ELLIGO ELITE LEARNING SERIES MONOGRAPH

The History and Future of Using EHR Data in Clinical Research

Roundtable 1: Solve Clinical Trial Enrollment Struggles With Better Utilization of Healthcare Data

Roundtable 2: Beyond the EHR: Clinical Trials in the Age of Abundant Data

Only Elligo accelerates clinical trials by providing direct access to 150M+ known patients with their trusted physicians and research practice management solutions.

The History And Future Of Using EHR Data In Clinical Research

The clinical research industry is buzzing with possibility around the promise electronic health record (EHR) data hold, from using data to accelerate patient enrollment to leveraging data down the care continuum for the benefit of patients, physicians, and sponsors. But where does the industry truly stand when it comes to EHR data? What have we learned from previous forays into the world of EHR and research? What challenges must we overcome to make such possibilities a reality?

Michael Ibara, Pharm.D., Chief Data Officer at Elligo Health Research®, hosted two Elligo Elite Learning Series roundtables with Xtalks focused on answering these questions and more.

The first roundtable, "Solve Clinical Trial Enrollment Struggles With Better Utilization of Healthcare Data," featured industry experts TJ Bowen, Ph.D., Chief Scientific Officer and Co-Founder, Deep Lens; Riley Ennis, Chief Product Officer, Freenome; Jeremy Brody, Head of Global Strategy, Cerner Enviza; and Mitra Rocca, Dipl.-Inform. Med., FAMIA, Senior Medical Informatician, FDA. It began with Mitra providing a detailed background on the FDA's Real-World Evidence Program and its guidance on the use of EHR in supporting new indications for approved drugs and satisfying post-approval study requirements, then moved into a discussion between Riley and TJ on how EHR data can accelerate and diversify clinical trial enrollment, streamline protocol design and implementation, enable precision medicine, and deliver postmarket value. The following section featured Jeremy explaining and expanding on the challenges of using EHR data for research. The roundtable ended with Michael leading the group in a Q&A focusing on actionable solutions and innovative ideas for overcoming EHR data challenges.

In the second roundtable, "Beyond the EHR: Clinical Trials in the Age of Abundant Data," Michael R. Fronstin, Global Head of Clinical Research and Consulting, Cerner Enviza; Doug Lee, Vice President of Operations and Chief Data Officer, Harris Computer; and Seth Hopkins, Ph.D., Executive Director of Translational Medicine, Sunovion Pharmaceuticals Inc. explored what data partnerships can accomplish in the research space. This presentation began with Michael Fronstin explaining the ins and outs of a data-sharing network of healthcare systems and how EHR data gathered from such a network can benefit research. Doug then described how his company solved data-sharing problems to ultimately provide a complete longitudinal view of a patient's healthcare journey, and Seth used the work he did on a psychiatry trial as an example of how EHR data are already enhancing research. Finally, Michael Ibara led the group in a discussion about how data literacy is becoming an essential part of bringing efficiency to research.

Industry Experts

Michael Ibara, Pharm.D.
Chief Data Officer,
Elligo Health Research®

Jeremy Brody
Head of Global Strategy,
Cerner Enviza

TJ Bowen, Ph.D.
Chief Scientific Officer
and Co-Founder, Deep Lens

Mitra Rocca
Dipl.-Inform. Med., FAMIA, Senior
Medical Informatician, FDA

Riley Ennis
Chief Product Officer,
Freenome

Roundtable 1: Solve Clinical Trial Enrollment Struggles With Better Utilization of Healthcare Data

Ayesha Rashid

Good day to everyone joining us and welcome to today's Xtalks roundtable. Today's talk is entitled, "Solve Clinical Trial Enrollment Struggles With Better Utilization of Healthcare Data." My name is Ayesha Rashid, and I will be your XTalks host for today. Today's roundtable will run for approximately 60 minutes. This presentation includes a Q&A session with our speakers. This roundtable is designed to be interactive, and roundtables work best when you're involved. So please feel free to submit questions and comments for our speakers throughout the presentation using the questions chat box, and we will try to attend to your questions during the Q&A session. This chat box is located in the control panel on the right-hand side of your screen. If you require any assistance, please contact me at any time by sending a message using this chat panel. At this time, all participants are in listen-only mode. Please note that this event will be recorded and made available for streaming on Xtalks.com.

At this point, I'd like to thank Elligo, who developed the content for this presentation. Elligo Health Research accelerates clinical trials through healthcare with access to known patients and their HIPAA-compliant healthcare data, IntElligo® Research Stack technology, and hybrid enrollment model, Patient*Select*®. Coupled with the largest known patient access network, Elligo's site solutions enable healthcare practices and research sites to participate in clinical trials. By adaptive engagement of known patients and physicians, Elligo accelerates the development of new pharmaceutical, biotechnology, and medical device and diagnostic products.

Now it's a pleasure for me to introduce our speakers for today's event. Dr. Michael Ibara has more than 20 years of experience in clinical research and development. Throughout his career, Dr. Ibara has sought to improve healthcare by bringing together healthcare data and digital technologies. His interests include regulatory and policy implications for digital healthcare, exploring the factors needed to allow interoperability of healthcare data for all stakeholders involved and implications for the use of big data, machine learning, and natural language processing to improve the ability to perform regulated clinical research. Before joining Elligo, Dr. Ibara was the head of digital healthcare for the clinical data interchange standards consortium (CDISC). There, he led the FDA eSource project and healthcare link efforts with registries clinical trials and mobile health to enable use of real-world data from healthcare for regulated research and decision making. Prior to CDISC, Dr. Ibara was head of business development, coordination, and innovation and also head of pharmacovigilance innovation at Pfizer, where he worked for 15 years in various positions, leading implementations of global systems and large-scale technologies.

Dr. Bowen brings a diverse set of skills to the team. Prior to joining Deep Lens, Dr. Bowen's career spanned from cancer research to software development and strategy and management consulting. His research focused on pathological identification of tumor differentiation in breast cancer is derived from P53 braca one to ATM and other mutations. Following his graduate work, Dr. Bowen worked as a strategy consultant in the biotechnology, pharmaceutical, and medical device space for LTK Consulting, where he helped with M&A strategy and operations for dozens of global organizations. Dr. Bowen has also held operating roles as the General Manager of the world's premium biology and pharmaceutical patent search software at CES. More recently, he was a founding leader of the software innovation team at Fuse by Cardinal Health, where his teams developed innovative products for healthcare providers, pharmaceutical companies, and patients. Dr. Bowen was a Regents Scholar at the University of California San Diego, where he received his doctorate in biomedical sciences and graduated with honors from Pepperdine University with a Bachelor of Science in Biology.

Mitra Rocca joined the Food and Drug Administration in 2009 as the Senior Medical Informatician responsible for developing the health information architecture of the Sentinel system. She serves as the lead for the FDA CDE, our health information technology board focusing on the use of health IT to enhance regulatory decision making. She serves as the lead for the FDA CDER lead to Health LevelSeven, or HL7, responsible for the review of HL7 draft standards. Prior to joining the FDA, a Mitra served as the associate director of Healthcare Informatics at Novartis Pharmaceuticals Corporation, focusing on the reuse of the electronic health record in clinical research. Mitra has served as co-chair of the Health Level 7 clinical interoperability counsel from 2012 to 2018. She holds an advanced degree in Medical Informatics from the University of Heidelberg in Germany.

With the knowledge and skills he gained as a biotechnology entrepreneur, Riley is helping to make Freenome's vision of a cancer-free world a reality. As the company's co-founder and chief product officer, Riley heads the clinical and commercial development of Freenome's non-invasive tests for early cancer detection and treatment selection. A Thiel Fellow, Riley developed a cancer vaccine and founded his first biotech company, Immutacon, while still in high school. While earning his degree in molecular biology at Dartmouth, Riley co-authored several publications and worked as a visiting scientist with Novartis. In addition to his work as a scientist, Riley worked as an analyst at Morgan Stanley and an associate at Bridgewater, where he observed the positive impact of a strong organizational culture firsthand. Riley's previous biotech experience includes work at Foundation Medicine, Cirrus Pharmaceuticals, Adam Mab, and Emergent BioSolutions.

Jeremy Brody is the Head of Global Strategy and a member of the executive committee of Cerner Enviza. Jeremy's primary responsibility is to lead the growth of the business. Areas of particular focus include real-world evidence, advanced big data analytics, clinical research, patient-centric applications, and digital health. Jeremy received a Master of Science and Health Policy and Management from the Harvard University School of Public Health, and a Bachelor's of Science in psychology from New York University. Jeremy is based in Israel and keeps his entrepreneurial spirit alive by interacting with startup companies located in the startup nation's famous silicon Wadi. When not at work, Jeremy enjoys spending time with his wife, six boys, and granddaughter who always keeps things exciting. And now without further ado, I'd like to hand over the mic to Dr. Michael Ibara as well as the panelists. You may begin when ready.

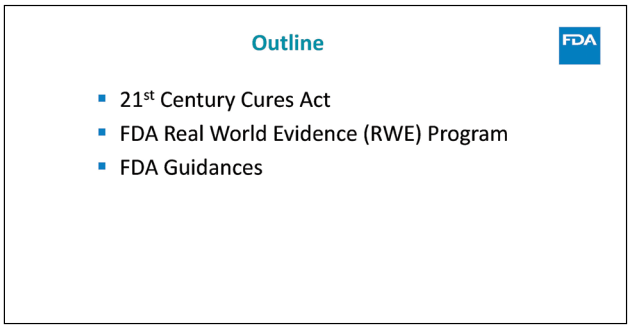
Michael Ibara

Thank you very much, Ayesha, and welcome, everyone, to this roundtable. I'm delighted to be here with several old friends and my colleagues on the panel. And we hope that we can provide an overview for you and then get into some specific discussion. So, the way we'd like to start is, I'll be asking a question of each panelist to get their perspective. And then we'll... we'll open it up for Q&A and for broader discussion.

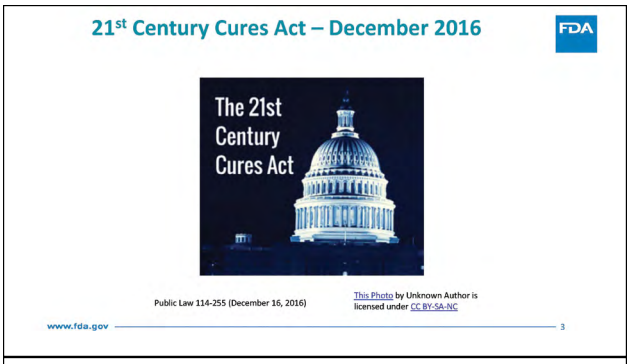
The first question I'd like to direct to you, Mitra, as a representative of FDA. Could you describe for us the regulatory developments that the FDA has pioneered in the use of the electronic healthcare records and how that might impact with real-world data? And I understand that you have some slides that you'll be able to go over with us to give everyone background for that.

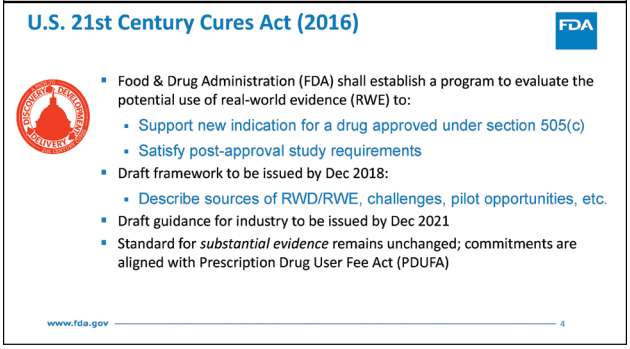
Mitra Rocca

Yes, thank you, Michael. So I'm going to answer your question in the slides that I have prepared. So I'm going to provide an overview to FDA Real-World Evidence Program and answer Michael's question on guidances. So the 21st Century Cures Act mandates

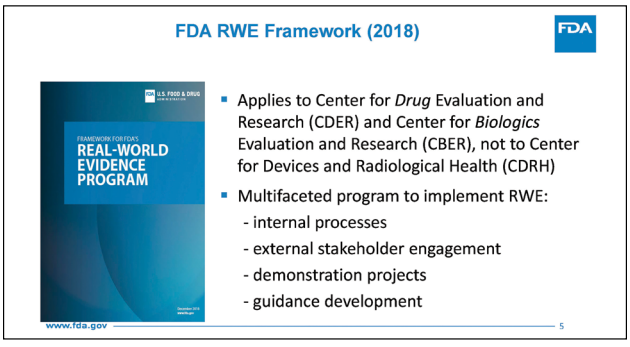


FDA to that. We will establish a program to evaluate the potential use of real-world evidence to support new indication for a drug approved under Section 505. C, and also satisfied post-approval study requirements. FDA will develop a framework by December 2018, and describes the sources of real-world data, real-world evidence challenges, and a series of pilot demonstration projects. We develop a suite of guidances by December 2021. And what is important is that the standard for substantial evidence remains unchanged. So commitments are aligned with PDUFA (Prescription Drug User Fee Act). Next slide please.



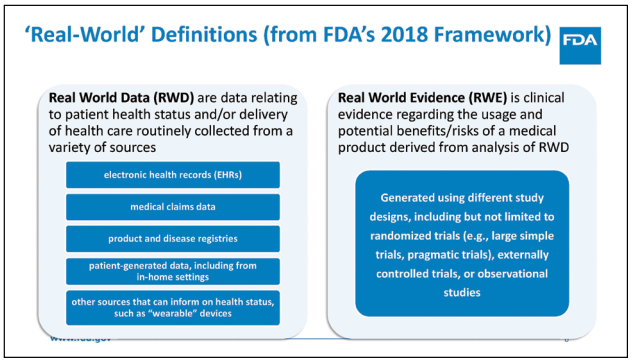


So as I mentioned, one of the requirements of the 21st Century Cures Act is that FDA shall develop a real-world evidence framework, and this framework was published December 2018. And it applies to two centers at FDA: the Center for Drug Evaluation and Research, where I work, and a Center for Biologics Evaluation and Research. See that it does not apply

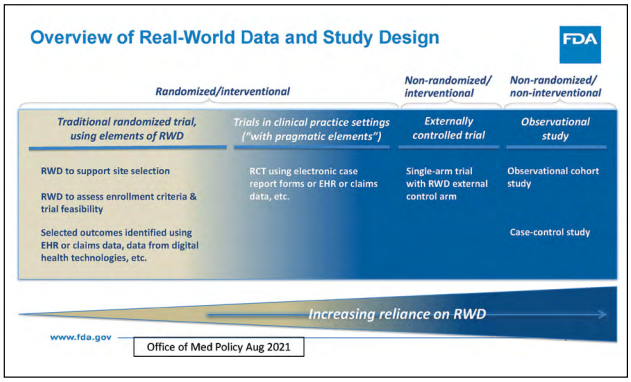


to CRS Center for Devices and Radiological Health. It is a multifaceted program to implement the real-world evidence. It addresses internal processes or how to engage with external stakeholders, a suite of demonstration projects that are in the appendix of

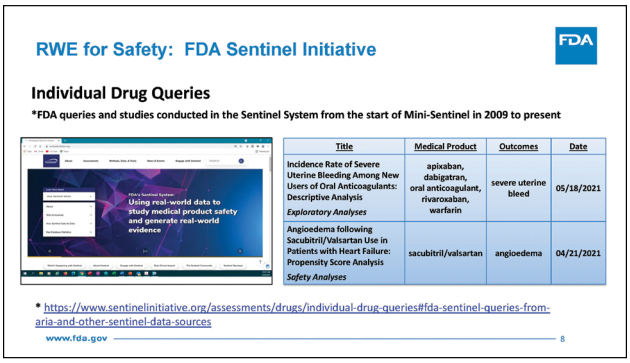
this framework, and a suite of guidances that we have developed and are... they are still in development. Next slide, please.



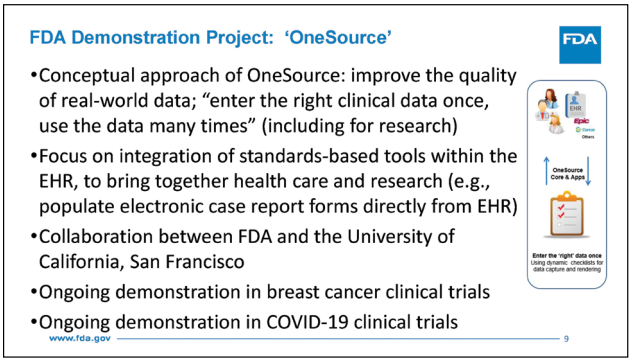
So this framework also explains or defines what is real-world data and real-world evidence. Real-world data is the data related to patient health status. This is data collected at the point of care, and examples of real-world data or electronic health records are administrative claims, product and disease registries, and patient-generated data —for example, the electronic patient-reported data. And then also data from digital health technologies, wearable devices. Real-world evidence is the evidence that is generated from these sources of real-world data. And that will help us with the usage and potential benefits or risk of the products. Next slide, please.



So here you see an overview of real-world data in study design. Real-world data can be used in different types of clinical trials: randomized, interventional, non-randomized interventional, non-randomized, non-interventional. And as you will hear from the other panelists, real-world data can support the site selection.They can help with patient recruitment, enrollment criteria, trial visibility, with selected outcome identifying using EHR claims, and also data from digital health technologies that could be used by patients participating in clinical trial. The real-world data can be used in clinical trial execution. And I have an example of a project that we're leading at FDA, where the electronic case record called or directly auto-populated from electronic health record data and multiple sites, then externally controlled trial, which is a single on trial, where the real-world data is used as external control. And then observational studies variable data can be leveraged both in cohort studies and case-control studies.



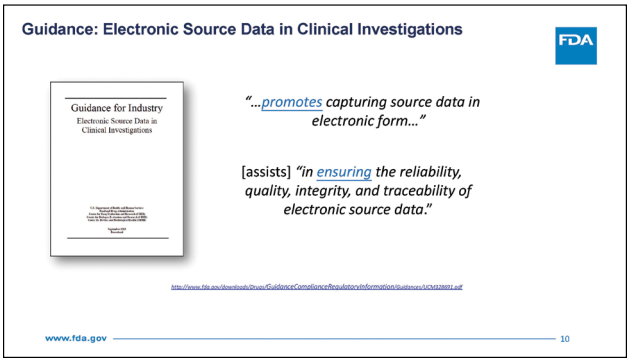
So as you see, there is increasing reliance on real-world data in clinical trials. Next slide, please. So two examples of projects are one focusing on postmarket and one on premarket. This project is the FDA Sentinel Initiative. This is our national system that is focused on postmarket surveillance and looking at safety of medical products. And on the right side in the table, you see two classes of medical product where we use Sentinel and sources of Sentinel system to analyze. Those look at the safety of those classes of medical products. And next slide, please.



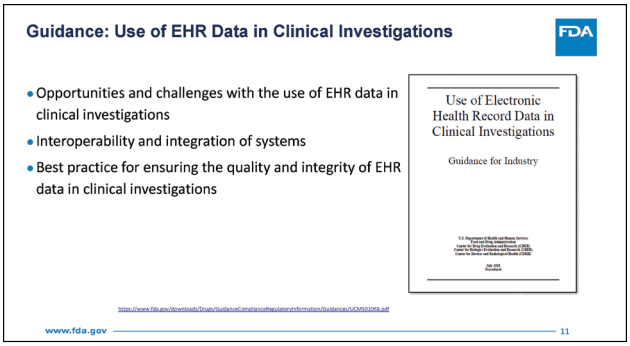
So this is a project that I lead in collaboration with University of California in San Francisco. The project is called OneSource. This is focusing on premarket. And here the goal is to build a case report form directly into the electronic health record system of the University of California, and not only the University of California in San Francisco, but the University of California and also other hospital academic medical centers. And we collaborate with...we leverage electronic health record systems Cerner and Epic, and populate the case report form directly from the electronic health record system, both for a breast cancer trial. These are adaptive trials for breast cancer. And then, when the pandemic started, we also are leveraging the same platform, OneSource for COVID-19 drug, clinical trial not for vaccine, for drugs. And the goal of OneSource is to collect data once and reuse it many times.

So now I'm going to answer my first question about the guidances that we have developed. The OneSource project is a working example of two of the guidances that we published. The first one was published in September of 2013 and is called Electronic Source Data and Clinical Investigation. It is a guidance that promotes capturing source data in electronic form. And with that said, it assists in ensuring the reliability, quality, integrity, and traceability of electronic source data. Next slide, please. The guidance use of electronic health record data and clinical investigation was published July of 2018. And in this guidance, we focus on opportunities and challenges: where the sites, the biopharma industry, the sponsors would like to use electronic health record data and clinical investigation, what are the interoperability challenges, and also integration of healthcare and clinical research systems. And then this guidance provides best practice for ensuring the quality and integrity of EHR data in investigations. Next slide, please.

So as part of the real-world evidence framework, we have published several guidances, and those have been draft guidances. And currently, we are addressing the comments that we have received. The first guidance we published last year was

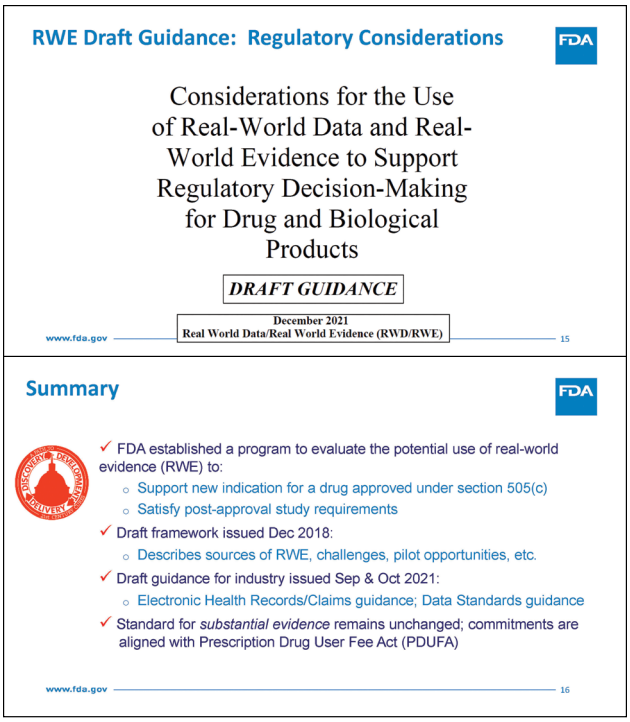


September 2021. This focuses on assessing electronic health records and medical claims data to support regulatory decision making. And this is for drug and biological products, not devices. Next slide, please. A data standard guidance that we published October 2021. This guidance focuses on data standards that are needed for drug and biological product, or when the sufficient use real-world data. And that one that was published, and we are addressing the comments currently.



Next slide, please. Registry data... this is both a disease registry and product registries. And how you can use registry data as a source of real-world data to support regulatory decision making, also for drugs and biological products. This guidance was published November 2021. Next slide. And the last guidance was published last year, and there are still some guidances in development, in regulatory consideration. This was published December 2021. And this is consideration for the use of real-world data and real-world evidence to support regulatory decision making, also focusing on drug and biologic products. Next slide. So in summary, we have established the program to evaluate the potential use of real-world evidence. And we developed the

framework that was published in December 2018. And we have developed a suite of guidances in past fall, and the PDUFA requirements...are the commitments are aligned with the requirements. Next slide. Thank you very much.



Michael Ibara

Thank you very much, Mitra. And I can... I can say as a frequent discussion, as these were being developed, often with you, and as somebody that's working in the space trying to apply some of this... it's, it's a real credit to FDA, I think, to be contemporary with this work and put out these guidances, which are very timely and help us while we're in the midst of trying to figure out how to do it all. So thanks. Thanks very much for that. So we're going to move now to sponsor perspective. And Riley is Co-Founder and... and CEO of Freenome. You're clearly qualified from this point of view, I want to ask you, from a sponsor's point of view, how valuable do you find real-world data or EHR medical records data and the work that you're trying to do or that you want to do? And what are... from your point of view in development, what are some of the greatest challenges in employing it?

Riley Ennis

Absolutely. And I would say that we've all experienced firsthand how COVID has transformed and really accelerated some of the opportunities around real-world data. At the start of the pandemic, we started looking very closely at EMR scheduling. And we saw that colonoscopies, which usually there 1,000s, occurring every week in the United States, went down to around over... I don't know, around 100 per week. And we saw that drop as we were enrolling in our pivotal trial for our Colorex cancer screening tests. We saw very quickly, from a leading indicator, that colonoscopies were going to have a huge backlog and that enrollment into our study would be near impossible.

So we actually had to use real-world data. It became a requirement to monitor and look at how COVID was spiking in different geographies and change your study operations so that not only could we reach people in any ZIP code through more of a virtual trial and incorporate telemedicine and other aspects into our study operations, but we also could help our clinical partners, where we have about 200 clinical sites as part of our pivotal trial. We saw a lot of information from real-world data that helped people really look at referral patterns from screening—some of the challenges and barriers from a health equity perspective that were preventing individuals from getting screened.

So not only did real-world data allow us to find individuals for the study, but it also allowed us to provide value back to our clinical trial partners and provide insights into their active screening programs today. So the value was there. And it created a level of flexibility and adaptability throughout the pandemic and allowed us to publish with a lot of our partners, just showing the opportunity that with real-world data and those insights, we actually could increase enrollment in some of the Black and other communities that were traditionally not well represented in clinical trials. So I'd say that real-world data become a necessity in the pandemic.

But a lot of the work at the FDA and Mitra, especially with your leadership and others across groups like CDRH, as well, we've seen tremendous opportunities to not only help in the clinical study phase, but postmarket, continue delivering value, improving our existing devices, identifying new populations, and really building evidence. But that comes with a lot of challenges. It's not easy. And we found that a lot of the foundational infrastructure...and it sounds like the work that Mitra is doing with UCSF, really speaks to a nice case study where we're missing the ability to handle heterogeneous data. And that infrastructure from a data perspective also requires cybersecurity and a level of privacy, given the trust that any subject and any patient is really giving to us as part of a clinical study.

So we see that there are a lot of opportunities, but still a long journey ahead in building those foundational pieces to ensure that the data is handled well. It's clean and normalized and can be leveraged to really maximize the impact in patients' lives. But I'd say the nuances that with real-world data at the front and center of these clinical studies, it's important that sponsors also give back to the clinical sites. And I think that's something that, you know, we're starting to see more and more. But I would definitely

encourage anyone who's running clinical studies to really think about how can you leverage real-world data to help the patients, help the nurses, help the principal investigators really gain additional value and insights from ongoing studies.

Michael Ibara

That's really interesting. Thank you. Thank you for that perspective, Riley. And as somebody that's waded into it, it's interesting that you can see the promise and it sounds like it's foundational to your development program as well. So thanks for that perspective. So, next question is for you, Jeremy, as somebody who, you know,... Cerner Enviza, one of the EHR vendors, which originally was meant to do a few things is, and now is asked to do a million different things. I'm wondering about your perspective. And specifically, the question is, from the point of view of a company managing the EHR, and generating the real-world data that we're all using, what are the some of the challenges, and also some of the misconceptions for those of us trying to do the research about the use of that data for clinical research?

Jeremy Brody

I'll start with the misconceptions. On the one hand, I think that there are a lot of people out there who feel that real-world data represents just a panacea of opportunity. That it's, you know, available, easy to use, and so forth. And therefore the use cases are never ending. On the other hand, there's a group of people out there who feel the exact opposite: that in fact, only randomized clinical trials can provide any evidence towards, you know, marketing, authorization, and FDA decisions and so forth like that. And I would say both of those, you know, are misconceptions, and both extremes that exist out there. And as with many things in life, the reality is, you know, somewhere in between.

And so where does that somewhere in between take you... take you, it takes you into the real world of real-world data, and in the real world of real-world data, the data are not clean. They're inconsistent. They require validation, there are parts of the data that are better parts of the data that are worse. Sample sizes, you know, vary dramatically from one data set to another, as does the quality. The ability to link those data sets varies from one data set to the next. And so the devil is in the details in terms of being able to go ahead and take what has tremendous potential, has the ability to do all the things that Riley mentioned—very practically to do all the things that Riley mentioned in the great examples that he just gave.

If, in fact, you go ahead, and you spend the appropriate time and effort in order to be able to make those data usable and valuable for these particular use cases. Because in fact, these data were not designed for this purpose. These data existed as part of clinical care, existed for billing purposes, and so forth. They were not created originally for research purposes. Again, tremendous potential for turning them into wonderful research data, but requires significant time and effort in order to in order to be able to do that. And if you're in fact successful, then indeed many of these challenges can be overcome. And the utility of these data is tremendous.

Michael Ibara

That's great. And it's... we really appreciate— all of us who have worked with the data, —appreciate your description of the misconceptions. I often in the past, and sometimes still talk to my colleagues about the fact that the EHR is not a big bucket of

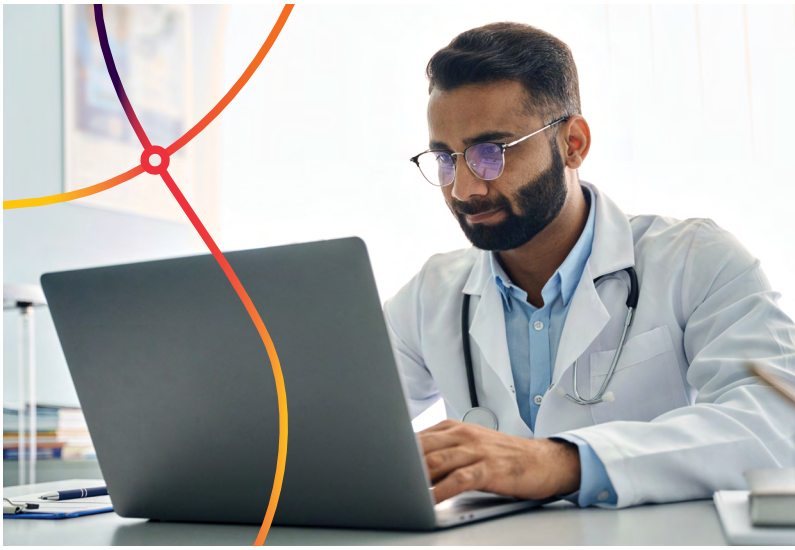
data. And it's usually quite surprising when people who haven't seen it before actually get into it. So your firsthand experience is well received, I think. So. Next panelist is TJ Bowen working at Deep Lens. TJ, in our conversations, you know, we've talked about the fact that you guys are on the front lines, in a sense. So it's... it's very interesting to hear from people doing what we often, a lot of us, talk about or write about, from your perspective. What do you see are the challenges in... in enrolling these patients using real-world data, specifically on oncology? In order to get them into clinical research, both working with the site and with the sponsor?

TJ Bowen

It's an important question. I think following these panelists, you've heard a lot of the reasons why this is challenging. You know, the data is not clean. The data is not consistent. Things like COVID have really impacted the ability to even capture the data. But I think I think it actually starts more fundamentally than that— it starts with the science. You know, over the past 20 or 30 years, the movement to precision medicine has been super important for patients. It's really improved the quality of care they're able to get and the access to those game-changing therapeutics. But that also is increasing the burden on the practitioners because the volume of data required to find patients that qualify for specific treatments is really hard. So, it's great for patients. It's hard for practitioners, which

I think Riley said it almost makes real-world data mandatory that you can't find patients anymore, unless you're leveraging real-world data. Because especially in clinical trials, which is where we focus, you know, the inclusion-exclusion criteria are getting so specific. It's really impossible to just go out and find a patient with breast cancer and find the right trial. You'd have to know so much about their molecular information, their treatment histories. The list goes on and on.

So I think it starts with that, which is where there's challenges. We spent a lot of energy focusing on harmonizing and normalizing the data as well. And as Jeremy said, you know, a lot of these systems are initially billed as billing systems. So if it's not something that gets billed for, there's not a whole lot of emphasis in normalizing the data. So you know, we dive into pathology records, where you start looking at stages in grades of tumors. We focus on oncology, but, you know, it can be applied across the board. And so when you start getting into that, you have to do a lot of things with natural language processing machine learning to really create your own normalization across disparate systems. I think the stats say that almost 50% of new therapeutics have some sort of precision component. And in oncology, it's close to 80%. So it's not... it's not resolving itself, right; it's just the data is continuing to pile up.



So when you're a community practice, that's trying to get the best therapies for your patients and there's this notion of CRACCO, or clinical research as a care option, which is becoming really viable, you really have to be in in control of the real-world data that you have access to it those practices. And historically, it's really only been possible at large academic medical centers. But we all know, as Riley mentioned that, you know, the patients need to be given access to this

stuff where they're treated. You don't get a diverse patient population enrolling in studies unless you go to where those patients are being treated. And so you know, the mission is really to give access to the real-world data that they're collecting, where they are. That's the biggest challenge and something that we're trying to tackle.

Michael Ibara

Thank you very much, TJ. And you're really somebody that's... that's been on the front lines, as you're discussing things, and you pointing to the future, as well. And adding ending my two cents to this discussion, with everything that's been said, I just want to point out to you that, despite the challenges, we're all in the same room now. And that's because after 21st Century Cures and the adoption of the electronic medical record, we do have, whereas our fight used to be to find the data. And we would pay people to get it.

Now we have a tremendous amount of data. And so of course, the focus switches to how best to use it. I would say that I am guilty of this idea— 10 years ago, maybe— thinking that just getting all the data would get us a long way to solving our problem. But as those of you that have been working on interoperability for the last 10 years, now, it didn't. And everything that's been talked about here is evidence of that. And not only from the data point of view, but when you were talking about finding patients for trials, I just want to remind everyone that we're now talking about doing this across sectors. We've got patients in Healthcare that we want to bring into regulated research, which is a different sector with a different business model— different concerns that do overlap. But we also need to do that as per the regulations, which is, again, is a different sector.

And anybody that's been in any of these knows that these are all their own universes. I think I was in a meeting with Dr. Califf before his first-time round, when he said, you know, he, his interest was in bringing together the two universes of healthcare and regulated research. And this is not an easy thing to do, not only because of the technical aspects of it, but because of the cultural differences, literally, in the concerns that have to be met. So in order to go into healthcare, and bring those patients into regulated research, we have to go there to where they live, as TJ, said and bring regulated research infrastructure to them. And it varies tremendously.

When you get outside of academic medical centers, you have sites that are focused on treating their patients, that don't have an informatics group, that barely have a group that manages the EHR, and certainly don't have a data scientist on staff. So that ability to enable them to do that, enable them to provide their data, I think is a key challenge of getting the data that we want in order to find the patients. So this initial discussion is meant from a varying perspective.

What I'd like to do now is just ask an open question to the group. And that is, we're talking about the use of the data that we can generate. Now, it's real-world evidence largely is often from the medical record, the EHR directly. And the challenges there. And we're talking about using that to put patients in clinical trials and some of the challenges there. A slightly provocative question from your point of view or your direct experience: What would you say as a panelist about if you had to give advice to the way that we do that today, that our traditional method of finding patients for trials and where it's coming up against the use of real-world evidence, either specific examples or general recommendations or that thing that really you think we need to fix in order to make it more effective?

So from your point of view, what is it about the way that we enroll patients or the way that we start up clinical trials today, that could be made better in terms of a process that would better allow us to take advantage of the clinical trial data that we're using? Open question for anyone.

TJ Bowen

Yeah, so I think what we see a lot is it's two sided, right? It's all... it's a sponsor issue, and it's a provider issue. So I think sponsors of studies, you know, put a lot of energy into making their clinical trial inclusion-exclusion criteria more uniform. We see them doing things that are really shortcuts for them that don't really help the practitioners, like saying a patient can have had a prior PDL1 therapy.

Well, what they don't think about is that you have a clinical research coordinator, working on the ground that now has to go through and figure out what all of those therapies are, because nothing's recorded as a PDL1 therapy in the EMR. So there's things like that on the sponsor side. I think it would really help a lot if they could sort of harmonize and provide things digitally...would be super helpful, so that...so that as people are trying to use digital solutions, the source is also digital to make that connection easier.

And then I think on the provider side, some of it's a little bit, you know... if we're going to take accountability as technology providers, making the UI better for the physicians, I think a lot of times we see them taking shortcuts. You know, they'll do things in the clinical notes instead of in a field location, just because the application's too challenging or not clear enough on how they need to do that. And that makes it really challenging to find the information you need to really kind of pair that patient with the right study. So I think just from my perspective, there's a couple of things that would be a good starting point.

Michael Ibara

TJ, the first comment you were making about on the sponsor side, are you thinking in terms of at the level of the protocol development. Being able to get that better, so that, because by the time you get to finish protocol, that could be one of the key reasons that you're not finding the patients?

TJ Bowen

Absolutely, yeah, the protocols are... are really challenging. And, you know, they change all the time, which I understand. I mean, they have to modify, update. But when you put very vague terminology into the protocols, somebody else has to interpret that. I think making it as explicit as possible for an end user will help you find those patients that you want to qualify for the study.

Jeremy Brody

Yeah, actually, I was going to make similar points to TJ. But then just one other thing, in addition to add is just that it's critical that the latency of the data, you know, also be as real time as possible. Because often what happens is that you go through that entire effort that TJ just described, and you work through the inclusion-exclusion criteria. You identify the sites. You identify the patients, and then, lo and behold, it comes time for actual recruitment. And situations have changed because people are human beings, and their lives change and their circumstances change. Their clinical data changes, and so forth like that. And therefore, a group of people who you thought were going to be great candidates for your trial are no longer great candidates for your trial. And vice versa: People who were not eligible for your trial are now eligible for your trial. And so keeping that latency to as minimal as possible in order to be able to make all that hard work and effort that TJ just described, actually produce, you know, patients enrolled in a trial at the end of the day... it's a critical piece of the equation.

Michael Ibara

Absolutely. Well, I've had the personal experience of looking for patients at a point in time, and then the protocol actually doesn't kick off till four or five months later. And you've lost a lot of them, as you're saying. Something else I've experienced, talking about the process by which we find patients and the world we're in, I do think there's some dissonance that we experienced because things have changed so fast.

And we mentioned, you know, the FDA deserves a lot of credit for trying to keep up with regulatory aspects of this. I wonder how well we're doing, keeping up with the aspects of the way that we initiate trials. I have a colleague that talks about going fishing, and he said, the traditional model is you put out your fishing pole and you wait for the fish to come by. So you stand up a site, and you put out your pole, and you wait for the fish to come by, meaning you wait for that site to do... find the patients over time. And it's not that you stand up all sites at once. You stand up sites over a period of time. By the time you're done, you've got all the sites up and running, but you've taken up a whole lot of time getting those sites up and running. And you don't know which ones are going to have the patients for sure. So you inevitably end up missing your recruitment timelines.

And given the fact that we can search for the patients so readily now, at least at a higher level, and try and enroll them in a more precision way, I feel like sometimes that's coming up against our traditional model, because there's so much involved in changing that process. That even though we understand there's a lot of patients, we end up hamstringing ourselves. Because we still do the same thing that we did in the past. We stand up at these individual sites and sort of wait around.

I think, Riley, what you described, you went through a quickly, but it's already a different model, I think, or how you guys have been working. I wonder if you can just compare that to what I was talking about to how you're really recruiting patients these days?

Riley Ennis

Yes, no, it's been tremendous. And I would say, I've never seen a clinical study where we were ahead of schedule in terms of enrollment. We initially were targeting 14,000 for the Colorex scan screening trial. And we're now at 35,000, completed subjects, meaning blood draw colonoscopy, and it's covering such a diverse population. And we decided to upsize our study just given the rapid rate of enrollment.

But really following a similar model to what Mitra spoke about with OneSource and UCSF, it's investing in your sites. And I think the concept of recycling and leveraging not only proprietary data, like our multiomics data to help, you know, TJ, find these very, you know, specific inclusion-exclusion criteria, but being able to invest in sites and build an infrastructure for them. While understanding what the pain points are, specifically around some of the quality measures, we found that simply by helping folks identify and improve their screening adherence today, they can hit HEDIS, and STARS, whether it's on the provider, the payer side, and that brings tremendous value to the site. And then when we, you know, progress to some of our multicancer studies, we've now built all that foundational infrastructure. We've helped improve their existing screening workflow, and they see us as a long-term partner that's enabling them to deliver better care.

And really, it's about listening. It's about sitting down with the nurse practitioners, with the clinical site coordinators, and understanding the challenges they face. And I think to TJ's point, you really must

understand those operational burdens on sites and find ways that we can invest in and support these sites to be able to perform, you know, the best research. But I still think there's a gap in the industry, where we have tremendous data now on 35,000, individuals with longitudinal follow up and tokenization in place.

And those data can help support so many other clinical trials out there. And I think we tend to silo data a lot of times, especially as companies, and I think it's time that we find ways and leverage the data that's been generated. So we can recycle... we can use them to improve outcomes and improve clinical studies across the board. Especially when there's no competition, you know, on the screening, diagnostic side versus therapeutics, we can play a huge role as we first engage the patient at screening and help leverage that data down the care continuum to not only help providers and sites but also sponsors.

And I think that's one of the biggest opportunities, and the companies that can help bring us all together as sponsors... I think it's going to make it much easier to identify patients and solve unmet needs today, and help sites build that infrastructure that they can run trials, where they don't have the IT, they don't have the funding or support, but they really do want to deliver on better care. And I think that's going to be the future is, you know, really delivering the value today, and then also coming together to share our data so we can enable more efficient trials.

TJ Bowen

Yeah, Michael, I think picking up on that, to what Riley just said, and kind of extending your metaphor about the fishing, right. So I think one thing we see a lot with sponsors is they tend to go back to the same fishing holes, without much evidence that that fishing hole is going to produce fish for their new... for their new study. I think what we really need to focus on is making sure we have data from a lot of the fishing holes that nobody's fishing it, right?

And I think, Riley, you said that you guys have done that a lot lately, and I think this whole equity issue is really important. You know, as we start getting more and more precise treatments for people, we really need to understand from a compliance perspective, if those patients are all going to benefit by, you know, race, ethnicity, other sort of socioeconomic status. And if we're going to the same fishing holes over and over again, we're really being homogenous with where we're sourcing our patients. So I think there's something we need to consider as an industry on how we democratize this access to data across all of the different fishing holes.

Michael Ibara

It's a really interesting idea. And I'm assuming from some conversations with you, Jeremy, it's not dissimilar to the approach that you know. Because Cerner Enviza has such a large repository of data, you have the same goals of being able to use and reuse that data for clinical research in similar ways, I would think.

Jeremy Brody

Yeah, no, that's absolutely true. And to TJ's point, one of the unique things about the Cerner footprint is that yes, there's a presence in the academic medical centers and some of the larger healthcare systems. But in addition to that, Cerner also has a tremendous presence in community hospitals all around the United States and many underserved populations.

And so when the FDA speaks about the idea of diversifying, you know, clinical trials and bringing in additional patients, you know, from hospitals and health systems that perhaps have not traditionally participated in clinical research, in many ways, that is the Cerner footprint, and we're very proud of that. And really, what we'd like to be able to do is bring clinical trials into everyday healthcare, and then to Riley's point, you know, beforehand, being able to bring that data back into the hospitals and health systems and ultimately, to the doctors and patients in order to be

able to impact that same everyday healthcare. But this is what TJ and Riley were just speaking about. It really hit home for me and really speaks to many of the things that we're trying to accomplish right now.

Michael Ibara

So this is tremendous. We have a question that's going to take us right back to our fundamentals. And we've all talked about some of this. And FDA has been looking at it from their perspective. Everybody looks at this, but the question is, we're so dependent on healthcare clinics and if their staff puts data in the right fields, and scan that result incorrectly from another clinic.

The first part of the question is, what are some thoughts and solutions that are being put in place to clean up real-world data for clinical research? I remember starting on an answer to this question years ago, and I still haven't answered it. But I'd love to hear everybody's perspective. Certainly, from the EMR vendor to Jeremy.

But the second part of the question is, how are the research sites getting back into the healthcare sites' patients' EMR? So I think the general idea here is, how is it a good idea? And are we able to bring study data back into the EMR, both for patient care and just as a technical solution? So anybody interested in commenting on either of those questions?

Mitra Rocca

I can comment on both of them. So for the first part of the question... so one of the things I work on, because there are so many data elements in clinical research that are not in the EHR system. So I collaborate closely with the Office of National Coordinator for Health Information Technology, and I push the data element needed for clinical research into their future EHR certification.

So for example, the adverse events actually sometimes are not in the right place in EHR. Sometimes it's allergy intolerance. Sometimes in unstructured text, you need to apply NLP to get the adverse event. And then for the research side for the project that I am... we're collaborating with UCSF. We will have... you have been working with EPIC to do a write-back. So the data from clinical research are written back to the EPIC, and then the next phase is to collaborate with Cerner on the same rate by capability.

So then the healthcare provider knows that this patient participating in this clinical trial had adverse events, so they know that their subject might have some adverse event happening to them. So this way, the clinical investigator knows what happened to the patient—if they went to emergency room and was seen by regular healthcare provider and yet, also the opposite, like healthcare provider. And here's what happened to the subject and can contrast.

Michael Ibara

That's a scalable solution, and tremendous, Mitra. I think it also goes back to your general point, Riley, of giving back to sites. I do. I will note here, too, that we are in a world where I coined the phrase, "The future is here, it's just not well distributed yet." I've seen these solutions. I've also seen sites where we need to supplement them with a study coordinator. And it's the only way to try and get them to input some of the data into the field. But other comments or perspectives on this— on these two questions?

Jeremy Brody

Well, the EMR obviously needs to continue to improve and, you know, be that much more user friendly, to enable, indeed, better data to come in on the front end. With that being said, the EMR will, I believe... will continue to be not designed for research purposes, right... So that will not be the fundamental reason why people will be entering in data in it. And therefore, there's also... when sites do agree to participate in clinical research, and, you know, they're being compensated, you know, for that activity and so forth, there is a quid pro quo, that is, indeed, you know, going on there.

And I think there's an education that's required. And it's really on the... on the sponsor, on the sponsors, partners who are working with them on that trial, in order to be able to educate the physician, the staff, and so forth, about the type of data that are being collected, why it's being collected, how it needs to be collected, and so forth. And to go ahead and reduce some of that friction that exists, you know, around the data that are being entered into the EMR versus the data that are required for the study.

Ultimately, however, I do believe that there will be some amount of cleaning always, you know, required on the back end. Data abstraction, you know, taking place will leverage technologies to the best of our ability to be able to do some of that work. But today does require also, you know, human beings to be involved. And so they'll always be sort of that element, as well. So I think that's with regards to the first half of the question.

And then on the second half the question, it's critically important to be able to, once all this effort has been done, to go ahead and get really good clinical data that's usable, and leverageable, and not an unstructured data and so forth like that— for that to indeed be fed back into everyday healthcare. And this is definitely one of the things that we aspire towards and are working towards right now. And when maybe the ways that Mira just referenced.

Riley Ennis

Yeah, couldn't agree more. And one thing I just want to add is that a lot of times in the early protocol development phase, we focus a lot on, you know... for example, our lead site is Kaiser. And Kaiser is very different than a lot of the other sites of the 200 sites that we work with. But we spent a lot of time in the communities understanding, from a data perspective, what are the challenges, where are the blockers and really co-develop and have an advisory board, that's not always the key opinion leaders, but also really working with sites before we lock a protocol to make sure that the burden is as little as possible, but also that we can understand what some of the barriers and challenges they're facing, and clinical questions that they're interested in, such as some of the issues in health equity and social determinants around cancer screening.

So that partnership and co-development is something that we found sites were very surprised by, especially, you know, very rural and other sites that don't traditionally participate in clinical studies. And they felt motivated, and they saw the short-term benefits their practice, as well as how this investment together as a team could allow for much more and better care

long term. So that working relationship and not being in the helicopter approach, or just coming in using the site and moving on, but really getting on the ground and helping understand those operational data challenges. Because a lot of times when there is an issue of data quality, if you can understand the source and the root cause and do that, in the beginning phase of designing a protocol, that can improve the data quality. It really builds trust with sites, and you can find them the clinical questions to then deliver data back to sites to help them in real time with existing clinical care.

So there's a lot of that work upfront. I think we rushed to get into the protocols lock, get role... you know, enrollment started, but taking that time at the beginning, pays dividends. And you know, I think we've really appreciated it and are actually humbled by how much we've learned by getting in the communities, in the neighborhoods, and just understanding what those barriers really are.

And then publishing, we had a great poster with Morehouse, at ACG, where we were hearing that African Americans have members of the Black communities did not want to participate in trials. And that was fundamentally not true. And we jumped on that opportunity to say, "Why is that the perception?" And we had amazing leaders on the ground who helped us really identify what the barriers were. And then we were able to make changes to the study operations, which allowed us to beat U.S. census around enrollment in the Black communities and with African Americans. And that was so motivating and meaningful because those are individuals that we want to serve and want to help.

So there's so much learning, and I think you have to go locally. And you... we can still operate globally and operate, you know, systematically. But we need to understand a lot of those issues upfront if we're going to maintain data integrity.

TJ Bowen

Some of those... some of those soundbites about, you know, certain ethnic groups not wanting to participate— I think that's almost becomes a scapegoat. And it's... it's a little bit that there's an endemic problem and where those patients are being served, that people don't want to address. Right, it's like getting access to them, which is what we see in our network is the first thing, and then once you get access, we see that a lot of people want to participate. Once you explain kind of what the opportunity is. So I think... I think it becomes this... this easy kind of broad brush to use to kind of basically avoid the reasons that they're not getting the right enrollments. So I'm glad to see that Riley and Freenome are addressing that head on. That's great.

Michael Ibara

These are... this is tremendous — tremendous discussion and lessons. In the last few minutes, I just want to summarize a couple points that we just were touching on that really, I think, go across the whole discussion here. And the first is in terms of, you know, as usual, when we're talking about how do we get more patients in our trials, one of the lessons learned is start further upstream.

So we're talking about, don't finish your protocol, and then wonder why you can't find the patients. Co-develop your protocol. And with the amount of data that we have today, then, really, it's sort of repurposing the term feasibility, which traditionally has meant "I've got a protocol. How many patients do you have for it." Feasibility now becomes part of the modeling process in creating your protocol, so that you can have a much better chance of hitting the right population downstream.

And then the second thing that... you mentioned it, Riley, you know, the famous phrase, "think globally and act locally"? This idea that— and really, you guys are also living proof of this, TJ— you often get a hold of

molecular data that you put together and sort so that you can offer back to sites that don't have the same ability to see what you're seeing. So you're actually able to organize the data and give it back to them. Jeremy, you're doing the same thing now with your Learning Health Network. And you guys are doing this for your protocol development rally.

So I think all of you are representing this part of this new model, which is the organizations that are expert at gathering and organizing the data can also then give back to the sites and help them augment what they're doing in order to then have them help bring the patients into research. So I think it's tremendous. I think it represents a good model.

When you ask the question, how do I get more patients into my trial? These are really the answers, I think, that you're all... you're all demonstrating. And on the regulatory side, Mitra, and your discussion of the OneSource program— I think it's fits in the exact same vein. And it's...it shows that throughout all the sectors, even though they're so different, there's actually a common model that I think is emerging. And that's... I think that's very exciting. So I think we're right at time, personally. First, I'd like to just thank all of our panelists, TJ, Mitra, Riley, and Jeremy. I talk and work with you outside of this, too. So I really appreciate you participating in this. And I really liked this discussion. Absolutely. So thank you very much, all of you, for participating. And thank you. Thank you. Thank you.

Ayesha Rashid

Well, thank you very much to our speakers for the very insightful presentation and discussion. We have reached the end of the presentation. If we couldn't attend to your questions, the team at Elligo Health Research may follow up with you. Or if you have any questions, you can also direct them to the email address that is displayed below.

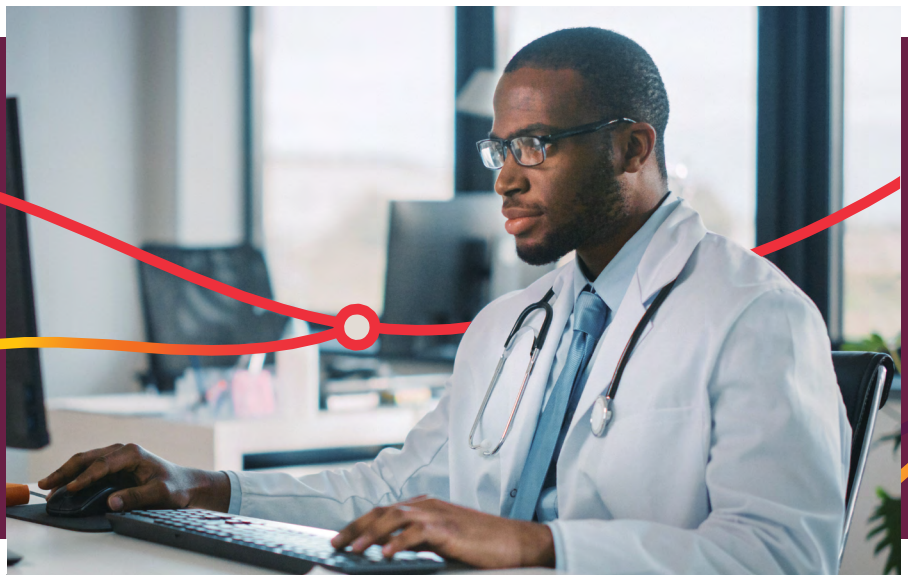
Michael.Ibara@elligohealthresearch.com

I'd like to thank everyone for participating in today's roundtable. You will be receiving a follow-up email from Xtalks with access to the recorded archive for this event. A survey window will be popping up on your screen. Your participation is appreciated as it will help us to improve on our roundtables. Now I'm about to send you a link in your chat box where you will be able to view the recording for this event. And you can also share this link with your colleagues when they register for the recording here as well. So I do encourage you to do that.

Now please join us in thanking today's speakers, Dr. Michael Ibara, Dr. TJ Bowen, Mitra Rocca, Riley Ennis, and Jeremy Brody. We hope you found this roundtable informative on behalf of the team here on Xtalks. Thank you for joining us. Please take care, and bye for now.

Roundtable 2 Begins on Next Page

Roundtable 2: Beyond The EHR: Clinical Trials In The Age Of Abundant Data



Ayesha Rashid

Good day to everyone joining us, and welcome to today's Xtalks webinar. Today's talk is entitled, "Beyond the EHR: Clinical Trials in the Age of Abundant Data." My name is Ayesha Rashid, and I will be your Xtalks host today.

Today's webinar will run for approximately 60 minutes. This presentation includes a Q&A session with our speakers. This webinar is designed to be interactive, and webinars work best when you're involved. So please feel free to submit questions and comments for our speakers throughout the presentation using the questions chat box, and we will try to attend to your questions during the Q&A session. This chat box

Industry Experts

Michael Ibara, Pharm.D.
Chief Data Officer,
Elligo Health Research®

Seth Hopkins, Ph.D.
Executive Director Translational Medicine, Sunovion Pharmaceuticals Inc.

Michael R. Fronstin
Global Head of Clinical Research and Consulting, Cerner Enviza

Doug Lee
Vice President, Operations and Chief Data Officer,
Harris Computer

is located at the bottom of your Go-to-Webinar control panel. If you require any assistance, please contact me at any time by sending a message using this chat panel. At this time, all participants are in listen-only mode. Please note that this event will be recorded and made available for streaming on Xtalks.com.

At this point, I'd like to thank Elligo, who developed the content for this presentation. Elligo Health Research accelerates clinical trials through healthcare with access to over 150 million known patients and their HIPAA-compliant healthcare data, the company's IntElligo® Research Stack technology, and their Patient*Select*® identification and engagement model. Coupled with the largest Known Patient Access Network, Elligo's Site Solutions enable healthcare practices and research sites to participate in clinical trials. By adaptive engagement of known patients and physicians, Elligo accelerates the development of new pharmaceutical, biotechnology, and medical device and diagnostic products.

And now it's my pleasure to introduce our speakers for today's event. Michael Ibara has more than 20 years of experience in clinical research and development. Throughout his career, Michael has sought to improve healthcare by bringing together healthcare data and digital technologies. His interests include regulatory and policy implications for digital healthcare, exploring the factors needed to allow interoperability of healthcare data for all stakeholders involved, and implications for the use of big data, machine learning, and natural language processing to improve our ability to perform regulated clinical research. Before joining Elligo, Michael Ibara was Head of Digital Healthcare for the Clinical Data Interchange Standards Consortium, or CDISC. There, he led the FDA eSource project and Healthcare Link efforts with registries, clinical trials, and mobile health to enable use of real-world data from healthcare for regulated research and decision making. Prior to his time at CDISC, Michael was Head of Business Development, Coordination, and Innovation and also Head of Pharmacovigilance Innovation at Pfizer, where he worked for 15 years in various positions, leading implementations of global systems and large-scale technologies.

Michael Fronstin joined Cerner Enviza, formerly Kantar Health, in 2005, and currently leads the organization's clinical regulatory and safety team. Michael's team is responsible for delivering high-quality, regulatory-grade work to support pre/peri-approval clinical research and post-approval safety surveillance. The clinical regulatory and safety team also leads global harm-reduction partnerships and separately, public health partnerships in Germany. In addition to overseeing the global team, Michael is accountable for supporting corporate development and product innovation. Michael's prior roles include Global Health of Offer and Innovation, General Manager of the Real-World Evidence Group, Chief Operating Officer, and Head of Life Sciences Business Development. Prior to joining Cerner Enviza, he held various leadership roles spanning industry, payer, and consulting organizations. Michael is a member of the Cerner Enviza leadership team and is proud to serve as a board member for International Guardian Ltd. Michael earned a Master of Business Administration from the University of Miami with a certification in healthcare administration. He has a Bachelor's Degree in sociology from the State University of New York at Albany.

Seth Hopkins is the Executive Director of Translational Medicine at Sunovion Pharmaceuticals. In his work at Sunovion, he has led and advanced new treatments for CNS disorders from discovery to regulatory submissions. Prior to his role in translational medicine, Seth served in a variety of roles, including those involving computational chemistry, pharmacology, and preclinical and clinical development. During his tenure, he has advanced programs through clinical development, applying clinical pharmacology, experimental medicine, neuroimaging, modeling, and simulations at Sunovion. His current research interest is the application of advanced mathematics and analytics to improve the efficiency of clinical development of breakthrough treatments for psychiatric disorders. Seth was a key contributor to the initiation, clinical development, and submission of IMDs, NDAs, and psychiatric indications. Seth completed his postdoctoral training at the University of California, San Francisco, and earned his Ph.D. in biophysics from the University of Pennsylvania.

With over 20 years of experience in business, technology, and innovation leadership, Doug Lee has emerged as a change agent. Through precise strategy and dynamic culture development, Doug has demonstrated the ability to help businesses weaponize their data to drive top-line growth and profitability. In his roles as Vice President of Operations and Chief Data Officer, Doug is responsible for data strategy, data commercialization, innovation, and operational excellence. He is active in related professional organizations, serving on various boards within the private and public sectors. And now without further ado, I'd like to hand over the mic to our speakers. You may begin when ready.

Michael Ibara

Thanks very much, Ayesha. I'm Michael Ibara. Thanks to everyone for attending this webinar. This is a fascinating webinar — to me, personally, as I work with all of our speakers here. When you look at the breadth of what we have, this is what it takes to run clinical research these days. I think there are several epochs in the history of using EHRs. I remember years back when they first were introduced, when I learned about them, and from the industry side, I thought, this can be a great boon to clinical research. But at the time, I think a lot of us thought of it as being like hooking up one machine to another. And that's going to get us where we need to go. Then we started to realize that achieving interoperability is much harder than we thought. So we started working on that, and then we realized, well, we need to get all of the data together, because we have to standardize it to a lot of things before it can work. So we started collecting large amounts of data, and then to our surprise, again — I suppose we shouldn't have been surprised by then — collecting all the data in one place didn't necessarily do it, because now we all have collections of data, and they're normalized within their own silos.

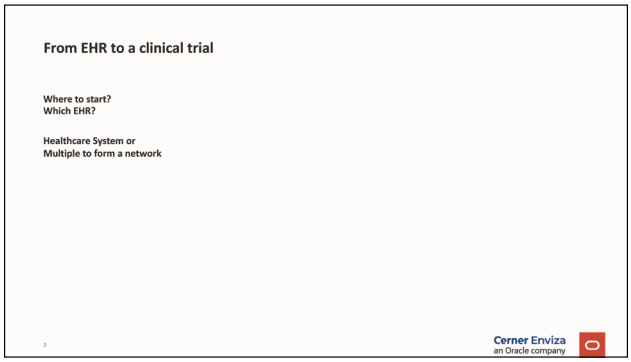
But a fascinating thing has happened in the last several years in clinical research. Whereas I thought we would basically be solving more and more of the problem, as clinical research has progressed, we now actually have a two-sided problem. On the one hand, we have much more specific requirements to go after specific populations, because drugs today are able to target more specific conditions and populations of patients, meaning we're finding smaller numbers of patients whom we need to target more specifically. At the same time, we've got studies running across 1,000, 5,000, 10,000, or 20,000 patients, where we need the volume. Amazingly, we end up with a continuing need to find more patients for trials. I believe this will be an ongoing trend. This panel represents the types of relationships I think we need to bring together, because no one group can really do it alone anymore. We've got folks representing development of an individual EHR and bringing the sites in for that, we've got individual companies holding many EHRs, we've got sponsors working on leveraging EHRs, and Elligo has relationships with all these folks. What it shows me personally is that when you digitize a field, you sort of bring everybody into the same room, and that's what I think we're doing today. Besides talking about using an EHR, how do you really use EHR data to place your patients into

trials and improve your trials? That's what we're about today. Each speaker has a little bit to say on that, and then we can open it up for discussion and Q&A.

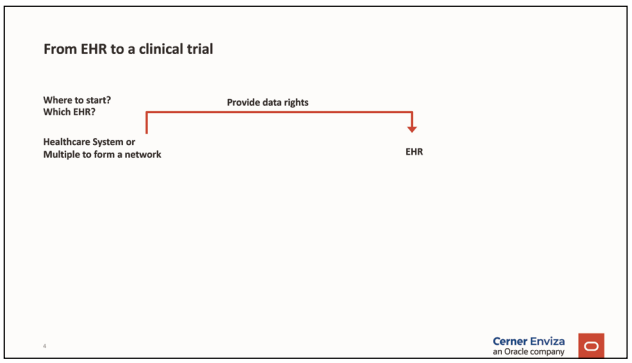
So I'd like to start with you, Michael. From the perspective of Cerner, having a single EHR and developing that and developing a learning health network, what are your perspectives on the topic?

Michael Fronstin

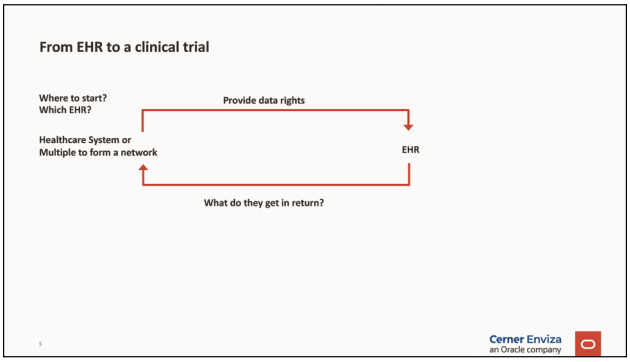
Thanks, Michael. First, let me say thank you, to you and to Elligo, for inviting me to join you in this discussion. And to Xtalks. I'm humbled to be with such great people and speakers here. What backgrounds — wow. The age of abundant data on that first slide. … We are not lacking in data, that's for sure. Getting to the data is the challenge, right? And it's even more difficult when it comes to electronic health record data. But where do you start?



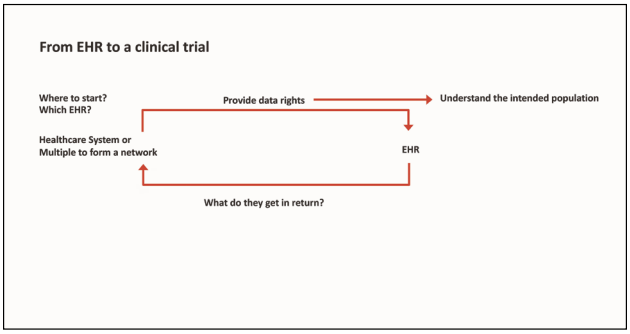
From an EHR perspective, if you want to get the data, have it harmonized, curated, and appropriate — fit for purpose, if you will, to use for a clinical trial — there are 200 to 300, I think, EHR systems in the U.S. There are aggregators, and there are other sources that you can go to in partners, so you have to start out by saying, "Where do I go? Which EHR?" Often, it starts with healthcare systems, or multiple healthcare systems combined to form a health network or a learning health network, as Michael mentioned. And that's not an easy task. There are a lot of considerations around these networks. What do they represent? What is their heterogeneity?



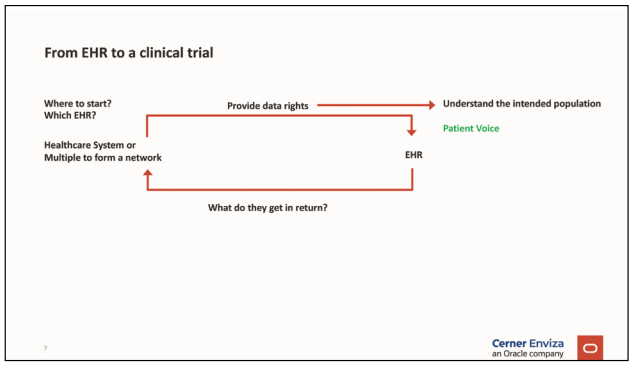
What do they look like? It's obviously all U.S. right now, because of GDPR. You can't get to the EHRs in Europe, or it's very difficult to, so you have to determine where to go and how to get there as a starting point.



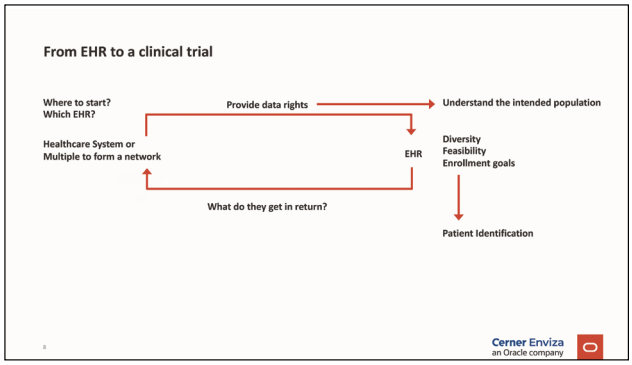
Then, really what you're looking for is for the healthcare system to provide data rights to their EHR to you so that you can use it. But then the data are very messy — not set up for research purposes or to identify the populations intended to be enrolled in clinical trials. There are a lot of challenges here. Why would they give you data rights? It's their bread and butter, their gold mine, if you will. What is it that they're going to get in return? You have to determine that upfront. You've got to talk to them about that —



negotiate and find out what's important to them. Is it bringing back clinical trials to them? Is it access to de-identified data across the entire network, if it is a multihealthcare system network, which will vary depending on what health system you're looking at? If you're looking at a small community hospital that's never done clinical trials or research in the past, their incentives will be very different from an academic medical center or some large, independent delivery network. You really have to have those conversations to determine what they want to get in return.

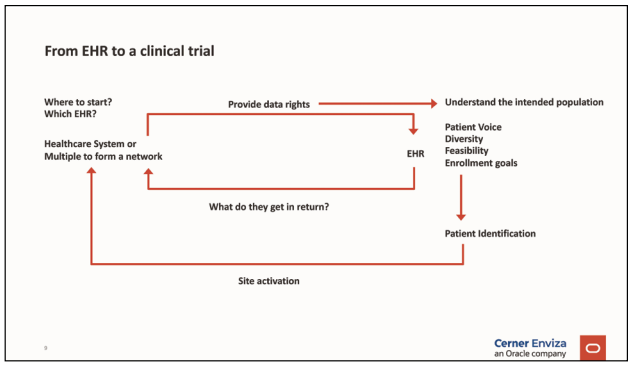


Once you figure all that out, and they do provide data rights to you, and you've now cleaned the data, organized the data, de-identified the data — and there's a boatload of steps occurring during this process — then you can start to understand the population you want to include in your clinical trials. And of course, the inclusion/exclusion criteria are critically important. Life science, medical device, and genomic companies are all going to tweak and massage their I&E criteria — relax it or make it more rigid, depending on what they want and what they're studying. Before you even dig into that next step of the EHR data specifically, you really need to take a step back and understand the patient's voice. We've seen the FDA in particular talking a lot about patient-centric clinical trials, and we talk a lot about patient experience and patient voice. But if clinical trials don't objectively measure what's important to patients, caregivers, and their families, then perhaps all that discussion isn't serving its purpose. A lack of understanding of patients' specific needs — their priorities, the experiences that they're living every day based on their disease — can really negatively impact clinical trials and their results. It could result in worse or lengthened enrollment periods, lower retention and recruitment, lots of amendments. … It really could just derail your clinical trial. It's really important to understand these things. Then you can dive into the EHR or whatever data set you're using to reflect and find what's important or most important to the patients, caregivers, and their families.

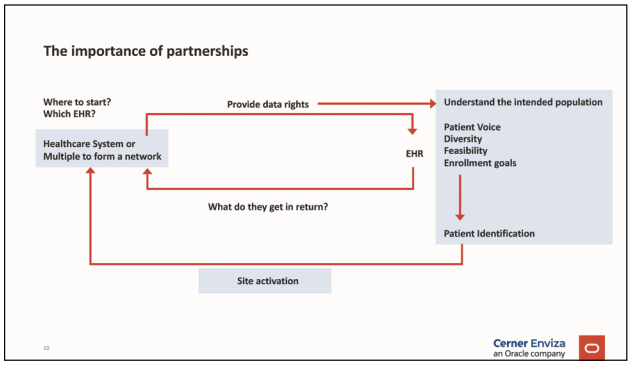


Now we start delving into the EHR data. There are so many different ways you can leverage the data to help establish what your clinical trial protocol is going to look like. You see, diversity, feasibility, and enrollment costs are just three of many things I've listed here, and diversity is at the top. There have been two sets of guidance rolled out by the FDA a couple of years ago, and most recently in April. And diversity is a part of everything from social determinants of health, and demographics, race, and ethnicity, to things like comorbidities, disability, and transplant patients, and where they are located. From a geographical perspective, it used to be that we were only doing clinical trials in the largest cities, but prioritizing diversity and health equity means not just getting to the underserved populations who may not have access, but also to those who don't have access because they're just not in the proximity of a research site. Using the EHR for protocol, optimization, and feasibility to understand what we can do out there — not even knowing necessarily if some of these patients are already enrolled in a clinical trial, and therefore the feasibility may be worse than we're led to believe — based on the data, you would use all this information to set up what your enrollment goals will look like, based on some

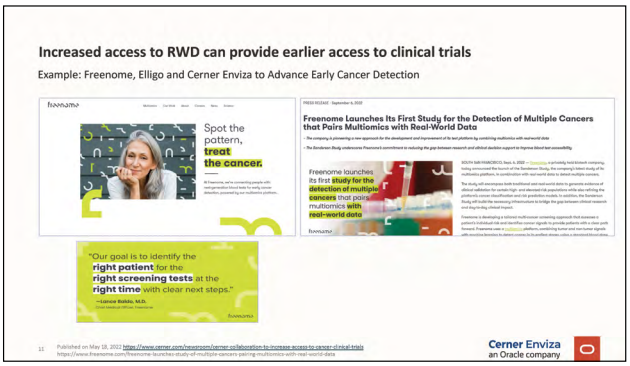
stratification of all these variables. So you have targets that represent the disease itself and not necessarily just the U.S. census, because certainly some diseases will occur in a disproportionate way among some specific group of people. Once you do all that, then you look in the EHR data to identify the patients, and when I say identify, what I mean is, where are they located? How do we get to them so we can start enrolling them into our clinical trials and activate them into the trial itself? And to do that, you need to start site activation. You go out to those



sites back at that same healthcare system where you've identified these eligible patients based on the ID and any criteria, and you start working with these systems. And again, based on the system itself, and whether it's an academic center or community health center, an IDN, or so forth, they may or may not have done research in the past. That's where it's important to have partners like Elligo at your side, to help you get this done in some of these research-naive settings.



I emphasize the importance of partnerships, because at each of these steps, having or lacking the right partners with the right experience is going to make your jobs and lives either easier or harder, set you up for success or failure. Now we're in a position where we need to accelerate clinical trials or recruitment into clinical trials the right way with the right patients, so that we can get these newer treatments into the hands of the people who need them the most, especially when you think about rare diseases and oncology. It's important to have partners every step of the way to think about that. The last thing I'll discuss is, how does this come to life?



Here's a real example, and a way that we're working with Elligo. The title says, "Increased Access to Real-World Data Can Provide Earlier Access to Clinical Trials." In this case, Elligo and Cerner Enviza leveraged the partnerships I just described in the Learning Health Network at Cerner. We're working with multigenomics and multiomics, and this has just been released in a press release. This is all public information, and the idea here is that we use the EHR data to identify newly diagnosed cancer patients and then, working with Elligo and working on behalf of the sites, we reach out to these patients before they get their first treatment, to enroll them into the clinical trial so they can get a blood draw. If you think about it, you have a very short window to get in there and do this. Working with EHR data, not only are you able to identify who the appropriate patients are in real time, depending on how you access the data and the rights that you have, you're also able to leverage certain aspects of the EHR data. We can see the patients' appointment schedule and call them up, saying, "Hey, I'm calling on behalf of

Dr. so-and-so, and I see you're scheduled for your next appointment in two weeks," or whatever it is. The use of EHRs to help accelerate this enrollment is really fascinating. It's come a really long way, and it's leverageable if you know how to leverage it. This is a real story, and we've already started enrolling our first few patients this last month or this month... the beginning of this month. It's going to be great. And with that, let me pass it back to Michael, and thank you again for the opportunity.

Michael Ibara

Thanks very much, Michael. You laid out a great road map from EHR to clinical trials and experience and things like that. Thank you. Next up, Doug, if you could address the challenges of starting a company within a company with a wide variety of EHRs and data stores, and then realizing that you want to bring clinical research to that sort of research-naive population.

Doug Lee

Absolutely. Thank you. So I'll take a huge step back. I'm a part of Constellation Software — that's our parent company. Then we have Harris Computer, which is the next layer. My company is a startup within Harris computer called Sidus Insights. Our brief, as Michael suggested, is to take a network of EHRs with EHR data and inpatient data and figure out how we pull it together into a central store. How do we gain insights from it, and how do we enable clinical research? It's been a long journey — 16 months since we first started. We had to jump through a lot of hoops. Of course, it all started with legal regulatory privacy and security. We started out with a lot of conversations on those issues, but with our sister business units, as well, and on data rights, as Michael touched on earlier. In this case, we were stuck: Do our EHRs have data rights from their providers? So there was that extra step that we needed to have in place in order to make our legal teams happy.

But at the same time, we also looked at how to build a system that could take all these disparate EHR data and inpatient data and pull them into a platform that made sense and that we could use to compute capabilities at a high level of performance. So we ran a bunch of POCs. At the end of the day, we ended up with a platform that was 12,000% higher performing than our previous one. To quantify that, with our previous system, one data set took five days to run, around the clock. With the new platform, the same data set took 45 minutes. So we definitely found something there, but from that, the hard part really started. We had to standardize the data, we had to transform the data, and we had to normalize the data. We had a master data model, and we wanted to make sure that we preserved data utility as much as possible. We cast a wide net, and we created our own master data model. Now we had a little bit of everything from each data source.

Each EHR records data differently, and there is no global standard out there. As it was, there was a lot of noise. The cleansing, the standardization — that transformation was huge for us. We were trying to get everybody to speak the same language. At the end of the day, there were data and identification that we had to build in-house. And we worked really hard. It took us over a year to run it through expert determination. We now have our expert determination certification for all our unstructured and structured data sets.

Ultimately, the goal was to pull together a longitudinal view of Patient X. It didn't matter if they went to this EHR or that EHR within our network — we wanted to make sure that we could tell their story. Usually, that story is between 15 and 20 years long, which provides a pretty good view of a patient. From there, the last problem to solve was really just data sharing at the end of the day. So how do we look at that problem? There were a few different ways we looked at it, and we have a few different solutions in place, but one of them I'm most proud of is working with Michael at Elligo — being able to have a direct share with Michael, so his team can have a view of the data.

When we share the data with them, it's a live view. For his team to be able to run queries directly on that data set was huge. I'm most proud of that. It's just a way for us to enable clinical research with our partners.

Michael Ibara

Thanks very much, Doug. And thank you for speaking on a topic near and dear to my heart, which is the heterogeneous EHR environment in the U.S. Honestly, usually, for clinical folks who are starting a trial and want to use an EHR, the last thing you think about is the thing that stopped you dead in the water, which is, oh, we can't merge the data. We need to clean it, or we need to standardize and things like that. You guys have done all of that with such a large amount of data. It's very impressive. As you've heard from Michael and Doug, doing the trial is the tip of the iceberg, and everything underneath there on the use of EHRs is a tremendous amount of work. Our next speaker can provide a great testimony as to why we would want to do all this. I'm very excited, Seth, about what you have to talk about in terms of showing that there is a payoff, at the end, of trying to use medical records. So I'll turn it over to you.

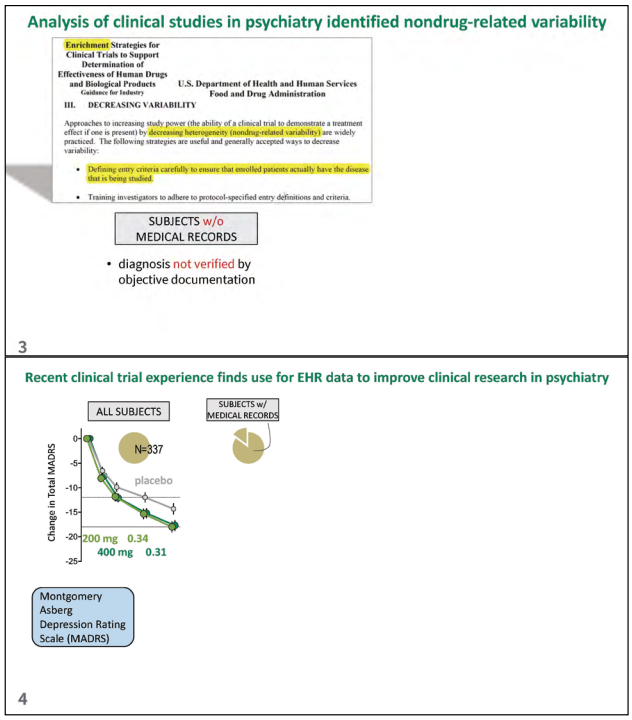
Seth Hopkins

Thank you, Michael, and thank you, Doug. I want to focus on some data — some actual clinical trial data and some approaches we're taking to incorporate medical records in the conduct of Phase III regulatory, FDA-adequate, and well-controlled trials for the registration of new drugs.

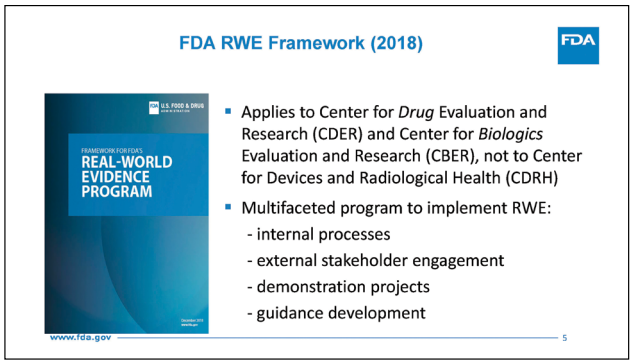
As I think Michael mentioned, we're in this epoch in which no one group can do it alone anymore. When we thought about our Phase III programs in psychiatry, we realized that, particularly in the U.S., our clinical trials could be more efficient. In the U.S., we've seen an erosion of drug signal. What I mean by that is this notion of a clinical trial effect, or you can think of a

placebo response: an inability to detect whether a drug is active in comparison to a placebo. So by no one group, we've focused on subject eligibility, as I think Michael pointed out, as well. I'm dividing subject eligibility across three domains. One is around symptom presentation. One is around medical history, which is where the medical records come in, and the other is around the infrastructure or the patient population who shows up for clinical trials, particularly in the U.S., where there are business incentives influencing the study population in which we study our drug effects.

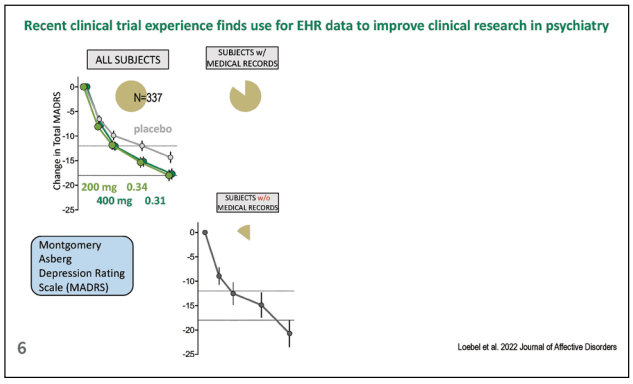
One of the key guidances we focused on, particularly around the erosion of drug signal, is the enrichment guidance issued by the FDA. One of the first elements of that guidance centers on defining entry criteria carefully to ensure that enrolled patients actually have the disease being studied. I want to take you through some recent data we've published around that erosion, particularly in subjects lacking a medical record and objective verified documentation of their condition.



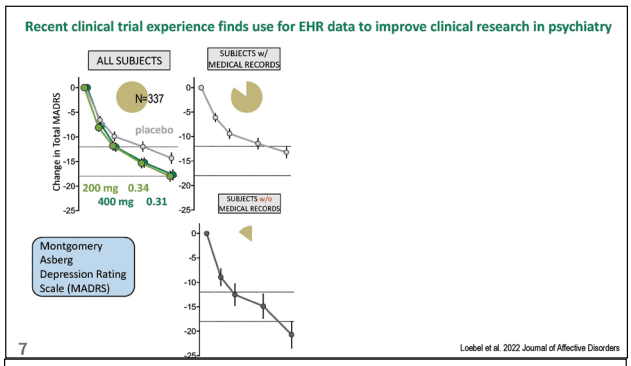
We're studying psychiatry, and in particular, bipolar depression. This was a Phase II study, where we were measuring improvement in total symptoms of depression over six weeks, and the scale we use is called Madras. What I'm showing you is the intent-to-treat population, the 337 subjects entering the trial, and the change in symptoms. I'm marking those dashed lines around "12-point change" versus around "18-point change." That's the window in which we can detect drug effects across all compounds that have been developed in depression over the last 15 years, and when placebo change is greater than that top dashed line, around -12 points. It's a ceiling effect — we've suppressed our ability to detect drug-placebo separation. This trial does have an effect size shown there, at about 0.3, and it was able to show a separation, but you can see that the effect size is relatively small, meaning that clinical trials dedicated to showing drug-placebo separation need to be very large, which is not an efficient way to develop new treatments for patients who need them. We noticed though, especially in the U.S., that there's a fraction of the subjects who did not have medical records that could document a diagnosis of bipolar depression, and who were currently experiencing depression prior to entering the trial. Once they enter the trial, the assessments are all very thorough, but we rely on the investigator and the patient volunteers to accurately portray their medical history.

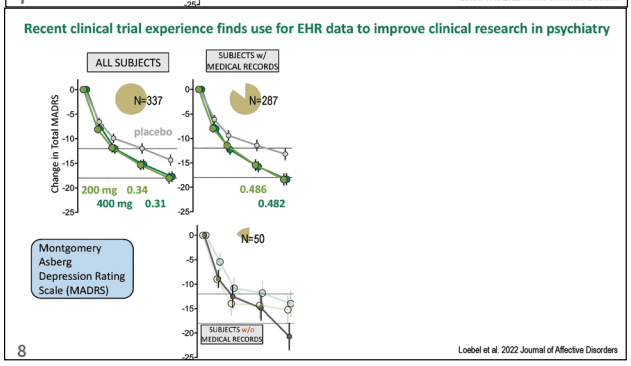


So we've separated out those subjects without medical records from those who had records supporting their diagnosis. In the bottom curve, look



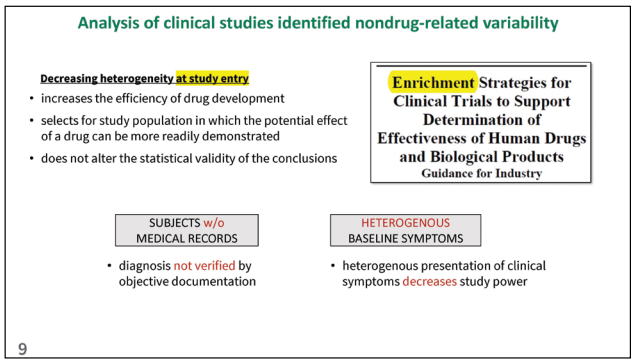
at what happens to the subjects who came in without medical records. That's a placebo curve, where the change on placebo is enormous. It's difficult to detect any drug-related improvement when all the subjects are getting better. The placebo change for those who had documentation of their diagnosis in their medical records was much more modest. You can see they're around 12 points. So the 10, the drug effect, and the top panel is now almost 0.5. That means clinical trials can be smaller and more efficient, and drugs can be approved more effectively. In the bottom panel of 50 subjects who didn't have medical records, the overall change even on the drug was very high.



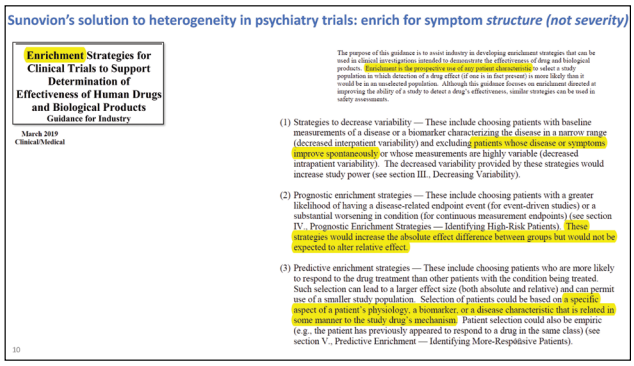


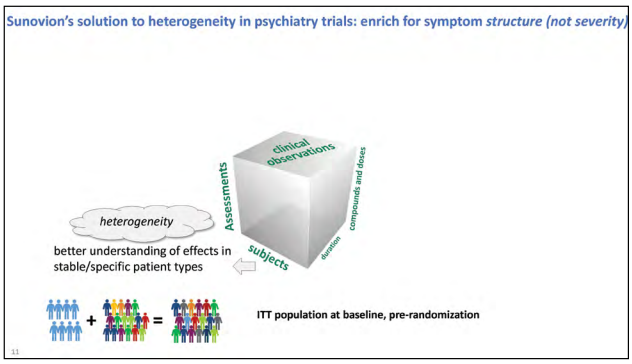
Going back to this enrichment guidance, that is a very important way to communicate the design of our trials, and the appropriateness and adequacy for regulatory submission we gained by making reference to this guidance. One of the ways to improve drug signal is to decrease heterogeneity, which increases the efficiency of drug development. This selects a study population for whom the potential effects can be more readily demonstrated, and in general, it's not considered to alter the statistical validity of the conclusions.

I just want to take a few moments to talk about an approach we've taken recently in psychiatry trials, and then I'll come back and relate it to infrastructure and patient population. Traditionally, when we write inclusion/exclusion criteria in our trials, we talk about symptom severity. We want to be able to detect the drug effect in a population of patients who have relatively severe symptoms in psychiatry, who

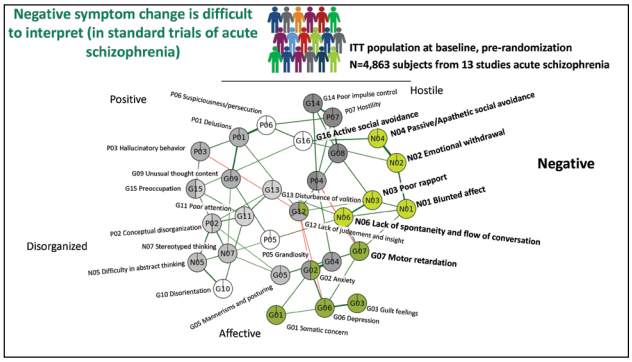


are relatively disabled by their symptoms. In their guidance, the FDA describes three strategies. One is to decrease variability — and I just showed you an example of that, where in those patients without medical records, there really was a prompt resolution of symptoms, and they improved spontaneously. Another two strategies focus on prognostic enrichment. These are ways to find subjects who have more likelihood of presenting with a disease-related endpoint, if it's an event-driven study, or who have a substantial worsening condition. Then the last one is the holy grail of predictive enrichment strategies, where you have an additional measure of some aspect of the patient's physiology that's related in some manner to the drug's mechanism. That's an approach that would ultimately shift benefit-risk calculations by identifying a marker and a patient. That's where this concept of right patient, right drug, comes from.

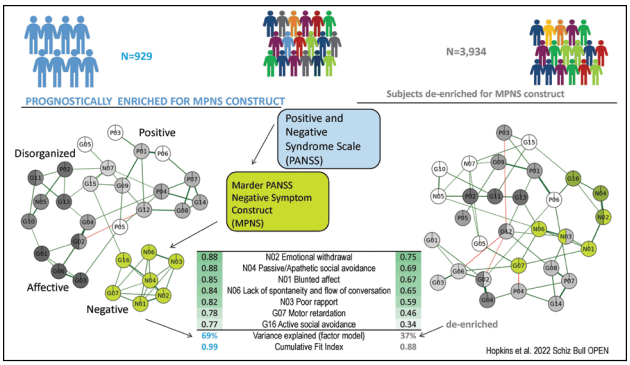




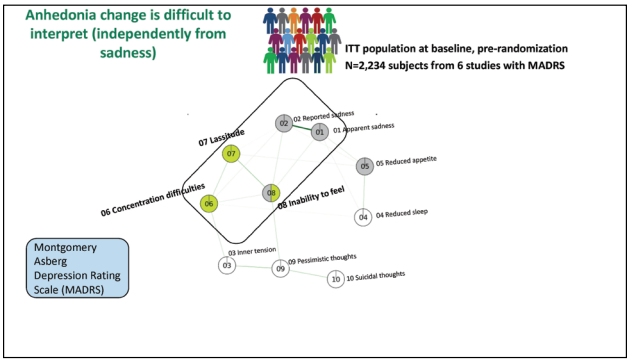
So this gets back to what Doug was talking about inside a drug company. We have a very large collection of clinical observations from our clinical trials, which have been standardized, and we collect clinical observations under very regulated conditions. So we looked back in our data sets from the past 15 years of trials in psychiatry and decided we could approach heterogeneity around patient type in a way that would help in the prospective use of inclusion criteria — one that wouldn't just be around symptom severity but around symptom structure. What you're



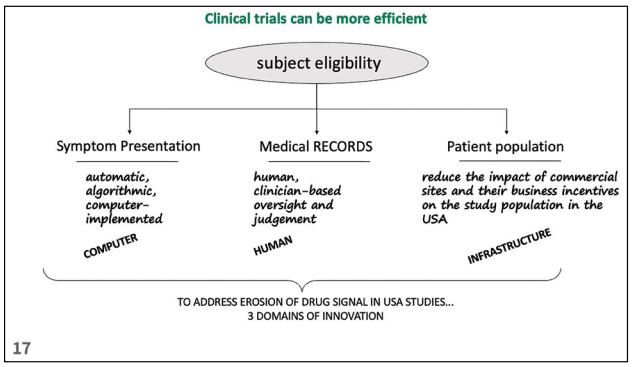
looking at here is the constellation of symptoms in schizophrenia. This is acute schizophrenia. We had run 13 studies, four to six weeks long. In the hospital, we had almost 5,000 subjects at baseline. These are the 30 symptoms of the scale used to register new treatments for schizophrenia. Each symptom is a node, and their relatedness is represented by the lines between them or the edges in the diagram. They're organized around symptoms that are positive, disorganized, negative, hostile, or affective. We want to develop and describe the effects of novel treatments on the constellation of symptoms, but in this heterogeneous population, that's very difficult to assess. We've discovered ways to prognostically enrich for particular patient types, defined by a constellation of negative symptoms,



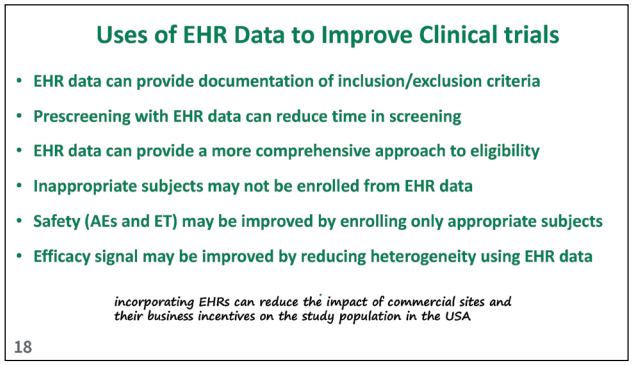
for example, as shown here. On the left side, we found approximately one-quarter to one-fifth of our patients had a very coherent community of symptoms associated with their disorder, which could be more readily measured with our existing scales. On the right side are the heterogeneous patients, in whom those measurements would be less reliable. We're working on inclusion criteria to enroll subjects in whom the endpoints can be more reliably measured.



That's where EHRs are very important. This approach can be applied in other psychiatric disorders, particularly in depression, and we can enrich for symptom presentation in various psychiatric disorders. On the left side of this slide, with the "no one group or one approach can do it alone," we have this concept of enrichment, where symptom presentation and



medical records go hand in hand. This next slide focuses on eligibility. Here on the right side, it's around access to clinical research as care, which gets to the patient population and infrastructure. Some of the uses of medical records from our perspective, which aims to improve clinical trials, really center on the documentation of the inclusion/exclusion criteria and confidence in the diagnosis and presentation of symptoms that actually can reduce time and screening. Incidentally, in the U.S., we've noticed a phenomenon where we screen far more subjects who ultimately don't get enrolled than we do outside the U.S. So there's a business incentive that's influencing how we enroll our patient population.



Medical records can provide a more comprehensive approach to eligibility in our protocols. Our protocols can help prevent inappropriate subjects being enrolled if we cannot access and incorporate that data. Overall, when we develop drugs, we need to very carefully describe safety in terms of adverse events and early terminations. For that reason, the inclusion criteria are very important around enrolling appropriate subjects who warrant treatment and participation in a research study, and the medical records help there. And ultimately, I think I've shown you how the efficacy signal can be improved by reducing heterogeneity. That revival requires access to patients' histories and medical records. So I'll end it there. Thank you. Back over to you, Michael.

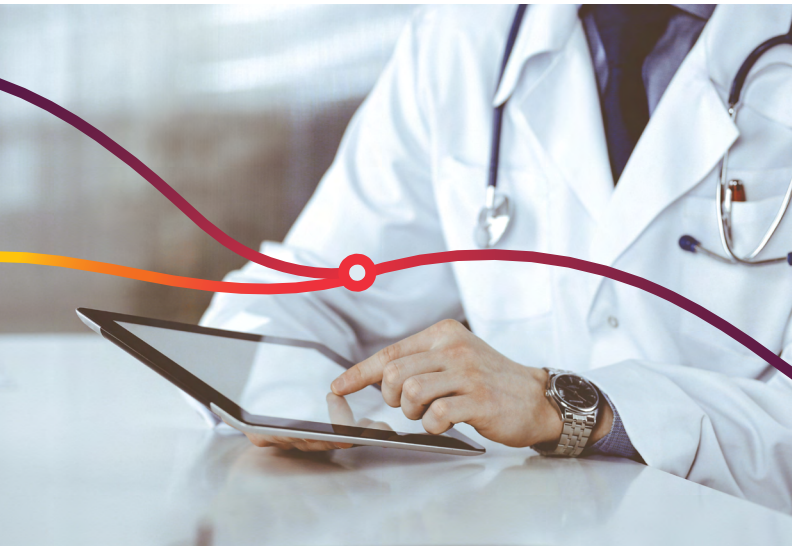
Michael Ibara

Thank you very much, Seth. As I mentioned before, I think this is tremendously exciting, drawing a straight line from the use of record-based information, which is more factual, to impacts on efficacy, which, like I said, are the payoff for all of us in talking about all this. So thanks very much for that.

From my point of view as the Chief Data Officer at Elligo, the speakers who have gone before are all part of my journey in what we've been working on at Elligo. Elligo's business model is to bring clinical research into healthcare and to those sites that may be research-naive or need help with that. Because of that, the emphasis is on standing up the research infrastructure at a site, let's say. But what is the role of working with data and data science in that organization? My remit is to get value from the data we collect, and the value is defined as bringing a patient into a trial, right? I've been at Elligo for years now, and in the time between when I started and now, I've learned two major lessons. The first is the topic of this of this webinar, which is that you need to form partnerships in order to execute research. In today's world, as you heard from Michael and Doug, the challenges that they have to go through, just focused on the data long before you try and bring it to clinical research, are immense. And as I said, this is typically the part of the iceberg that you don't see — that's underwater. So if we want to stand up research at a site, there's 100 things to be done before that, and it can take up 90% of the attention of a data partner like Cerner, or Harris and Sidus. The

first thing my group had to do was learn how to work with other groups. If you're a data science group, in addition to looking at analysis and things like that, we had to learn not just our own data, but learn our data partner's data, because we need to make things as easy as possible for them so that they can concentrate on what they have to do. And they do have so much to do, just in working with the data. Now we want to stand up clinical research.

What I found, to my surprise, is that data science becomes a link between partnering for the data and executing on the final product, which for us is getting a patient into a trial. You heard Doug talk about the fact that we have direct access to their de-identified data, and we have the same thing with Cerner. That's hours and hours of discussion and work spent on understanding the history of the data; the way the data rights are set up, as Michael mentioned; the operating principles in both companies; and the endpoint we want to get to. In addition, working out the process and the cycle time, because as you know, standing up something, getting a query out understanding the protocol, all of that moves at a very accelerated pace these days. So very quickly, we switched data science into a collaborative group, where we're working as much outside as inside the organization. That was a lesson for me in the way I needed to set up a group.



The second lesson has been more recent. That's about a general shift from a primary population approach to finding patients, for example, to more of a precision approach, to coin a term from precision medicine, where we're finding records at a patient level. So for a few years now, a lot of us have been finding patients by going over a large number of medical records — hence the reason for the partners we've chosen. You find that at a population level, and then you have the individual patients to look at. But now there's an increasing need, I think, to find all the records for any given patient. Seth and Sunovion give us a great example of that. For us, I realized we have to create a turnkey sort of operation to do that. For any given patient at an individual level, let's find all the records associated with them. So we set up a service, and if you're familiar with it, there's no one way to get all the medical records for a single patient. Many times, they may come in in a PDF format, and you can't search those very easily at all. So we had to set up a system where, simply to get all the data into a structured format, you're going to have to run it through OCR and NLPD. All these terms basically mean you can take a PDF form and turn it into a structured data set — sort of an Excel spreadsheet.

In the end, the goal is to collect all the encounters from all the providers for any individual patient and have that available. We're working with our data partners to do that, as well. We're also working with other vendors, because if you're going to your primary care physician, and then you find out you have cancer, you're going to go to an oncologist. You may be traveling and going to a different provider, and you may be seen by an emergency department. So I feel like that's the next step, and it's happening much quicker than I thought it would.

We got into a conversation with Sunovion. Seth showed us what he was doing, and I realized, okay, so while we initially designed this system to work for a volume of 5,000-10,000 patients, now we see another direct use is what Seth and Sunovion are doing: to be able to find, upfront in a trial, medical records that you can use to confirm and clarify patients' suitability

for inclusion/exclusion, so you can improve the outcomes of the trial. To me, that's the second lesson. Those two things I said were not in my purview when I first started, and they're not necessarily the way I grew up thinking about clinical research, or even thinking about EHRs. So those are the takeaways for me, from what it means to do clinical research now that we have most clinical sites having EHRs and producing data. There's always one more step you have to do. But I feel like we're getting much closer to closing that gap between what you have to do to get the data ready and how you can use the data to impact your trial. From Elligo's perspective, that's what I've seen so far.

I'd like to open it back up now for discussion by our panelists. I had a couple of questions for the group, one concerning the past and one future-facing. The first question is something we all alluded to a little bit, from each of your perspectives — Michael, working to get this setup to run smoothly; Doug, introducing the idea of clinical research; and Seth, introducing this idea of using medical records. I imagine you've all run into some change management issues, some skepticism, some concern, things like that, because we're changing the model. I'd love to hear your perspectives on what sort of problems you run into as you're trying to do the work you're trying to do. Seth, you could start us off?

Seth Hopkins

Yeah, I would. I smile, but it's a tragedy that what is enabling our adherence to this new way around requiring medical records is that we can no longer run trials in Ukraine or Russia. There's a reason we were running trials in those countries, and it comes from access to medical history. Before we lost that capacity, that volume that you speak of, change management was not possible in U.S. We sought to minimize their exposure to the heterogeneous access to psychiatric care in the U.S., but that's not a path forward anymore. So there's a huge hurdle to change. But it got accelerated by the war.

Michael Ibara

Very interesting. Doug, what is your perspective?

Doug Lee

I always say that, in this data world, changing is like moving sands. There's always a new regulation popping up on the radar, be it at a state level or elsewhere. GDPR is looking at the next iteration and how it's going to affect HIPAA. At the end of the day, will there be a new standard that will pop up on the radar? I think we're always chasing the goal posts, and they keep moving for us. But I think it's just being plugged in, right? You know, I see data as a community, and it takes all of us — like those of us right on this call — to jointly create something meaningful. It starts from all of us, and it flows through this app. That's sort of how I see the workflow. In the end, what I really hope for is a global standard that we can all stand on. If we can get there, that will be magical.

Michael Ibara

I have to say, I've been hoping for that for most of my career, but I'm still with you, Doug. Michael, I was going to say you have a foot in both worlds, but actually, you're in more worlds — you have more worlds that you're in than you have feet. So from your perspective, how's the challenge been? What do you see as the sort of resistance to we need to overcome to get there?

Michael Fronstin

You know, I sort of wish you'd asked me to talk first because he answered in the way I would have, at least for part of my answer. Certainly, anything that's new is always a challenge when it comes to change management, and in healthcare, we're always the last to change. In every way. It's just how we are, because people's lives are at stake. It's just so important, right? But I'll tell you, the introduction

of the 21st Century Cures Act opened up a lot of possibilities. And we talked about interoperability. While it's encouraged — mandated, or whatever you want to say there — many health systems are doing it, many data companies are doing it, but not all of them are enabled or ready to do it. There are so many things going on right now, you might say it's just a mess. You have to figure out how to navigate that mess, to be specific and know exactly what you're looking at, what you're doing, what you're pulling in. I think that's part of the challenge. Michael, you and Seth said it really well, using a little different wording, about bringing the patient into clinical research. Seth, I think you took it a little bit further when you talked about bringing the right patient into clinical trials, but to do that, you've got to know where you're starting and what you're doing. If you do that, if you bring the right patient in, then everybody wins. And you'll also avoid the AES and other things that have been talked about so much. New things are really tough for a lot of people, and you've got to figure out how to navigate the sea of information that we have.

Michael Ibara

I agree completely with all these statements. A divide that I've seen is if you ran a clinical trial, sort of on the front end of it, for the last 10 years or so, you needed to know what a medical record was in concept, probably seeing it sort of as paper, but you haven't had to be data literate, as it were. And what I see is what you guys represent right now: data literacy as part of bringing efficacy to clinical trials. Every so often I think about the fact that when I'm in discussions with folks like you, we lay out all the terms that we use when we're talking. I'll bet my clinical colleagues may understand less than 10% of those terms. The same is true when they're talking about patient care and things like that, if you're on the ground working with data. When I first had my group, they understood less than 10% of the clinical terms. I had to literally recruit people who had both of those skill sets, and they're very hard to find these days.

So I agree on all that change management has to do with the ability to see across from being data literate over to being clinically literate. That's something our industry is still going through, I think. We used to think of technology as something we laid on top of a process that we figured out, and now we're actually recognizing that if we understand the data from the beginning, we can directly influence the clinical results.

Michael Fronstin

Can I add something to that? Even though we've been working with real-world data now for, I'd say, 5-10 years, depending on who you're talking about — long enough for many of us — why is it that every webinar you go to about using real-world data, except this one, starts with a slide defining real-world data? Why is it that people still don't know what it is, or claim EHR is being used interchangeably with RWD? You know, oh, it's the same. It's not the same. So we have a long way to go. Yes, we've come a long way, but we still have a long way to go. And I think the fastest-growing jobs are data scientists and biostatisticians as a result of that. So yeah. We'll get there, we're in a good place.

Michael Ibara

We've one more comment, but either Seth or Doug, I didn't know if you had any further comments on that?

Seth Hopkins

Sure, I'll jump in. I do agree with your aligning of all the terms and the inability to translate between the various disciplines. Another phenomenon that I think stems from that is those who maybe don't understand the set of terms from one view to the other. We may be on the clinical side and be like, isn't there a gadget out there that you guys can press a button on? And then it's just impossible to narrow it down. We have that on our side, too, where often we refer to a biomarker, for example, as what we were measuring. And we wouldn't call it a marker, we would actually name what we're measuring. So there are aspirational terms, there are actual terms, and a lot gets lost in translation.

Doug Lee

I fully agree. I think terminology is large for our business at the end of the day. And Seth, I get that all the time — what, don't you have some AI bot that you built? To translate this, I go, "No, that's why we have data scientists and biostatisticians." Going back to Michael Fronstin's point, I think it's an ongoing education. I think everybody's learning at their own pace. I know in healthcare, sometimes it's a little bit slower. And going back to Michael's point, again, it all starts with a definition of what real-world data are. More and more, I'm seeing the definition starting to become clearer, you know — everybody's starting to speak the same language. That's a positive, so I think we're evolving. We're moving in the right direction.

Michael Ibara

Absolutely. So I'd like to thank everybody for attending. I especially want to thank the panelists here, because I think what we demonstrated here is that we're doing the actual work in this area. I encourage you to reach out to Doug, Michael, and Seth about the work they're doing. I think this proves that even though it's hard, it is happening in today's world. I'll turn it back over to you, Ayesha.

Ayesha Rashid

Thank you very much, Michael, and thank you to all our speakers for that very insightful presentation and discussion. We've now reached the end of the question-and-answer portion of this webinar and the webinar itself. If we couldn't attend to your questions, the team at Elligo may follow up with you, or if you have any further questions, you may direct them to the email address displayed on your screen. Thank you, everyone, for participating in today's webinar.

You will be receiving a follow-up email from Xtalks with access to the recorded archive for this event. In addition, a survey window will be popping up on your screen. Your participation is appreciated, as it will help us to improve our webinars. Now I'm about to send you a link in your chat box to where you will be able to view the recording of this event, and you can also share this link with your colleagues when they register for the recording. I do encourage you to do so. Now please join us in thanking today's speakers Michael Ibara, Michael Fronstin, Seth Hopkins, and Doug Lee. We do hope you found this webinar informative on behalf of the team here at Xtalks. Thank you for joining us. Please take care and bye for now.

About Elligo Health Research®

Elligo Health Research accelerates clinical trials through healthcare with access to over 150 million known patients and their HIPAA-compliant healthcare data, our IntElligo® Research Stack technology, and our Patient*Select*® identification and engagement model. Coupled with the largest Known Patient Access Network, Elligo's Site Solutions enable healthcare practices and research sites to participate in clinical trials. By adaptive engagement of known patients and physicians, we accelerate the development of new pharmaceutical, biotechnology, and medical device and diagnostic products.