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Advances in IBD Care: Monitoring with Wearable Sensors

Dr. Turck:
Welcome to *GI Insights* on ReachMD. I'm Dr. Charles Turck, and today I'll be discussing wearable point-of-care testing in inflammatory bowel disease, or IBD, with Drs. Shalini Prasad and Sriram Muthukumar. Dr. Prasad is the co-founder of EnLiSense as well as the head of the Department of Bioengineering at the University of Texas at Dallas, and she presented on this topic at the 2025 Crohn's and Colitis Congress. Dr. Prasad, it's a pleasure to have you with us.

Dr. Prasad:
Likewise, Dr. Turck.

Dr. Turck:
And also joining us is Dr. Muthukumar, who is the CEO and a co-founder of EnLiSense. Dr. Muthukumar, thanks for being here.

Dr. Muthukumar:
Thank you, Dr. Turck.

Dr. Turck:
So starting with you, Dr. Prasad, what was your objective in developing a wearable device for IBD patients?

Dr. Prasad:
IBD, as we all understand, is a disease of flares and remission. In a disease that goes up and down, it is absolutely important to have a technology or a tool that allows us to monitor disease activity in a real-time and continuous manner. Currently, the only ways of doing this are through stool testing or through serum testing or imaging. So in between these points, the patient, especially when they seem to believe they have symptoms, wants to know if it's a false alarm or if it's real. The clinician, on the other hand, does want to know how the patient is doing, and the biochemistry primarily for C-reactive protein and calprotectin are the two major clinical cues that help a physician to make assessments of how the patient is doing. So wearables, especially perspiration wearables, which is what EnLiSense has developed in collaboration with my lab at UT Dallas, allow you to track in real-time these inflammatory markers and report the actual expression profiles—that is the quantification—and eventually allow for thresholding of patient activity based on these measures.

Dr. Turck:
And would you explain a little bit more about how this device detects IBD flare-ups?

Dr. Prasad:
Absolutely. This is a three-part device. There is a little sensor strip that sits on the skin, and it is then connected with a small reader. This reader then talks to the cloud. So as we're wearing this, all of us today in this room are sweating, and we're sweating at a very small rate. It's one nanoliter per gland per minute. So on this IBD Aware device, the sensor piece of it essentially pulls in that perspiration that is there and looks for key inflammatory biomarkers. It can look for four biomarkers at any point of time, and currently, we're looking at C-reactive protein, calprotectin, and IL-6 and TNF-alpha, primarily from the perspective of what therapy looks like today for patients.

Now, what happens is that every three minutes, a measurement is taken that essentially looks for the expression concentration of these biomarkers and converts the actual measure or transduces it into a reportable concentration. So this measurement is then made through the data, which is then sent out to the cloud where all the algorithms reside, where it's converted back into the concentration. And a real-time trending profile of the expression profile of these biomarkers show up on your app, whether it's through your phone or in

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some form of an electronic interface.

So this is the ecosystem of IBD Aware, and this allows you to track patients primarily four days at a time before you replace that sensor strip. You continue to do this similar to what you do with continuous glucose monitors for blood glucose.

Dr. Turck:
For those just tuning in, you're listening to *GI Insights* on ReachMD. I'm Dr. Charles Turck, and I'm speaking with Dr. Shalini Prasad and Dr. Sriram Muthukumar about the development of a wearable device capable of detecting IBD flare-ups, which was showcased at the 2025 Crohn's and Colitis Congress.

So turning to you now, Dr. Muthukumar, let's discuss how we can incorporate this device into clinical practice. How do you envision it impacting the daily lives of patients with IBD?

Dr. Muthukumar:
The subject will be prescribed the wearable device by the clinician based on their disease severity. The markers that Dr. Prasad referred to are the markers for IBD. Today, the clinical cutoffs for the IBD disease severity are based on the serum CRP threshold of greater than 5 mg per liter and a fecal calprotectin cut off that can range—depending on whether it's ulcerative colitis or Crohn's disease—anywhere from greater than 50 ug/g to all the way up to 150. So we are going to be using these thresholds to optimize our thresholding in sweat. A clinician will be looking at the sweat CRP and the sweat calprotectin levels to decide how the patient's disease is trending, and this is done in real time through a remote patient monitoring using both an app-based interface and a web portal. And using that information, the clinician and the patient can then decide on the next course of action, which would be imaging or follow-up blood tests.

What this helps with, with the current standard of care, is that today, the serum CRP levels and the fecal calprotectin are done asynchronously, and there is no clear insight or limited insight into the disease severity or when the flare is going to happen. With this device being a real-time monitor looking at the sweat calprotectin and the sweat CRP, the clinician and the patient can actually monitor their levels, and when it's going up above the cutoff, they can then take the necessary action. That is how we plan to make it a patient-centered clinical decision support system.

Dr. Turck:
Do you think this device has the potential to replace any ways in which we use current methods like endoscopy or blood tests?

Dr. Muthukumar:
Absolutely, because today, these endoscopy tests or blood tests are done regularly, where the patient is scheduled to come in every three months or every so often. And these can add a significant cost burden to the subject. Without having an insight into when the flare is going to come, most of these testing are done post-symptomatic, which means the patient has already relapsed and is on a painful recovery path, which can last anywhere from a few weeks to a couple of months. This device complements the current standard of testing wherein you're now getting active levels of your sweat CRP and your sweat calprotectin, and that way you can actually anticipate when the flare is going to come. So there is a level of presymptomatic alert that can then give the patient and the clinician time to do a timely intervention, minimize the likelihood of relapse, and avoid expensive endoscopy and blood testing.

Dr. Turck:
As we approach the end of our program, I wanted to ask you both, what are your hopes for the future of noninvasive monitoring technology? Dr. Muthukumar, let's start with you.

Dr. Muthukumar:
Today, what we see is that reliance on blood-based glucose testing has significantly gone down, and people use continuous glucose monitors. Even that is used as the feedback loop to do insulin delivery to the diabetic. Similarly, we envision with this IBD wearable being able to track inflammation in real time and actively monitor. And over time, we expect such noninvasive technology to replace expensive or invasive blood testing imaging and be the standard of testing for inflammation levels. So today, none exist, but in a decade or so, this is going to be the game changer.

Dr. Prasad:
We think that IBD care can be transformed with this IBD Aware platform. The reason is that, as Sriram indicated, the idea of having the opportunity to know what the disease activity looks like at any given point of time is a tool that can help actionable information to be used in clinical practice and in the way the patient is enabled towards looking at actively managing the disease.

IBD is an expensive disease because it requires essentially long-term chronic monitoring. If there is a tool that can essentially close this loop and provide the closed-loop feedback so that the time to a particular clinical intervention can be modulated or the peak of the flare can be reduced—if these two things can be done or the path towards biochemical remission can be identified—then truly, that is the

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game-changer that every IBD patient is seeking.

Through the Crohn's and Colitis Foundation, who are our evangelists for essentially putting us on this road towards looking at novel technologies, this is an outcome of those initiatives towards building out capabilities that are truly noninvasive and are very patient focused in the care delivery that they may offer. So with that vision in mind—we started on this path six-and-a-half years ago—today we can show you impact of this IBD Aware platform. We have run multiple clinical studies with our collaborators at Mount Sinai and University of Chicago, and we have shown that, yes, we can measure calprotectin in sweat, which correlates to what you see in stool. Yes, we can threshold serum CRP along with that with what you see in sweat. The sweat thresholding maps to the serum thresholding. These are the first two critical steps towards truly enabling this platform technology to have patient impact.

Dr. Turck:
That's a wonderful look ahead as we come to end of today's program, and I want to thank my guests, Dr. Shalini Prasad and Sriram Muthukumar for joining me to discuss exciting new wearable technology for patients impacted by inflammatory bowel disease. Dr. Prasad, Dr. Muthukumar, it was great having you both on the program.

Dr. Prasad:
Thank you, Dr. Turck. It was a pleasure being on this program.

Dr. Muthukumar:
Thank you, Dr. Turck. It was a pleasure for me too.

Dr. Turck:
For ReachMD, I'm Dr. Charles Turck. To access this and other episodes in our series, visit *GI Insights* on ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening.

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