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How Artificial Intelligence Is Changing the Practice of Gastroenterology

Dr. Buch:
Have you ever wondered exactly how artificial intelligence is changing the practice of gastroenterology? If so, you're going to want to stay tuned because this is *GI Insights* on ReachMD. I'm your host, Dr. Peter Buch, and joining us today to guide us through this new world is Dr. Ali Soroush. Dr. Soroush is an Assistant Professor of Gastroenterology at Mount Sinai School of Medicine in New York, and he's actively involved in research focusing on AI and gastroenterology.

Dr. Soroush, welcome to the program.

Dr. Soroush:
Thank you for having me.

Dr. Buch:
It is a delight. So, Dr. Soroush, let's start by examining some definitions. Can you define artificial intelligence, machine learning, and deep learning for us, please?

Dr. Soroush:
Of course. So artificial intelligence I think is the most commonly used term to describe a wide variety of things, but all it really means is that you have a machine that is trying to mimic human intelligence. And this can take many shapes and forms, so it can be something as simple as maybe implementing a clinical practice algorithm at a very crude level, so just simple logic statements, or it could be something as complicated as a ChatGPT and the types of AI systems that are coming out in the past year or two.

When you move down, the next level of complexity is something called machine learning. So machine learning is a type of artificial intelligence that can pick up patterns on its own and start to self-optimize. So this type of technology has been around for 20-30 years. Classic statistical models are basically built this way in how they fit to the best curve, but these models are not as powerful as the AI models that we're seeing today. And their big limitation is that they can't eat, so to speak, as much data as the newer AI models, so they're limited by their simplicity, and so they can't really deal with complicated scenarios.

The next level is deep learning, and deep learning generally involves something called neural networks, and this is a highly complex type of statistical model that can intake a lot of data. And the advantage of this type of model is that you don't need to put labels on as much of your data, meaning you don't have to say this piece of data means this and that piece of data means this. The model kind of figures it out through the sheer force of data. And this is what the current generation of AI models really are building off of. So ChatGPT, these artificially generated images, the way they're built is with complex models that are massive that have been trained on trillions and trillions of words or billions and billions of images, and they from that are able to then do the amazing things that they're capable of.

Dr. Buch:
And with those definitions in mind, let's move on to some specific scenarios. First, how does AI assist in the diagnosis of Barrett's esophagus? And do we have a percentage improvement over not using AI?

Dr. Soroush:
The guidelines say to consider maybe three to five clinical factors to generate your own internal risk prediction and decide based on that whether to screen a patient. But in reality, it's probably many, many things that are driving that risk, and a lot of those things we do collect on a day-to-day basis in our electronic health record. So some newer risk models are seeing, oh, if we go back and we pull all the data that a patient has generated through their routine care, then we do a better job of identifying those who would be at risk.

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And then finally, circling back to the endoscopic AI models, these types of models are trained to help us put a box around abnormal tissue when we're doing an endoscopy. For lesions in the upper esophagus, it's incredibly hard to see some of these things, and the people that are good at it are good at it because they've been doing it for many years and they have lots and lots of experience. It's impossible to truly train everyone to do that because there's not enough cases to do it. But what the AI does is it basically gives everyone the opportunity to operate at least at a level similar to an expert, and that's what the data shows at least with the preliminary models.

And if you compare an AI to a general endoscopist, I'll give you some numbers from a pragmatic clinical trial published, and they looked at four European centers. They trained it only on images and videos from about 150 patients. But even with this small training set, when they went to go test the model performance on new videos and compared it to general endoscopists, the difference in sensitivity was 93.8 percent for AI versus 63.8 percent for general endoscopists. If you looked at specificity, it was 90.7 percent for AI, 77.9 percent for general endoscopists. And the negative predictive value and accuracy were both similarly about 20 percent different. But what they found is that the AI is just better at picking up these more subtle and flat lesions that humans, especially non-expert humans, really have trouble identifying.

Dr. Buch:
So how does AI assist with gastric cancer?

Dr. Soroush:
In terms of endoscopic AI, there have been models that have looked at, can we visualize H. pylori gastritis or atrophic gastritis endoscopically and be able to diagnose that? Intestinal metaplasia of the stomach, dysplasia of the stomach, or even early staging of cancer, meaning like can we predict endoscopically with our AI, is this going to be intramucosal or submucosal which can help guide decision-making during endoscopy?

Dr. Buch:
So there seems to be some controversy when assessing the benefit of AI in detecting colon polyps. Would you please elaborate on this subject?

Dr. Soroush:
Sure. So in contrast to the types of numbers I was reporting with lesions in the upper GI tract, the AI for detection of colon polyps is only, let's say, marginally better than if you don't use AI. And I think this makes sense because in the US at least, the primary bread and butter of GI is to do screening colonoscopies. We have lots of experience doing high-quality exams. It's been studied, and the knowledge has kind of been disseminated broadly within the United States on how to do a good high-quality exam, so everyone is closer to the level of an expert on average in the US than they would be with upper GI neoplasias. So there's less for the AI model to kind of improve upon at baseline.

The other difference is that these AI models are actually not better than humans, at least the way they are now, in detecting flat and subtle lesions, like sessile serrated lesions. What they're better at detecting are kind of small types of standard adenomas, and it's not clear whether even detecting more of those will necessarily improve outcomes, even though it does technically increase the adenoma detection rate.

Dr. Buch:
For those just tuning in, you're listening to *GI Insights* on ReachMD. I'm Dr. Peter Buch, and I'm speaking with Dr. Ali Soroush about the use of artificial intelligence in gastroenterology.

So, Dr. Soroush, if we continue examining the use of AI in certain scenarios, how is it used when assessing patients with metabolic dysfunction-associated steatotic liver disease, which was formerly called non-alcoholic fatty liver disease?

Dr. Soroush:
So the first is how can we take electronic health record data and do a better job in terms of identifying that those who have—I'm going to call it MAFLD—then identifying those who have MAFLD who are the ones that have clinically significant fibrosis and figuring that out in a way that doesn't require imaging necessarily; or if you do use imaging, then you can use ultrasound versus an MRI and get similar quality results. And then the third layer of leveraging EHR data will be to say if I take my EHR data and maybe some of my imaging data, can I prognosticate with this large amount of data into the future and have a better sense of who are the people that are going to progress that I need to dedicate my resources and my energy to?

When you take the EHR data and you then layer on additional data streams, you can get even better performance, and this is true, I think, of all spaces within medicine. How can we better assess fibrosis and better assess disease prognostication?

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At the level of even taking the biopsy, there's work being done to just have a more consistent definition of what a metabolic-associated fatty liver disease looks like and what are the different stages of disease that are more clinically useful in terms of predicting progression and assessing disease severity than what is currently being used.

Dr. Buch:
So how close are we to using this as a clinical tool to make that distinction between MAFLD and MASH?

Dr. Soroush:
I'd say we're on the precipice, but how close to the precipice is a tough one because the issue—and this is true of all AI-driven models—is that it's very easy to make an AI model. It's very hard to make a good clinically relevant AI model you can implement. And so where we are on that spectrum kind of depends on how fast people are going to move and how effectively they move. I would say a lot of these models are in the preliminary stages where they're kind of saying performance is good; we're predicting the thing that we say we're going to predict; but we have to kind of also see how these things work when we put them into practice and how they impact our clinical metrics in terms of does it actually improve patient care as opposed to do we get nice numbers with our prediction.

Dr. Buch:
I can't wait to use it as a clinical tool. Up until now, we've discussed all the benefits of AI. What are the pitfalls?

Dr. Soroush:
So I talked about some of them just now. I mean, some of it is working with complicated models different than our standard logistic regression model means that you have to deal with a lot more data, and each piece of data has its own complexities and problems.

So let's say you have a colonoscopy polyp-detecting AI, and you're driving around in the colon and it puts a box around something. Now you don't know if it's putting a box because it thinks it's a polyp, or you don't understand its internal reasoning process and to know whether to listen to it or not, so you kind of go with whatever your internal belief system is towards AI. So you might be a skeptic, or you might be like a true believer and you may under- or over-trust an AI model.

I think those are kind of like the main things in terms of working with AI is understanding kind of that they can be supremely accurate and effective but then can sometimes have situations where they just make very strange decisions or recommendations and understanding that they're interpreting the data differently than we do, so there's strengths and weaknesses to both and learning how to interface between the two.

There's one more thing I just wanted to mention, which is that because so much data is going into AI, it is really prone to picking a bias. And so let's say you're building an AI model using electronic health record data. All that data from day-to-day care is going to have captured all the explicit bias of the healthcare system, and that's at multiple levels, not just maybe how care has been allocated, but even the fact that there is data for one group of patients and another will lead the model to have better predictions for one group. So that's not what we want. We want AI that improves equity, that improves delivery of care, and improves the quality of care, but if you're not careful, it can do the opposite of what you want it to.

Dr. Buch:
So before we close, Dr. Soroush, are there any additional thoughts you'd like to share with our audience today?

Dr. Soroush:
Sure. So we've talked a lot I think about, in terms of healthcare, AI models that are using more traditional approaches. I'm excited about the coming wave of artificial intelligence in that it's a little bit different and allows us to do some cooler stuff. And these are generalist models I call them, and other people call them this, but they're models that are trained on so much data that you can ask them to do a wider range of things without having to over-engineer anything. You don't have to teach a model to just detect colon polyps. You could build an endoscopy AI that is able to detect any type of pathology and maybe give you a statistical assessment of what it thinks the most likely diagnosis is.

This is already playing out with things like ChatGPT where you can ask it to do all sorts of things, but all you have to do is write a couple sentences and maybe give it some background information. If we extend that into medicine, we can really open up a wide range of things that we can improve patient care with and also improve provider well-being by getting rid of a lot of these repetitive tasks that we do in our day-to-day and let the AI do that.

But I'm hopeful for the future and that AI can improve the quality and efficiency of patient care.

Dr. Buch:
What an amazing review on the use of AI in gastroenterology. I want to thank my guest, Dr. Ali Soroush, for sharing his insights.

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Dr. Soroush, thanks so much for joining us today.

Dr. Soroush:
Thank you for having me.

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

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