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UMass Chan experts discuss benefits, concerns of AI in health care

David McManus, MD'02, MSc'12, and Neil Marya, MD'12, discuss how artificial intelligence will impact the field of medicine and research.

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Jennifer Berryman
Artificial Intelligence is changing so many parts of our lives and of course health care is no exception. How will AI change your appointments with your doctors? What should we be aware of, and could AI actually save be the thing that saves health care? Two of our colleagues here at UMass Chan are perhaps more equipped than most to answer some of these questions. So, let's welcome doctors David McManus and Neil Marya. Good morning to both of you.

David McManus
Morning, Jennifer.

Neil Marya
Good morning.

Jennifer Berryman
Dr. McManus is a cardiologist by training chair and professor and executive of medicine in the Department of Medicine here at UMass Chan, an executive sponsor of the Program in Digital Medicine. Dr. Marya is a gastroenterologist, assistant professor of medicine and co-director of the Digital Medicine Program. Thanks to both of you for making times in your schedules to really help us understand what's at stake. And let's just start with AI. It's a huge buzzword, but it can mean a lot of different things to different people. So, Dr. Marya, why don't we start with you? Could you help us define AI? And how you think about it?

Neil Marya
Yes, so you know, I think of AI from a historical basis. I think when people think about artificial intelligence, they think about what they've been seeing in the news over the last four to five years. But it's interesting, the history

of artificial intelligence goes back to the late 1940s and the early 1950s. And people I don't think realize, you know, probably the earliest application of artificial intelligence that you're probably familiar with is when you played checkers against a computer when you were a kid. And that was the machine learning algorithm that was developed by IBM in the early 1950s. And that's where the term machine learning actually came from, was when they created a machine that could play checkers to human beings, and actually improve over time, as the AI was trained to learn about different pieces on the board. And it sounds like a very simple application. But when you think about it, it's kind of a complex system that they had created. And, you know, there was a lot of trial and error, I think, from the 1950s to the early 2000s. It didn't really, obviously take off because a lot of people have not thought about AI think in the same way, like they're thinking about it now until very recently. But something that Dr. McManus and I have talked about a lot. AI has actually been involved in industry and in your daily life probably a lot longer than you can think of, you know, with ad tech, you know, where, you know, the different ads that pop up when you're searching the internet or surfing the internet, that's based on your inputs, that you provided a machine based on your search history. And there are a lot of complex algorithms running in the background to say, "Hey, I think you know, you might be interested in purchasing this or that." And, when I think about artificial intelligence, I think about a computer algorithm that is trained on a series of inputs, a large volume of data to try and predict a particular outcome. And that's something that's been, you know, basically been around, like I said, for about the last 60 years or so. And I'll let Dr. McManus sort of get provide his definition. But how it applies to medicine, I think is where things get really interesting.

Jennifer Berryman
That's right, Dr. McManus, what would you add to that in terms of medicine and 2023? And AI?

David McManus
Yeah, I think Neil gave a great definition of kind of how artificial intelligence came to be. The idea about applying it to medicine falls into a few different categories. And maybe we'll talk about it more.
One, I think a lot of the attention around artificial intelligence recently comes from the chat GPT generative AI space. And so that's one application whereby a model was created to go out and read everything on the internet, or everything provided to this machine with the idea of generating new content back in response to a conversational entry. Like, you know, does the airport have a security checkpoint? You know, whereas if you Google that you would not necessarily get what would feel like a conversational answer from a human chat. GPT will analyze what's out there and actually provide you back a narrative and of course, it uses a variety of semantic techniques to really speaking it doesn't use the same neural pathways that we do when we learn how to speak. But in essence, it's learned what the right thing to say, collectively in response to a series of promises, and that, in a sense is not so different from learning to play chess, based on a certain set of rules. The other space is in predictive analytics. And that's a space where AI has been around a little bit longer in the background. And we have multiple applications of use of artificial intelligence for prediction going on at UMass could talk about I think that's probably the first and more dominant area that is being used in health care to say, predict, when you're likely to need a trip to the ICU or to predict a patient may be more likely to respond well to a particular therapy, and to, you know, to identify potentially risk and escalate that there is a one application at UMass, for example, is that you have a scan down of your lungs, an AI algorithm will read that scan to look for something urgent, like an embolus or a clot in the lungs. It still requires a human ovary, but it will flag because there's 1000s of these scans done, it will prioritize that scan for an overview so that the issue is not missed, or

there are not delays in care. So that sort of application is current, whereas some of the generative AI areas are less applied, although there's some really interesting studies using generative AI to respond to patient messages and other health care areas of need. So, whether there are also some folks using it to generate their notes or responses to insurance companies about particular prior authorizations, what have you. So, they're all using generative AI, but I would say the predictive AI spaces is really more predominant. I'd add one thing, which is that I think the focus on AI, is interesting to me, because the application of these tools is really more of a shift in the concept of acknowledging, because now there's a software as opposed to an individual physician or other human that you're dealing with. But the concept of sort of behavioral economics is at play here where health systems are electing to apply these tools, and they're doing so in a way to guide towards decisions and that and to augment human decision making, which in the prior paradigm of medicine, there really it was the doctor's decision was kind of the highest level of decision making. And you know, now this requires the acknowledgement that that a system or an application might be able to nudge or kind of move decisions, as I just mentioned, to augment humans to augment the doctors, and that that component of application of AI to me is as or more interesting, actually, than the software itself.

Jennifer Berryman
I mean, I think that could probably be uncomfortable for some people, right? Uncomfortable, maybe for traditionalists or people who just maybe need to have a better understanding of how it's working. So, let's dive into a specific example. Dr. Marya, I know you're utilizing AI tools for like Dr. McManus was saying predictive diagnostics. So, let's go very deeply into that example. Tell us about that innovation and how is it improving the care you can give to patients?

Neil Marya
Sure, yeah. So, I work in something called advanced endoscopy, which focuses primarily on tumors that occur in the pancreas or in the biliary system which are basically these tiny tubes that drain your liver. And I'll talk about one example, which is in the bile ducts, there's a condition called Cholangiocarcinoma which is a relatively rare cancer. But we do see here at UMass and around the world, where a tumor can form within some of those very small pipes that drain the liver. And to get patients that optimal treatment outcome, you need to get a diagnosis sooner so they can get on treatment or potentially get surgery sooner. And unfortunately, our current diagnostic techniques that we have available to us to diagnose Colangiocarcinoma are not great. So right now, we have a very fancy like pipe cleaner that can go up into sort of scrapes themselves off the pipe, or these very miniature forceps to get samples. But what we've seen in several studies is that the false part sorry, the false negative rate associated with those biopsy techniques is extremely poor. So, we're saying we're seeing folks having a sensitivity of like 15 to 30 percent. So, the false negative rate of greater than 50 percent. So, patients receiving multiple exams, multiple sampling techniques, until they can get a diagnosis, which could sometimes be several months after they initially had symptoms of Colangiocarcinoma. And as we know, with cancer, the longer someone has to wait to get a diagnosis means the longer they have to wait until they can get on treatment, which can unfortunately, lead to them having a later stage of disease by the time they actually get treatment, and then they can't get surgery. And so, where AI can potentially help, there's a new tool called the colangioscope which is basically a miniature camera that we can put into those pipes and actually directly visualize the tumor. And there were studies that came out in the last 10 years or so that when a physician looks at the images generated by that camera, he or she can actually say with some pretty good certainty, gosh, that

looks bad, that looks like cancer. Now, the problem is, is you can't take that to a tumor board or to a surgeon and say, hey, look, I think it looks really bad. You need to put this patient on chemotherapy. Now you need to take this patient to surgery now. They're going to say to you, "Well, you know, it's, I'm glad that you think it looks at, you know, but how am I supposed to make a decision about putting someone on chemotherapy, just based on your visual impression." So, what we're doing in our lab, is we're using something called Virgo, which is an endoscopy recording platform to record all of the videos from all of our endoscopic procedures here at UMass, but specifically from that miniature camera that I was talking about, that can go into the bile duct. And we've generated and I'm going to talk about Virgo maybe in another way, but we've generated over 20,000 video recordings of procedures across the U.S. in the last one and a half years, and from the client just spoke to generate about 100 video recordings. And we've taken from all those video recordings, we've taken each individual frame from every single video. So just to give you a sense, the frame rate for colangioscope of scopes is about 30 frames per second. So, a 62nd, or video will generate 1800 images. And we can use all those images to train a computer program or a neural network and an artificial intelligence to say, hey, does this look like cancer or not? And what's nice about that is in the end, we can actually instead of just generating a, you know, physicians' impression saying, hey, gosh, this looks like cancer, we actually provide a number, like we can provide you a percentage likelihood that this is cancer just based on a visual impression alone, generated by AI. And the way I sell it to people is like this is just like a tumor marker, you know, when we generate, when we're trying to people with different types of tumors are these blood markers that can give basically a level saying, this is a lot more concerning for cancer or not. It's the same thing. It's almost like it's like a visual biopsy. In some ways. That's what we're getting with our artificial intelligence. And what we've shown from our internal data is just the AI reviewing a video recording of the bile duct that is actually more sensitive, and more specific and generally more accurate significantly. So then taking biopsies of the tumor.

Jennifer Berryman
Wait a second, say that again?

Neil Marya
Yeah, just the camera, just the AI viewing the video recording of the conlangioscope is more accurate, significantly more accurate than taking biopsies. And what we've also shown from our study is that it can actually decrease the number of procedures patients need to get a diagnosis. And then actually, if you went on the AI's interpretation of the vague recording, you actually can decrease mortality in patients. We showed in a modeling study that you could decrease mortality by 17 percent. If you went with the AI's interpretation of whether or not someone had cancer or not, versus biopsy, because you're getting these patients on treatment sooner, and you're also preventing them from getting needless surgeries. So, it's actually it's a fascinating space for sure. And I'll leave with one additional thought. Dr. McManus is talking about how we can apply these things. You know, I think what we've seen a lot in academic medicine, is people are generating these models, but they're not actually testing them in the wild. When you generate these models, they're in a very specific test scenario, right? Where everything is controlled, you're giving them really good data. And that's not real life. What we're doing here at UMass is we've actually generated a computer that can actually be brought into the operating room, and actually run the AI model in real time during real patient exams. And so, we're actually running our model productively in real patient cases in real time. And even in that situation AI can still maintain significantly greater accuracy than biopsy.

Jennifer Berryman
I mean, that is such a powerful example of the potential, I guess. So it sounds though, as though what you're saying is like, we're not turning patient care over to artificial intelligence, but really, we're using it as a tool that then with the physicians and the technicians expertise, you can really improve outcomes and patient experiences.

Neil Marya
Yeah, you know, I see what We sell this to people. What I try and tell them is like, Listen, I'm not trying to tell you that you use AI's interpretation alone. And that's meant to drive care. It's meant to provide another data point amongst an ensemble of data points, including someone's tumor marker, including the physicians, visual interpretation, including the results of the patient's CAT scan, and MRI, and all the other things that we use to make a diagnosis for something like clinical carcinoma, which, you know, historically, because it's so difficult to get cytologic or histologic diagnosis, we have to rely on other data points. And this is just providing one more sort of data point that otherwise has not been available for the last several years.

David McManus
I like to collect quotes. And I, one that I heard recently, and I love is AI will not replace doctors, doctors with AI will replace doctors. Right. Okay. And I think that's the that's the distinction you were making. I would add that I think that while we've focused a lot on appropriately, on enhancing diagnostic capabilities with AI to date, where I see the greatest opportunity for AI is to help with all the stupid stuff that prevents doctors and nurses from having more time to be humans with their patients, we really have not applied AI to all of the administrative waste, which is in health care, we spend way more than other comparable countries on our health care system. And a lot of that spending is not on the people delivering the care, it's on administrative or bureaucratic requirements for documentation or faxing this or, you know, storing that. The fact is that if an AI algorithm can be used to manage transfers of trillions of dollars between banks, and it's trusted to do that by some of the most conservative people on the planet, in bankers, why health care executives are reluctant to let it use movement to patients across their system befuddles me. I think that's really where we should be thinking about AI as a care traffic controller as well.

Jennifer Berryman
I mean, that's been the case in the United States for decades, upon decades. We keep making the same mistakes over and over, while we're still getting the same outcomes, right. And they're not really anything to write home about. Let's give some other examples of AI. So, I think predictive diagnostics is very powerful. But there's also this whole field of devices, keep providing more care at home, where patients can potentially be safer and more comfortable. So, let's, if you could share one or two examples of the work that's underway on that front?

David McManus
Sure, yeah, I think there are two. So first, to emphasize your point, care is moving into the home, it's moving away from brick and mortar, big hospitals, and urban areas with parking fees, and, you know, people with disabilities and other issues in terms of just even busy schedules, you know, can cannot get in and receive care,

there's definitely evidence that our current model of care introduces disparities. So, whether it be for access reasons, convenience, reasons, cost reasons, comfort reasons, people want to receive more of their health care, when they need it as promptly as possible in the comfort of their own home. So that is just the truth. So correct. That that to date has included thinking about home nursing, right. So that's been around for a long time. But increasingly, we're seeing through a variety of different initiatives, movement of increasing levels of complexity of care, outside of the clinic, outside of the hospital and into people's homes all the way up to acute care now in the home setting where nurses are going into the home monitors are being used continuously on patients to keep an eye on them. And physicians are using telemedicine to conduct their rounds and their visits to discuss the case with the nurse and the patient. All of this is facilitated by technology, certainly, but a very old school approach to medicine of the house call. And I think that is really, really an exciting area of innovation in general. It's an area of great recognition for UMass as a place where this is happening. But it does require a lot of new technologies. So for example I was meeting with a team that had developed a In an application powered by AI, that we use a photograph of the skin to identify the severity of a ulcer, it might be a need for a wound care consult, to allow a nurse to identify a patient at risk for deep infection or bone infection or potentially need for antibiotic or surgery. And to date, you know, that would require someone to be in the hospital to have a formal wound care console. Very limited resource. So really, that's upskilling, the nurse at the bedside for this particular care environment, right? Because why do you, I don't need a phone to do that in the hospital, I just call my friend, the wound care nurse, and she comes by but there is no wound care nurse, you know, on Chandler Street. So, you know, you need that capability to say, okay, who should we bring in, who can remain in the home. There is a variety of other examples of point of care, ultrasound, as well as all sorts of technologies for continuous monitoring of the patient's blood pressure and oxygen level, mental status falls, all sorts of cool stuff, also tracking medications in terms of adherence to medications, because you can't directly observe all the time the patient in the home environment, but you sure can track a pill that has a little bio sensor, that it sends off an RFID that, that notifies you that the pill has been taken, all sorts of technology is now being developed for this applications. And I'm really, really excited to think also about some of these infrastructure changes, for example, growing out Paramedicine and thinking about, you know, paramedical, services, upskilling, paramedics, upskilling of EMTs, even, you know, thinking about lay public, through high school, college courses, to get many more people to be able to do a lot more in the home to save a life and, and maintain their loved ones help. So, lots of really great stuff going on, but just a couple of applications.

Jennifer Berryman
So, I mean, I think as a consumer, or certainly as a patient, all of us want to really better understand the potential upside of artificial intelligent digital medicine. And also, we really want to understand what the red flags are. What do we need to be aware of, or skeptical of, frankly. So, I'm going to ask you both to answer two questions. First, what is the highest and best potential of AI? I think you've given some powerful examples Dr. Marya, but also what are the risks? What worries you? Is it moving too quickly to you? So why don't we start with Dr. Marya and then Dr. McManus, I'd like you to answer the same questions.

Neil Marya
Yeah, I think you know, from my space, what I'm really interested in, in terms of what's the highest of highs is, you know, there are a lot of models that we're generating using expert annotations, we're, you know, just to give another example, we have a cytologic AI where, basically, we've taken brushing samples of the bile duct

and we've taken these cells, and we're having Experts cite a pathologist at Mayo Clinic, basically label each and every slide and say, Do they think the B cells look like cancer or not, and recruiting an AI from their expertise, and what's really cool about that is that you can now apply that to a brushing sample in rural Idaho in somewhere in a different part of the world, and you're taking the expertise that was otherwise localized in one particular place, and now you can apply it everywhere. And I think that's what's really cool. In some ways, I see that as a way to make it more equitable care that patients can receive anywhere, they can get the same expert, sort of consultation from a sighted pathologist at Mayo Clinic, if they're not in Rochester, Minnesota. And I think that's potentially where I can see it being really cool from a predictive analytics standpoint. But in terms of the question about what I'm worried about, it's the same thing I was kind of worried about with the COVID research that was coming out originally. And a lot of these peer reviewed journals were publishing some questionable study. And I'd seen that I review a lot of AI articles that publish these sorts of higher up journals. And I think AI has moved pretty quickly. In the academic space, there are a lot of journals that don't have reviewers that are trained in AI methods. And we're seeing a lot of these articles get published, but they don't pass the smell test when you really take a good look at the methodology, and you think about how are these data sets are actually created? There are claims about what this AI can actually do? Did they really use a test set that can truly live up to those claims? And I'm sorry to say a lot of times I read things I'm like, no, this is not this is not what they're saying. And I think that's something to be really aware of as a consumer, is that unfortunately, just because something gets published in a peer reviewed journal does not necessarily mean It's gold standard that it, it truly lives up to that standard, I think there's a lot more that we need to do as scientists to ensure that the AI that is making it into the marketplace has gone through rigorous study, rigorous analysis to ensure that it is able to be replicated and that it can be applied safely in the marketplace. And just to give you an example of that, there is a commercially available skin cancer AI in Europe, where basically, you take a picture of a mole, and it will tell you, oh, is this cancer or not. And there was this really interesting study in *JAMA Dermatology,* where they took a picture of a benign mole on the cell phone, the AI said, oh, this is not cancer, then they took a picture of the same mole, and then they drew surgical markings around it. And then they took a picture of it. And now the AI says it is 100 percent cancer. And they took a picture of the same mole without surgical markings and just zoomed in on it. And now it looks really big. And that AI says again, yeah, this is 100 percent cancer. And that's just another example of, and that one's commercially available. Right? I just think that it's super exciting. I'm really excited about all the work that we're all doing here at UMass. I think that we have to be better. On an academic standpoint, we have to expect better amongst our colleagues that and I think otherwise, it we're going to generate a lot of models that aren't going to do well and in the wild, and it's going to be this mistrust among the public.

Jennifer Berryman
Dr. McManus, what would you add to that?

David McManus
Well, Dr. Marya made some really important points. I'll start then with the fears. And to be frank, I think Dr. Marya cited insider problem with AI. He cited a problem with the medical community and its level of expertise. And in reviewing the weaknesses of certain AI models, and appropriately flagging the ones that perform poorly and emphasizing the ones that perform well. And yes, in the research space, there's a lot of a lot going on right now. There are relatively few applications in the in the health care setting, in relation to other industries in

relation to what's going on in research. And so, my answer to your first question, are we moving too fast, we're moving too slow. The pace of technological change is way more rapid than the pace of political, social, business, change, and certainly health care change, which has been rooted in really practice patterns that go back 100 years. And I would say the next five years of medicine will see more change than we saw in the prior 100 years. And where my greatest fear, like Dr. Marya is, is that we will not develop the ethical frameworks, governance frameworks, the necessary application and monitoring that's required to ensure that AI models, not just even if you accept that a model performs well, on an initial data set, and then you validated on your dataset, you have to come back again, to revisit how it's performing. Because there can be something called drift that can introduce bias and cause all sorts of problems. Because again, it's learning. It's moving constantly. And, you know, our models, like the IRB model that we use in the medical school to ensure review of science is built on a certain paradigm of review of the initial proposal, periodic updates about safety, but it's not really designed for AI review. And I would just say we're vulnerable because we have not moved as quickly as I would like to really dedicate sufficient energy to ensure that AI models are governed and monitored. Well, that being said, the flip of that is, if we allow restrictive policies politics, unfortunately enter into this frequently lobbying group saying certain job types need to be protected or physician groups saying you know, AI is taking our jobs. And the reality is those really prevent the application of AI where it's desperately needed to reduce cost, improve access, reduce inequities. And I think we really need to balance this risk by doing exactly what Dr. Marya said, showing the public that we're fully committed to actually saying no, that AI algorithm is not good. But when we find one that is really doing a good job to ensure that it's safe. And I think if we if we move with the idea that we have to maintain the trust of our patients and our research participants always at the forefront, that AI will be a very powerful net sum game for us in the end.

Jennifer Berryman
Right? Well, that's a pretty bold prediction that we're going to see more change in the next five years than we have in the last century. Let's get one final word about Dr. Marya. I'll ask you for your prediction. When you look in your crystal ball, maybe for the next decade when it comes to AI? In health care? What do you say?

Neil Marya
Yeah, you know, in my space, I see probably in the next 10 to 15 years that many of our endoscopic procedures will have an onboard AI system to help either detect or diagnose malignancy. There's already an example of that being used here at UMass. There's a device called Gi Genius, which is being applied over at Eastern Avenue. If you ever have a colonoscopy done at Eastern Avenue, there's going to be an onboard AI system that's actually going to be helping point out polyps to endorse Kapus during their colonoscopy to make sure that all the polyps are removed. And I think that's the first iteration of endoscopic AI platform. And my prediction is probably in the next five to 10 years. Amongst all the different procedures that we do, I imagine there'll be at least one onboard AI system for the majority of those. So, I think it's coming. My hope, though, is that we can make the systems better because I can tell you, the GI Genius platform, it's great, but it could definitely use some tweaks.

Jennifer Berryman
It's got a good name, Gi Genius. And Dr. Neil Marya and Dr. David McManus a really fascinating, timely conversation. I really thank you for making time to share your insights with us.

David McManus
Thanks for the invitation.

Neil Marya
Thanks so much.

Jennifer Berryman
And to our listeners. If you like the Voices of UMass Chan, please subscribe wherever you get your podcasts this year. You can find all of our episodes on the UMass Chan YouTube channel as well. If you prefer to listen there. Thank you for taking the time to listen. I'm Jennifer Berryman, vice chancellor for communications here at UMass Chan.

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Voices over artist

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