



## **HeartBEATS from Lifelong Learning™**

### **Pregnancy Planning, Evaluation and Management of Patients with Pre-existing Cardiac Disease**

**Mary Canobbio:**

Hello, and welcome to this episode of Heartbeats from the American Heart Association's Lifelong Learning Modules. Today, the topic is pregnancy planning, evaluation and management of the patient with preexisting heart disease. We have three speakers today. I am Mary Canobbio. I'm a clinical nurse specialist at the Ahmanson/UCLA Adult Congenital Heart Disease Center where I have been working with adults with congenital heart disease. And I was on the cardio-obstetric program focusing on the management of women with complex congenital heart disease. We have two additional speakers, Dr. Rachel Bond, and Dr. Stephanie Martin, and I'm going to let them each introduce themselves. Dr. Bond, do you want to take over?

**Rachel Bond:**

Thank you so much. Yes, I'm Dr. Rachel Bond. I'm a preventative cardiologist in Arizona with a special focus in women's cardiovascular health. Nationally, I lead a lot of efforts that focus on women's health as well as maternal health from the scope of equity as well as making sure that the life course is factored in to women's care as well.

**Stephanie Martin:**

I'm Dr. Stephanie Martin. I'm a maternal-fetal medicine specialist, co-owner and medical director at Clinical Concepts in Obstetrics.

**Mary Canobbio:**

All right. Well, thank you, Dr. Martin. So we have our disclosures listed here. On the next slide, we have to remind our viewers that the recommendations and the opinions presented by our guest speakers may not represent the official position of the American Heart Association. The materials are for educational purposes only and do not constitute an endorsement of instruction by the American Heart Association or the American Stroke Association. The American Heart Association and the American Stroke Association does not endorse any product or device. So our learning objectives for this module we hope is that the learner will be able to identify key components of the pre-pregnancy cardiovascular risk assessment and to be able to apply current risk stratification tools to determine potential pregnancy risk for this population and then to review the diagnostic evaluations for high-risk patients specifically for their individual cardiac disorder and to

integrate cardiac risk stratification tools and multidisciplinary collaboration into a coordinated delivery care plan that supports patients' reproductive goals safely. So this is important topic because cardiovascular disease remains a leading and preventable contributor to maternal death. And specifically for women with preexisting heart disease, morbidity and mortality approaches 50% in those women with the highest risk conditions. Therefore, these pregnancies are at even greater risk of complications. Some examples such as those in obstetrical complications include preterm birth, fetal growth restriction, pregnancy loss, cesarean birth, and postpartum hemorrhage, cardiac complications not limited to thromboembolism, pulmonary edema, and arrhythmias. And so the highest risk cardiac patients does require very specialized evaluation and long-term planning. And therefore pre-pregnancy intervention has proven to improve maternal and fetal outcomes. So the goals of preconception assessment and planning in women with preexisting heart disease include the need to identify and reduce not only the potential and the actual risks that jeopardize the future of health of the mother and her baby. We also want to optimize preconception health and address the modifiable risk factors and provide education about pregnancy risk.

And in doing so, we hopefully we will decrease the likelihood of unplanned pregnancies. So preconception counseling provides an opportunity to identify baseline unrecognized and future cardiovascular risk for both the mother and the baby across the life course. It's important because it allows us to review potential complications, both cardiac and obstetrical, and it also allows us to develop these risk stratification scores to guide the antepartum delivery and postpartum plan. It allows us to facilitate multidisciplinary care planning to reduce maternal and morbidity and mortality, and it provides an opportunity for medication reconciliation and teratogenic risk mitigation as these patients are often on many drugs, many of which can affect the fetus. And finally, it allows us an opportunity to address those health disparities and access gaps particularly in women at highest risk. At this point, we will move on to the next session and Dr. Bond will take over. And so Dr. Bond, take on.

**Rachel Bond:**

Thank you so much, Mary, and thank you for giving a great framework as to why preconception care and counseling is so important. If we look at this slide here, which gives us a good understanding and overview of maternal heart disease and all the different categories of it, one thing that it highlights without a question is the fact that when we think about pregnancy as a whole, the reason these maternal heart conditions are so pivotal is because we usually call pregnancy a woman's first and oftentimes their most important stress test. Reason being is we have hemodynamic changes that increase our cardiac output, our blood pressure, our blood volume, and oftentimes our heart rate as well. So many a times women may go into the pregnancy with known cardiac conditions, the most common being congenital heart disease. But a lot of times because of those hemodynamic changes, they may actually acquire or unmask heart disease during the pregnancy as well. And understanding the different types of cardiovascular disease, framing from ischemic heart disease, coronary artery disease, mechanical valvular disease, cardiomyopathy,

aortopathies, as well as valvular heart disease, including congenital heart disease is so important, especially as so many advances in the world of cardiology has led many women who were diagnosed with congenital heart disease as children to live to reproductive years and think about the prospect of growing their family. But we also know with the advent of advances in cardiology as well, many women are having children later on in life. So with that, a lot of these acquired conditions are coming up. And this is why pre-pregnancy care is so, so important. When we think about what goes into pre-pregnancy care, we have to first realize that it's not episodic. It actually is across the continuum of a woman's reproductive life. The first time really being once the female has reached reproductive age, and the way we define that is with menarche.

When we think about what we should be doing during the person's adolescence, we know that this is where early discussions of reproductive goals and potential risks of unplanned pregnancies are so important, especially if patients have known congenital defects or even acquired cardiovascular complications that we know may pose a risk for them in the future. During early adulthood at every visit, oftentimes their wellness visit, we should be assessing for their pregnancy intention and also discussing the potential risks of an unplanned pregnancy. And if that person is not yet quite at that point in their life where they want to grow a family, this is where assessing contraceptive usage as well as side effects of it are so important. This is where discussing the different types of contraception along with any contraindications for their cardiovascular condition becomes key. And although cardiologists have to become more comfortable with these discussions, it's also important to realize that we have colleagues in women's health like OB-GYNs and women health experts that may be able to guide us when it comes to the best contraceptive options or alternatives when we're dealing with these high risk patients.

I want to highlight the most important group, which are oftentimes those that fall in the moderate to high risk cardiac disease category, those that are defined as Modified WHO II to III, III and IV, because this group oftentimes, without a question, needs multidisciplinary care between a cardiologist, a primary obstetrician, as well as a maternal-fetal medicine specialist with the opportunity to optimize medications, assess their functional status, review maternal and fetal risks, and ultimately create a care plan for their future pregnancy. And when we go into that care plan, we always, always, always think about two things. One is maternal cardiac and obstetric risk, but the other is the fetal and neonatal risk that comes with it as well, understanding that the goal is to optimize their health before that actual pregnancy. And when we think about what determines one's risk, there's several, several things that go into the mix.

There are core clinical factors that help us define pregnancy risk in women with cardiovascular disease. The first one of course is understanding their underlying cardiac condition. Is it congenital or is it acquired? What is the lesion type and what does that severity look like? We know that having a repaired atrial septal defect is at a very, very different risk than somebody who has severe pulmonary hypertension or advanced cardiomyopathy. Understanding their family history and genetic risk is also important. Are

they at risk of cardiomyopathies, congenital heart disease or aortopathies? What did their surgical history encompass? Were there residual lesions or complications after they did require surgery? What medications are they on? This is an opportunity to identify and transition any teratogenic agents, think about anticoagulation strategies if indicated, but this is also an opportunity to factor in comorbidities. Do they have diabetes, thyroid disease, obesity? What's their activity limitations and their symptoms? And are there any presence of devices such as pacemakers and defibrillators?

The most pivotal I would say, especially for our congenital heart patients is understanding are there any residual or sequelae that have been associated with their initial lesions such as cyanosis, arrhythmias, systemic or pulmonary hypertension, as well as ventricular dysfunction? So really understanding that this assessment is individualized and it extends so far beyond the actual naming of the cardiac diagnosis. Also included in this assessment are other factors, the most important probably being the prior pregnancy history. We could learn so much about one's future pregnancy based on their prior pregnancy, understanding was their prior pregnancy planned or unintended? Were there any medical or obstetric complications such as cardiovascular disease, heart failure, arrhythmias, thromboembolic events, or hypertension? Did they have any obstetric or advanced pregnancy outcomes like preterm birth, preeclampsia, gestational diabetes, fetal growth restrictions, having a child that's small for gestational age?

But also probably the most pivotal is understanding what is that person's social support? Do they have a partner, a family member, or at least a community that's helping them through that pregnancy? In addition to that, what are their limitations to get to the office? Is there any insurance limitations? Is there any transportation limitations? Understanding also what their access to healthcare looks like, not just necessarily the run-of-the-mill healthcare, but also what's their access to high-risk cardio-obstetric care if indicated. This is also the time in the visit where we want to talk about behavioral risks, if they smoke tobacco or use any vape products, if they're having a high intake of alcohol use or the utilization of illicit drugs. The preconception period is the opportunity to provide guidance on abstaining from all of those social and illicit factors. And once we take that detailed history, this is where we usually use risk stratification tools.

This slide, which is often very busy, gives a very, very good summary of what the commonly used tools look like. And these tools are there to estimate what the maternal cardiovascular risk in pregnancy may look like. Such common tools are the CARPREG II, the Modified WHO, as well as the ZAHARA. And these tools really help us as cardiologists as well as maternal-fetal medicine specialists to quantify the risk for complications such as heart failure, arrhythmias, thromboembolism, or even maternal morbidity. They're especially helpful for counseling patients before pregnancy and really determining the level of monitoring that would be required throughout the pregnancy. And although these tools are helpful, it's important to realize that there are limitations to it. And because of that, we cannot use these tools to replace our clinical judgment. A lot of these limitations come into the mix with a newer population where we have a series of women who have

repaired congenital defects, women that are of advanced age, women who have multiple comorbidities that may place them at a higher risk of cardiovascular disease. So although it is highly recommended that we use these tools to guide the discussion, shared decision-making and clinical judgment at the end of the day are the most pivotal part of it. And this is where multidisciplinary care and discussion is so key, especially when it comes to women with underlying cardiovascular disease. Now, when we think about really the tool that has been most utilized, it really is the Modified WHO. And the reason for that is that it does a very good job in linking the diagnosis to the expected maternal risk, but also providing recommendations in terms of level of care. So if we look at this table here, what we know is that Class I lesions are at the lowest risk, but then there are Class IV lesions like severe pulmonary hypertension, severe mitral stenosis, having a prior history of peripartum cardiomyopathy where you have residual reduction in your ejection fraction. And all of these unfortunately are contraindications to pregnancy. The reason being is that they're potentially life-threatening maternal complications.

But what this tool does is it gives us a good understanding of what that risk looks like. And as the risk increases, it normally means that the follow-up frequency increases. It also usually means that there needs to be referrals to tertiary centers. It also means that the delivery plan becomes more intensive. So a tool like the Modified WHO really gives us a framework for not just planning, but also caring for the patient once the pregnancy actually ensues. And before we even get into that pregnancy, doing diagnostic testing and diagnostic evaluation are so pivotal and so important. A lot of that includes laboratory studies, getting a baseline CBC, a comprehensive metabolic panel where we're looking at fasting glucose levels. We're looking at thyroid studies. We also want fasting lipid panels. We also may want a pro-beta natriuretic peptide. And the reason being is that it gives us the baseline. So if we need to trend it as the person becomes pregnant, it gives us an opportunity to allow for that.

Cardiac testing also at baseline includes an electrocardiogram along with an echocardiogram, which is foundational because that gives us the opportunity to not only look at the rhythm when it comes to the electrocardiogram, but also from the echocardiogram, look at the chamber sizes, the ventricular function, is there any evidence of valvular disease and what those pulmonary pressures look like. And additional testing is really dependent on their risk as well as their symptoms. That may include exercise stress testing, cardiac catheterization, cardiac CAT scan, or even cardiac MRI. Really the key messages when it comes to preconception testing is that it really needs to be purposeful. We want to obtain a detailed history, figure out what these tests are really going to help in terms of guiding the pregnancy.

But for the most part, what these tests allow us to do is give a framework of what the possibilities are in terms of complications during the pregnancy and what we need to do before that pregnancy to optimize their overall cardiovascular health. I'm now going to hand it over to my colleague, Dr. Martin, who's going to go in a little bit more detail about the obstetric focus that we also look at when it comes to preconception counseling.

**Stephanie Martin:**

Thank you for that, Dr. Bond. Now let's shift gears a little bit and talk about once the patient's actually successfully become pregnant. So once your patient has actually become pregnant, it's important that she consult with a maternal-fetal medicine specialist early in the pregnancy as possible in order to outline her pregnancy plan of care. And if we're fortunate enough to see that patient in the first trimester, which is ideal, we'll be going through things like discussing her current medications, reviewing their role and any potential risks and benefits during the pregnancy and addressing any concerns she may have about her medication use. Of course, we'll be establishing her due date and exactly how far along she is. This is important when we start talking about delivery planning as well. We'll perform our baseline risk assessment that we've already been discussing and outline a pregnancy plan of care both for the antepartum care, intrapartum care and postpartum care.

During the pregnancy when she shows up for prenatal visits or at any time she presents to the hospital, we're always going to be screening for any evidence of the two most common cardiac complications that can occur in women with preexisting cardiac disease while they're pregnant, and that's pulmonary edema and arrhythmias. It's very important that you understand the role of a collaborative multidisciplinary cardio-obstetrics team. Now this team is going to vary by institution, by geography, and also by the patient's needs, but everything is centered around the patient herself. And it will include specialists and other parties such as the cardiologist, the maternal-fetal medicine specialist, her obstetrician if she's under the care of an obstetrician and a maternal-fetal medicine specialist, her primary care physician, anesthesiologist, nursing team is very important to include in this, particularly as delivery approaches. And in the more complicated patients, you'll need other specialists, perhaps geneticists, social workers, and pharmacy.

Prior to pregnancy, this cardio-obstetrics team is very, very important in talking to the patient about planning her pregnancy, and that's going to include counseling about contraceptive options and optimizing her cardiovascular and medical status. She may be on medications that require adjustments preconception, and that risk assessment, including the Modified World Health Organization classes, CARPREG II and ZAHARA score as appropriate are important. It's important that these patients really understand how to plan their pregnancy and they're given the tools that they need in order to do that and make those decisions for themselves. Once she's pregnant, this team-based care approach is very, very important, centered around the patient. And then every patient will have a slightly different plan of care based on her needs, but that will include monitoring for signs of complications including pulmonary edema and arrhythmias and delivering planning. Labor and delivery will include planning around route, timing and pain management and what particular cardiovascular monitoring needs to take place during her intrapartum period.

Postpartum, both immediate and in the weeks and months following is very, very important to evaluate her for any evidence of cardiovascular and obstetric complications. And we'll

talk a little bit more about that as we go on. Long-term planning is also very important as these patients may be at increased risk for cardiovascular complications, particularly if they've experienced an adverse pregnancy outcome such as a hypertensive disorder of pregnancy or gestational diabetes. When we're addressing delivery planning with the patient, this will be highly individualized with input from the cardio-obstetrics team for our highest risk patients. The key things that will need to be discussed are delivery location first. It's very important to understand what the patient's needs are, what the resources are that will be necessary at the time of birth, and then determine the most appropriate facility for the patient to give birth that can meet those needs.

Not all facilities can meet the needs of all of our patients. And so this ideally occurs in the antepartum period so that planning can take place, the patient can understand where she needs to go should she have issues and when birth is indicated. And sometimes this requires even change of geography or change of caregivers in order to meet those needs. In general, for delivery timing and route, we're going to be anticipating a term birth and a vaginal birth. Cardiac conditions do not require cesarean birth, but we'll be discussing those things with the patient as the pregnancy moves forward. When you're talking about intrapartum care planning, we're not only talking about where should the patient give birth, but also within the facility itself, where should the induction or labor or cesarean birth take place? Are we talking about labor and delivery, the main operating room and intensive care unit?

We need to understand where in the hospital the patient will best get her needs met, and that's going to vary based on the needs that she has. For example, some women will need continuous ECG monitoring during her labor process and might even need more invasive hemodynamic monitoring such as arterial lines. And that will dictate where in the hospital her care is best met. Some women will have pacemakers or implantable cardioverter and defibrillators and they may require cesarean birth, and those needs will need to be addressed with anesthesiology and the nursing team as well, ideally prior to her giving birth. A consultation with anesthesiology is important so you can begin to plan her pain management needs and anesthesia needs should a surgery be required. Postpartum, it's helpful to think of the postpartum period divided really into the immediate postpartum period and the longer-term postpartum period. Immediately, she may be at increased risk for acute decompensation such as with pulmonary edema or arrhythmias, particularly if she has other obstetric issues such as hemorrhage and hypertensive disorders of pregnancy.

Once she's given birth, the location of her recovery will also need to be planned, particularly if she has a cesarean birth. L&D or the post-anesthesia care unit may be appropriate. She may require intensive care unit monitoring for a period of time versus just going directly to the mother-baby unit where the nurses may be tasked with caring for three or four mother-baby dyads and not able to meet the more intensive needs of the patient's monitoring. And these needs can include continuous ECG monitoring and invasive hemodynamic monitoring such as an arterial line. She may also need particular lab follow-

up in the immediate postpartum period, including NT-proBNP, complete blood counts, complete metabolic panels and monitoring of magnesium levels. And some women, if they're on anticoagulants, may require monitoring of their anticoagulation. The immediate postpartum period is also the appropriate time to be discussing medications. She will likely need re-initiation and optimization of her guideline-directed medical therapy where appropriate and perhaps resumption of oral anticoagulation now that she's in the postpartum period.

All of this should take place in consideration of her preferences and plans for lactation. And lactation and breastfeeding should be encouraged for our patients when it's desired as breastfeeding does offer maternal cardiovascular benefits in the long term. Fortunately, there's very few medications that are not compatible with breastfeeding. And when there are concerns, there are frequent acceptable options that can be considered in place of those specific medications if there's concerns. Once the patient is ready for discharge, we enter what we call the fourth trimester. It's important that at the time of discharge, the patient be educated and counseled about a variety of issues that she needs to be aware of. This includes the timing of her postpartum and her cardiology visits. We need to address any social factors that may be impacting her care or her access to care that might include insurance benefits, transportation needs, parental leave planning, and general access to care.

She needs to have both verbal and written information about specific signs and symptoms that she needs to be on the lookout for and when and where to report these should they occur. Again, planning for contraception and helping her understand her options is important to reinforce at this time. Ideally, this counseling has already been taking place in the antepartum period as well. And discharge is another time to readdress and reinforce her breastfeeding plans and address medication compatibility. It's never too early to begin educating her on her reproductive and obstetric history as a marker for future cardiovascular risk. For example, women who have preeclampsia and other hypertensive disorders of pregnancy, gestational diabetes, and preterm birth are lifelong risk factors for cardiovascular disease. Thanks for your participation in this module. We hope this has been helpful for you in learning more about how to care for this group of patients.

**Mary Canobbio:**

All right. Thank you, Dr. Martin and Dr. Bond for those wonderful sessions. So as we end this module, this session, we'd like to just have a few takeaway points. First, early and ongoing evaluation and risk assessment is critical, and it's also important to use structured risk tools to guide decision-making and pregnancy planning. The diagnostic work-ups must be comprehensive, but they also must be individualized to the risk of the individual patient. Delivery planning must be multidisciplinary, one that includes not only cardiologists and the obstetrical teams, but also anesthesia, the labor and delivery staff, the critical care staff, it might be necessary, and the neonatal teams. Postpartum care is equally essential and needs to be monitored carefully. So it's been proven that cardio-obstetric team approach does improve outcomes and therefore very important to include in the planning.

And finally, bridging the obstetrics to the long-term cardiovascular care of our patients is essential to reducing maternal morbidity and mortality. And with that, I would like to thank our panel, and I thank you for participating.