Melanie Cole, MS (Host): Welcome to the podcast series from the specialists at Penn Medicine. I'm Melanie Cole. And we have two Penn Medicine physicians for you today in a thought leader panel. Dr. Neilanjan Nandi, he's an Associate Professor of Clinical Medicine and Gastroenterology; and Dr. Anish Sheth, he's the Chief in the Section of Gastroenterology at Penn Medicine Princeton and a Clinical Assistant Professor of Medicine. And they're here today to highlight the current state of colonoscopy and a new tool, GI Genius, designed to incorporate AI into practice.

Doctors, thank you so much for joining us today. And Dr. Sheth, I'd like to start with you. As currently practiced, colonoscopy has a reported adenoma miss rate of about 25 percent. How much does operator-dependent variation influence the outcomes of individual colonoscopies today?

Anish Sheth, MD: Yeah. Thanks for having me. It's a great question, a great way to start off. So, when we think about colonoscopy quality, the adenoma detection rate (or ADR) is the number one quality metric, which is basically a simple ratio—the denominator being the number of patients in whom we do screening colonoscopies and the numerator being the number of those patients in whom we find adenomas or precancerous polyps. And there are many factors that have been studied that show that we can influence the ADR and actually we can get better.

And some of those things include quality of the bowel preparation. Probably most importantly, how much time the endoscopist spends withdrawing the scope and how carefully they look at the colon, right? So, the minimum benchmark is a six-minute withdrawal. I think most of us realize that nine minutes is sort of ideal in order to find these polyps, which sometimes can be difficult. And so, these are some of the factors that influence how well we do in terms of finding adenomas during colonoscopy.

Neilanjan Nandi, MD: Yeah. Anish, you know, that's a great recap and I think one of the important things for all our clinicians in the community to understand is that this adenoma miss rate may explain that even a patient who is adherent to surveillance and screening guidelines their entire lifetime still at the end of their lifetime has a minimum 5 percent risk of having a colon cancer despite being adherent to colonoscopy. So, every adenoma that we can detect we hope can prevent interval adenomas and, of course, interval cancers, too.

Host: Great points that you both made. And Dr. Nandi, let's turn to artificial intelligence, which isn't really well understood generally yet. Can you give us a simple explanation of AI and how it's used to enhance colonoscopies? And

while you're doing that, give us an overview of what GI Genius is, how it was originally developed. Tell us a little bit about that.

Neilanjan Nandi, MD: Sure. So, artificial intelligence is a very broad and enlarged encompassing term. The more accurate message here or technical term is computer-aided detection of polyps. What happens is, in real time, as a colonoscopist is watching a video on their screen, looking for polyps, every single image, every single frame is fed through the computer processor in real time. And the software has been trained to look at shadow, light, refraction. It's been trained to look for shapes, circles, stalks, etc. And then, each image at some point in time in the processor helps us develop or identify where the colon polyps are.

So, GI Genius is actually one of several FDA approved devices for the detection of polyps. All of these devices are basically very powerful processors, but more importantly, very powerful software. GI Genius is one commercial product by a company known as Medtronic. Their platform was trained on over 13.5 million images. Every one of those images-- can you imagine this-- had to be annotated by a human, every single image to determine what was a polyp and what wasn't. Was it just debris or mucus, etc. And then, the computer software, the AI learning machine, figures out how to identify with greater accuracy, which is a polyp and which isn't. So in current randomized clinical control trials, looking at the implementation of an AI versus traditional colonoscopy, they found anywhere from 10 to 13 percent increase in adenoma detection rate. So, what this looks like in real time is a GI just does a regular colonoscopy and yellow rectangular or square bounding boxes appear around an area that the software believes is a polyp. And that allows the physician to look closer and examine whether that's an area that needs to be inspected and removed.

Host: Isn't this an exciting time in your field? And Dr. Sheth, GI Genius -- it's also been described as an AI algorithm How is that algorithm incorporated into colonoscopy?

Anish Sheth, MD: I think from an algorithm standpoint, it's basically what the computer is doing, so to speak, to analyze various things that come across our screen during a colonoscopy. And it basically will go through its own sort of flowchart in terms of, "Okay, I've seen this before. Is this debris? Is this an air bubble? Is this a polyp?" And one of the interesting things, you know, Dr. Nandi mentioned 13.5 million images. One of the things about AI in any field is that it continues to get better. So, the first iteration is not as good as the second and the third. And the reason is that the machine learning, and the algorithm for machine learning, gets better and better with time.

And so, for instance, one of the things that I think colonoscopists have struggled with for a long time is detecting these flat what we call sessile lesions, typically found in the right part of the colon. And when you look at patients who develop colon cancers in between their colonoscopy screening, you find that a lot of these cancers happen on the right side of the colon. And the thought is that these flat, difficult-to-identify polyps have been missed.

One of the things that we have noticed here, in Princeton is that artificial intelligence for colonoscopy is great, but the learning algorithm for those flat polyps, which can sometimes blend into the colon are also difficult for the machine to find. And so, one of the things I'm looking forward to as the algorithm gets better is to find some of these difficult-to-identify polyps.

Host: Dr. Nandi, speak about the learning curve when you were adopting GI Genius, both for you and your team, letting other providers know what to expect. Tell us a little bit about the technology involved.

Neilanjan Nandi, MD: Yeah. You know, it's really little to no learning curve. It's plug and play, which means, you know, the GI Genius looks like a DVD or amplifier that you would hook up to your HiFi system at home. You basically plug this into your existing endo tower and it's compatible with any EndoSystem. It's an overlay. So, every image is fed to the processor and the processor feeds a video overlay on your existing video screen. So, it's cross compatible. So, you plug it in, and it works immediately. There's no learning curve and understanding that the yellow bounding box when it pops up is trying to signal you to focus on an area that may be a polyp.

Now, pre-AI, we always were trained that four eyes or six eyes were better than two, meaning not just the physician looking, but the nurse, the technician, anybody else in the room. We were more likely to focus on different parts of the screen and find more polyps together than we were as a single individual, and there's data to support that. With the AI, this does enhance our ability to look at the entire screen, right? So, the software is looking entirely.

Now, that said, I do share Anish's concern about sessile polyps. I also have some concern about over-reliance. There's one thing that's clear, AI is not going to replace the physician, not at all. So, the reliance that I speak of is encouraging young fellows and young clinicians not to over-rely on the technology for the purposes of polyp detection, because there is a false-negative rate. The software can misidentify something that isn't a polyp. It really is a tool that aids us, computer-aided detection, to inspect an area closer to look for a polyp. But in

truth, a fold, a section of the mucosa, bubbles can even sometimes be rarely mistaken as a polyp. And therefore, it's always going to require, for now, human clinician oversight. I think that there's a lot of great pluses. But I think that, as we, again, evolve the AI algorithm as we go from 13.5 million to a hundred million or more, I think the technology will get much better.

Anish Sheth, MD: To echo what Dr. Nandi just said, I think it's very important to understand that AI is only as good as the visualization is, right? So, AI is not going to help you look behind folds. If a colonoscopist gets to the cecum, which is the right side of the beginning part of the colon and starts his or her withdrawal and flies through the colon and has a three-minute withdrawal and didn't look behind folds, didn't take a second look in the right colon, which is established standard of care, the AI can't see those polyps. And I think that's really the key point, is that this is something that is only as good as the colonoscopist's technique. You know, we talked at the opening about withdrawal time, which has been really the long-standing quality metric of colonoscopy. And this just further emphasizes that you do need to see the mucosa for AI to be able to help you. And it's interesting when you look at the studies, Dr. Nandi mentioned that anywhere from 8 to 10 to 13 percent increase in adenoma detection rate. As you could imagine, the increase in adenoma detection rate is higher for what we call the low performers. So, say, your adenoma detection rate is hovering around 25 percent. Well, then this technology can be really helpful. But what we find for high performers, while it is helpful, maybe the benefit or the boost is somewhere near 3 to 5 percent. So, it really shows you that you can really improve your adenoma detection rate by having good technique, taking your time, and AI is just going to pile on top of that and help you to get even more polyps identified.

Neilanjan Nandi, MD: You know, it's a really good point. And you reminded me something to share with all our listeners that a lot of these studies have shown that, in the AI world, for colonoscopy, that there is a high non-adenoma detection rate with the software. So, it highlights certainly a polyp, but it may be something benign like a hyperplastic polyp. It's that specific ADR that we're trying to focus on. There's a couple of meta-analyses looking at how to improve or maximize ADR with computer-aided detection. And Anish actually alluded to this in the beginning of the podcast, but quality of the preparation is really important, so educating and counseling the patient. But then, using tools during the colonoscopy to expose more mucosa, which he was just saying, we have a hard time looking peripherally or behind all folds. But there are a couple of devices that one can add to the end of your scope. There is a commercial product called Endovision, which is basically a distal attachment device with tentacles that pulls back the folds, and that has been shown itself to increase

ADR by helping us pull the folds back so you can look more closely. And there is a study underway combining that with computer-aided detection.

And then, I think that's just the tip of the iceberg. I'm really looking forward to the software. So, Anish alluded to 1.0 basically is where we're at, but 2.0 and 3.0 has already been in development. And those softwares are able to actually give an approximation for how much mucosa has actually been exposed in the colon and can actually grade the prep more objectively perhaps than one GI to another may do in terms of prep quality. And then, the future reports will also even be able to be auto-generated during a procedure. That means the software will recognize when a forceps or a snare has been placed. It will record how much energy has been used to cauterize a polyp. So, it will actually generate the report so that the clinician at the end of the case can focus on just reviewing it. But that means also, because it's saving time there, that the clinician can spend even more time during the procedure, not worrying about completing the report, but really focusing in-depth on that colon to make every single colonoscopy high quality. So, I think there's a lot of potential promise for how this software is just going to get better and better over time.

Host: I'd like to give you each a final thought here. Dr. Nandi, the presence of GI Genius at Penn Medicine is due in part to a grant received in 2022 to enhance colon polyp detection rates in West Philadelphia with the ultimate goal of further reducing colon cancer locally. Have you seen progress since this effort began?

Neilanjan Nandi, MD: Yes, we have actually. And we're very lucky to have received this grant from Medtronic, which was a health equity grant. What was great about this grant was that we were taking cutting-edge technology, to help the people who needed it the most, the people who have challenges in accessing healthcare and getting colonoscopies done in the first place.

So, in our West Philly community, we're very privileged at Penn Medicine to serve our community, some of whom are under-resourced and under-privileged. So, we were able to apply this technology. To-date, we have the technology running for just under a year. We are currently doing an analysis. We have seen month to month there's fluctuations in ADR at every single site. But we have seen some improvements in ADR during certain months, but there's so much variability that we're waiting to collect more data over the next three years for which we have the grant so we can increase our volume.

We have seen other things that were not intuitive, which was we had thought this would add to our procedure time, and it hasn't. It really has not substantially or significantly changed the length of the procedure. It has increased the detection of non-adenomatous polyps and adenomatous polyps. But again, before I can definitively conclude, we're hoping to continue this out for a full three years so we can be well-powered. But we are optimistic that the technology has enhanced the quality of the colonoscopies our patients received, and we're optimistic about the future of this technology in our patient community.

Anish Sheth, MD: I'll just jump in here and just say, you know, the whole goal of all of this technology is to prevent colon cancer. And I think what we've talked about for the most part today is what we can do within a specific colonoscopy to find precancerous polyps and then prevent colon cancer. And just a quick statistic, which I always found interesting is that for every 1 percent increase in ADR, the chance of developing what we call an interval colon cancer, so a cancer between colonoscopies goes down by 3 percent, which is really tremendous when you think about it. Just finding one extra adenoma out of a hundred people is going to decrease the rate by 3 percent. So, it really shows the importance of that.

But the second point is the other big effort we need to make to decrease colon cancer is actually to get more people screened. So, over 20 percent of the United States adult population has still not been screened for colorectal cancer. And I think if we really want to make a dent and get these, like Dr. Nandi said earlier, you know, lifetime risk of 5 percent, if we really want to make a dent in that number, I think we also need to do a better job of outreach, figure out what the barriers are to getting colonoscopies, and then obviously apply this technology when they do come through the door.

Host: Thank you both so much for joining us today and sharing your expertise in this fascinating topic. Thank you again. And to refer your patient to Dr. Sheth or Dr. Nandi at Penn Medicine, please call our 24/7 provider-only line at 877-937-PENN or you can submit your referral via our secure online referral form by visiting our website at pennmedicine.org/refer-your-patient. That concludes this episode from the specialists at Penn Medicine. I'm Melanie Cole. Thanks so much for joining us today.