AI in Neurology: What Tools Are Emerging?

Dr. Lisk:

Recent developments in AI technology have shown to aid with disease diagnosis, risk stratification, and treatment response in the field of neurology. So what are the newest AI applications? And what is to come in the future?

Welcome to *NeuroFrontiers* on ReachMD. I'm Dr. Jerome Lisk. And joining me to talk about recent applications of artificial intelligence in neurology is Dr. Mark Mintz, Chief Medical Officer and Founder of NeurAbilities Healthcare. He also presented a session on this topic at the 2022 American Academy of Neurology Annual Meeting.

Dr. Mintz, welcome to the program.

Dr. Mintz:

Thank you very much for having me.

Dr. Lisk:

All right. So, Dr. Mintz, can you start by first explaining what artificial intelligence is to our audience and how it is being used in neurology?

Dr. Mintz:

The issue is can you take what we know about human intelligence and then either train or teach a machine or a computer program to mimic that and have, if you will, almost their own independent ability to function in a way that humans do and the way we neurologically process and come up with conclusions. So in the area of artificial intelligence, it really is the science and engineering of making intelligent machines and computer programs. The way it's being utilized right now in healthcare in neurology is mostly, if you will, augmented intelligence. That's what happens to us very commonly with electronic health records. It's the assistance to the physician with a computer rather than trying to compare a computer to what an MD can do, what a physician could do, so it's more rules-based-type systems like electronic health records.

Artificial intelligence gets a little bit deeper into this concept.   First, there's the sort of basic umbrella of artificial intelligence, which would include if/then type of rules that we see with electronic records and clinical decision support and then it can go on to a little bit deeper area where machines of different types could have different algorithms that can then go one step further. So can a machine be taught to read a neuroradiological study? Yes. I mean, that's happening now and it does happen very well. And this is called the lock function where the algorithm doesn't change, but then can you change the algorithm so it's more adaptive so that a machine can then change behavior over time just like a physician would over time as we learn more and get more experience. And this might be somewhat analogous to smart sensor devices that we have that can predict seizures rather than just something that's very fixed and might provide neurostimulation. It can now really sense something and be more predictable.

And then that goes into even farther types of issues of AI that are called neural networks where they become even more predictive, getting different data inputs and trying to figure out and predict what might happen in terms of a disease course or onset. And then one step further is this so-called deep learning. These are neural network models with many different variables and predictive outcomes features, and this might actually get to the point where you could develop systems where they can perceive maybe what the human eye

can perceive in the same way.

Dr. Lisk:
Are there any specific specialties that you're seeing AI use as having the biggest impact? And how is it disrupting healthcare?

Dr. Mintz:
AI is very much in its infancy. I would almost consider it like a fetus in the sense that this has a great promise going forward and also some extreme challenges going forward, but right now being mostly used for diagnosis and treatment, helping with patient engagement and adherence, especially with remote monitoring and getting all that information and data to help physicians make decisions. It's going to be very useful in a lot of the repetitive work that physicians do that often lead to fatigue and burnout, you know, interface and communications with, payers in terms of pre-authorizations and authorizations, trying to do work at off hours where you're more fatigued, which can increase the chance for human error, and again, machines can do this without fatigue and they could do it 24/7. In the area of radiology, it's been extremely disruptive as it's been found that certain AI programs, particularly sort of the more deep-learning machine-learning type programs, are very good and equivalent if not better at times in actually reading the sort of pixels of an x-ray. Now the question then comes in clinical interpretation and translating that information to something clinically useful.

In the field of genomics, AI and bioinformatics in general have been explosive and necessary. There's just no possible way that we'll be able to interpret very complex genetic studies like whole genome sequencing without the use of bioinformatic aids to explore different variants in the literature and in silico analyses to see if the variant is pathologic or not pathologic, and this is very complex without having this type of technology.

Dr. Lisk:
For those just tuning in, you're listening to NeuroFrontiers on ReachMD. I'm Dr. Jerome Lisk and I'm speaking with Dr. Mark Mintz about recent artificial intelligence applications in neurology. So are there existing challenges with AI applications in clinical practice?

Dr. Mintz:
Trying to gain trust in AI I think is a big challenge. So these deep-learning algorithms are not something that a physician can answer a patient's question about "Well, why should I trust that AI decision or outcome?" because you can't really explain the algorithm to them. It's very complex. So how do we gain trust in what the AI is reporting is real? Like any computer issue, if the inputted data is not very accurate, then, of course, the conclusions are not going to be very accurate, so the quality of AI is only as good as the inputted data or the quality of the algorithm. With AI, there's going to be a lot of privacy issues. How do you protect all this information going through so many different systems all out in the cloud? Another big challenge I think for physicians in particular is going to be the question that nobody's really answered yet: who is legally liable for the decisions of an AI program? Are you the physician responsible if there's an error in the AI program or their report is not accurate? And I think the other big challenge going forward is a lot of the AI programs and technology in general is being developed more from the payer, provider, pharma side and not getting a lot of input from patients and families into what their needs are because that could change the algorithm design

And one of the biggest challenges I also think for not just neurology but medicine in general is the next generation of physicians. How is this going to impact their medical training, medical education, and also how they choose specialty professions?

Dr. Lisk:
What else do you see in the future for AI? And will physicians be able to direct it towards patient care rather than towards payers just kind of being able to make more profit?

Dr. Mintz:
The next step I think is going to be very important for physicians who will be using AI to alleviate us of a lot of the tasks and chores that we find very tedious and help to contribute to burnout. You know, these pre-authorizations interfaces with the payers and pharmacies and even with the, you know, patients doing a lot of mundane tasks.

A lot of people call this the fourth industrial revolution where you're getting blurring of boundaries and integration of the physical world, the digital world, and now the biological world. As all that comes together, it's this sort of internet of things where everything is connected and you get immense amount of data, and to make sense of this data, you're going to need machine-learning. Robotics will interface with this as well. 3D printing and all these very advanced computing techniques, quantum computing, and all types of aspects of genetic engineering, this is all going to have impact on the way we practice medicine going forward.

Some people are aware of the brain-machine interfaces that people like Elon Musk are doing with their company Neuralink trying to actually use the brain to operate a machine directly without the interface of your limbs and everything else—very useful, and people who have brain injuries and paralysis and other issues like that—but also brain-brain interfaces. I mean, direct brain-brain interfaces might be an interesting concept. It sounds like science fiction, but with the use of AI, it should become a reality at some point. And that will be important also in the field of neurology for people who require that type of approach who can't communicate by other means.

I think overall the future is bright. It's very exciting.

Dr. Lisk:
Well, there are certainly some exciting and emerging innovations happening in the field of neurology. And I want to thank my guest, Dr. Mark Mintz, for a great discussion. Dr. Mintz, it was a pleasure speaking with you today.

Dr. Mintz:
Thank you very much for having me.

Dr. Lisk:
For ReachMD, I'm Dr. Jerome Lisk. To access this and other episodes in our series, visit ReachMD.com/NeuroFrontiers where you can Be Part of the Knowledge. Thanks for listening.