ADVANCING PATHS TO PRECISION BRAIN HEALTH

Announcer 00:00

Please welcome the panel on advancing paths to precision brain health, moderated by Cara Altamis, managing director of Milken Institute Philanthropy.

Cara Altimus 00:22

Okay, welcome to the last hours of Global Conference. We are within the final, final couple of sessions, and so extra great to see such a good crowd today. Before we get started, let's do some raise of hands. Who in the audience has a family member with a brain-based disorder? We are speakers. And who in the audience has been a primary caregiver? And, yup, who here maybe is dedicated their lives or time to innovating for brain-based illnesses? I love this, okay. How about invested in technologies or the space of brain-based illness? Good, we've got some investors in the room. So we've got people that are deeply committed to making brain health better. Thank you. Thank you. I'm Cara Altimus. I'm managing director of Milken Institute SPARC program, and I'm joined by a really amazing set of panelists that are going to be with us today to think about, what does holistic precision brain health look like? Before we dive in, I want to kind of set the stage a little bit. What are we talking about when we talk about precision brain health? What? What is that vision? I was struck when I first arrived in the building. I got here Saturday morning, and it was quiet, very quiet, and I wandered down and I had lunch, and no one was down there, except for a gentleman who was responsible for production of all of this. He is responsible for making us look like we're on television. And he watches all the panels, and when I told him who I was, he was like, oh, you know about the brain. I got some noise. And over the course of an hour and a half, I heard about many members of his family. And we talked about depression, we talked about suicide, we talked about two family, two parents that had Parkinson's of totally different manifestations, one very movement-based and one with a bunch more dementia. And what was striking was that those journeys, none were alike. All were in the same family, and they were as much about care and what happens at home, as they were about the medical experience, but they were both parts, and so I want to now challenge us to think about what happens in cancer. You go to the doctor with symptoms something is wrong, and typically, imaging is the first moment that somebody has an awareness that there is a tumor or a manifestation of cancer. See if it's me. [Background microphone feedback] From the imaging, there is blood-based work. There is removal of, Oh, they've turned it off. Okay. [Microphone switch] So starting at this is my left. At my left, I'm joined by Sandra Abrevaya, who is the co-founder and CEO of Synapticure, and they are providing transformational support for patients and caregivers through access to specialized neurologists. Next, we have Erin Angel, who is the vice president of research and scientific affairs at GE. You might not know this, but you're going to learn about it, they are critical for providing the imaging technology necessary for brain imaging and other components. And then we have Mark Frey, Dr. Mark Frey, a psychiatrist at Mayo Clinic in Rochester. He's the scientific chair of Breakthrough Discoveries for thriving with Bipolar Disorder, often called BD squared. Mark and his team at Mayo have also established a biobank for bipolar and works in genomics. We'll hear from Mark about what does this look like in the clinic. And finally, Richard Lui who's joining us. He is a correspondent on MSNBC, am I getting this right? NBC, yeah. Thank you. And here we go, and NBC News, and is joining us as he has been working to elevate what does it mean to be a caregiver of a loved one with dementia. Okay. Thank you panelists. So Mark, I'm gonna actually start with you. I gave a little bit of what does this look like in cancer, but I think it'd be really useful. You sit on the other side. Many of us show up in a clinic with a loved one, or we are the loved one, but you are looking at individuals and trying to help them without necessarily the tools in place. What do you have? What does that look like? How do you think about it?

Mark Frye 06:07

So as a psychiatrist, and I think the way Cara has presented this is doubly painful, is I—is we really recognize what we don't have when we are trying to best serve the patients that are putting their trust in our care and our institutions. When I think about the example Cara gave, I don't have an imaging study that I would use routinely to stage an illness. How far someone into their life with schizophrenia, what is the parameter of their brain function that might suggest responding to one treatment versus another for depression, that is absent. What I do have is certainly earnest intent and an established set of criteria that we've used for decades based on [inaudible] logic work or what we know about, kind of how mental illnesses evolve over time, and we use those criteria to make a diagnosis, and then we think about potential treatment strategies. And again, in comparison to tumor biology in a specific cancer chemotherapeutic treatment, I don't have that. I can be a good steward and really think about the types of symptoms that might be present in someone who's struggling with depression, which is my day job. I can be very aware of new treatments, gold standard treatments, where we need to be thinking about different strategies. But the profile of how Cara introduced this discussion and this panel today, that's what we need, that's what we want. That's what we don't have. Lots of pieces are coming together in really wonderful ways. And BD squared, it's a great example of that. Great opportunities to think about functional imaging and genomic medicine in major—in major mental illnesses and brain health. But, the practice you described, I do not have and desperately want.

Cara Altimus 08:25

We're going to talk more about how we get there. But before, Sandra, you are an incredibly unlikely innovator, and yet working across actual biomedical innovation and the caregiving experience. Can you share with us how you've found yourself here, and what are you hoping to land on?

Sandra Abrevaya 08:47

Well, I have a background in government, federal government and politics, and I worked on the House side, the Senate side, in the Obama White House, and my husband and I actually met on the Obama away campaign, and we've always made a good working pair, and we ended up finding ourselves in this line of work when we were diagnosed with ALS when we were 37 years old, and at the time, had a two-year-old. And it was the day we came home from the hospital with our second daughter, and my husband has no family history of ALS, which 90 percent of people who get diagnosed don't either. He just had weakness in his left hand. He was having trouble gripping a pen. He was actually serving as an AUSA to the Gang and Violent Crimes Division in Chicago. So I thought, Well, I mean, of course, you're tired, of course, you know you have some fatigue in your left hand. And he just went to this routine appointment and came home and said that I've been told that I likely have ALS, and also that I likely have six months to live. You know, we had our whole lives in front of us, and it obviously came crashing down. And after, you know, we dealt with that, we picked ourselves back up, and we said, You know what we are, people who have spent our life in public service and in finding meaning, in having an impact. And so that's what we're going to do. And so we know how to have an impact in government, and we put ourselves to work, initially in the advocacy space, and we have mobilized a patient and caregiver community to increase federal funding for ALS research by over $1 billion now, and we have, [pause for applause] and we've also written legislation that President Biden signed into law to get patients access to therapies after phase two trials, because ALS patients number one are, by and large, excluded from clinical trials and two, you know, they're not going to be alive to wait for the phase three to be completed. So we created a real funding mechanism for an expanded access program through an NIH grant program. So anyway, that was our back story. And then we said, oh my gosh, we spent so much time helping get drugs approved, and lo and behold, the care infrastructure is not there. People can't get an appointment with a neurologist. So what does it matter? If we have new therapies that's just going to become in the first 10 years of new therapies in neuro it's going to become privileged to be able to get access to those drugs and we said, That's not acceptable, and so we set up a medical practice. It's called Synapticure. That's where I sit today. It's where I focus the lion's share of my effort. And essentially, we provide access to top subspecialty neurologists in Alzheimer's, ALS, Parkinson's, in the neuro sector, within two weeks, and we give you genetic testing, and we help you get the imaging done where you need to get it done, and we're available in all 50 states. And we are democratizing care, because as these new the promise of neuro feels like it's here like it was in oncology 20 years ago. But if we don't create this care infrastructure, only the privileged few will have access. And so we are democratizing that care absolutely [applause].

Mark Frye 12:20

Outstanding.

Cara Altimus 12:24

And to be able to be in all 50 states just shows how, how democratized that is. Erin you work in effectively making imaging available now. What does that do for brain health today. Start with today.

Erin Angel 12:45

Can I just go from today to the future?

Cara Altimus 12:48

I can't stop you while we're on stage together.

Erin Angel 12:51

Okay, so today, medical imaging is across the world. I mean, we do business in 160 countries, and you're going to find medical imaging devices in most, if not all of those, in brain we're usually talking about MRI or PET, those are like two of the big, you know, giant donuts of destiny, the things you go in for imaging, if you will. And so that's kind of like where we're at today, where I think that we need to go in the future is definitely a focus on advanced imaging for earlier biomarkers for disease, as well as blood-based and fluid-based biomarkers, and kind of AI pulling all that together. So just to kind of maybe, like bring that into context if we think about ALS and if we think about FTD, which, if that doesn't sound familiar to you, is somewhat similar to ALS in some ways, except for has cognitive decline as well. Bruce Willis probably the most famous individual you would know with that disease. If you look at these two diseases, there's sort of a continuum between them. There's some patients that are 100 percent ALS, some that are a little bit that are 100 percent FTD, and then between them, this kind of continuum of cases. And why is that? Because today we diagnose disease clinically, right? We say, like, once this patient has symptoms, then we can diagnose their disease. And the problem with that is, most major diseases today are a death sentence, right? So if you look at the like, $9.8 billion that are put into health care globally, most of that is like delaying that death sentence and not necessarily at the best quality of life. So if we can get earlier biomarkers and advanced imaging to see that disease before it actually develops into disease, to see risk of disease, and can find interventions earlier, that's where the future of medical imaging is really focused.

Cara Altimus 14:40

Awesome. I have a lot of follow-up questions. We're going to come back to that. Before we get there, Richard, you have spoken and worked to elevate what it is like to be a caregiver and what it means to have a family member with Alzheimer's. If you could share for the audience a little bit about what the early days were. What were—what was that interaction with getting a diagnosis and learning what to do?

Richard Lui 15:08

Thank you for the work you're doing and trying to raise awareness about precision brain health, because it's the opposite experience as was brought up by Sandra as well as Erin and Mark. And for me, I had the experience of the exact opposite of what precision might be. And I know I'm not alone in this room. For those of you who've raised your hands. For me, when my dad was diagnosed, and he gave me that call and he said, you know, I finally went into the neurologist. They do say that I'm at the beginning of my journey with Alzheimer's. First of all, I was glad that my dad did decide to do that. Number two, I was like, okay, so what are we going to do? And for me, being a news anchor working eight days a week, when I say often and 25 hours a day, you know, my bosses used to call me at any time to be there for a story. That meant saying goodbye to that, because I wanted to be there for him.

He would do it for me, too. And as we went through that journey of going into the big donut, meeting with the neurologist, and not being able to understand anything that was really precise was, I think, on the narrative side, what brought me to the on the caregiving side, me being part of that caregiving dyad, that care pair. Well, what is I going to do to bring precision to his journey, which was one of 100 million, and my journey too, as a caregiver, like, How could there be 100 million of us here? And I, we have zero precision on my narrative amount to go through with my dad. And that began the journey of two documentaries. First off, in a space with, I mean, who wants to raise your hand if you want to see a caregiving documentary, right? That's not what I mean when you're thinking about what you want to see. That's not on your list, typically, but sharing that journey of what people were going through in a precise way, what was happening as you and your husband were caring for each other, right? What is that like? And so when we talk about precision brain health, that is just one part of that precision, isn't it? Because that's the usage case question and answer to when we get farther down into the donut. What does that mean at home? What does that mean in that those micro, atomic experiences that all of us have gone through in our care journeys? That's what brought me to it, and what has completely changed my career journey, which we can talk about later, in terms of how I want to bring precision to this space.

Cara Altimus 17:34

Well, okay, I was gonna make you answer the next question first. Anyways, as we think about the the gap between, what are we experiencing today? What happens to many people? What led to Synapticure being necessary, not enough people that are able to diagnose all the way through? We don't have the depth of tool and we don't know how to match individuals with treatments. But now think about in your shoes. You're helping another person, someone you love deeply, navigate care and diagnosis and all of the next steps. If you're to think about what does that, if you can change it and say, what are the scientific questions or pieces that you want answered? What, when you walked out, or when your father walked out and he called you, what would have been helpful to hear or know? Just totally imagining.

Richard Lui 18:41

Well, I'm very much action-based, putting on my business hat is I want to know what the next steps you are that you have to take, and how do you get to that outcomes. What would be the outcomes? And as you know, we lived through a period not too long ago where we didn't want to diagnose like it was. You know, you're in the beginning of the journey. Stephen, go home. Good luck. Basically, what is fantastic is, you know, I do believe Cara and you're the expert in this space, but as an outsider looking in, we really have a lot of vectors that are coming together in society, where this is a good time. It really is amazing, where we're bringing emotional health and physical health together when it comes to brain health, when you and I were together at Davos, and you were leading this conversation at the brain house, it was the beehive of energy when it came to health care. It was really something that was a new discovery. And so what I do think, which has been the gap in the last 10 years, that we are in a little bit of a nice collection of vectors that says, hey, we can do something with this right now, that when I started filming, you know, eight years ago, for the first documentary, completely different space. And now, as I begin filming for my third documentary, a totally different opportunity. And if this is why I kind of like the venue that we're in. We're coming out into the sunlight, aren't we?

Cara Altimus 20:04

We sure are.

Richard Lui 20:06

And it's, it's not fully, not fully right. So next year, when we gather, we're going to be out in the garden fully, right. Better put on your shirts and T shirts. So the gap that you you're asking about, I think we're at a good time where we can make some moves, not perfect, I'd say perfect, but at a good time, because the vectors seem like they're coming together in a way they haven't before.

Cara Altimus 20:30

Let's talk more about that. I'm going to jump to Mark. Mark, you lead, you're scientific director of BD squared. You're focused on bipolar in that initiative and that years of planning to start to bring a much more biological understanding to bipolar what has it taken to bring a community together to take a more biological perspective?

Mark Frye 21:02

This has been an incredible journey. And I think if I was to try to think of the different types of stakeholders that really needed to come together and, importantly stay together, I think first and foremost, we have benefited so tremendously from philanthropy. I want—it would be important to know that in this space, bipolar disorder, what was formally referred to as manic depressive illness, has consistently been underfunded of all the major mental illnesses and addictions. And I think that has come at a cost where we simply just don't have the number of regulatory approved treatments that we should, we don't have the neurobiological understanding of the illness that we should. And I think philanthropically, a group of people who clearly were living this gap said, this is fundamentally needs to change, and not in small steps. This has been a transformative endeavor, and I think that, for me, really highlights that the likelihood of this being successful and truly facilitating bipolar individuals to thrive will happen. So that's a necessary first step, but the composition of our teams has been incredibly inspiring and rewarding. There are people like myself, busy clinicians, clinical researchers. I see patients every day, and I see all the gaps in what I am unable to understand, what I am unable to provide for patients, and how oftentimes, sort of working in a thick fog storm I am with regards to treatments. So we need people like myself who understand where the problems are, where the gaps are, what would success look like. And to emphasize the dyad, the person right alongside of me is an individual living with bipolar disorder who regularly reminds me what's important to you is not necessarily important to me, and we need both of these outcome measures working together in real time in a very wonderful, nurturing way. Clinicians, individuals with lived experience, we need the scientists, and Cara had referenced the biological base of BD squared. What's incredible here never done before is we will harness the power of genomic medicine, harness the power of functional imaging, and really start to understand biological risk factors of the illness in a way that we've just not had at our disposal before, but in a way, every cancer doctor does and start to really think about that neuroscience really informing practice—scientists, clinicians, individuals with lived experience. We need statisticians, computational biologists, information technologists that can really harness all the AI tools that are going to be at our disposal and we take all of this and put it into a learning health network, which is an opportunity to generate new knowledge and to use Richard's term "new vectors of knowledge" that we never would have put together before but now we have the technology to do so and make sure that the new knowledge is reinvested back into individuals so that they thrive and reinvest it back into the practice where we can really say this discovery has changed the way we think about the illness, and this is the new practice model. Here's how it's helpful, and here's how we create an opportunity to get it scaled, get it covered and have access. How much time do we have? You see the clock.

Cara Altimus 25:18

So bringing that to what do we do in this space? You're bringing science to people and clinicians and families today. Even as we continue to expand that science, I want to carry that idea to what's happening at GE. I'll betray myself and say, once I was a scientist in the lab, and I would have told you, GE makes machines, and we use them and we innovate on them. And what I've learned from Erin is that's a very naive view, and that GE is also thinking about innovation and how to expand what's possible. From your vantage point, how are you guys using AI to then continue to update what's possible and what do those collaborative models look like?

Erin Angel 26:09

Great question. So if you think about care today, we do for the most part what I would call episodic care. So what's that mean? It means like a patient comes in and they go to a specialist and they get a result, and then they go to another specialist and/or their primary care, and they get another result. And if they're lucky, at least those individuals are putting their medical data into an electronic medical record. If you're not familiar, that'd be like My Chart, if that sounds familiar. And if they're lucky, those physicians or caregivers have the same EMR, so that at least that information is getting carried across for that patient, but this is still just recording of different episodes of care, and there's a couple big challenges with that. One, think about the inpatient. So that's like a patient in the hospital, they're getting their vitals taken several times a day, and every time one of those vital signs is checked, guess what happens? The machine eats it, in other words, like it doesn't get directly input into that patient's account unless a human physically inputs it into that patient's record, right? And so human error, of course, and in addition, how many of those are actually getting recorded, and how relevant is it for the disease process anyway? Okay, so work with me here for a minute. Imagine we are all brain surgeons, and we're brain surgeons in oncology, brain cancer, right? And imagine you're going maybe into or actually, literally in a brain surgery. What do you want to know? I mean, ideally, you want every caregiver that knows anything about that patient from birth till now with like, a perfect memory, and you want them in the room with you while you're planning for the surgery and at the surgery, but that's not what happens today, obviously, for very practical reasons, all they have is the information that is recorded. In fact, I often hear it's a lot like doing a biopsy on data just to figure out the right information for the person within health care that needs that information. So imagine a world where we can use foundation-based modeling and agentic AI to solve for this, so that each persona within a given health-care system has access to the information they need, both because there's sort of an Internet of Things of any systems collecting data across health care, and also because those are input into a space where AI can help bring the right information to the right individuals without giving them excess data to health care for that patient. So that's what we envision as a future of health care. But if I can, there's one really big problem with that, please. And the big problem with that is the way that we're doing it today is too slow. It doesn't meet the need. So the reason for that is the health-care institutions own the patient data, just so you know. And the companies that are developing technologies need that data in order to develop the AI, in order to develop the decision support, or whatever they're going to develop to help this care right. And the way that us, industry companies are buying that data today is literally for a given study or for a given development, buying it from a health-care system. They anonymize the patient data so that it can't be identified, and they sell it to the company, and then they start to develop a project. This approach is way too slow. It's way too cumbersome, and it doesn't achieve the main goal. So if we think about like, where we need to go to really change the game faster it would be to develop a way to get access to care, sorry, access to data that can help us innovate technologies that are faster and fairer and developed in a much smarter way for how we care for humans.

Mark Frye 29:32

Cara, could I give the clinical translation of that, which I absolutely agree it is a must, and it's not moving quickly enough. One of my mentors would often say, you know, Mark, with all the precision brain health mechanisms, biomarkers, information technology, a patient's going to walk into the clinic, and there are going to be 400,000 data points of theirs that are at your disposal as a clinician. That sounds rather daunting, and what you're really describing is the importance of how that AI algorithm can take those 400,000 data points and based on the presenting symptoms, the review of the record in a trajectory model sort of way, find the 200 points that are probably the most important for that episode of care. And so this sounds like an incredible way to personalize precision health when with so much power at its at its side. And I think with Sandra and Richard, there's another piece of this. If the clinician's in the office and they can't find those 200 data points, and they keep looking and there's 90 mouse clicks, there's a fatigue that's getting generated by the clinician and a frustration that is getting generated by the care provider, this is the way to solve this problem in a faster way. So completely agree, Erin.

Cara Altimus 31:03

And a lot of times that data that it's taking an AI agent or 90 clicks or sifting through 400,000 might even feel intuitive to a caregiver as they have experienced it. And so to bring this back to the people that are with that are caregiving and experiencing daily or are themselves navigating this disease and trying to then navigate the health-care system to describe their experience, you guys are innovating in a caregiver-led way. What does that mean?

Sandra Abrevaya 31:45

Yeah, well, I think for these neurodegenerative diseases, it's important to acknowledge that the caregiver is often the customer of the care, right? So if anybody here has a family who's lived with Alzheimer's or related dementia, you know the cognitive impairment puts you as loved one in the driver's seat in terms of their care. For my husband, thank God he's alive seven years later, but he is paralyzed. He can't even move his fingers, he can't speak. I am the customer for his care, and so it's really important to create a care model that serves the caregiver. And one of the key burdens that I felt on me as a caregiver, and is directly related to the need for precision medicine in this field, is that, you know, last night, I was at a dinner, sitting next to somebody who said, Oh yeah, my brother was told he had this rare cancer when he was a freshman in college. He also went to University of Michigan, like you, and he's given six months to live. And I was like, Oh my God, what happened? And he's like, Oh, he's great. He's got three kids, they're great. And I was like, what happened? He's like, Well, he got into this clinical trial because they really looked closely at his data, and they figured out the one trial in the country that was happening, that could be his bet to save his life. And I'm telling you, when you go in with ALS or Parkinson's or Alzheimer's, that is not the kind of care we get. The kind of care we get is, I don't know, maybe you should do some research. My mother is in industry, she's the head of diagnostics at Abbott Molecular, thank goodness. My mother attended every international ALS conference, and my family leaned in to look for the best clinical trial for my husband. Why? Why is that on the caregiver? We need a different version of care where the onus is on the clinician. And yes, to your point, we need AI to make that, you know, collating and synthesis of the material and the data easier, so you don't fatigue the clinician, because a clinician has to be available for the number one thing, which is to provide a personalized care plan for the patient. Do not tell a patient, why don't you enroll in my clinical trial? Because I'm convenient and you can drive here in 30 minutes. No way. These are terminal illnesses. We want to know where in the world we fly to have our shot to survive.

Cara Altimus 34:09

Absolutely. [applause] I want to talk about accessibility, which this has a lot to do with so there's accessibility for knowledge. There's accessibility for who's able to go where there's accessibility issues around, what do we have paid for? So let's start right here. What? How are you guys thinking about? You've talked about clinics in 50 states. We've talked about understanding what clinical trial landscape looks like no matter where it is. How are, how are you bringing accessibility to the forefront for real people and as many as possible?

Sandra Abrevaya 34:48

Yeah, absolutely. I mean, my husband, three years ago, four years ago, was able to attend conferences, and we went to JPMorgan Chase, and we said we're going to start a neurodegenerative disease care company. And people were like, I don't know, it's not a top five issue. It's not cardio, you know. And I was like, oh my god, can something other than a GLP get attention, you know? Or just it was really tough, and we couldn't break through. But another big stigma and stereotype around neuro is like, oh gosh, Alzheimer's. ALS, man, that is tough. You can't do that stuff virtually. That is crazy hard. Those are the worst diseases, and I am telling you, from a caregiver and patient standpoint, that is the kind of care you need. You need it in your home. You cannot travel. You become physically disabled. You become cognitively disabled when you do a diagnostic test for Alzheimer's, like a [inaudible] and you take someone out of your home setting, you disorient them. I have heard story after story of Alzheimer's patient freaking out. I've heard stories about an Alzheimer's patient trying to jump out of a moving car because they thought that they were about to be committed, when, in fact, they were just being taken to the clinic for their diagnostic test. Well, you can imagine they get to the diagnostic test and they're totally out of their normal state. So I am here to tell you that the research backs that getting diagnosed in your home setting for Alzheimer's is advantageous. Getting cared for in your home setting is advantageous. And we're a virtual care provider. We have physicians licensed in all 50 states, and we are reaching people who never get access to care because they live in rural areas, because they can't afford to fly to MGH and UCSF, and frankly, they don't know somebody to get in.

Richard Lui 36:29

Hey, Cara, please just on the caregiving that you brought up, as well as data itself, and we've talked about institutional data buckets, and that is right now where it all sits. I'm working on a project with the University of Michigan [inaudible] on something we're calling the care genome. And the opportunity that you brought up, doctor, is that we can really look at on a multi-omic level that we haven't been able to do before, right? And that is amazing, right? Because we're actually open to that idea that we can look at all these different levels of what is the base of what we are doing in care now, if the big bucket right now in data, and because we're talking about AI always goes back to the data you have, there's certainly some opportunities to go micro with small language models in hospitals, right since they're kind of be it's pretty expensive to do this, I mean, to buy the data that you know. And you know that in the capital markets right now, the play for capital is not in the LLMs, it's in the data. We're going to go buy data, right, and how much you're going to pay for it. So I think if we think micro first, and we think of being good agents, because always I was that agent that had to go in and speak and give that narrative, that resume of who my dad is and was my job, and agentic is a great application and a micro level for these small groups. So how do we develop models that they can take in simply, so we don't have to deal with the debt, because I know we want to get to a macro solution that would be ideal, better good, right? But we have to start somewhere. That is one conversation. But the real opportunity, I believe in AI and data is a lot what Jensen Huang said yesterday from Nvidia, when he was sitting with Mike, and he said, you know, look for not only the problems that you haven't attacked before, but think of the solutions that you never thought you could potentially attack and make happen. I believe the Big Data grab is what you were saying, Sandra, and that's outside in home, we are focusing on in home health tremendously, because we know it's good for the family. It's good on cost. That's what care genome. And this project we're looking at is what is the atomic-level data that happens at home in care, the conversation you just brought up, what's important to your to the dyad is going to be different for the two that are involved in that space. I think that's an opportunity for true precision brain health.

Cara Altimus 38:53

And I know when I go to a physician, I present differently than I do when I'm sitting in my dining room.

Richard Lui 38:59

We can always look good for that time for the dinner, right, right.

Cara Altimus 39:06

Right, right. Taking this a step more practical, when we think about going into the big donut, or even getting to a health center that has one—they are expensive, many of those buildings are gigantic, it is hard to know the right person to be able to walk through the front door to enter those buildings. What does this? How do we make imaging, or any of these technologies that we're talking about, so that we can, at a much more physical level, understand brain illnesses? How do we make that available for all? If I flip it and say, for oncology, breast cancer, every town has a place to get a mammogram, and it's no big deal. And now we have been able to make that preventative, what does the future look like to make it not a big donut maybe?

Erin Angel 40:06

Let me take that one. Okay, so tough question. First of all, access to medical imaging, particularly in the US, is pretty good, right? Like we have, actually, I think of all the countries, the most number of imaging equipment per capita. So if you wanted to get access to a piece of equipment, and you are able to wait in line right now, because what happened, by the way, after COVID, is diseases got a lot more complex, and cases got a lot greater in quantities. So health-care systems are just, there's just crushing workflow burden. So there are ways to get onto equipment, but if you can get onto the equipment, then you can get an MRIs. But a lot of the discussions we're having up here are about really advanced imaging. And so then the question is like, how do you bring really advanced imaging to the whole globe in a way that it's palatable financially? And when we think about that in our research teams at GE and I'm sure in other companies, we think a lot about like, what can we do with our existing install base? So we have over 4 million pieces of equipment, over 160 countries, right? So what can we do that is a software upgrade, and it don't think that's a bad thing. I'll work with me for a moment the software upgrade that really can impact our ability to diagnose and I'll give you an example. A couple of years ago, we developed an MRI solution on our existing—that could be applied to our existing install base that reduced scan times by as much as 50 percent. So now imagine you're in a rural region in any country in the world, and that scanner got upgraded to that time savings, the time to scan that patient of up to 50 percent, and you were on a seven-month wait list. Imagine what that means for you into getting access to that care. And we were able to offer that in a way that it was an upgrade approach, a sustainable upgrade approach, as opposed to, well, we made something, so go rip out that whole system and buy a new one. So really thinking about innovation in a way that it's scalable and sustainable for access to care.

Cara Altimus 40:32

Makes a lot of sense. I want to talk about cost of anything in the neuro space, and I realize that this is something that we all experience and probably have a lot of ideas about. Mark, can you talk a little bit about how coverage insurance coverage plays a role in psychiatry and how people experience care over the long term?

Mark Frye 42:31

So I think this is a complicated question about care models and reimbursement, and I think it's important to emphasize that for every part of the conversation we're now having, there is just as many patients, if not more, who have made a decision not to go to care or are unable to get care, and I think that really speaks to the disparity access piece that I feel we're positioning to look at quite convincingly as we go forward. But the good news is there has been a lot of effort with biotech companies and pharmaceutical companies to really design and develop important FDA-approved treatments. These tend to be very expensive while they are on patent, and it is any number of years, typically 15 to 16, before they go generic and are less expensive. The challenge where this gets magnified is if we have someone really struggling with difficult-to-treat symptoms of depression or bipolar disorder, they've generally failed the conventional treatments, and that is why they're looking for new paradigms and new treatment opportunities. So right away, the newest treatments, which really could be life-saving for many who have failed, the existing treatments may be off limits from a standpoint of cost. There are programs that can provide some support for the short term, but, but this, this has to be addressed in a way to really close gaps and difficult-to-treat situations. I think, I think the other piece is if we can show that there is more benefit than just having symptom reduction, I think this is where partners and family members can be so critical. If we show that it's not just about having a 50 percent reduction in symptoms, or getting to the point where you are no longer symptomatic of your psychosis, but your quality of life has improved. You are back at work. You are participating in your kids' schools events. You can't put a cost on that, but if we start to really highlight that. The benefit goes beyond the budget accounts of the hospital or the clinic that I think might turn this around. So really bringing in the holistic outcome measures that might change this conversation or equation with insurance reimbursement.

Cara Altimus 45:18

It's like holistic data, holistic storytelling, so that we're able to, oh, Sandra more—

Sandra Abrevaya 45:25

Yeah, I just have a in addition to addressing the care costs, we need to address the caregiving costs. And so, you know, it's not great to navigate out-of-pocket for a care visit or a new therapy. That's expensive, but at least there's something for caregiving. There's nothing we're starting from nothing. Caregivers, family caregivers, either have to quit their jobs and become the full-time caregiver for their loved one, or they have to find a way to pull together enough resources to pay for paid caregiving. And my husband has a team of caregivers that cycle through and I spend $400,000 out of pocket—0, 0, is covered by Medicare, by commercial payers, nothing. How in the world? I hate it when people say, You know what? People need to be more financially prepared for those situations. Unbelievable. Nobody. Nobody is financially prepared for half a million dollars cash out of pocket annually. How can we expect this of people? So I am seeing CMS do something bold and beautiful. The CMMI Guide program is a dementia-focused program that is reimbursing for respite care for dementia families. Thank goodness for that. And you know why? Because they're making a bet that they're going to see savings. And I would love to see a payer, a commercial payer, take that jump, because when you take care of the caregiver, first of all, the caregivers, health outcomes are going to be better when you take care of the caregiver, the patient is going to have fewer hospitalizations. When you take care of the caregiver, you are going to delay the transition to long-term care facilities. All of these provide savings, and I would love to see a payer stand up and get in the game.

Richard Lui 47:26

And that's the thing. Cara, we don't have the data on the space, as you were saying. And how can we—So CMS is kind of going out on a diving board here a little bit, without having the micro data that they would need to and that's why we see the long-term care insurance space almost disappear in the last decade, because it's a lack of the data they need to know that certain disease paths, I can probably get back into that market, but I don't have enough data to know that those three disease paths probably make sense for me to offer product, A, B, or C. And so the caregiver cost, which you're bringing up so well, Sandra, is something we need to dig in clearly and because it is part of better outcomes. And you know, one of the things we can't measure, but we probably would to your point as well, Mark, is, how often does a care pair laugh, and what's the data around that laugh? And how do we replicate that? Like, when do you and your husband laugh? Right? What are the environments at that time? Like, I think about when I laugh, when I care for my mother now, who also has dementia and Alzheimer's and some Parkinsonianisms. Like, my goal is to make her laugh, because I laugh too, because that's the better outcome, isn't it? It is, it is. And those are the things like, if we really get down to the basics of that care pair and good outcomes, that's not only good physiologically, it's good emotionally, and that's hopeful, and that's also getting down to the precision that I know you want to get to.

Cara Altimus 48:56

Right? And what you guys are highlighting is that we cannot create precision anything in a vacuum. That the precision health future that we want to get to involves making sure that we're taking novel data into account and thinking about, how do we bring that in, that we're bringing the whole—the whole house experience, the whole family experience, into what kinds of solutions must come into this.

Mark Frye 49:27

You can see where this starts to get really complicated, if I just add really quickly, but it's a must do. And I think Sandra's presenting the road map. The problem is so often it's a hospital that has their own budget, and they look at that, it's the pharmacy that has their own budget. And they look at that. What you're really describing, and CMS is making the bet, and I think they're right, is we're gonna look at the entire cost of providing care for this individual, which involves three other people. They have their own electronic health records. It involves care at the hospital, care at the pharmacy, nursing home services. None of those data sets exist in the way that they need to really get this to happen. But that's that whole concept of vectors of data we never would have put together before, and we have to now.

Cara Altimus 50:14

But last I checked, it was 2025, and my telephone can tell me how old my daughter is, so like we have the technology to do it, we have to choose to do it.

Richard Lui 50:28

And we also have the culture right now.

Cara Altimus 50:29

That's right.

Richard Lui 50:31

All of us are ready to share our journeys in a level that maybe 10 years ago, we didn't have enough information, and therefore culturally would go, no way. Am I going to share what I'm going through, because what are they going to do with it? I'm not saying it's perfect, but I think we're on the other side of that point where I would say, Yeah, I want to share what I'm going through with my mom, and you can put the sensors in my home to so I can help somebody else. And that's really important, isn't it, because when we you were talking about earlier in terms of data costs and privacy and who owns it, and these are all relevant, but I think we're at a space of actually, maybe we forget those data sets for a moment. What if we go out and get the data we don't have, because that's cheaper, and we have the right relationship culture right now to go and harvest it.

Cara Altimus 51:19

I'd say, Let's get them both and bring them together.

Richard Lui 51:21

Yes.

Cara Altimus 51:22

Okay, we are really close to time, and I've got questions on this iPad, and I know that the Institute is telling me I need to do these two. I we have one person in the audience that asked about timing and how to think about the timing of care and diagnosis, and if there is specific value and there is a specific diagnosis mentioned, but I think this is worth asking across the board, from perspective of the panel, how much does it matter that you have a diagnosis as soon as possible for long-term outcomes, anyone [inaudible] please.

Sandra Abrevaya 52:06

So I can give an example in ALS, specifically, of an individual who wanted genetic testing, who didn't have family history of ALS, but said, You know what? I just there's a therapy, Biogen has got a clinical trial. It's called tofersen, like, if I have sod one and I could qualify, like, I need to get tested, and the clinic wouldn't give her the genetic testing. And then I had another friend, went to a better clinic. The clinic immediately got him genetic testing. He was sod one positive. He got into the Biogen trial. She then went, my friend in the first place to like, a second clinic, a third clinic. Finally, she got genetic testing. Yes, she was sod one positive. It was too late to get into the Biogen trial. My friend who got in lived five times longer than any member of his family who had ALS and he played sports with his kids, and yes, he did pass away, but he had an incredible quality of life for a very long period of time. And my other friend who didn't get the genetic testing missed the window to get into the clinical trial, and she's in her 30s, and she's totally paralyzed, and she has a terrible quality of life, and she's at end of life, and it is literally, in some cases, getting the testing and getting diagnosed quickly is the difference between life and death.

Erin Angel 53:31

Ditto, Sandra, when you tell that story, what I think about is, is platform trials, and I'll explain myself in a moment, but like, there's a better way to serve these patients who want to be in trials, and this model of single company with a therapy doing a research study, and patient tried to get into that research study, and then maybe that doesn't work, and they try to get into another research study. It's not an ideal model for economics, nor for the patients. A more ideal model that I have no idea why it took us so long to figure this out, it started in breast cancer with the I-SPY study. I think somebody might correct me and say there was an earlier one. But the concept is this, there's a control arm, right? You know, the controls are like the normals of subjects, and then you've got your subjects that are going through different treatment arms. So rather than like one drug or one therapy or one approach, there's a bunch of different companies and or treatment arms that are considered so that patient with the right genetic profile may start in one arm, but if it's not working for them, they have the opportunity to move to another arm, which is really great for the data, because now you can see how different patients and phenotypes perform under different treatments. And for great for the patient, because they only have to at least get into that first trial in order to have access to all these therapy options.

Richard Lui 54:44

You know, in my reporting, I remember conversations from about seven years ago when I was starting to say I gotta report on this as well, you know. And so I would go on to Today show and talk about this during November, you know, as you know, as family caregiver, caregiving month, and the number of scientists that would say, Yeah, I've done something in Alzheimer's. This is old, Richard, but just there's no demand for it. So we look at market activity as an indicator today then, because now that we do have some solutions on the pharma side, even though not perfect, it is excited the start-up space. So I'm a supporter of two moonshots, the Alzheimer's moonshot, as well as the caregiving moonshot. And we had sessions in the last two months where all of these founders would sit around and say, this is what we're we're pitching, and what we're doing, and the majority of what they're doing in the Alzheimer's and caregiving space diagnostic, because now they that, that we have some solutions, as you know, which are very imperfect, as you know, not not perfect. Here it's enough to say, hey, there's market demand. Because my dad, there was no test. There was a test, but the neurologist said, we're not going to give it to you, because there's nothing we can do now that there is something on the other end. Although not perfect, it is exciting the market to say we're now going to start to invest in this space, and diagnostics is like eight out of the 10 start-ups and the founders and what they're doing. So if timing is the question people are saying, earlier, earlier, earlier, and we're not saying anything that everybody doesn't know.

Sandra Abrevaya 56:21

Yeah, but Alzheimer's is actually a little ahead of the game in diagnostics, and that you actually can measure the protein that leads to Alzheimer's. A lot of these neuro issues are proteins in ALS and FTD. Those proteins are not yet measurable. So it's not an example of perfect, but example of good and a little bit closer to where we can measure that, and—[inaudible]

Richard Lui 56:42

The market wants to go earlier. So that's good, because before, as you know, the market was saying, we're not even going to bother.

Sandra Abrevaya 56:47

Right.

Mark Frye 56:49

Knowledge is power, right? It's the uncertainty that's so anxiety provoking. Having a diagnosis, you have a decision of what you will do, can do, won't do well.

Sandra Abrevaya 57:00

And then now, you know, people say, Oh, my family member died of ALS or Alzheimer's, and they have this gene, right? That predisposes them. I don't even want to know if I have the gene, but now—

Mark Frye 57:13

Right.

Sandra Abrevaya 57:13

The answer is, we might be able to do something about it. There's an ALS drug that is being offered to patients pre-symptomatic, who have the gene so like, not only do we need to know when you're symptomatic, but we might be able to help you avoid this in the first place, which is especially powerful.

Cara Altimus 57:32

This gets us—we are wrapping in the final minutes, and I want to end on a, what do we go do? And what we're talking about across the board is, how do we drive more innovation? How do we make what the innovation we have more accessible? And I've heard from all of you now is the time we have a lot of things that have come together, and when we look at the conversations and the rest of the conference, we've also heard a lot around a change in how science is funded, and some of the priorities. So as we kind of make a call to all. Everyone here that is an innovator, an investor, a policymaker, or an advocate, because we all are what is needed for the innovation to make it home? We're start at the end, Richard, and work our way down.

Richard Lui 58:23

You know, I would say, look for this in spaces you didn't think it existed. For instance, I was during a discussion this morning that Sandra was on my examples in consumer banking and financial services, where might you be able to help in this idea of developing a precision, complimentary solution for a family going through this and my example was, you wouldn't necessarily think in consumer banking there would be something, but what if you were to take 10 or 12 of the products you already have that you've already have, the risk models built in, but you tailored it towards Sandra or myself and what we're going through, because certainly, we've had financial discussions related to the care arc, and you, if you got a little more precise about what we're going through, we probably would have engaged into that product set, and you would have, in the end, helped us and helped yourself, because we would stay with you forever. So think of where we can be precise, in spaces. Maybe you wouldn't think it's there, and that's the opening we have right now because of these vectors coming together.

Cara Altimus 59:36

That's right, everyone plays a role. Mark?

Mark Frye 59:39

Same comment about vectors and go to spaces that make you feel uncomfortable. I think that's where you learn that you have to be thinking about things differently, functioning differently. And I think as BD squared would really exemplify there is no doubt that a single institution or a research or their group, is going to make amazing contributions to science. I am very clear, in my opinion, that if we're going to be talking about transformative science that really impacts the way people live, that is not going to be an investigator, that is not going to be a university, this has to be a consortium of really talented, different people working together.

Erin Angel 1:00:24

So I will say that it's interesting, because if we're really truthful about where a lot of this innovation comes from, some of it is from companies. Some of it is from philanthropy, but most of it is from US government dollars, other governments as well. But by far and above the largest investor in medical innovation is the US government, and we're seeing that change right now. And if you take all the emotion and all the political leaning out of it and just kind of like approach it like a mathematician and say, like, what's happening here? What's happening here is, after World War II, the US decided to become a leader in US innovation, right? It was a conscious decision. And so they introduced the grant program, and it was sort of like this contract between the US government and these academic institutions, saying, you do the research, we will fund the research, and we will fund the infrastructure. And they did achieve that goal, undeniably. I mean, the US is undeniably the leader in medical innovation globally because of that model, and also it influenced the reputation of many of those academic institutions. So there's a sort of inflow of trainees in the medical space to learn in the US and gain from that education model. So recently to just kind of, I see the clock, I'll be fast. Recently, we see a change in the approach from the US administration again, take emotion out of it. Their approach is, this is not working for us. So there's something about that model that is not working for the US government. And the question we need to be asking is, is it that the US government does not want to be a leader in medical innovation anymore, or is it that the US government does want to be a leader in medical innovation but thinks the model needs to be changed? And that's a really important question, because if they do not want to be in innovation anymore, then we will see that innovation move to other countries, and there's a real delay in regrowing that infrastructure that we've grown over the last so many years, until that kind of gets to the level of innovation ecosystem that we have in the US today. So that kind of regrowth we'll have to kind of wait for if that's the model, and if it's not that, if it's that the US does want to remain a leader in medical innovation, then we're all at the edge of our seats, kind of finding out what's that new model look like, and how can we scientists support. And I would encourage us all to be a part of that discussion about what the new model looks like, because I can't imagine that the US does not want to be the best.

Cara Altimus 1:02:41

Sandra, final comments.

Sandra Abrevaya 1:02:43

Yeah, just that, you know, when we were diagnosed, the answer was, sorry, but I can't help you. And I think finally the answer is, hope is coming. The science has really advanced. Brian and I have been at the forefront of a doubling of the number of ALS FDA-approved therapies and two new Alzheimer's therapies. It's not perfect, to Richard's point, but we're seeing the advances, and please see the hope in neuro. Please see that neuro is the next oncology. Please put your energy there, because with focus, attention, and energy, we can turn the corner, and it does feel like the moment.

Cara Altimus 1:03:19

So to wrap us up, I think what we've heard is, do remain an advocate, do remain an investor, and make sure that we're bringing science and caregiving and the whole person experience to the forefront as innovation is moving forward. I want to thank our panelists before we round out [applause] and thank you guys, we made it.