

Title: Artificial Intelligence in Cardiology: What You Need to Know in 2024

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My name is Dr Ami Bhatt. I am an adult congenital heart disease cardiologist by training, spent many years at Mass General Hospital in Harvard, and I'm now the Chief Innovation Officer at the American College of Cardiology.

So, I think there are three main areas that we've seen a lot of progress in innovation:

The first is really thinking about AI. Now, I know AI is everywhere. However, here at ACC, what we're seeing is real science supporting the use of AI in clinical medicine. I'd like to start with thinking about risk prediction because we've been doing risk prediction in cardiology for a very long time. Risk prediction is based on algorithms, and if there's a field that's good at algorithms, good at guidelines, that's our field.

However, what we're learning is that the amount of information available about a patient, ranging from their actual data and electronic health record, to their social data, to their demographic data, as well as all the research that's now available about their diagnosis, it is really hard for the average clinician to take all of that information and make sense of it in a 20-minute visit.

Much of the risk prediction algorithm work that we've seen, and the AI and risk prediction here at ACC, has been about thinking about the most complicated cases and how we can help people understand.

Let me give you some examples: In atrial fibrillation populations, who are the ones that are truly at risk for stroke, and how soon? In populations who have right ventricular disease, which is very challenging to image and understand, either through echocardiography or MRI or functional testing, can we use AI parameters based on the electronic health record in addition to imaging to help us better predict who is going to respond well to a therapy? Who is going to decline from disease? When we place left ventricular assist devices, what are outcomes going to look like? That's something that we can now do using risk prediction. So, we've really advanced our ability to think about risk prediction because we're able to use artificial intelligence in that process.

The second area that we're seeing a lot of movement because AI and radiology have been around for a long time, it's easy to take AI and radiology and bring it to cardiovascular imaging. But the EKG is really the basis of a lot of work we do.

And when we think about equity in the communities where we're serving, the one test we know everybody can get is, in fact, an EKG. With that in mind, there are many studies now coming out about the use of AI on EKG, an area that is getting increasing interest in every field right now is a large language model, or generative AI. I taught a group of fifth-grade STEM students recently, and they were very familiar with chat GPT, perhaps more so than some of my colleagues. But now we have research. We have research where we're using large language models, and we're using them in a way that we at ACC refer to as collaborative intelligence.

We don't refer to it as artificial intelligence. The reason is especially for generative AI. We need to know the data that's going into the LLM model, and we need to be able to work with the data that comes out. So, the data we're putting into large language models is the data that we trust. The guidelines, the expert consensus documents, the information about the patient and the data that

we get out may or may not be exactly what we would do clinically with them, but it sure can get us closer to doing guideline-directed medical therapy than we have been. As you know, a conversation at ACC for many years has been, how do we get more people doing guideline-directed medical therapy? Well, think about how many guidelines are out there. That's hard to ask of the average cardiologist, but can we bring those guidelines to the point of care?

And we believe we can. And the research we're seeing at ACC shows us that if you train a large language model with trusted information that we have created at the ACC, then we can actually get outcomes that help us understand (...) I think the guidelines suggest this next, what do you think? We're not taking away clinical acumen, but the research shows that we can help our clinicians provide the best care possible. And the use of AI to use EKG to say, do you have a specific disease, let's say hypertrophic cardiomyopathy? Are you having progression of your aortic stenosis? Is it possible that you have a reduced left ventricular ejection fraction, and I can know it based on AI for an EKG, rather than echo? Well, yes. Yes, we can do that now. And those are the kind of studies that we're seeing. There's one study in particular I found very interesting. That's actually a photograph of an EKG because let's say you have to upload an EKG, you need a computer system. Can we do that in rural America? Can we do that in inner-city America? Can we do that globally? Not necessarily, but do you have a smartphone in a majority of those areas? We do. In fact. Can we take a picture of an EKG? And can the AI tell us, based on that photograph, what kind of outcomes this person may have, it's actually increasingly possible. So that research, I think, was a whole new era of now thinking about how do we prevent the digital divide? How do we create mechanisms of innovation that will actually help in the communities that need it the most.

The third area that I'd like to think about is the virtual area. We have virtual reality modules that you can see all over the expo floor. We have sim stations, simulation stations, where you can actually do a left atrial appendage occlusion procedure, wearing an Oculus device and learning how to do the catheter procedure. Now, why do I mention that? That's not the same as research per se, but it's actually innovation. It's innovation where our members designed what does it feel like? What does it look like? What are the guidelines to do an LAA occlusion? And now you can wear the Oculus and you can do it. What does this mean? This means we know that operators do better when they train more. We're not replacing in-person training, but for areas where maybe the population is underserved, where maybe they're not a tertiary center for a complicated procedure, we can now take those operators, those interventionalists, and train them in a way that they can provide the highest level of care possible.

So I think these are some of the innovations that we're really excited about here at ACC 24, and I'm sure we'll talk about many more of them in the next year as we approach ACC 25.