

## **Pull Back the Curtains with Mayo Clinic's Cardiac Monitoring, ECG Laboratory, and Inpatient Team**

Announcer: Welcome to Mayo Clinic's ECG segment, Making Waves, continuing medical education podcast. Join us every other week for a lively discussion on the latest and greatest in the field of electrocardiography. We'll discuss some of the exciting and innovative work happening at Mayo Clinic and beyond with the most brilliant minds in the space and provide valuable insights that can be directly applied to your practice.

Dr. Kashou: Welcome to Mayo Clinic's ECG segment: Making Waves We're so glad you're joining us today, Today, we have an exciting episode in which we'll be joined by Mayo Clinic's cardiac monitoring team. We'll get a chance to pull back the curtains to see how they're able to pull off the magic that we get to see on the front end as clinicians. Joining me today is my cohost Tara Gosse, operations manager for the Department of Cardiovascular Medicine at Mayo Clinic Rochester. Tara, I'm so glad you're joining us today, and I can't think of anyone better to help with this episode.

Tara Gosse: Great Thanks Dr. Kashou, for inviting us all to come and copresent about the exciting world of cardiac monitoring at Mayo Clinic. I have the pleasure of kinda kicking off this talk with a number of different key stakeholders and leaders across our cardiac monitoring practice at Mayo Clinic, and I'm excited to first introduce Zach Linn, who leads our remote monitoring team. Zach, can you take a minute to introduce yourself and share a little bit about your background and the work that you lead here at Mayo Clinic?

Zach Linn: Yeah not a problem. Good morning, everybody. My name is Zach Linn. I'm the supervisor for the Remote Cardiac Monitoring Lab out here at Mayo Clinic. I have been a part of Mayo Clinic here for five years. I first started as an interpreting technician working with our 12-lead ECGs and then scanning our Holter monitors, and then I transitioned into an education coordinator position where I was able to educate our new technicians coming in and get them ready for their exams as they continue to move forward to become certified in our cardiac monitoring area, and then, with that, I did transition to a new supervisor role where we are leading a new initiative with our extended remote monitoring program here, so the remote monitoring team provides 24-7 monitoring service for ambulatory cardiac monitoring, including event and mobile cardiac telemetry exams. Earlier this year, we did transition to a new cardiac monitoring service that has more modality capabilities to better care for our patients' unique needs. This new service delivers clear, accurate ECG recordings that have helped our providers really dive into the critical information and really assist our electrophysiologists for earlier diagnostic findings.

Dr. Kashou: Who would be the ideal patient that you guys would kind of care for and oversee in your world?

Zach Linn: Yeah, that's a great question. Realistically, with our remote monitoring service, we do get a wide variety of patients, a lot of them for more extended monitoring needs. Perhaps this is a symptomatic patient that has infrequent symptom episodes, so we wanna capture on a more extended monitoring service all way up to maybe a more high-risk patient, maybe post-procedure

for various different cardiac procedures. Could be a transcatheter aortic valve replacement or really just looking for maybe some burdens for patients, if they be chronic atrial fibrillation to look at some rate control medications, so a large variety of patients we do see on our monitoring service.

Dr. Kashou: I know a lot of what we do as clinicians is trying to figure out... We put them on these monitors to... Can we capture something? And some of the durations that we set, and I know Tara can speak a lot more for, is kind of can we? Do we know? Can we improve the detection time? Have you seen us able to actually capture earlier detection, say, of atrial fibrillation or other rhythm disorders?

Zach Linn: Yeah. That's another great question. Prior to our go live here in March, our ambulatory monitoring orders were a lot higher with our event monitors than it was for our mobile cardiac telemetry exams. Since March has been moved forward, we really noted an increase in our mobile cardiac telemetry orders compared to the event monitors, and that's actually kinda flipped internally here at Mayo Clinic. With our improved communication pathways that our team has set up, we're actually delivering more accurate, quicker, and effective results to our providers. With that, we do have a new streamlined order set that we're really trying to get more provider engagement, so realistically, we have actually seen a decrease in our average wear time for our patients to about eight days, so really, the standard prior was roughly 30 days on monitor, and we've actually seen that decrease down to about 22 days.

Dr. Kashou: Amazing, and when you think of kind of costs, expenditures, even as a patient wearing that device all the time, if you could minimize and say, "Hey, we got what we needed. "Here's your your next steps in management," I think that's ideal, especially... I've never been in that position, but I can imagine, as a patient wearing a device, it's not always the most comfortable, and then, for us, there's a lot of always human error and we don't wanna miss anything. Tara, anything else? What amazing work Zach's doing over there.

Tara Gosse: Yeah, and if I can just comment that I think Zach, what we're hearing from providers and patients that are experiencing this monitoring, we're getting really good feedback of the reduction of monitor time and a reduction of alarm fatigue. Zach's team are really certified experts to be able to tee up to the clinical team the information that's actionable and relevant, so just kudos to the work that you're leading and with the growth of this remote monitoring service across our Mayo Clinic enterprise Midwest and then extramural clients, we've also been adding leadership roles to our team, so also a pleasure to introduce Josh Krell, who's kind of there along with you, that's also helping to lead the transformation of this cardiac monitoring activity. Zach or Josh, any other comments you'd like to make just about kind of the revolution that you've seen in the last year of our cardiac monitoring practice?

Zach Linn: It's really an exciting time as we continue to take on our new technology here to better improve patient care. As you mentioned, we are growing rapidly, so just to echo those thoughts with me today is our new supervisor in the area, Josh Krell. Josh is still in training here, but he has an extensive background working in the labs all the way through our atrial PML labs internally here as well as CV surgery. Josh is gonna continue to play a really key role in our

growing department, and we're really eager for him to to dive in to really start working on more change as we move forward to better provide patient care.

Dr. Kashou: Thank you so much, Josh and Zach. We're so glad you have you both on today, and I can't wait to learn more about what your team is doing because there's so much that we're not seeing, and so that's the remote monitoring team with Zach and Josh out there. Next, who we have here is Chad, Chad Schmitz from our Holter team, and maybe, Chad, tell us a little bit about yourself, your role, and your background.

Chad Schmitz: Yeah, good morning and thank you for having us on. I'm Chad Schmitz. I am our supervisor of our ECG technician team. We are responsible for placing all of our Holvers and the device that Zach was talking about that does do the remote monitoring, so they really are what I like to call the face of the cardiology. There are many times that we are the first people that they see within the cardiology department, and we're able to give them the ECGs, provide the providers with all the ECGs, and by attaching the devices, the Holvers, the mobile cardiac telemetry devices, the event devices, which is really the same device. It's a three-in-one device, which is really neat technology, and so, yeah, I've been with Mayo Clinic for 15 years, 16 years now. 2005 is when I started. I originally started with our ambulance service. I have a dual master's degree and really wanted to get more into the healthcare side, became a critical paramedic, critical care paramedic, got into leadership, really wanted to get kind of more into the healthcare side, like I said, and cardiology just seemed like the right fit for me to kind of come over to that side, coming from being a critical care paramedic and understanding ECGs, and it's been a really smooth transition coming over to this area, and it's been a lot of fun, yeah.

Dr. Kashou: Very good, thank you, Chad, and I know Zach didn't mention it, but all your team gets training in how to interpret. Is that right? Even in the Holter world, do you have techs that help out?

Chad Schmitz: Yeah, exactly, so all our technicians are certified as well. They go through extensive training within our education department, so they're all able to recognize lethal arrhythmias as needed, and they're able to, they know who they need to contact right away when they see these arrhythmias. They also really take the time to make sure that we're getting in a good rhythm to make sure that there's not a lot of artifact within the ECGs and within the monitoring devices to make sure that it is clear as possible for everyone so the providers and the technicians who are reading these are able to really identify quickly any lethal arrhythmias.

Tara Gosse: Chad leads a team over 55 front line ECG team members, and I think within the cardiology practice, our ECG technicians are unsung heroes. They're really, as Chad shared, boots on the ground, working directly with all of our patients in emergent and nonemergent scenarios, interacting with all of our different care teams and physicians, and do just a fabulous job of being able to make sure that our patients' needs are met. They're trained experts, and we're just very thankful for all of the work that our ECG technicians do to make everything else that we do within our cardiac monitoring practice happen, so from a healthcare administrator standpoint, they're truly a key, key piece of our practice and are very valuable contributors to everything that we do.

Dr. Kashou: Agree, and I couldn't echo that even more, Tara. When I, as a physician and one that actually loves ECG interpretation, I could tell you they are amongst the best in probably the hospital, and I would argue probably better than most physicians at interpreting ECGs, and so they challenge me every day, and I'm so glad we have them to help provide that better care. Now, why don't we move over to the ECG lab team? So this is our third team. We had a chance to see what Zach and the remote monitoring team was doing, the Holter team with Chad, and now we have Josh Busby from the ECG lab team joining us. Josh, thanks for joining us. Tell us a little bit about what you do, your team, and all the scope, and what kind of patients use your work.

Josh Busby: Sounds great. Thanks for having me on. The team down here, we use and interpret all of the main ECGs going forward taken from the hospital throughout Southeastern Minnesota, Northwest Wisconsin, and Western Wisconsin, and including some out-state practices. We interpret those from start to finish, including every little thing that you could ever wanna know about what's going on with that patient, and then we pass them on to our physicians. Secondly, we overview and read and interpret all of the Holter monitor data, which are on the patients for 24 to 48 hours. We interpret those beat by beat for that entire time that the patients wear the device. Along with that, just as the new monitor started here this last couple of months, we now have a new order set and that order set can, if we don't find exactly what the physicians are looking for within that Holter time, we can automatically, once prompted, send out a new order for an event or a MCT device and get ahold of Zach's and Josh's team out there, and then the patient can continue to wear the device to try to shorten the length of time.

Dr. Kashou: I just heard that, as a physician, I don't have to reorder or have to bring the patient back in. I can continue monitoring something if I don't find it. Is that what you said?

Josh Busby: Absolutely. With the new cascading order set that we have developed over the last six, eight months here, it saves physicians a little bit of time if we do not diagnostically find what they are looking for within the Holter monitoring period.

Tara Gosse: You know, I can just speak to the work that we do within the ECG lab. It's pretty phenomenal. Reading over 300, that was in ECGs a year. We really have the utmost trained experts in ECG interpretation and also really kind of transforming that Holter cascade where we start the patient with the Holter device, and then that can remotely and seamlessly transition to extended monitoring. That saves the patient that experience coming back into the clinic. Dr. Kashou, as you mentioned, save the ordering provider kind of that additional steps to take, and it's really been kind of streamlined in the patient experience, so kudos to Josh, and Josh and team, just out of curiosity, right? So when you were in high school, did you ever dream that you were gonna be a cardiac monitoring professional at Mayo Clinic?

Josh Busby: Absolutely not. If you would have asked me eight years ago today that I would end up in a outpatient or inpatient patient practice of some kind doing what I'm doing today, there's no way I woulda said yes. I've been with Mayo now for coming up on six years, and it's been the best move of my life, so I appreciate all the help that I've received and the training that I've received from the clinic, and I'm grateful to be able to do what I do today.

Josh Busby: Well, we're grateful that you stumbled into this career track, and I think we're excited to be able to offer this advanced training for others that are interested in joining the field.

Dr. Kashou: Thank you, Josh. I wanna move over to our inpatient telemetry team because all of what we just discussed is more outpatient stuff and so much we're doing, and I think that field's growing ever so much, but the inpatient, we still have patients we care for, and so with us today, helping us tell us about the telemetry monitoring team and the inpatient side, is Jill Culp, and certainly no stranger to us all or to the Mayo Clinic family, so Jill, thanks for joining us. Tell us a little bit about you, and I think you should tell them how long you've been with us because it's phenomenal.

Jill Culp: Thank you very much, Dr. Kashou. Well, I'm one of three educational coordinators at the Heart Rhythm Physiological Monitor Lab. I've actually been at Mayo for 47 years, and I educate all the staff that is in the inpatient care or hospital setting, so to speak. I currently have two different certifications from Cardiac Credentialing International, the Certified Cardiac Technician certification, and also the Certified Rhythm Analysis Technician certification, and as Chad alluded to, that all of our staff throughout the entire department have to be certified within one to two years 'pending on which position you're in, so with that being said, some of the education part of it we actually implement, develop different critical cardiac courses for our staff. They have a six-week course that they have to take, and then they have to pass 90% or greater within our departments, and that prepares them to become certified. Also, in the hospital setting, our staff actually take care of all the patients, typically cardiac patients that have pacemaker, STEMIs, pre-op patients, and they keep aware of what's going on 24-7 for all the patients. Back in 1982, when we started this area, we actually had 12 patients, and now we're up to over 120 patients that our technicians monitor, and they have the ability to communicate with the nurses, the physicians. Very important to do so. The philosophy was that we are going to be proactive versus reactive, and so that communication, as I said, is so critical. The technicians sit at the console, for those of you that would like to know, they sit at the console four out of the eight hours that they're with the patients.

Dr. Kashou: Amazing. Well, I remember in medical school we had to pass an ECG test. I think the passing was 65 or 70%. I'm not sure I could pass the 90% high bar you guys have set. Maybe now, but certainly not at that point. Jill, so what I'm hearing is kind of the, in terms of the telemetry, that's kind of grown quite a bit, and you guys can connect directly with the patient and nurse to kind of alert them. Is that what you were saying?

Jill Culp: Yes. The communication is phenomenal here. We have video cameras in each of the patient's rooms plus audible, so we can talk to the physicians, the nurses, the patients. We know where they're at at all times. We code the patients because, as I said, that we have the ability to monitor them at all times.

Tara Gosse: And I think, to date, Jill, that there's been over 119 codes that were generated out of our telemetry overview monitoring lab, so that really speaks to 119 lives that the team really impacted because of their expert trained ability to identify lethal rhythms and then immediately consult with the care team, so just incredible work and a huge peace of mind for all of our care teams, physicians, and patients.

Dr. Kashou: Amazing. It's phenomenal. I mean, from the remote team with Zach and Josh and that whole team to the Holter team with Chad and the ECG lab with Josh and Lindsay and everyone else and Mel and Jill in the inpatient. I am so amazed that we have this. You know, Tara, any final closing thoughts you have before we end today?

Tara Gosse: I can't end without saying that as Jill is coming up on her 47th year and reaching retirement, she has trained and educated over 283 professionals at Mayo Clinic, so all of the people that have origins throughout Mayo Clinic, many of those started within our ECG or cardiac monitoring practice and have now went on to be RNs, PAs, physicians, you name it, and thank you, Jill, for the expertise and the passion for education that you've imparted on so many of our colleagues and teams. I think people like you, who have started this passion of ECG, have really kind of led us to the point we are today, so we appreciate you.

Jill Culp: Thank you very much.

Dr. Kashou: Thank you so much, Jill. At Mayo Clinic, the needs of the patient come first. It is amazing to witness firsthand the work that the ECG lab team does each day as they grow and adapt to the rapid change the field is facing and continue to ensure we deliver high-quality patient care. This is such an exciting field, and the future could not be brighter. Thank you to Tara, the whole ECG lab team, those that are not here today for being a part of this. Your work amazes me every day, and it is always a pleasure talking and working with you.

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