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The Future of Multiple Sclerosis Patient Care: Personalized Medicine Through Digital Health

Announcer Introduction:
You're listening to ReachMD. This medical industry feature, titled "The Future of Multiple Sclerosis Patient Care: Personalized Medicine Through Digital Health" is sponsored by Biogen, pioneers in neuroscience. Here's your host, Dr. Charles Turck.

Dr. Turck:
Technology's advancing exponentially, and this has been more evident than ever in the field of medicine. In fact, biotech and pharmaceutical companies are bringing biology and technology together to better meet patient needs across a range of specialties, and that's why today we're going to talk about some new research and initiatives in digital health that are working towards a future of more personalized medicine for patients with multiple sclerosis, or MS.

This is ReachMD, and I'm Dr. Charles Turck. Joining me to discuss this important topic is Dr. Shibeshih Belachew, who is the Head of Science at Biogen Digital Health, which is a global digital innovation unit at Biogen that aspires to transform patients' lives through personalized digital medicine. Dr. Belachew, thanks for being here today.

Dr. Belachew:
Thank you. This is a real pleasure to be with you today.

Dr. Turck:
So before we dive into digital health initiatives, Dr. Belachew, can you provide some background on the status quo in MS care?

Dr. Belachew:
Sure. You know, the grand approach to evidence-based medicine in MS largely relies on average treatment effects and subgroup analyses, which are limited when it comes to enabling the precise prediction of treatment effect at an individual level, and both of these approaches at the end are coupled with measures that don't cover the full parts of MS-driven impairment.

Additionally, conventional measurement of MS in clinical studies or in clinical practice are episodic – about once every 6 or 12 months – and so it does not provide the comprehensive temporal day-to-day view of the disease's impact on the patient.

And then, the last thing that I'd like to point out is that, as we know, MS is a highly complex and heterogenous disease. It is complex over time and over space, as is the human brain, and, you know, MS actually starts with an M, which stands for multiple, which means multifocal, meaning MS can nearly hit the central nervous system anywhere in multiple foci, so that further complicates our ability to understand the patient prognosis. For instance, two individuals with near identical demographics or disease duration can have very different disease presentation and treatment response because spatial distribution of the disease may be radically different, which illustrates the need for comprehensive precision phenotyping and monitoring to better select the right treatment and assess treatment response in each person.

Dr. Turck:
With that background in mind, how is Biogen Digital Health leveraging technology to address some of these issues?

Dr. Belachew:
In collaboration with partners, our research at Biogen Digital Health is focused on using technology to advance analytical methodology and disease phenotyping. Let's focus on the first.

The research we do in analytical methodology aims to drive the field forward in the direction of advanced methods and precision

medicine models that would provide the better estimate of the individual patient response to treatment and ultimately support truly personalized medicine. Such an effort is in part enabled by the MS PATHS network for Multiple Sclerosis Partners Advancing Technology and Health Solution, which is a collaboration between Biogen and nine leading MS centers that uses advanced technology to curate longitudinal and multi-modal patient data during routine clinical visits. This MS PATHS network allows us to generate research-grade data at real-world scale to unlock novel insights on MS disease and therapies.

For example, we recently presented analyses using real-world data from 1600 patients in the MS PATHS network at the 2022 Congress of the European Committee for Treatment and Research in Multiple Sclerosis, the so-called ECTRIMS conference, where researchers were able to replicate findings from previously published two-stage precision medicine models originally applied to clinical trials but then providing here a proof of concept that this precision medicine methodology can be used with real-world data of MS PATHS, and so offering a pathway to use these models one day for potentially predicting and choosing specific treatments in actual practice based on an individual's presentation of the disease.

Dr. Turck:
For those just tuning in, you're listening to ReachMD. I'm Dr. Charles Turck, and today I'm speaking with Dr. Shibeshih Belachew about digital health innovations in the care of patients with multiple sclerosis, or MS for short.

So, Dr. Belachew, earlier you explained some of the analytical methodology research that Biogen Digital Health has been working on. So, can you now elaborate on the disease phenotyping piece of that research?

Dr. Belachew:
Of course. So, when we talk about advancing precision phenotyping using digital health technologies, we're focused on understanding and measuring more precisely the characteristics of how MS uniquely presents in each patient because every single patient has a unique phenotype, and we look at that as falling into two categories.

The first is imaging and radiomics. In MS, I used to say the image of the brain is the closest you can get to the pathological tools of the disease, as tissue biopsies are generally not available. Advancements in computer vision techniques of image analysis and the use of machine learning enable the extraction of information from magnetic resonance image of the brain – so-called MRI scans – that exceeds human eye capabilities. This means potentially enabling a more detailed characterization of an individual's disease and improved prognosis, and so our research is exploring the ability to augment the information that can be derived from conventional MRI scans by using machine learning and deep learning, also called artificial intelligence.

For example, through a partnership with TheraPanacea, we're working to leverage machine learning and artificial intelligence analysis to develop digital health solution, and in this case, this means trained mathematical algorithms that will process the image of the brain from each voxel to generate an output that will improve patient care or that could potentially accelerate product development and further the understanding of the underlying pathology of neurological disease, such as MS but also Alzheimer's or Parkinson disease.

A second category for precision phenotyping is about digital measurement of the disease using sensor-based tools. The exponential advancements of sensor technology enable the collection of large amounts of digital measurements that can capture motor and cognitive function and their actual impairment that can also be self-acquired by patients in the ecological settings of their own daily life. This holds the promise of creating an augmented data reality that could enable us to build a higher resolution map of each patient's disease, which may lead to a more comprehensive capture of their disability experience, and when compared to conventional in-clinic tools, this approach could provide a potentially more objective and more sensitive measurement of motor and cognitive function and their change over time, which is of critical interest – for instance, in clinical trials where you have to detect a treatment effect on very small changes in the disease status because progression is slow and subtle in clinical trials because clinical trials only span across a relatively short time of 1 or 2 years, while some of those diseases may evolve over decades.

Dr. Turck:
And what kind of tools are you currently using – or might ultimately use – to offer that more comprehensive measurement of MS disease activity?

Dr. Belachew:
So, currently we are developing a smartphone sensor-based digital platform that enables the individuals with MS to quantitatively self-assess their own neurological impairment or disability. It has potential applications for clinical research, as I said, but also for real-world use, although it's currently only being used in limited research settings.

Dr. Turck:
Now, we're almost out of time for today, Dr. Belachew, so before we close, what are some key takeaways from our discussion that you'd like to highlight?

Dr. Belachew:
So, I think it's important to keep in mind that organizations like Biogen Digital Health are working to realize a different future of healthcare – a future where multidimensional data may be leveraged not only to better characterize and monitor MS disease progression but also to precisely predict therapy response at an individual level, something which currently today is impossible, and we do that because personalized treatment is critical as we look to advance the future of care in neurological disorders that are uniquely heterogenous and complex, and, after all, every patient has a unique disease and a unique treatment journey and experience, and we are at a place technologically where a one-size-fits-all approach to treatment should no longer be the reality we aim for if we care about optimizing better outcomes for people living with devastating diseases that can ultimately alter who they are and how they function and behave.

Dr. Turck:
That's a great way for us to round out our discussion on the future of patient care for those living with multiple sclerosis, and I want to thank my guest, Dr. Shibeshih Belachew, for helping us better understand these key considerations. Dr. Belachew, it was great speaking with you today.

Dr. Belachew:
Thank you. My pleasure.

ReachMD Announcer:
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