

## TABLE OF EXPERTS



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# A CONVERSATION ON INNOVATION IN HEALTH CARE

**Moderator, Shoshana Center: How does innovation in health care affect your role?**

**Alejandra Alvarez:** It's my job. In 2016, Regional One Health made a strategic decision to commit to harnessing our best talent, and that's our personnel, in a way that we could disrupt health care. Hence, the creation of the Center for Innovation. We serve as a platform that cultivates and inspires disruptive innovation, from internal and external health care visionaries to our organization. We do that through programmatic efforts that focus on this choice and mentality and culture of innovation to create change.

I say disruptive innovation because you can innovate by doing process

improvement. You can innovate if you incorporate things like Six Sigma and efficiency metrics and components that allow you to run as a better organization or by introducing a new service line. When we were defining the kind of innovation we wanted to work on, we wanted to focus on developing solutions that solve a problem or a need that didn't exist, creating a new market or reshaping existing ones. Uber, for example. We've used taxi services all our lives, but you can say Uber was disruptive in that space because they changed the realm and thereby created a new need in a new market. We want to invest our time in something that has the potential for disrupting this space.

**Dr. Jean Simard:** In orthopedics there

has been a lot of innovation in the past few years — every year we get something new. A few years ago, the patient for hip and knee replacement was spending almost a week in the hospital, and now they spend a day, or they do it outpatient. We used to use a jig system for knee replacement surgery, now we have a robot to do that.

We have better material for hip and knee replacement, and they last longer and wear better. Every year we see innovation, new technology, and we're not done — it keeps going.

When you learn the robotic surgery, like every new technology, you have a learning curve, you need to do the training. But if you understand knee replacement, the robotic technology and the computer system together

give you so much more data you didn't have before to plan and do the surgery precisely.

**Dr. Robert Davis:** What we're trying to do is create the infrastructure for innovation in the near-term future. There has been great success over the past couple of years building a fully consented biorepository at the University of Tennessee Health Science Center and Le Bonheur Children's Hospital — kind of like a library of DNA from children — and it's primarily representing an underserved population. What we're hoping to do now is expand that process to more partners throughout the state and create a biorepository of genetic information from 100,000 people, which would be primarily representative of under-served minorities. We want to create this repository where you could have genetic information linked to the electronic medical record (EMR) so that, in the future, this information can be used to help treat disease or discover new therapies.

The reason for doing this is because there is a lot of innovation in the health care system right now in the field of genetics. However, at the same time, it is important to ensure that the African American community is not left behind when it comes to receiving the benefits of this innovation. We're particularly interested in spurring innovation in things like drug discovery and disease

**TABLE OF EXPERTS**

causation or application of genetic information to patients. This has to take into account the minority population, because currently many of the genetic tests and/or genetic treatments that are being developed are based largely on genetic information that is primarily Caucasian.

**How are patients or clients reacting to innovations in health care?**

**Alvarez:** Part of our programmatic effort is to work with external innovators through our access program. We work with entrepreneurs or startups in Seed or Series A stage who have developed a disruptive health care innovation and need access into the system to understand how it works and get feedback on the use or applicability of their inventions and thereby improve their go-to market strategy.

One of these examples is a company called SweetBio — they're the poster child example for utilizing the startup ecosystem in Memphis to grow their company. They've developed the first ever solid and dissolvable sheet that incorporates natural materials like honey and gelatin to treat complex wounds. It's a wound product, so you put it on your skin, and its patented composition creates an environment conducive for optimized healing. Through our access program, providers and patients get to use the product and provide feedback on their overall experience.

When we first announced the partnership in the access program, we had patients calling us asking to sign up to use this product, thinking it was an open clinical study. Even though it wasn't a study they could signed up for, that's it's a very positive reaction.

On the flip side, we also have experienced the hesitant type of patient. Patients were excited about the product but wanted to understand more about it and how many other people had used it before considering it. We've seen some people who say, 'I'm getting a revolutionary product that's going to help me, let's do it,' and others say, 'That's cool, I would use it, but tell me more.' Both of these are very good reactions in our program because it gives the startup company feedback as to how potential consumers are going to respond. So of course we welcomed it.

**Dr. Simard:** With the robotic joint replacement, most of the patients are really excited. When you say robot, they think it's better and they want the robot. I explain it and give patients the option to do it both ways — robot or jig. But people are very positive toward the robot, they want it. Most patients don't ask too many questions, which I'm just surprised about. I think it's because people trust their surgeon.

I've only had one patient who said they didn't want the robot, they wanted the knee done the old way.

**Alvarez:** We're under the fourth Industrial Revolution, also known as the Connected Revolution. Things like IoT, AI, big data, and block chain are more common to hear, read about, and see. It's become the norm. It's part of their daily life. These terms don't scare people as much as they probably once did.

**“But people are very positive toward the robot, they want it. Most patients don't ask too many questions, which I'm just surprised about. I think it's because people trust their surgeon.”**

**DR. JEAN SIMARD**

Take Alexa, for example. Now, a robot to them is the most effective and efficient. I believe that such acceptance has a lot to do with the level of trust between the end-user and the creator — in this instance with Dr. Simard, a surgeon — and how technology has made its way into our lives.

**Dr. Davis:** It's affected considerably by the context in which you present the information. We approach a parent in the hospital and ask them for permission to use leftover blood samples, which is how we're collecting our biorepository now. There are no extra sticks, no pain for their child. After the blood has been tested, it's maintained in the lab for a few days, in case the tests need to be repeated. Before it's thrown out, we basically say, 'Do you mind if we use that?'

Once people understand, they think it's great. Especially with parents, and being a parent myself, if it benefits our child or other people's children or humanity in general, it's very welcoming and especially here where people have historically been left out of this type of research.

We're getting good receptivity to our efforts. We've tried to be careful, especially since historically the United States has a poor history of studies with disadvantaged minorities, as was seen, for example, with the study in Tuskegee. We need to remain aware of that track record.

People expect us to do the newest cutting-edge science, but we can't necessarily predict what we are going to want to study or be able to study five or 10 years from now. So we say, 'We're not sure about everything, but science is moving fast and there might be some breakthroughs in the future that we don't anticipate now. So we're asking for your approval today to store the DNA now, and then use it for studies in the future.' When people understand that, they are usually very receptive, which is great. We're making sure that we're communicative with how we're doing this process.

**Alvarez:** I think the downside to all of this is the recent occurrences of data hacks and lack of a strong security infrastructure. Once you create that comfort level that says we're doing everything that we need to do to protect your information, then there's an easier acceptance curve. The key is: Do you have an infrastructure that people can

trust to protect their information?

Data can transform things, but it can also be extremely detrimental if we don't take the right measures to protect it.

**Dr. Simard, How does the Mako machine refine the joint replacement process before and during surgery? How does it improve recovery for Mid-South patients?**

**Dr. Simard:** Mako technology is a robotic arm-assisted surgery. Before doing a knee replacement, we'd try a good conservative treatment first. When you're ready for surgery, you've got the option of doing a total knee replacement surgery or partial replacement. The old jig system still works fine. But studies show that 15% to 20% of patients are not satisfied after conventional total knee surgery: their knee still hurts, it's stiff, it looks good on X-ray, but the patient doesn't feel good. That's why we came in with robotic technology to try to get that 20% down to 10% or 5%, to improve results.

The robotic surgery is more precise. We do a CT scan of the knee a couple weeks before robot surgery. There is not one knee that's the same — the shape, the size, the bone cysts. Using the CT scan, we create a 3D virtual model of the patient's knee, it's all done on the computer. We know exactly the size of the prosthesis the patient needs, and where to put it to fit the bone well. We know the thickness of bone resection, the angulation, the rotation, where the bone cysts are, everything.

You want to preserve the bone as much as possible, and with the CT scan and the robotic technique, you know exactly how many millimeters of bone you would cut to get under a bone defect and to well balance and align the knee.

We know a lot more before and during the surgery compared to the old technique, and the robot is very accurate with the execution of the surgical plan. The advantage of the Mako is that before you make the first bone cut, you can fine-tune the position of the prosthesis placement precisely to achieve a well-balanced and well-aligned knee. You know the exact size of the medial and lateral joint space in flexion and extension, which is very important for obtaining a well-balanced knee. You have a computer plan customized for your patient's anatomy. A knee not well-balanced is a reason why a patient would not feel good after surgery. A knee well-aligned and well-balanced will feel better and last longer.

The robot surgery takes about the same time to do as the jig surgery. You just look at the computer screen and guide the robotic arm. It does not move on its own. Its haptic technology does not allow you to go too far with the blade — the robot will stop. It's a safety measure for the soft tissue.

So the advantage is that it's a more precise technique that allows the surgeon to align and balance the knee better. So far, the patients whose knees I have done with the robot have less pain, their knee feels better and they

**PANELISTS**

**ALEJANDRA ALVAREZ**



is director of Regional One Health's Center for Innovation, a launch pad for health care innovation. Her background spans clinical and non-clinical environments within

startup and scale-up companies, and leadership roles in strategic planning, business development, international marketing and more. She is a certified Project Manager and Patient Experience Professional and is fluent in Spanish.

**DR. ROBERT DAVIS, MD, MPH**



is Governor's Chair and Director of the University of Tennessee Health Science Center for Biomedical Informatics. Dr. Davis has over 25 years' experience conducting

epidemiologic research with a focus on perinatal epidemiology, and currently has a large study underway in Ghana looking at genetic risks for preeclampsia.

**DR. JEAN SIMARD**



is a dual board-certified, fellowship-trained orthopaedic surgeon at OrthoSouth, where he specializes in hip and knee replacement, shoulder and arthroscopic surgery.

He utilizes the latest technologies including Mako Robotic-Arm Assisted Surgery for partial knee, total knee and hip replacement surgery.

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## TABLE OF EXPERTS

Continued from Page 15

recover faster. I did the first robotic total knee surgery in Memphis two years ago. We still have only one robot in Memphis. Last year there were 550 robots in the U.S., and this year we're at over 700.

Joint replacement surgery is a great way to improve quality of life. I really think the Mako system is a game-changer in the total joint industry.

#### How is Memphis creating an ecosystem to cultivate and inspire disruptive health care innovation?

**Alvarez:** Memphis is becoming a hub for entrepreneurs. It's very well-suited because of the medical device companies, logistics experience, and the various support resources available to startups in life sciences in ecosystem. Through our access program, these entrepreneurs, who come to Memphis through the local accelerator program, for example, get some customer validation and operational insights. The Center for Innovation completes the circle of support that a lot of these entrepreneurs need to scale their startup.

In addition to that, we are expanding our impact by collaborating with existing services and organizations that are building the Memphis ecosystem in other areas. Here's what I mean:

**"The hospitals or health care systems that succeed in innovation, education, and implementation will, in the future, be those that are fully digitized."**

**DR. ROBERT DAVIS**

Code Crew, is a nonprofit organization that's predominantly focused on helping children learn how to code. Most of those children are from low-income and minority areas. Code Crew recently released a new program that's focused on adults. It trains young adults to become entry-level software engineers for free. It's called Code School.

So, we've created a partnership to hire some of them as interns in our Center for Innovation, so that we can advance some of our technology ideas, while giving them the experience they need. Code Crew is creating skills and a resource for us in Memphis. And we're advancing those skills by giving them a place to practice, but also advancing our own priorities and needs

by creating applications and testing them. We believe this to be a win-win for everybody.

We're looking to do that with engineering and other areas like invention because fresh perspectives are really what's important.

**Dr. Davis:** The entire medical care journey is rapidly getting digitized. So the hospitals or health care systems that succeed in innovation, education, and implementation will, in the future, be those that are fully digitized. It used to be a common lament that you could log on to Netflix or Amazon and they know more about you when you log on than the equivalent medical system. Now, though, things are rapidly catching up to where we can get and use much more of this type of information in real time.

Hospitals are increasingly able to capture massive amounts of data, and for example, use it to predict when people are going to develop sepsis in the hospital or their risk for infection after joint surgery. That means creating the connections to collect all that information and employing people trained in artificial intelligence and machine learning. We want to figure out how you take this great new information and give it to the health care system in a way that doesn't overwhelm them with data but helps them figure out what to do next. That's the dream and the vision.

There is a lot of hype right now surrounding this area, and it is not possible to say when the impact of this new technology will begin to transform medical care. It might take 10–20 years, and people will be stomping their feet wondering why it's taking so long. People have high expectations and they have every right to, so we're trying to harness that impatience to help spur us along.

With genetics, however, even though patients are impatient for us to be using that information, it is also critical to protect their information as strongly as possible. In the future, we hope to proactively employ this data – for example, to screen people before surgery, so we can adjust medications accordingly. These are things that people are expecting because they are possible, and we just need to set up the system in Memphis so that we can do it and do it for a population that is getting left behind.

**Alvarez:** That's a big one because we have this device at the tip of our fingers that can do so many things, and the health care experience is constantly compared to that of retail. For example, today I can take a picture of my eye, upload it to a website, and have it recommend 15+ different makeup products and customized looks for me. For example, the type of foundation I should wear because it's detected my skin type in my ethnic background. So,

Robotic-assisted surgery, **yes.**



Robotic personalities, **no.**

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**TABLE OF EXPERTS**

why can't health care do that? We are trying to get there as fast as possible.

**Dr. Davis:** Health care systems are naturally set up to protect patient confidentiality, which is what they should do, and that's paramount. But patients are saying, 'I want to share this because I want you to use images of my eyes for disease prediction or disease detection.' With my experience in 25 years working with health care system, their first response is: 'That's an additional risk.' So we have to manage the risk, and that's understandable, but things are moving so fast that it's creating this gap.

**Alvarez:** The use of WhatsApp between provider and patient is the everyday thing in other countries. They send a picture of what they have, and the provider responds back. It's so much more of a normal relationship with the use of technology in other countries.

Whereas the United States has a barrier to manage and balance, for your protection. But at the same time, creating roadblocks to being able to achieve some of these great customer experiences or journeys.

**Is the transition from paper to digital standard in health care now and are there still frustrations?**

**Alvarez:** EMR is standard, but not everybody's there yet. Or, some parts of the organization are, and others are not. Size and capacity vary. It's still a struggle.

**Dr. Davis:** We are in a period of pain. We've all seen the vision of what the future might be. An EMR that is your helper, and one that recommends what tests to do or what drugs to prescribe. That's the future that everyone is being sold.

But today, it's incredibly clunky and people are very frustrated with how much time they have to spend on recording data or completing computerized 'paperwork.'

**Dr. Simard:** There is frustration for sure. But there are some good things. When you're done with the chart, you're done. We have the dragon dictation/transcription system, and even with my French accent, surprisingly, it captures everything pretty well. When you're done with the chart, it generates the code and the billing is done automatically. So you save some time. There is some advantage.

**Alvarez:** At the very beginning, it added more work than it alleviated. It's the change process, you've just got to work through it, and now it's much easier, of course.

**Dr. Davis:** Things are definitely getting better. I remember back in training one of my attending physicians had handwriting that was simply unintelligible. We had to find his personal nurse who'd worked with him for 25 years to read it and tell us what the patient was supposed to be getting. The digital transformation of medicine has solved some problems that we don't even think about anymore.

**“We want to get to the place where we are treating people as individuals, based on their genetics, rather than giving them tests or drugs on a one-size-fits-all basis, which is what we've done to date. There are lots of things we can do that will improve health care and health care outcomes with this infrastructure we're putting in place”**

**ALEJANDRA ALVAREZ**

**Dr. Davis, what is the UT 100,000 Genome Initiative, what benefits will it bring to Tennesseans, and why is UT launching it?**

**Dr. Davis:** In the initiative I mentioned earlier — the Biorepository Integrative Genomics Project (BIG), we've obtained individual informed consent on pediatric patients, requesting to use their leftover blood specimens. That's been a nice success. We've gotten 20,000 families to agree to participate, and since not all children have blood drawn on every hospital visit or clinic visit, we have DNA on 10,000 patients. The success of that project and the arrival of a new dean, Scott Strome, who is a visionary and thinking big and wants to make a mark in Memphis, has encouraged us to launch a new initiative: the University of Tennessee 100,000 Genome Initiative.

The idea is to continue to grow on and expand upon the success of BIG to enroll a total of 100,000 people. We don't want to limit this just to pediatrics, instead we are talking with local and regional partners in Tennessee. Over the next five years or so, we want to get to 100,000 DNA specimens.

Once we get that in place, it will allow us to do a wide array of important studies and projects. We want to get to the place where we are treating people as individuals, based on their genetics, rather than giving them tests or drugs on a one-size-fits-all basis, which is what we've done to date.

There are lots of things we can do that will improve health care and health care outcomes with this infrastructure we're putting in place. And we're launching it right now. We're in discussions with a couple of partners in terms of expanding that. We're excited, and we expect to be moving forward very soon.

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