%) were related to cardiovascular disease. The most common causes were related to acquired cardiovascular disease (97.1%), including cardiomyopathy (27.9%), stroke (22.9%), hypertensive disorders (12.9%), arrhythmias (10.7%), and coronary disease (9.3%). Relatively fewer deaths were related to congenital heart disease (2.9%). In California, nearly a quarter (24.9%) of the pregnancy-related deaths from 2002 to 2006 were attributed to cardiovascular disease, and two-thirds of these deaths were related to cardiomyopathy.⁴

Maternal deaths were deemed to be potentially preventable in approximately a quarter of the cases reviewed by these 2 state committees.^{3,4} Preventability was assessed by whether specific and feasible actions could have been implemented to lead to a nonfatal outcome, such as evaluating the cause of severe shortness of breath in a postpartum woman.⁴ The complex problems facing high-risk obstetric populations require a team-based approach including cardiology, maternal-fetal medicine, obstetrics, anesthesiology, and nursing.

HEMODYNAMIC CHANGES AND UNMASKING RISK

The physiological changes of pregnancy involve multiple hormonal and vascular adaptations, substantial increases in volume, cardiac output and heart rate, decreased systemic vascular resistance, and increased hypercoagulability. Diagnosing cardiac conditions, such as heart failure and arrhythmias, during pregnancy can be challenging as the signs and symptoms can mimic those of normal pregnancy. Obstetrics teams must be alert for symptoms that are outside the norm, and cardiologists should understand the significant hemodynamic changes that occur during pregnancy, labor, and delivery and the normal physical findings in each stage.

The long-term risk of cardiovascular disease among women with complications during pregnancy is increasingly recognized. Preeclampsia, hypertensive dis-

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orders of pregnancy, gestational diabetes mellitus, and preterm birth have all been associated with increased maternal cardiovascular risk later in life.^{5,6} Pregnancy has been compared with a stress test whereby subclinical cardiovascular disease may be unmasked by the hemodynamic changes. Women with demonstrated increased future risk of cardiovascular disease should be identified, educated, followed, and treated when appropriate. Effective communication among cardiologists, obstetricians, primary care physicians, and patients is essential, but the ideal approach for following and managing these patients over the long-term requires further research.

TEAM-BASED CARE

A cardio-obstetrics team requires a group of dedicated individuals committed to caring for this growing population of women. Similar to other multidisciplinary teams within cardiology, such as advanced heart failure and transplant cardiology, cardio-oncology, and valvular heart disease, team-based care requires commitment and effective communication. At many institutions, regular interdisciplinary meetings involve discussion of labor and delivery plans for all the pregnant women with any type of cardiovas-

cular disease.⁷ In attendance are experts from cardiology, obstetrics, maternal-fetal medicine, anesthesia, and nursing (Figure). A primary focus is the patient's progress with the pregnancy and a plan for safe delivery. Additional expertise, as needed, is provided by pharmacists, social workers, and case managers. Patient preferences and shared-decision making are important. Nurse navigators can play a pivotal role by supporting and linking the patient with various specialists, particularly when visits are not concurrent. Some programs opt to have shared clinic space for maternal-fetal medicine specialists and cardiologists to improve communication and reduce barriers for patients who need multiple appointments or travel long distances.

Late referral to a higher level of care has been cited as a contributing factor in preventable maternal deaths.³ Systems that support timely referrals, as well as close followup postpartum, could potentially improve maternal outcomes. Within the first 6 weeks postpartum, before the standard postpartum visit, is a high-risk time for complications.³ The American College of Obstetrics and Gynecology Presidential Task Force on Redefining the Postpartum Visit recommends that all women have a follow-up visit within the first 3 weeks postpartum.⁸

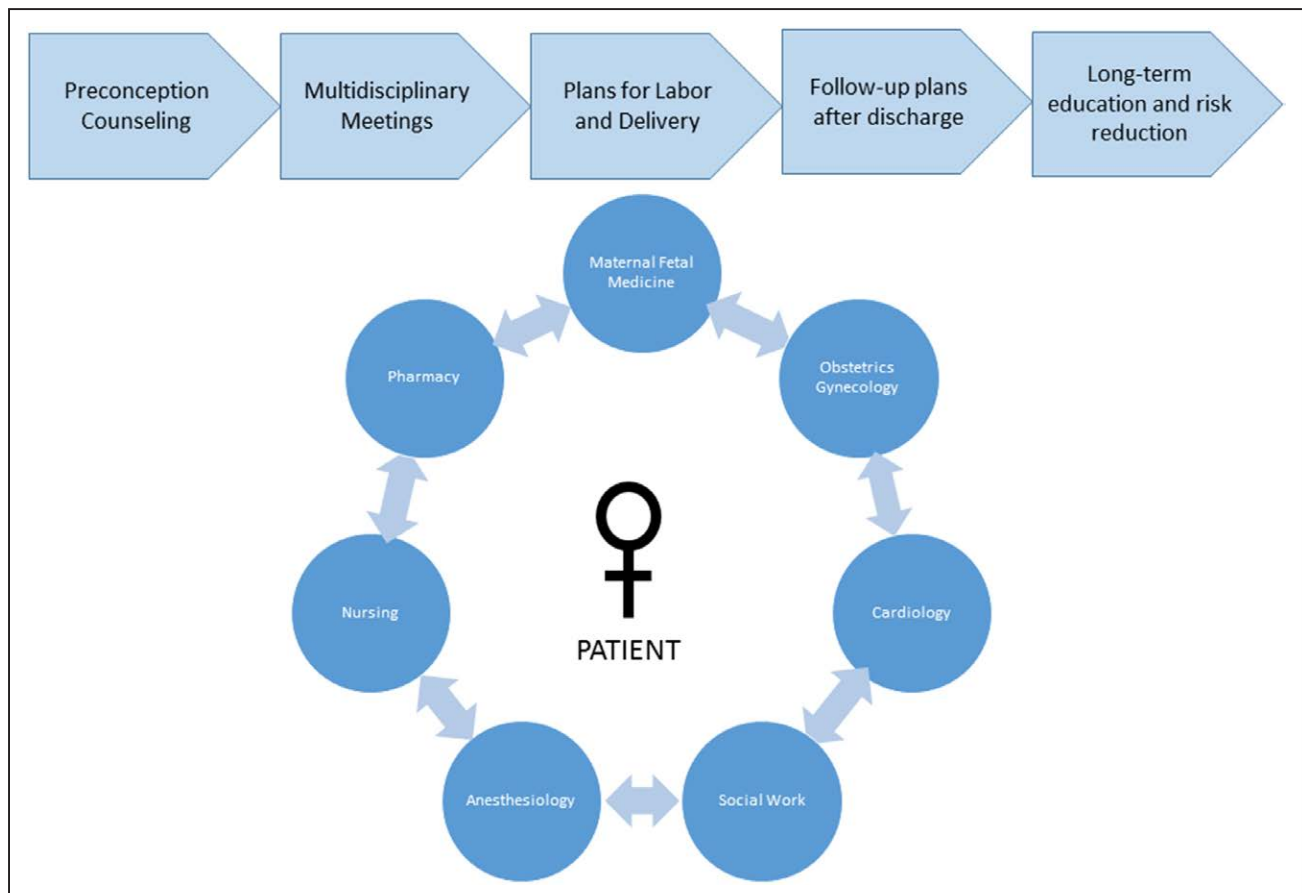


Figure. The key components of a cardio-obstetrics team.

Cardio-obstetrics teams also provide care and expertise around pregnancy planning. Women with cardiac disease, previous pregnancy complications and those with risk factors are counseled by the multidisciplinary team, often along with genetics counselors. Estimates of complications recurrence, suggested mode of delivery, and intensity of intrapartum monitoring and follow up are shared with patients and their families. Such planning allows for shared decisions about conception planning.

QUALITY OF CARE AND SPECIALIZED TRAINING

Despite cardio-obstetrics being a clear area of need for improved quality of care, physicians do not receive formal training in this field. Most team members involved in the care of these patients have learned through experience. There are no formal training requirements during cardiovascular disease fellowship. The Core Cardiovascular Training Statement 4 states briefly that exposure to various specialty experiences is recommended, including “an obstetric clinic visited by pregnant patients with heart disease, optimally in the context of an interdisciplinary approach to high-risk pregnancy”⁹; however, many fellows will not have such an opportunity, and formal metrics are lacking. Cardiologists would benefit from training about hypertensive management during and after pregnancy, medications that can safely be used during pregnancy and lactation, the maternal cardiovascular benefits of breastfeeding, long-term outcomes for women with pregnancy-related risk factors, interpretation of biomarkers and echocardiographic changes during pregnancy, and the complex effects of hemodynamic changes during pregnancy, labor and delivery on various types of cardiovascular physiology. Cardiovascular indications for cesarean section is needed expertise to avoid unnecessary surgical interventions. More organized training could be broadly explored. As cardio-obstetrics programs develop and formalize, training opportunities for fellows will naturally grow.

RESEARCH AND COLLABORATION

Improving quality of care for this population also requires collaboration among researchers. The heterogeneous nature of cardiac diseases in child-bearing women, and the relative rarity of each condition, makes robust research challenging. Multicenter collaboration and registries are important for furthering our understanding. The Registry of Pregnancy and Cardiac Disease, established by the European Observational Research Program, has provided significant insights and has also drawn attention to the wide variety of care

practices and settings that exist at an international level.¹⁰ Additional registry development can help us understand ways to improve quality of care in this specialized population.¹¹ Long-term risk reduction for women with complications during pregnancy, such as preeclampsia, hypertensive disorders, gestational diabetes mellitus, and preterm birth can be addressed longitudinally as the cardiovascular risk does not abate over time. Communities of researchers and clinicians will need to work together to create evidence-based best practices. Research at a population health level will better determine the independence of preeclampsia, eclampsia, and gestational hypertension as cardiovascular risk factors.

FORMING PROFESSIONAL COMMUNITIES

At the 2018 American College of Obstetrics and Gynecology meeting, one of us (Dr Walsh) presented her vision for cardio-obstetrics and emphasized the importance of collaboration and teamwork, establishing the social media hashtag #CardioObstetrics. The hashtag has helped create an online community around this emerging discipline with users sharing recent studies and literature as well as promoting awareness. Clearly, there is broad interest, and we expect this field will grow exponentially in the years to come. In this country, the risk of morbidity and mortality related to pregnancy is appalling. We can and must do better. By working together and forming dedicated teams and communities, we can improve the health of women with cardiovascular disease and those at risk, thereby benefiting mothers and their families for the decades that follow.

ARTICLE INFORMATION

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Disclosures

None.

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