

[MUSIC PLAYING]

**MALAMO** Hi, I'm Malamo Countouris. I'm a cardiologist based at the University of Pittsburgh and Magee-Womens Hospital.

**COUNTOURIS:** I'm excited to talk with you all today about hypertensive disorders of pregnancy and care for women with these conditions across the lifespan.

A brief outline-- I'm going to start by talking in general about hypertensive disorders of pregnancy, how we diagnose them, and link with future cardiovascular disease. Then we'll transition to talk about postpartum management after a hypertensive disorder of pregnancy and some initiatives here at the University of Pittsburgh to improve care in the postpartum period for women with a hypertensive disorder. One of the initiatives that we have is a multidisciplinary postpartum hypertension clinic, which I'll give a general overview on for today.

So this is no surprise for anyone in the audience-- cardiovascular disease is the number one cause of death for women. You can see in the graph on the right we have made some improvements in care for women and men with cardiovascular disease and reduced death. However, there's still some disparities. Women are still dying more from cardiovascular disease than are men.

And, in addition, we have a major problem in the United States with maternal mortality. So most developed countries have seen a decrease or a sort of stabilization in mortality for women around the time of pregnancy. Conversely, in the United States, we see an increase in maternal deaths, and this is a major, major problem.

When do we see maternal deaths happening? You may think that this happens in pregnancy or around the time of delivery. But, in reality, actually, the majority of pregnancy-related deaths occur in the postpartum period. So you can see here about 30% of deaths occur in pregnancy, 17% around the time of delivery, but 52% happen up to one year postpartum.

Why are women dying? Well, there's a-- the number one cause of maternal death is cardiovascular related, and that can encompass hypertensive disorders of pregnancy, cardiomyopathies, or reduced ejection fractions, and other cardiovascular conditions. In particular for Black women, they're more likely to die from cardiovascular cause during or after pregnancy. And you can see here in the blue, we're talking about Black women are more likely to die from a hypertensive disorder from a cardiomyopathy and equally likely for other cardiovascular conditions.

Why are women dying more? And part of this is that we are underdiagnosing and likely undertreating women. So this has been a hot topic in the news, and this is just one news briefing about a woman who died in the postpartum period. So she had a miscarriage in March of 2019. Reportedly, she had an enlarged heart.

And then she presented to an emergency room with chest pain and shortness of breath less than a year after her miscarriage. She sat in the ER for a while, got frustrated with lack of being seen, and ultimately left and went home, and then died shortly thereafter at home. So this is a missed opportunity to diagnose and treat this woman. She should not have been waiting so long in the ER, and there are other cases of women who do get evaluated and still get sent home and are dying, essentially.

Another issue is that we understudy women, in particular, women with cardiovascular disease-- so I have this cartoon up here. It says, this drug has proven effective in testing of 500 women with your condition. And, of course, the gentleman sitting on the exam table here looks a bit concerned because that means it wasn't really tested in someone like him. And so we see that in women, where we've done a lot of testing for men and a lot of evaluation on best practices and clinical trials for men. And we need more evidence in best practices for women.

I'm going to transition a little bit, then, to talk about some of these risk factors for cardiovascular disease that are occurring in pregnancy. So this slide shows general cardiovascular risk factors. On the left-hand side, you're going to see ones that are applicable to men and women. So they're our traditional cardiovascular risk factors. We're not going to really talk about those today.

I want to hone in on those that are specific to women, in particular, in pregnancy. So preterm delivery, hypertensive disorders of pregnancy, and gestational diabetes-- all of these are very common. And also, we see them presenting in pregnancy and are associated with later cardiovascular disease risk, which we're going to talk about.

How much do these conditions increased risk for future cardiovascular disease? When we think about gestational diabetes, these women have about double the risk of future cardiovascular disease, but eight times the risk of type 2 diabetes. This is pretty intuitive. If someone is going to have a metabolic disorder and pregnancy list like gestational diabetes, it makes sense that they'd be at increased risk for type 2 diabetes in the future. And some of the risk factors for both of these are the same, as you might expect-- just obesity, advanced age, et cetera.

Hypertensive disorders of pregnancy, we're going to talk a lot about today. These women are at over two times the risk for future cardiovascular disease and five times the risk for hypertension. Again, this is intuitive-- if you have a high blood pressure disorder in pregnancy, it makes sense that you would be at increased risk for hypertensive disorder for life.

Something that you might not think as commonly about is preterm delivery, so delivery less than 37 weeks gestation. This is a risk factor for cardiovascular disease also. If we look at even early or preterm delivery at 34 weeks gestation or less, those women are at three times the risk of cardiovascular disease for the future.

Let's hone in a little bit more on hypertensive disorders of pregnancy. What do we mean when we say this sort of umbrella term of hypertensive disorders of pregnancy? Well, this can include gestational hypertension, and this is the classic hypertensive disorder that develops in pregnancy, and it has to be after 20 weeks gestation.

A high blood pressure that occurs before 20 weeks gestation is going to be considered chronic hypertension. But after 20 weeks, an elevated blood pressure is going to be gestational hypertension. An elevated blood pressure, we're talking about greater than 140 over 90.

Preeclampsia is a more severe form on the spectrum of a hypertensive disorder during pregnancy. Here, we're talking about high blood pressure plus other organ involvement. Classically, we think about preeclampsia as high blood pressure plus proteinuria. But also we've broadened our definition of preeclampsia, and this can include acute kidney injury, LFT abnormalities, thrombocytopenia, heart failure. All of that is going to be encompassed in HELLP syndrome. Sometimes we think about more severe forms of preeclampsia, but those can also be criteria for the definition.

And then eclampsia is going to be the extreme end of the spectrum, where you have preeclampsia plus seizure-like activity. And we learn about this in medical school and in our training. It's pretty rare, but we do still see it.

And then, lastly, I want to touch base on women who have chronic hypertension predating pregnancy. Those women are at increased risk for preeclampsia. And when they develop preeclampsia, it's something called superimposed preeclampsia.

So who's at risk for preeclampsia? Really, any woman. But some common risk factors-- as we mentioned, chronic hypertension is going to be the number one. But other things, like chronic kidney disease, obesity, diabetes-- all of those also increase risk for preeclampsia-- if you're in your first pregnancy, if you're older at the time of your pregnancy, and then other things that contribute that are related to the pregnancy, like in-vitro fertilization or if you have a twin or triplet pregnancy.

How much does preeclampsia increase the risk of cardiovascular disease? I had mentioned broadly that they're at more than double the risk. But let's look in a little more granularity at the types of cardiovascular disease these women are at risk for. Now, you'll notice here that we're talking about a mean follow-up just within 10 to 15 years of postpartum.

And women with a preeclampsia history had almost four times the risk of developing hypertension, 2 and 1/2 times increased risk of ischemic heart disease, more than four times the risk of heart failure, and more than double the risk of cardiovascular disease mortality. Women with severe preeclampsia are at greater risk, and 41% have hypertension at just one year after delivery. And within five years, about 50% of women with preeclampsia will develop chronic hypertension.

This graphically just shows you what I just discussed. Here, we have on the y-axis cumulative probability of cardiovascular disease. The blue line is going to be men, the red is women with preeclampsia, and green, women with no preeclampsia. And you can see women with preeclampsia are definitely looking closer to the risk of men than they are with women who never had preeclampsia.

And just to talk again about this concept of severity of disease-- so the green line here is women without preeclampsia, and we're looking at the proportion of women without major adverse cardiac events, so almost the reverse of the graph I showed you on the prior slide. And women with preeclampsia alone are in the black dotted line.

And then you see the colored lines below that, where women are at increased risk in-- just we're talking on the x-axis here about age. Women who are in their 30s, 40s, and early 50s, if they had more severe forms of preeclampsia, have increased risk. They're developing major adverse cardiac events sooner. So that's preeclampsia with a small-for-gestational-age infant or preeclampsia with preterm delivery.

If you have recurrent preeclampsia, that also puts you at increased risk. And so here, basically looking at risk ratios of events for women who had recurrent preeclampsia compared to those who had a one-time preeclampsia event, and that really does increase your risk of hypertension, ischemic heart disease, and heart failure pretty significantly.

So what can we take home from this discussion on cardiovascular disease risk for women with adverse pregnancy outcomes? Really that young women have unique cardiovascular risk factors that may be unmasked by pregnancy. This can provide us with a window to the future. And these women have increased risk of cardiovascular morbidity and mortality, and they often face undertreatment.

So, really, prevention is key in this time period from pregnancy, from delivery to when they might develop cardiovascular disease. And we're uniquely positioned as providers of young women and women in their midlife to really impact long-term health for women who had a pregnancy complication.

I wanted to then bring up a case that will help us move forward with discussion on best practices for care for women with a hypertensive disorder of pregnancy. So this is a 29-year-old woman. She's had four prior pregnancies. She's G4, presenting at 25 weeks gestation with a headache. She's not having any contractions or other sort of evidence of preterm rupture of membranes. And otherwise, her pregnancy has been relatively unremarkable.

She does have a history of chronic hypertension. This was diagnosed after her first pregnancy. And, normally, she's on lisinopril but, during this pregnancy, has not been on any medications.

To review her obstetric history, her first pregnancy, she delivered very preterm at 26 weeks. She was induced for preeclampsia with severe features, and, ultimately, then that she developed a neonatal demise. In her second pregnancy, similarly developed preeclampsia around 26 weeks and delivered a baby girl. Her G3 ended in miscarriage, and this is her fourth pregnancy. She does smoke about a half pack a day.

On arrival, her blood pressures were severely elevated, in the 220s over 120s. Unfortunately, there was no fetal heart rate found, and an ultrasound confirmed fetal demise. She had evidence of HELLP syndrome as well, so AST and ALT were elevated at thrombocytopenia and an elevated uterine protein/creatinine ratio.

Her blood pressure was treated. She was starting on a magnesium drip and induced, ultimately, delivered a stillborn fetus. And then blood pressures improved. She was treated with nifedipine, the 30 milligrams twice a day, and was discharged.

What is our standard of care for these women in the postpartum period? After delivery, the American College of Obstetrics and Gynecology recommends a blood pressure measurement within 3 to 10 days postpartum. So historically, about 43% of women are seen for an in-office visit for a blood pressure check within 3 to 10 days. And then they recommend that women get a follow-up visit at around six weeks postpartum. Historically, 60% of women are seen for a postpartum visit in that period.

So this is pretty abysmal, especially for women with preeclampsia. One of the initiatives that we've done here and they have also reported on at other institutions is something called remote blood pressure monitoring, so utilizing blood pressure monitoring at home through a telemonitor device, through text messaging, and seeing if that improves the number of women that will check their blood pressure within 3 to 10 days after delivery.

So this was a trial that looked at just that-- randomized women to either an office visit or a text-based remote monitoring blood pressure system and looked at who had a single blood pressure measurement within 10 days after delivery. As you might expect, this number is much higher for the women that had the text messaging intervention, so 92% for the remote monitoring group versus 46% who had to come in for an office visit. So this significantly improved compliance with that 10-day recommendation for a blood pressure measurement.

In addition, the other notable thing is that usual care office visits created a significant racial disparity in who was getting their blood pressure measured. So you can see here in the orange, this is Black women. In the blue, this is non-Black women. Only 33% of Black women were having that 10-day blood pressure check. Versus those who participated in the remote monitoring system, we see an elimination of this disparity, essentially, where, again, both Black and non-Black women have greater than 90% compliance with blood pressure measurement at 10 days.

We have started a program here at Magee and other, actually, UPMC hospitals that do deliveries. We are providing remote blood pressure monitoring for every woman that has a hypertensive disorder of pregnancy. The goals of this program are to really increase education and awareness of management of high blood pressures in the postpartum period, increase patient engagement and care, really targeting having those within-10-day blood pressure measurements, provide us with the ability to track and monitor trends of blood pressure in the postpartum period, and then try to avoid readmissions for women with a hypertensive disorder of pregnancy.

So there are a couple of deliverables-- again, wanting to decrease the need for that in-office blood pressure check, improving postpartum follow-up, and facilitate transitions of care to the primary care physician. So this is what the application looks like. Essentially it's text based. So women get a text reminder, and then they're able to click on a link that goes to the web browser, where they can input their blood pressure on a daily basis.

Here are some of our data that were reported by my colleague, Dr. Hauspurg. You can see systolic and diastolic blood pressure is improved in the weeks postpartum. But there are still some women-- I mean, this is a mean of everyone, but as you can appreciate, there are some women who are going to have persistently elevated blood pressures even after six weeks postpartum.

And looking at Black versus white women, Black women have a more adverse postpartum blood pressure trajectory. So you can see that, in the blue, we have mean blood pressures for Black women with a confidence interval and for non-Hispanic, white women in the orange. And so Black women are having higher blood pressures postpartum, so really important that we are monitoring for these women.

How many women remain hypertensive? On our program, we've identified about 50% remain hypertensive at the conclusion of the program. And this is by the AJCC guideline definition of a hypertension of 130 over 80 or greater. And 33% of women remain on meds at the conclusion of the six-week postpartum monitoring program.

So I think our postpartum monitoring is highlighting that hypertension is developing not decades after pregnancy, but rather shortly postpartum. And these are women who, again, are at really increased risk for cardiovascular disease and, in the short term, at increased risk for hypertension.

This is a study that looked at hypertensive disorders of pregnancy and preterm birth and association with hypertension in the two to seven years postpartum. I think we've talked about this a lot already, but just to further highlight-- preeclampsia and also preterm birth both increase your risk of hypertension. And again, we're seeing numbers in the 30% to 50% range in just a couple of years after delivery.

Let's go back to our case. So our patient, just to recap, is a woman who has had multiple episodes of preterm preeclampsia. Unfortunately, this most recent pregnancy had fetal demise. She was seen for a postpartum visit four weeks after delivery. Her blood pressure at that time remained elevated, was 170 over 100 millimeters of mercury.

Nifedipine then was uptitrated to 60 milligrams twice a day, and the patient was instructed to follow up with her PCP for ongoing management of her hypertension. She did call her PCP, and the PCP's office said, OK, we'll schedule you for six months. And, unfortunately, she missed that follow-up appointment. Fast-forwarding to one year after delivery, the patient is brought into an outside hospital after being found down by a neighbor and then transferred to Presbyterian Hospital.

On further history intake, she had evidence of a stroke with neurologic abnormalities, including left-sided weakness, left facial palsy. And her CTA showed an M1 occlusion consistent with a right ischemic MCA stroke. Most likely related to high blood pressure, on presentation, her systolic blood pressure was greater than 220.

So this is an unfortunate case. We have this really young woman who I think really identified herself during pregnancy as having a severe risk profile with severely elevated blood pressures. How could this outcome have been avoided? In this case, we're not talking about a maternal death. We're talking about a major adverse cardiac event with this woman's stroke.

And when we look at maternal deaths related to preeclampsia, a lot of them have been attributed to provider or system factors. System factors include a lack of communication between providers. So in our patient's case, you can see that the OBs identified her as being persistently postpartum. They really tried to help her manage her blood pressure. But that transition of care after the six-week typical period from the OBs to the PCP is where we I think dropped the ball for this woman.

Part of the issue is that we are not all recognizing that hypertensive disorders of pregnancy are a risk factor for heart disease, and we're not doing a great job at history-taking and including this in our past medical history documentation for women. So this study looked at PCPs and also OB physicians and how many are obtaining pregnancy history as part of their cardiovascular risk assessment.

So the numbers here are really not too bad, but you can see a difference. So primary care physicians, about 75% are including that in their history-taking, versus 90% of OB physicians, so some discrepancy, where the primary care physicians-- not everyone is recognizing this as an issue and then, similarly, not documenting these as risk factors, again, highlighting a lack of communication potentially from obstetricians who maybe know this to be a risk factor to the primary care providers and highlighting barriers to coordination of care.

What can we do to improve this coordination to improve these transitions and handoffs from the OBs to PCPs? Well, a number of programs have been developed across this country and also in Canada-- you can see the Maternal Health Clinic here-- to care for women in the postpartum period, particularly those with hypertensive disorders of pregnancy.

And we have developed something very similarly. So what does this look like? When are women seen in a clinic like this? Again, I'm going to talk about the timeline in the postpartum period-- 3 to 10 days. Really, this is covered within the purview of the obstetrician. 3 to 10 days, we want to see that blood pressure measurement. Four to six weeks postpartum, the OB is going to see a woman in follow-up. And we can utilize innovative strategies in this period, and we have done this at UPMC with the Vivify or Connected Care remote monitoring system.

Then, potentially, women have high rates of untreated hypertension after the six-week time period. So this is a really vulnerable time for women. How can we engage them? This is when we brought in what we call the Bridges Clinic, which is a postpartum hypertension clinic. It's a multidisciplinary clinic with maternal fetal medicine and cardiology.

This gives us a unique time point to really talk with women about blood pressure control, screening for cardiovascular risk factors, and lifestyle counseling. In our clinic, we can see patients longitudinally, but we also help transition care back to primary care providers or other subspecialist-- cardiologist, a nephrologist, that kind of thing, for ongoing hypertension care and screening for the life course.

Our Bridges Clinic was developed conjointly by Austin cardiology, Dr. Berlacher and myself, and also maternal fetal medicine Drs. Hauspurg and Jeyabalan. And we started with a clinic in the Magee location and now have expanded to a clinic also in Erie at Hamot with Drs. Hayes and Dr. Speer, and we're looking to expand additionally also into the central PA region.

The objectives of our clinic are as follows-- number one, to establish feasibility of a postpartum hypertension clinic and to show that women will attend this kind of clinic. We wanted to improve adherence for follow-up appointments in the first year postpartum and improve screening for cardiovascular risk factors, improve education, and lifestyle modification in the first year postpartum.

Looking at our first objective, we wanted to show that this is feasible. First of all, this is a very unique subspecialized clinic. It's the only clinic in Western Pennsylvania, and it's one of about five in the country. Now, there are additional clinics popping up, and some of whom are modeling after ours here at the University of Pittsburgh.

We had to work with administrators both on the HVI and the maternal fetal medicine level to establish protocols for running a joint clinic. And we'll talk a little bit more about this on a later slide. But anyone really can refer to the clinic. We see from obstetricians, primary care providers, cardiologists, and then some self-referrals as well.

And we successfully started the clinic in November 2019, so this is just a tweet from one of our very first clinics. We have a clinic brochure, and this is, of course, myself and my colleague, Dr. Hauspurg.

So our target population for the clinic is anyone with a hypertensive disorder of pregnancy, whether that be chronic hypertension, gestational hypertension, preeclampsia. And we also include peripartum cardiomyopathy because that often runs hand in hand with preeclampsia.

Why do we see patients? Well, a couple of things we do in the clinic-- manage ongoing hypertension. I think that's fairly obvious. We do cardiovascular risk factor screening. So we want to check for hemoglobin A1C and lipid panel. Now, this needs to be after three months postpartum because those can be still influenced by the pregnancy up until that point.

We provide individual counseling. So each woman has unique risk factors-- we talk about those-- and cater lifestyle modification recommendations based on each person. We talk about future pregnancies and risk reduction of preeclampsia for those pregnancies. And then a very key piece of our clinic is to be able to communicate back to primary care providers, to obstetricians, and to other cardiologists in the community.

We get a lot of our patients from the remote monitoring program, actually. So women who have ongoing hypertension beyond six weeks postpartum, who are still needing medications-- we are able to provide refills for them, and then we would like to see them in the clinic as well. And I mentioned we get a number of referrals from obstetricians, from cardiologists, from primary care providers, and some who have found us just by searching on the internet.

So let's talk a little bit about some of our outcomes of the clinic. One of the major ones was to improve follow-up, and we achieved that with this clinic. So of 173 women that we had scheduled in our clinic, 140 attended a visit. That corresponds with an 81% show rate. Recall that typical six-week postpartum show rates are around 60%. So this was really remarkable for us, and we were really happy to see that women want to come to our clinic and value these appointments.

We are seeing our target population. About 78% of women had a diagnosis of preeclampsia, 33% with chronic hypertension-- of course, there is some overlap there-- and then about 6% had a peripartum cardiomyopathy. The population that we see is diverse. About 32% of women are Black, and this is on par with statistics for women that have preeclampsia in our system. Mean age of women was 34, and we're seeing them about 11 weeks postpartum, but there's a wide range of when we see patients.

We were pleased to see also that we're seeing women who live both in urban and rural areas, so geographically diverse population. Particularly, I think this is made possible by virtual visits, and that was accelerated with the pandemic but has been a real positive for women who have newborns at home. And it's a major challenge to try to bring their newborn in to an office visit. So to be able to tune in remotely is key.

You can see here this is a heat map, where the more blue is going to indicate a higher number of patients that we've seen from that area, of course, a lot we see from the Pittsburgh and surrounding areas. But we have seen a decent number of patients from the Newcastle, Youngstown, Oil City area, and as far reaching as Michigan, Maryland, and York, PA, and also New York State. We see women a mean of 11.3 miles from the Magee-Womens Hospital.

We are seeing also an at-risk population. So mean BMI was 31. So most of the patients we see actually are obese. Almost 70% remain on antihypertensive medications at the time that we see them, but decently well-controlled blood pressures with a mean of 126 over 82.

Now, our third objective was to improve cardiovascular risk factor screening, education, and modification in the first year postpartum. Now, and this model can be adapted for those of you who are seeing women in the postpartum period, not just for our clinic, but it gives some best practices. One of the things that we did was extend the postpartum blood pressure monitoring beyond six weeks. So we've now extended that for up to a year postpartum for women. This is the same sort of Vivify program but adapted for a longer monitoring period.

We, over a 10 month period, invited 929 women to participate in the extension of monitoring. About 40% of women were interested in enrolling in that. 157 women have been graduated from the program, and 214 remain active.

One of the interesting things I showed you that there's a lot of-- there's differences in blood pressures for Black women postpartum and some disparities also in treatment. And we were pleased to see that actually we're almost over-recruiting for continued monitoring in the postpartum period for Black women. So they're interested in continuing participation.

And this is a quote from one of our patients who said, quote, "I love this program. It really helped me keep track of my blood pressure. I appreciate you guys calling me, especially since my blood pressure can continue to be elevated in the year after delivery." This is a key quote here, not just because women like the program, but also because you can show that, by showing women that it's important to monitor blood pressure, they're seeing that this is not something that just is what happens with pregnancy and goes away. This is a lifelong thing that they're going to have to be measuring their blood pressures longitudinally.

Through the Vivify app, we're able to also provide some education resources for patients, information on the DASH diet to reduce hypertension, exercise best practices, and that thing. And then we also communicate with these patients after our visits to help them find a PCP if they don't have one and to also give more information on lifestyle modifications that can help with blood pressure.

We are screening for other cardiovascular risk factors in our clinic. This includes lipid panels and hemoglobin A1Cs. Median HDL in our clinic was 54, so low. Median LDL, 98, so not quite high, but pretty close to that elevated, if you consider elevated to be over 100 for LDL.

Now, we do have room for improvement here. 40% of our women have lipids measured within a year after delivery. We really want to improve that to be closer to 100% So that's something that we're working on. But we also rely on PCPs to help us with this ongoing longitudinal monitoring for women.

Why does it matter that we check their cholesterols? Well, preeclampsia is a risk enhancer, according to the AHA/ACC 2018 Cholesterol Guidelines. And just as a reminder, what that means is, if you have a woman that's falling into the borderline or intermediate risk category, then risk enhancers may make a difference on if you want to start this woman on a statin or if they should be on more intensive statin therapy. So remember preeclampsia is a risk enhancer. And I would say, even though it's not quite in the guidelines yet, preterm birth, gestational diabetes should also flag to you as potential risk enhancers for women that are falling in these borderline risk categories.

You may be asking yourself, well, then, should we just incorporate hypertensive disorders of pregnancy into the pooled risk cohort equation? This has been looked into. The short answer is not quite yet. At least for women who are over age 40, the more traditional cardiovascular risk factors-- often, they're more prevalent in women who have a history of hypertensive disorder of pregnancy. Those are still better risk-classifying women.

But I think more data is needed in the younger age range, so women who are in the 30 to 40 years old. This kind of evaluation with unique risk factors that we can identify even earlier than when someone might get actual hypertension could be beneficial. So stay tuned.

And then this is bordering on a progressive research, but just to keep in mind, cardiovascular imaging also can help risk stratify people. It's been shown that women with preeclampsia have increased LV wall thickness. They're more likely to have left ventricular remodeling within just the 10 years postpartum. And they tend to have also higher likelihood of coronary atherosclerotic disease, so higher coronary artery calcium scores on CTA scan. And so you might consider a coronary artery calcium scan to help you risk stratify someone who's further following in that borderline intermediate risk range.

One slide I wanted to devote to consideration of future pregnancies-- there is a high risk of recurrent preeclampsia for women that have preeclampsia. That risk is about 20%. Women who have a history of preeclampsia should be on a baby aspirin in a subsequent pregnancy to help prevent preterm preeclampsia.

Just be aware of starting medications if-- you need to have a discussion with women who are of childbearing age on if they desire future pregnancies, especially if you're thinking about starting a medication that would be contraindicated in pregnancy, like ACE inhibitors, ARBs, or statins. And again, this is just a shared decision-making time for women with their providers.

All right, with that, I want to leave you with a couple of conclusions. I hope I've shown you today that there are unique pregnancy complications that are associated with increased risk of hypertension and cardiovascular disease in later life. These include preeclampsia, of course, gestational hypertension, gestational diabetes, and preterm birth.

There are ways that we can improve care for women in the postpartum period. One is through the postpartum hypertension clinic, like the Bridges Clinic, also through remote monitoring programs we have shown that both of these improve blood pressure control, they improve screening, and provide an opportunity for lifestyle modification, can reduce disparities. And we really hope that this helps transitions of care from MFM and cardiology to primary care providers and sort of back and forth, that we can really increase communication between providers for women in this vulnerable period.

And then that women who have a history of adverse pregnancy outcomes really need aggressive cardiovascular risk factor screening for high cholesterol, for diabetes, and then to have aggressive lifestyle modification recommendations.

So what I would charge you with is something that was published in circulation just last year-- steps for cardiovascular risk reduction in women in general. And I will look at this through the lens of women who have a history of adverse pregnancy outcomes.

So step one is really for us to be screening for sex-specific risk factors for women. When you see women in a general clinic, if you're talking about cardiovascular disease prevention, you need to ask about pregnancy complications. So we need to be documenting, did they have preterm deliveries? Did they have preeclampsia? Did they have gestational hypertension, gestational diabetes?

If you've identified some of these sex-specific risk factors, particularly those that occur during pregnancy, the next step is really to make sure we're being aggressive with the cardiovascular risk factor screening and modification. So you want to screen for hypertension, for diabetes, for hyperlipidemia, metabolic syndrome.

The third step after that is then to manage the risk factors that you've identified, really keeping in mind the American Heart Association's Life's Simple 6. So in addition to the risk factor screening and management, making sure women are eating a cardiovascular healthy diet, they're maintaining a healthy BMI, that they stay active and exercise regularly.

And then step number 4 is to incorporate some of the screenings into 10-year ASCVD risk estimators, and then again, just treatment in line with the AHA/ACC guidelines.

So I just also want to leave you with the thought that our interpregnancy care is a bridge to future health and that we can't do this alone. It can't just be us in the postpartum hypertension clinic. It has to be broadly cardiologists, primary care providers, obstetricians. It really takes a village and collaboration in multidisciplinary care. Thank you, and it was a pleasure talking with you today.