Kendal Williams (Host): Welcome everyone to the Penn Primary Care Podcast. I'm your host, Dr. Kendal Williams. So, the United States' maternal mortality rate in pregnancy has been increasing in recent years, and now is dramatically higher than comparable nations. Whereas the UK has 6.5 deaths per 100,000 and Canada 8.4, the US is much higher at 23.8 deaths per 100,000 births, and as high as 55 deaths per 100,000 in black populations. One-third of these deaths occur during the birth process itself, mostly related to bleeding or amniotic fluid embolism, one-third occur before birth, and one-third occur after birth with the risk persisting up to a year after the delivery.

Host: Overall, heart disease and stroke are major contributors, complications of preeclampsia, eclampsia as well as peripartum cardiomyopathy, all of these extend the risk out to a year, as I noted. The other big driver is mental health. And that plays a large role, particularly in the postpartum period. It's felt that 84% of pregnancy-related deaths are preventable. So, we have some folks at Penn that have given a lot of thought to this and we have an opportunity to bring them on the program. So, Dr. Mario DeMarco is an Associate Professor of Clinical Family Medicine in the Department of Family Medicine and Community Health. He has a focus on obstetrics and is the Director of the Family Medicine Obstetrics Program. Mario, thanks for coming.

Mario DeMarco, MD: Thanks for having me on the show.

Host: Dr. Monica Sanghavi is an Associate Professor of Cardiology at Penn with a focus on women's health. She frequently sees patients in the postpartum period, in particular, who have had eclampsia, preeclampsia or other cardiac complications of pregnancy. Monica, thank you.

Monica Sanghavi, MD: Thank you for having me. I'm excited to be here.

Host: So, we decided to do this podcast and think through this in terms of the prepartum period, the peripartum period, and then really focus most of our attention on the postpartum period. If you think about primary care, most of us, even within Mario's Division of Family Medicine, no longer do OB. So, we're seeing these patients before they go into the hospital or the delivery and then afterwards. But, as we mentioned, two-thirds of the problems are before and after. So, these are patients that we're going to see and we need to be able to think through. So, let's start with the prepartum period. Monica, how do you think about the risks associated with the pregnancy before the actual delivery?

Monica Sanghavi, MD: I think that's a great question. I think there's been a big paradigm shift, and I just want to really mention that, for a long time, I feel like

pregnancy was a little bit of an island, a metaphorical island. Women would get their care on this island and then after delivery or after their pregnancy, they would come back to the mainland or the rest of the medical community. And we really wouldn't dig deep into what happened on that metaphorical island, we just took it at face value. But what we are realizing is that pregnancy is a stress test for women. It's nature's stress test for women, and there is so much that we can glean from this time period. And so if we don't ask women about what happens during their pregnancy, we're missing out on this opportunity to really modify their care, to optimize their care, short-term and long-term.

And so, when I think about a woman before pregnancy or right early, when she's become pregnant, you know, I think one of the big factors before pregnancy is cardiovascular health, her baseline cardiovascular health. There are studies showing that baseline pre-pregnancy cardiovascular health is actually declining for women across all age groups and all races. There are racial disparities with optimal cardiovascular health being less in black women, but it's across all races. And we know that poor baseline cardiovascular health is associated with increased adverse pregnancy outcomes. And so, I think before pregnancy, it's an opportunity. Anytime a woman of young age touches the medical care system, it's an entry point, a gateway to discuss cardiovascular health for these women. So, that's one thing.

The other thing is the medications that they're on. So, there are certain medications that women should not be on during their pregnancy. And those include any kind of RAS inhibition. So if they have underlying hypertension and they're on a RAS inhibitor, that should be discontinued before they're pregnant or if they come to your office pregnant, that's one of the first things to make sure to discontinue because of the fetopathy associated with it.

Other medications to be aware of include statins and discontinuing statins if a young woman is on a statin for whatever reason. For a long time, FDA had a black box warning on statins and pregnancy. In the past few years, that black box warning has been removed. We still don't use it commonly in pregnancy, but that might change as clinical trials are now underway using statins to try to prevent adverse pregnancy outcomes in high risk women.

And then, I think the last category of medication that I think about are anticoagulation, specifically DOACs, that are contraindicated in pregnancy too. So if a woman is on that, she would need a good plan, whether she's on lovanox or to switch to Lovenox or warfarin, depending on the plan, and DOAC would need to be discontinued. So, I think those are the three big categories that you

want to look out for before pregnancy or if a woman comes to you early in her pregnancy and has not seen an OB-GYN.

Host: Well, you just took out of my toolbox probably my three most important medications to improve cardiovascular health. So Mario, when you think about this maternal mortality number and how it's rising and then, of course, you are seeing patients both as a primary care physician. I mean, you do primary care, but you also do OB, so you see the whole spectrum, what are some of the things that you are paying attention to?

Mario DeMarco, MD: Yeah, Kendal, I think that that's a really great question. I am coming to this topic as a primary care physician who has a focus on maternal child health and obstetrics and have spent years in my training and all of my years as an attending working on labor and delivery and being an active obstetrician. That gives me some perspective into the differences between the care that we provide in that period of time compared to the general primary care that's delivered in the outpatient setting.

And I think Monica described this really well by describing pregnancy as an island. And it often does seem that way. I'd say that, in our country, pregnancy is very special. It's a special period in somebody's life and in their health. And it's sort of an episodic period of time. And some of those characterizations of the care that's delivered in that time are that it is very specialty-driven. You have special providers. You go to special practices. And in some communities, you even deliver at special hospitals, which only exist for labor and delivery or obstetrics, or women and babies.

The care that's delivered is oftentimes separate from your routine care, and people enter into a sort of parallel experience that takes them away from their usual source of care. And the focus on pregnancy care is heavily on monitoring the fetus and preventing stillbirth. During that time, which is generally up to 40 weeks, there's high engagement with visits that are happening every few weeks until delivery. And at the end of pregnancy, it's really happening every week with high engagement and connection with the practice. And then, we understand that there's a different phenomenon that happens afterwards. And for over four decades, the care that's delivered after pregnancy has been defined by a single visit with your obstetrical provider that occurred six weeks after birth. Again, this is separate from your routine care. It's not integrated with your primary care or your usual source of care, and it's really not about addressing the chronic illnesses that you had going into pregnancy or that developed during the pregnancy. And mostly, it was not very helpful or desirable to the patients who were experiencing that because it comes at a time when they've already

been through the toughest part of their recovery. And so, engagement around that time was pretty low. In fact, over 40% of people don't even receive a postpartum visit and about 45% don't receive any care at all from the time that they give birth to the time in the six-month period following childbirth. So, I think that that sort of sets the stage for why we have different outcomes than most of the other developed countries.

Since 2015, every other developed country has had a declining maternal mortality rate, and the United States was increasing. And after recognizing that the mortality rate had been increasing, it's only increased even more. In fact, the maternal mortality rate in the United States has increased 83% since 2018. And I think that that tells us a lot about the fragmentation of pregnancy and maternal health and the need to integrate that with primary care and other chronic disease management.

Host: So Mario, aside from the cardiovascular issues, are there specific things that you pick up on in a prepartum visit that says, you know, "This is a little bit higher risk"? But obviously, we know about high risk pregnancy, but I guess I'm getting to issues of predicting postpartum depression, which can be a driver of poor outcomes afterwards. We're going to get into the cardiovascular issues in more detail in a moment. But are there other things that we should be looking out for?

Mario DeMarco, MD: Yes. I think, certainly in primary care, we have an ability to do some risk stratification on a lot of different fronts. And I think that is true in pregnancy as well. As people enter pregnancy, some of the greatest risks are about what happened in their prior pregnancies. And some of those are obstetrically related. People who have had more than one C-section or have had experienced preterm birth or an adverse birth experience or a condition that's unique to pregnancy are more likely to have that in a subsequent pregnancy than somebody who didn't have those.

But the other thing that elevates risk are chronic medical conditions. And some of these chronic medical conditions that might be more common in a younger population of women of reproductive age are not things that we generally consider high risk in our general primary care practices. In fact, the greatest risk for maternal mortality in the year after childbirth is advanced maternal age which can be defined as young as 35 and over, but in often cases, really thinking about 40 or 45 and older at the time of pregnancy. But even hypertension or diabetes, things that we commonly see are risk factors and obesity is another cardiovascular risk factor.

One of the greatest challenges and most common outcomes or adverse experiences of pregnancy is postpartum depression. And what's interesting about postpartum depression is that only about 40% of postpartum depression is newly diagnosed in the postpartum period. About 60% of depression is present even before people get pregnant or diagnosed during their pregnancy. So again, a chronic condition that can worsen during the time of pregnancy and in the physiologic time period afterwards.

Host: From a psychosocial perspective, the birth of a new baby is a major system stress as Monica-- the stress test, you know, I mean, I've had four children myself. Every time it happens, it is a major life event and everything around you changes. I want to ask just some practical questions in the pre-pregnancy period. We have Monica here, so we're going to focus a little on the cardiovascular stuff. Monica, you told us what we can't do, what can we use for the patient who comes in with some hypertension or even some congestive heart failure before the pregnancy?

Monica Sanghavi, MD: So, I think, it's important to talk about the management of hypertension in pregnancy, so that's what you're basically talking about, like how do you manage hypertension in pregnancy. And I think there are three things to think about: what is the threshold for treatment, what medications to use and any other medications or treatments.

So when I think about the threshold, our threshold for treating chronic hypertension is now 140/90. When the blood pressure is above 140/90 is when we initiate treatment for hypertension. And this is based on the CHAP trial that was published last year that showed that women who were initiated on blood pressure medications or treated to a goal of less than 140/90 versus the prior standard of care, which was close to 160/100 or 110, you saw better outcomes in terms of risk of severe preeclampsia and other fetal outcomes. And so, that's the threshold for treatment. The threshold for treatment with someone who does not have underlying hypertension, who develops hypertension in the first 20 weeks of pregnancy is still not clearly established and what the threshold is for treatment.

Other things to consider are how do you diagnose chronic hypertension in pregnancy? So if someone has a known diagnosis of hypertension, that's easy, right? But part of the physiology of pregnancy is that the SVR decreases. So, blood pressure naturally decreases during pregnancy through nadirs in the second trimester and then increases back to normal or in the third trimester. And so, it's not always clear if someone's coming in with a normal blood pressure the

first trimester, they could have underlying chronic hypertension that we haven't picked up.

So, I think one is understanding how the definitions of hypertension in pregnancy are established. And then, we'll go back to the treatment options. So when we think about hypertension in pregnancy, we think about the 20-week mark as a dividing line between chronic hypertension. So if a woman has a blood pressure greater than 140/90 on two separate occasion, at least four hours apart, she's diagnosed with chronic hypertension. If that blood pressure is elevated after the 20-week mark, it's considered gestational hypertension. If there's evidence of end-organ damage such as proteinuria or really severe hypertension or end-organ damage, such as elevation in creatinine, transaminitis; if you have thrombocytopenia or other symptoms such as pulmonary edema, right upper quadrant pain, severe headaches, that is when you start diagnosing preeclampsia.

The diagnosis of preeclampsia used to be purely based on blood pressure and proteinuria. Proteinuria is only now one of the factors. It is not required for the diagnosis of preeclampsia. So, that 20-week mark determines whether it's chronic hypertension or a gestational hypertensive disorder of pregnancy.

Host: And gestational hypertensive disorder of pregnancy is the umbrella term for what we've classically called preeclampsia, eclampsia, right?

Monica Sanghavi, MD: Yeah. So, hypertensive disorders of pregnancy is an umbrella term for gestational hypertension, which is the least severe out of those where it just has high blood pressure. Then, you have a spectrum where you have preeclampsia, severe preeclampsia, eclampsia where you have the seizure. And then, there is another term called superposed preeclampsia. So, superimposed preeclampsia is diagnosed when someone has underlying chronic hypertension and, on top of that, there is superimposed preeclampsia. And so, that's one other diagnosis in that spectrum.

Host: So when I last looked at this or thought about it, which has been a while, we didn't really understand the preeclampsia aspect. I mean, we didn't understand what was driving it. Do we have a better understanding now?

Monica Sanghavi, MD: A little bit. I think this is still under investigation, but I think the general consensus is that this is a problem of the placenta. There is persistent or chronic ischemia of the placenta resulting in some placental dysfunction release of factors that cause the maternal syndrome that you're

seeing, the endothelial damage, the renal dysfunction. The whole spectrum is caused by the factors released from the placenta due to this persistent ischemia.

Host: Mario, I mean the teaching has been that delivery is the treatment for the eclamptic patient. Is that still the case? And how do you see that process?

Mario DeMarco, MD: Yeah. preeclampsia is still one of the most severe conditions that we see and experience in managing pregnancy. And you're right, Kendal, delivery is the answer for the treatment and management of preeclampsia. And unfortunately, it can occur as early, technically, as 20 weeks, and sometimes we see it in the later part of the second trimester when babies are still quite preterm.

So, one of the decisions that we have to make is how we can try to optimize care by delaying delivery, enough time to allow the infant the best chance to survive and to thrive despite being born preterm and manage the risk and the complications of elevated blood pressure and risk of eclamptic seizure in the mother. And these are very difficult cases to manage and they can be managed and observed, but usually in the hospital. And there's a variety of ways that we can do that safely. For people that are at risk of having seizure disorder, we actually treat with very high amounts of IV magnesium, which does work as a muscle relaxant and can reduce the chance of seizures in people with preeclampsia. And the other thing we do is make sure that that blood pressure is controlled. There's a lot of reasons to make sure that blood pressure is hovering closer to the normal range. But The most important reason is the reason why we do that for all patients, whether they're pregnant or not, which is to reduce the risk of severe cardiac event like a heart attack or a stroke.

Monica Sanghavi, MD: So, maybe I can go back to the treatment of hypertension. So if you're talking about chronic hypertension, you're starting treatment when blood pressure gets above 140 to a threshold below that. And the medications of choice really are nifedipine and labetalol, those are the first-line treatments. And then if blood pressure is not controlled on that, sometimes we do use hydrochlorothiazide or hydralazine as options as well. Methyldopa is like what we hear about on the boards or the board answer, but the problem is that it's just not very effective in treatment. So, it's rarely actually used in the management of hypertension. And then in the acute setting, you know, in all of our practices, at least in primary care cardiology, we see blood pressures of 180, people with chronic blood pressures of 180 in our office and they're asymptomatic, and we just treat as an outpatient.

The one thing to know about pregnancy is a blood pressure above 160/110 is basically a hypertensive emergency in pregnancy and needs to be treated very urgently. And so, I think that's one of the things that all primary care physicians should know, whether you're treating a lot of pregnant women or not, is if you have a pregnant woman, especially someone who doesn't have underlying chronic hypertension, who has a blood pressure of 160/110, you don't send them home. You'd call their OB, they should probably be admitted and managed expectantly or with IV medications in the hospital and then consideration of delivery versus expectant management, as Dr. DeMarco mentioned.

I think, one other thing that's really interesting is you mentioned the pathophysiology of preeclampsia. I just told you that it's the placenta and delivery is treatment. However, there is a phenomenon called postpartum preeclampsia. And the mechanism by which that occurs is not really clear because the placenta has also already been delivered. And so, it's not clear whether that's like the persistent endothelial injury that we're seeing manifests later a few days after delivery. But I just wanted to mention that because, if you're seeing a postpartum woman with severely elevated blood pressure, it could still be preeclampsia and that patient still needs to be treated urgently with magnesium or with IV medications to try to control blood pressure and prevent progression to eclampsia.

Mario DeMarco, MD: I think that's an excellent point. And I really think that as primary care physicians, we have to recognize that maybe the single most important way that we can prevent a severe maternal morbidity or mortality event is to recognize when blood pressure is elevated particularly in the late third trimester or in the postpartum period. While we always take that seriously, we have a greater risk tolerance for managing things as a chronic medical condition over time for patients outside of pregnancy. And preeclampsia is not a long-term chronic condition. It's a very acute condition and blood pressures and end-organ damage can happen in a very short period of time.

So, the best thing you can do is feel very uncomfortable with elevated blood pressures in a patient who is pregnant or was recently pregnant, and make sure that you're referring them to the appropriate spot, which can always be a labor and delivery unit or contact somebody that does do obstetrical care.

Host: So, that's the major thing that we're going to be worried about postpartum as well. And we could kind of skip over the peripartum period because none of us are going to be there, some of us who are listening won't be there, but Mario, of course, would be there. So, we have these patients, let's say somebody comes back into our office two weeks after delivery. I think you both have raised a

really good point about understanding blood pressure management and these folks and how to think about it and what's an emergency and what's not. Monica, you had mentioned that there is already a pathway that exists at Penn for patients that are preeclamptic or eclamptic during pregnancy to be directly deferred to cardiology, and you're managing those folks. We might be in a place where we don't have access to you or they may be coming back to us and there's not a cardiologist within 50 miles. And so, how are you managing these patients? What are you doing when they come back to you postpartum?

Monica Sanghavi, MD: Great question. So, I think a couple things, one is that postpartum time period is again a touchpoint into the healthcare system. And so, I use that opportunity for a very comprehensive, evaluation of the patient. So if I know a patient has had an adverse pregnancy outcome like we just talked about such as preeclampsia, then I start my systematic approach to their management. And right now, we don't have good guidelines on how to approach this. So, this is my approach based on my management of many of these women.

So, I like to think of it in a framework of P-A-S-T. And hopefully, that's helpful to think about. So, P, past history. And what does that mean? So, past history is their family history. So, past history includes their pregnancy history and their history of hypertension, whether or not they had it. And so in their pregnancy history, I am asking how many total pregnancies they had, how many children were delivered. Were there multiple miscarriages? Because if there are, that raises the flag for a hypercoagulable state for me. And for each pregnancy, I'm asking about whether they had an adverse pregnancy outcome. And in that adverse pregnancy outcome, I'm asking about preeclampsia, eclampsia, gestational hypertension. I'm asking about preterm birth, so a birth before 37 weeks; small for gestational age child, a child that was less than the 10th percentile or gestational diabetes. So, I'm asking about all of those adverse pregnancy outcomes when I'm asking for each pregnancy. So, that is part of their pregnancy history.

Then, I'm asking about their family history. This is an opportunity to find women who are high risk because they have a family history of premature coronary disease. So, I ask them do they have a first-degree family member, a male who had a heart attack before the age of 55 or a woman who had a heart attack before the age of 65. If they do, I am much more aggressive in management of those patients. And then in terms of their hypertension history, so if I'm seeing a patient with chronic hypertension with superimposed preeclampsia, I'm asking when they were diagnosed with hypertension. Some of these women will tell you that they've had chronic hypertension since the age of 16, and just everyone's ignored it because they were so young. And for some of

those women I might do a secondary hypertension evaluation given how early they developed hypertension. So, that's the P for past.

The A is abnormal exam or abnormal signs or symptoms. So, I'm looking for is that patient still very dyspneic or more dyspneic during postpartum? After delivery if they had some pregnancy-associated symptoms, it should be resolving in the weeks postpartum. And if it isn't, then I think there's a problem and I need to look into that a little bit more. The same thing goes with lower extremity edema. So, abnormal signs and symptoms.

S is then screening. I am screening that woman for her lipids, A1c. If they're hypertensive, I am getting a TSH. Also, in their screening, I ask them are they breastfeeding, because that will determine my blood pressure medication choices and are they on birth control, because that's another question. Are they planning on future pregnancies?

And then, T is treatment. Under treatment, I think about blood pressure management, diabetes management, weight management. It's a sensitive topic postpartum. No one wants to talk about that. It's already uncomfortable. The data's not great, but there's some data to suggest that retained weight between pregnancies associated with increased risk of future preeclampsia, and we know that recurrent preeclampsia is associated with worse cardiovascular outcomes.

And the last thing I do is educate, educate about their future risk for preeclampsia and what we can do to prevent that, including the use of aspirin in their next pregnancy after 12 weeks, after the first trimester, to try to reduce that risk of preeclampsia, especially preterm preeclampsia. So, that PAST framework allows me to try to do a comprehensive evaluation of these women.

Host: Mario, aside from the immediate cardiovascular issues or the preeclamptic patient, what are you thinking about in the postpartum period? What should primary care physicians make sure we don't miss?

Mario DeMarco, MD: Well, Kendal, everything. I think that's the answer to the question. There's so much that happens in that postpartum period that we really need to be attuned to. And I think about it like where this model has gone broken in the past. We all take care of patients who are post-op or have an acute issue. If you have a joint pain and you go see an orthopedic surgeon, you have arthroscopic surgery, they want to see you back for your post-op visit in a week or two. Even people who have an appendectomy should have a post-op visit in a couple of weeks. And most people are not that attached to their appendix. Here in this case, there's a lot of social context and health risk in pregnancy. And at

the end of it, families have a new life, a new human, that are part of their world, that they're responsible for 24/7 that depends on them for their nutrition and nourishment, survival, safety, all of the hormone changes that happen, all of the physiologic changes that happen after birth. And for decades, they were just told to schedule a six-week visit and we'll check in then. And that was a visit that most people didn't go to.

And so when I think about postpartum care and what we need to do, I really think about the fourth trimester model which is not a new concept, but one that really I think describes the way in which we should approach postpartum care now in the context of everything that we know about pregnancy and risk and increasing morbidity and mortality in our country. And the fourth trimester really tries to reconceptualize the three months after birth to suggest that what if we applied the same intensity and engagement that we did in that third trimester where we are really in touch with our patients, that we're screening for all of these things, we're asking a lot of questions, we're seeing them very frequently, we're sending them for testing and referrals and they have a contact. If they don't show up for a visit, we call them. You know, we're really worried. And we just sort of apply that afterwards when people go home with a newborn and say, "Now you have a baby and you're going through all these changes back. And we really want to followup with the things that have happened." And that can impact many things about childbirth and pregnancy.

For one, over 40% of people report having a traumatic birth experience. We're not super good at identifying what is traumatic to any one individual, but that's more of a personal diagnosis that patients make about their own experience. Being able to connect with healthcare providers that understand what they went through, that can relate to them, that can normalize, and that can listen appropriately in sort of a trauma-informed care framework is really important for people to understand and contextualize what happened to them and to not be afraid to engage with healthcare in between pregnancies and at the time that they become pregnant again.

Then, there's a lot of symptoms that patients have in the aftermath of pregnancy. And we always just assume that that's what seems normal after you go through childbirth. And patients are taught and trained to sort of normalize those experiences, "Well, that's what happens after you have a baby." So, things like pain, heavy bleeding, hemorrhoids, urinary incontinence are difficult and they affect patient's quality of life, but they're not things that were traditionally addressed by the healthcare provider team after pregnancy. And they can create a lot of discomfort and frustration and stress for patients.

I'll add into that, that 50% of patients report that backache as either a minor or a major complication in the two months following childbirth. Forty-three percent report a lack of sexual desire. Twenty-seven percent report pain with intercourse. A third have dysuria. Nearly 50% have pain or tenderness in their breasts or nipple discharge or mastitis. Fifty-five percent report feeling stressed. A third have symptoms that are consistent with depression. And 50% report physical exhaustion. And 60% describes sleep loss, which is not surprising to any of us who have had a baby, cared for anybody in the first two months after childbirth. We expect that. But without getting sleep, people are easily irritated, their blood pressure could be up, their nutrition is not great. And weight control, as Monica mentioned, is a big challenge in those first two months with almost 50% of people struggling with their weight and returning to normal weight in those two months after pregnancy.

So, there's a lot that we can do to check in and identify. And so, one of the ways that we're doing that at Penn Family Care is becoming more of a national expectation, is to have an earlier postpartum visit. That that visit doesn't have to happen at six weeks, that it can happen at two weeks. And what we're trying to do is to identify those that have risks that might need to connect with either their primary care doctor or their obstetrical provider in one week, certainly within the first three weeks, which is currently the ACOG standard guidance. And they don't have to have one visit either. Sometimes you need to have a visit to check in on symptoms or address something that's acute in that early period, and then come back a couple weeks later to see how things are recovering and to make some progress in other care management, including chronic disease.

And then finally, I think in my practice, I often am the PCP for patients that I take care of during pregnancy and deliver. And I get to see their children as well most of the time, which is a real sort of benefit of being a family physician that does this work. But I think one of the biggest things and the biggest gaps that we haven't closed is for us to transition patients away from their maternity care once they've completed that journey and make sure that they're landing safely back into primary care. And we should all be prepared to do that, both on the sending end from our perspective and on the receiving end as PCPs.

Monica Sanghavi, MD: I just want to add, exactly to Dr. DeMarcus point, ACOG, the American College of Obstetrics and Gynecology, has mentioned that they want to move away from this one postpartum visit to a postpartum process. And when I think about it from a hypertension or preeclampsia perspective because that's the approach that I think about a lot, is the first two weeks. So when we think about preeclampsia, we think about the immediate danger, which we talked about, severely elevated blood pressure. Then, the

immediate postpartum risk, which is the fact that blood pressure actually goes up before it goes down in the postpartum period. So, it actually peaks in about the six to eight days postpartum. And so, monitoring the blood pressure immediately postpartum. Penn has a fantastic text-based platform through which they interact with postpartum women to gather that data and to be in touch with these pregnant women who often don't return for an in-person visit. And so, the use of technology in that immediate postpartum period is part of this new process of postpartum care.

Then, we think about in the year postpartum after preeclampsia, these women are at higher risk for developing chronic hypertension. So, engaging the PCP or cardiologist to try to determine is this patient transitioning from a preeclamptic patient into a chronic hypertension patient. And we know, at least from some studies, that at least 20%, probably closer to 40% of women are actually chronically hypertensive at the one-year mark, especially those with severe underlying preeclampsia.

And then, we think about the long-term cardiovascular risk. And with patients with preeclampsia, we think about a twofold increased risk of coronary disease; stroke, fourfold increased risk of heart failure and increased risk of valvular disease. And recent studies have shown that largely this risk is mediated through traditional risk factors. And I think about 60-65% of that risk is thought to be mediated through traditional risk factors. And I understand that 35-40% might not be, but that's 60% that might be under our control as patients, as healthcare providers to help prevent that future risk for women.

And so when we're thinking about this postpartum transition process, it's really a process that acute care that first year and then that long-term care. And so instead of having this island of pregnancy, I think we're finally building bridges and creating this connection between the larger healthcare system and the obstetrician-gynecologists, family medicine physicians, MFMs, who are taking care of patients in the acute setting, creating more of a team approach.

Host: This is a great discussion. It reminds me, I did a lot of work as a hospital-based provider. And I used to think of the hospitalization as a time to really understand the whole patient because you have them there for a few days, and try to redirect their overall health and try to get things moving in the right direction. And as you frame this, as pregnancy being that, but really for life, not just for a short period of time.

There's one topic I want to get to mostly because of my own history. I have a dear friend that I lost to peripartum cardiomyopathy. And Monica, I want to

spend a few moments talking about that. Can you tell us just some of the outlines of peripartum cardiomyopathy? What we should be looking for in the postpartum period to identify patients who are at risk and/or maybe experiencing it?

Monica Sanghavi, MD: So, we define peripartum cardiomyopathy as new-onset heart failure in the few months before pregnancy or a few months after. There used to be definite guidelines, but they've kind of removed that, understanding that peripartum cardiomyopathy or postpartum cardiomyopathy can happen along a larger spectrum of time period. So, this is new-onset heart failure with an ejection fraction less than 45% and without some other underlying cause. So, someone shouldn't have a PE or some other reason for their heart failure symptoms.

And then in terms of diagnosing it, I think it becomes very important to diagnose this earlier. One of my colleagues here has done really fantastic research showing that sometimes especially there are racial disparities in how quickly peripartum cardiomyopathy is picked up, and that can lead to adverse prognosis for those patients. So in the postpartum setting, in that PAST framework, I mentioned adverse or abnormal signs and symptoms. So if you have a woman in your clinic, it could be during pregnancy or usually postpartum, who's having worsening dyspnea, orthopnea, PND, worsening lower extremity edema. Some of it can be postpartum-related. But what I find very useful and is clearly well documented is the use of NT-proBNP as a risk stratifier of probably pregnancy-related symptoms versus true heart failure.

And so in the postpartum period, if I see any woman who has these symptoms, I do get an NT-proBNP or a BNP in order to try to differentiate that. If that BNP is high, immediate referral to cardiology or, if they're having a lot of symptoms, the ER for a quick diagnosis and quick management. So really in that postpartum time period, if you're thinking about abnormal symptoms, they're more short of breath than I would expect, think about that. So, the highest risk for myocardial infarction in the peripartum time period is also immediately postpartum. And so, severe chest pain requires additional evaluation, especially associated with diaphoresis or, you know, the other classic symptoms that we think about a heart attack. If it's pretty severe, send them to the ER.

And I think one important point is that the most common cause of heart attacks in the peripartum time period is spontaneous coronary artery dissection or SCAD. But I think it's what we've seen is many women postpartum who have elevated troponins who are sent home, assuming that these women cannot have an MI. But an elevated troponin in a postpartum woman, if you see someone

like after hospital discharge or ED discharge and their troponins were elevated, call a cardiologist, send them back to the ER, that is not normal. And the SCAD, spontaneous coronary artery dissect associated with pregnancy, can be a very severe multivessel proximal disease and should not be ignored. So, take it seriously, especially a postpartum woman who has elevated troponins. That's not normal part of pregnancy or delivery.

Host: I think we'll have you back eventually, Monica, to talk about cardiac disorders in women and how they're different because that's a big discussion. I have a woman in my practice who had SCAD and it's something we don't know a lot about. So, I'd look forward to talk to you more about that. Just getting back to postpartum cardiomyopathy, how many of these folks get better on their own and get back to having a normal ejection fraction?

Monica Sanghavi, MD: A large majority actually do recover back to normal pretty quickly. We often start them on treatment immediately for heart failure treatment. This includes beta-blockers and in the postpartum time period, not during pregnancy. If it happens during pregnancy, they can start on beta-blockers. But postpartum, we would treat them with beta-blockers and a few ACE inhibitors. There are a couple of ACE inhibitors that are safe with lactation and I like to use the acronym Baby Can Endure. So, benazepril, captopril and enalapril, those are the three that are safe with lactation. And if you can't remember, LactMed is a great platform to look at what's safe during lactation. And then, if their EF recovers, their rejection fraction recovers to normal, some of these women can actually go on to have another pregnancy. However, if the EF remains reduced at all, then the recommendation really is to avoid future pregnancy.

Host: So, I don't know if even I realized how much there is to talk about here and we could really keep going for another hour, I think. But we need to wrap it up. Is there anything that you feel that we've missed, Mario?

Mario DeMarco, MD: Yeah, if I could, I think if there is a silver lining to some of the cardiovascular diseases that we talked about, it's there are ways to screen and identify those symptoms. There are specialists and care systems like Dr. Sanghavi that can recognize those and treat patients effectively. And that those patients can improve with medical treatments.

One of the things that we've recognized as more and more states have developed MMRCs, which are Maternal Mortality Review Committees and Pennsylvania was one of the states that only recently established a Maternal Mortality Review Committee. And I have been on that committee for the last year along with

some other Penn colleagues who have also been on that committee or the Philadelphia Maternal Mortality Review Committee as well, is that we understand that the reasons why people do experience mortality afterwards go far beyond some of the medical conditions that we thought were the drivers of poor maternal health. And of course, cardiovascular disease is there and there's a lot that can go wrong. But oftentimes in the death records, they get misclassified as cardiovascular disease or infection or pulmonary disease, when in fact there's something that's more plausible to explain the mortality. And sadly, in Philadelphia and in Pennsylvania, half of these deaths are related to what we would say deaths of despair. They are related to suicide, unintentional drug overdose and homicide or violence, which is often related to intimate partner violence. These are unfortunately increasing with the other substances that are in our drug supply including Fentanyl and tranq. And we haven't fully been able to address those concerns.

And so, my hope is that all of us, wherever we're practicing, whether that's in primary care or urgent care, or in the emergency room or specialty clinics, when we see somebody who may have been pregnant in the last year, and we should do a better job of trying to figure out if somebody was pregnant in the last year, we need to recognize some of those other drivers of really poor maternal health outcomes and connect them to the resources that we know can change their trajectory, like social services, mental health, recovery from drug and substance use disorder, medications for opiate use disorder and crisis centers to address violence. And we can all do this without knowing anything about how to actually manage labor or deliver a baby. But as a primary care workforce, we should be able to recognize that, screen for that and refer as appropriate.

Monica Sanghavi, MD: I agree. I think that we all have to take this on our shoulders. It is our whole medical community's responsibility to improve the maternal mortality crisis in our country. And we all have to do our part, and I think that can be a number of different things, but it can't be isolated to a few professionals. I think it's a whole medical community issue. And so, as Dr. DeMarco mentioned, please take a pregnancy history. It's part of my H&P. It's part of my initial note for every woman. I always take a pregnancy history for every woman, whether she's 60 or whether she's 20. So if it's part of your practice, you will do it, you will learn something about that patient and can use that for optimizing her health.

Host: The word that comes to me for this whole podcast is recognition. You know, recognition that maternal mortality is a crisis issue. Recognition of the various danger signs that you both have pointed out so beautifully for us to look out for. And then, once you've been able to do that, we all have the compassion

really I think the skills to be able to get people in the right places to try and reduce this together.

So, thank you so much for coming on and bringing this to our attention and, sharing it with the Penn Primary Care community. Thank you all for joining us for the Penn Primary Care podcast. Come back again next time.

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