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THE MODERNIZATION OF HEALTH CARE THROUGH MOBILE
TECHNOLOGY AND MEDICAL MONITORING DEVICES

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PROCEEDINGS

MR. WEST: Good afternoon. I'm Darrell West, Vice President of Governance Studies and Director of the Center for Technology Innovation here at the Brookings Institution, and I'd like to welcome you to today's forum on mobile medical devices. And this is part of our mobile economy project sponsored by Qualcomm, and we are webcasting this event live. We've set up a twitter feed at #TechCTI, that's TechCTI, so if you wish to post comments or ask any questions, you can feel free to do so through that. Then we'll be having a question and answer session following our opening remarks, so we will take questions both from our live as well as virtual audience.

So, there's been an explosion of mobile medical devices. At the consumer level, there are calorie counters, my personal favorite, the exercise trackers, and prescription reminders. But then we're also seeing instruments that display the electrical signal from your heart rate, electrical activity in the brain, blood glucose levels and sounds coming from your arteries and veins. These are very helpful to health care professionals, because they can provide early warning signs of serious problems. I was in China a few months ago, and while there, visited a medical clinic where physicians were monitoring patient symptoms. There were a number of different patients for whom they had remote monitoring devices. Those

electronic readings would come into this medical center and there were a number of physicians that were monitoring those readings in real time. And they told us that in twenty percent of the cases, they found abnormal readings. And then they would refer that individual for further medical evaluation.

And I think this is the type of proactive medical care that is great for patients and great for the medical system, because it can an early indication of problems that might be very serious. So there are a lot of exciting new applications that are coming online. There are many experiments and innovations taking place, both in the United States as well as around the world. Today's event is going to focus on improving health care through mobile medical devices and sensors. We obviously face many challenges in the healthcare area. This includes access and affordability in quality delivery, but the good news is that mobile technology can help on many of those issues. For example, remote monitoring devices can improve the delivery of care. Mobile sensors can help bridge the rural urban divide that exists in many countries, and mobile devices offer new ways to connect patients with their health care providers.

Today we are putting out a paper on mobile medical devices; we provide examples of some of the cool things that are happening in the

health care area. There are a number of very interesting innovations in the diagnosis of health problems. There's been a proliferation of sensors and remote monitoring tools, and we discuss some of the policy changes needed in order to facilitate mobile health innovation. So if you didn't pick up a copy, we have them out in the hallway, right outside the auditorium.

To help us understand this topic, we've assembled a number of distinguished experts. Erik Augustson is program director of The Tobacco Control Research Branch of the Cancer Control Division of the National Cancer Institute. He holds a doctorate in clinical psychology from the University of New Mexico, and a Masters of Public Health degree from John Hopkins with a focus on epidemiology. His research focuses on health behaviors and hard core smoking, and how to deal with that issue. He has over forty publications and has made over 100 public presentations. He directs NCI's smoking cessation websites, such as smokefree.gov and women.smokefree.gov.

Ilfat Husain is Founder and Editor in Chief of iMedicalApps.com. He is a second year emergency medicine physician at Wake Forest University. It's a school of medicine. He is a Masters in Public Health candidate at the University of North Carolina School of Public Health. He's writing a thesis focused on the affordability of electronic health records in an ambulatory setting, and he's very interested

in how mobile technology can improve the physician patient relationship.

Asif Khan is CEO of Caremerge. This is a company that focuses on solving communication and care coordination challenges, facing senior citizens in particular. This is a demographic that has more chronic illnesses, costs the most in terms of health care, and has the greatest number of providers involved in their individual care. Prior to forming this company, he served in several senior and global product marketing roles at GE Health Care.

So I'm going to start with Erik. You work in the medical area. What are some of the key issues in using m-health as an intervention platform?

MR. AUGUSTSON: Thank you Darrell. I want to thank the conference organizers for inviting me here today.

MR. WEST: That would be me, by the way.

MR. AUGUSTSON: Oh, okay. Thank you. I think I'm required by law to make a statement that is something like even though I am from the National Cancer Institute, nothing I say today should be interpreted as the official stance of the National Cancer Institute or the Department of Human Health and Services in any way. Okay, so got that out of the way. I think I'm also required to say smoking is bad. So now we've taken care of that.

So as Darrell mentioned, I am the director of smokefree.gov, which is a very large e-health and m-health initiative that NCI has been on the point on. And this now encompasses four different web sites, about seven, maybe eight -- I've actually lost track -- text message programs, half a dozen smart phone apps and well over a dozen social media platforms. The function of this entire program as a whole is designed to deliver behavioral interventions via e-health and m-health resources. So our interests from its very onset, and this is actually our tenth year anniversary -- from it's very onset we have never approached this as a dissemination tool, but specifically as an intervention tool, and that has been where our focus has been. The challenges that I see -- I'm seeing four challenges right now within this field, and although I'll be talking about these as challenges from an interventionist perspective, I think that these are equally true for everyone in this room no matter how you are touching these technologies. So these technologies have obviously become very important to us, very integrated in our lives. And so I'm not going to ask for a show of hands but be honest with yourself. For how many of you, would you be more panicked if you forgot to say goodbye to your loved one this morning, or you forgot your phone at home this morning. Again, no show of hands, okay?

So the challenges, I think come down to this. The first of

these has to do with health literacy. We are now capable of collecting so much data in real time that we can create these massive databases, but then what do we do with those? It's really easy to get enamored with our ability to collect data but ultimately we have to be able to crunch that data down into something meaningful, whether that is data that is going to a medical team, which will have much more sophistication than the audiences that I reach out to, which are the actual end users. And keep in mind that the individuals that carry the greatest health burden in this country are the people that are least likely to have health literacy. These people don't understand the numbers that their doctor is giving them. How are they going to understand the numbers that we are creating with our massive data sets? So health literacy, I think, is our first challenge. The second is, are we in fact reaching our target populations? And Darrell actually alluded to this just a moment ago when he was talking about some of his favorite apps. So I'm a runner, I love my running apps. I actually have three or four places, I track them, okay? I'm probably not your target audience for a diet or physical activity intervention.

I run marathons, which you wouldn't necessarily know to look at me. But again, I am embracing these technologies full on, but I'm not who we need to be reaching. So, and again, it becomes really easy to become enamored with, oh, five million people have downloaded this

particular piece of technology, but how many of those people actually needed a health behavior intervention?

The third challenge I think we face, has to do with the sustainability of behavior change. So again, as an interventionist, I'm focused on behavior change. We are very very good, despite what you might read or hear from behavioral scientists, mostly because we are our own worst enemies, but we're actually very good at initiating behavior change and getting it sustained for short periods of time. We are not that good at getting it to extend over long periods of time. And so this then becomes a place where we can actually use these technologies, but today, we haven't done that very well. And this is a fascinating place where the intersection where some of the basic, what we know about human behavior and the psychological interventions, and the psychological literature, come very nicely in intersection with the technology which is emerging.

So how can we use that functionality to help sustain behavior change? And then the other side of that is, how can we take more sophisticated psychological approaches to how we prime the appropriate motivation to sustain behavior change? Now, I'm very very lucky. I have a colleague who's here today, Dr. Heather Patrick -- Heather, go ahead and raise your hand -- I won't make you stand up. So

Heather is an expert in priming motivation in order to sustain behavior change. And so she's recently come on to my team and will be serving a very important role in new initiatives that we'll be rolling out within the next 18 months or so, which are really going to be trying to address this issue of sustainable behavior change.

The last point I want to make has to do with evaluation -- how do we know these things work? We have, and so now I'm going to put on my NIH researcher hat, keeping in mind that nothing I say is an official -- okay, all that -- but as a researcher, the models I was trained in, take multiple years to answer big questions about the effectiveness of an intervention. That is not feasible, not tenable, in the space that we are all working. In the time that it would take me to initiate a large scale RTC, a large scale randomized clinical trial, and then collect twelve month follow-up data, so recruit all those people, treat all those people -- that's the time frame in which basically the iPhone has existed. That's what we're talking about. So I would launch an assessment program that by the time I came to the end of my results were published, I'd be dealing with a technology that was so out of date, that how could it be relevant? So there is a real tension that is going on between the conservatism of research approaches -- our standard research approaches -- and the very entrepreneurial and dynamic nature of the space that we are in, in the using m-health and e-

health kinds of interventions. We have not yet effectively found a way to blend those two to come to the middle space, where we can both be doing solid methodologically rigorous evaluations while also recognizing the dynamic-ness in the rapidly changing field that we're in. And I will stop there.

MR. WEST: Okay, thank you. So, Itifat, developers put together new medical applications and you review them on your web site. What are the most promising mobile medical tools or applications that you are seeing?

MR. HUSAIN: Okay, yeah, in terms of, at our medical house we review medical devices and mainly focus on mobile applications as well. I think my fellow panelist mentioned something very interesting about how the research yet maybe isn't being intertwined with the devices that are being produced as well, and I hope we talk about that some more later. But some of the standard ones that a lot of people know about are blood pressure monitors, we have glucometers as well. So these can be done wirelessly, so you can take your blood sugar reading and wirelessly upload it to your iPhone. You can take your blood pressure cuff on your phone, connect it to your iPhone or Android device and you can trend out your blood pressure levels, go to your doctor's office and they can see where your blood pressure is and they can titrate accordingly.

Two devices I'm really interested in and over the past year have been getting a lot of buzz, and full disclosure, I don't have any sort of financial or vested interest in any of these devices, unfortunately, but, you know, I always say that anytime we talk we have to give a full disclosure, but, one of them is a smart pill bottle. So you have AdhereTech, which is a really interesting company that is using these smart pill bottles to essentially see if patients are compliant with their medication or not. And you can put your pills in this smart pill bottle that will determine if -- how many pills you have left, determine if you opened the pill bottle or not, if you took the medication, and it will actually send patients a text message to let them know, hey, you need to make sure you're taking this medication. That's tremendously important because medical adherence is a really big issue and patients that are non-compliant end up costing the health care system. I see it on a daily basis. I'll see it in patients who come in because their blood pressure is just completely out of control; it's led to them having a stroke. Or I'll see it in patients who come in with basically a diabetic coma, because they weren't taking their medications appropriately. So I think tackling, those types of devices that tackle diseases that have a high burden are very interesting, very intriguing, you know I think, are game changers. One other one that I think is very interesting is ViSi Mobile, by Sotera Wireless. They've got an FDA

approval and are getting a lot of buzz. And this device can actually passively measure all your vital signs, so it can measure your blood pressure, it can measure your heart rate, it can measure your pulse oximetry. And also your overall telemetry, so your heart rhythm. I think it's really interesting -- it does it in a non-aggressive way. It does it in a very passive way. I think that's very important. When we review devices, we've noticed a new approach, and one of the biggest barriers is getting -- if you can do things in a passive way without necessarily having the patient to have to initiate things, you can collect a lot more data and you can get consistent data as well. And I think it has a lot of opening the ambulatory setting, and also the inpatient setting, because of how easy it is to use. But saying all this, I say with an important caveat, that just because we can monitor vital signs and other things, doesn't necessarily mean we should, and doesn't necessarily mean that it leads to better outcomes. I won't call out companies specifically, but we're starting to see this emergence of baby monitoring devices, and how they call them. And these types of devices will monitor children's pulse oximetry, their heart rate as well. And that's not necessarily a good thing. We have literature; I'll give you an example. Bronchiolitis is a type of viral infection that affects a lot of toddlers, and they come into my ER and the child is not breathing. And it's a self-limiting type of disease; it lasts 3 to 4 days. And

we'll put them on the pulse oximetry and see how the oxygen levels are a little low, we're going to admit them to the hospital, we're going to put them on a monitor, trend them out, see where the oxygen levels are, see if they need any supplemental oxygen as well. But in 2004, a pretty big study came out that said that when you continuously monitor these children, they actually have longer hospital stays. So we should only be intermittently monitoring their pulse oximetry. So the sequel of having a longer hospital stay for a child can lead to worse outcome. So just because we can monitor, just because we can collect this data -- it's not necessarily a good thing, so we need to be very careful of which population we decide to monitor vital signs, and which populations we determine are high risk. Right? Just because we can do it, doesn't necessarily mean we should. I hope some of the other things we talk about are going to be incentivizing physicians to use this data too. There's data that shows that slightly over 50 percent of patients visits can be done virtually or through e-visits or through emails or through communications. So what is an incentivization to additionally communicate with their patients? I think that's something that as a society we need to figure out. And as a society, we need to figure out if we're willing to change the fundamental physician patient relationship. Often times, we say we're using all these modern techniques, you know we want

our physicians to use it, but as society are we willing to say, instead of every three to four months you have to go to your doctor to get your blood pressure taken to see where your blood pressure levels are and get your medication levels titrated, or are we willing to say, you know what, you don't need to do those three to four month visits. Instead, your doctor can see virtually where your blood pressure's trending. Where if you're having any other symptoms of high blood pressure and they can just virtually send you a message that says, okay, you need to double up on your blood pressure medication, or hey, you can decrease your blood pressure medication. Are we willing to do that, as society? I think that's going to be interesting, especially with the new influx of patients that we're getting. Because I'll tell you what -- we can't just throw more primary care doctors on it. They're not coming. We keep talking about how we need more primary care doctors. It's not going to come. So we have to figure out how to do things more efficiently.

MR. WEST: Okay, Asif, you focus on health care for the elderly. So how do mobile devices enable health care for senior citizens?

MR. KHAN: Right. So, what we do is, our solutions are not used by the elderly. It's actually used by the people who are providing care for them. So like you mentioned earlier, as we grow old, we have the most chronic illnesses, we cost the most to health care, and we have a lot

of providers around us providing care and hopefully they're talking to each other. But realistically we know that doesn't happen. So to Itifat's point, I think, earlier, we're at a point in time where we have to kind of understand what is doctor patient relationship -- how that's going to change. With respect to elder care, we provide our services, and I'll kind of round out why I identify with Itifat's point. That's there are a lot of elderly in senior living communities, for example, there are lots of providers outside of those communities, a lot of family members who make their decisions for them. And the demand on the primary care physicians, or just any physicians and nurses is increasing, 30 plus million people, like Itifat mentioned, accessing health care system now, so that demand is very high. According to research, there are 10,000 people reaching age 65 every day in the United States for the next 17 years. When you talk about the demand and the physician patient relationship, I think we don't have a choice. We have to figure out ways to get the right information, at the right time, about the right patient, to the right provider so they can make the right choices, and just move on. So having said that, I think one of the things that we focus on at Caremerge is providing tools for these providers and family members, so they can just press a button and capture information quickly. And we have algorithms in the back to automate a lot of communication among them. So if somebody has fallen, they can just

press a button. Information is then faxed, messages go to the director of nursing, to the family members, and whoever is involved. So now everybody's in the loop very quickly, and with a log of a lot of phone calls that go back and forth. This is one tiny example. So what we have seen is, and to Erik's point, where you focus on behavioral changes and lots of apps out there, and people download, are these the right people -- what we're finding is that -- and this is something that's still out for debate -- we are finding that people, as human beings, we're not necessarily evolved to a state where, not a lot of us, a state where we consciously worry about our health. But you know who worries about our health? It's the people who love us. Right? Think about it. It's the people who love us that worry about our health more than we do. So technically, if you can provide those people tools, to provide and coordinate better care for me, then that may be a way to get me to be a better healthy person. This is just one thought, but that's what we're seeing in the elder population because lots of providers, lots of family members -- they want to help the elderly live a higher quality of life. And how they do it is with simple solutions that help them track information and notify each other, share information, document information in a HIPAA compliant manner. So that's kind of what we have seen in the health care space.

MR. WEST: Okay, I'd like to throw out a question for each of

you. And the question is, how would you judge the state of public policy in this area now, in terms of regulation? The Food and Drug Administration recently put out a guidance document on how it is thinking about regulating mobile medical devices. What about the state of reimbursement policy? Where are we today, any of you?

MR. AUGUSTSON: And what I'll do is I'll focus on the FDA piece, again, keeping in mind that I don't represent the FDA, but --

MR. WEST: You don't seem to represent anyone, FDA, NCI --

MR. AUGUSTSON: Yeah, he just grabbed me off the street at the donut shop and I said sure.

One of the real strengths that FDA has is its ability to develop regulations. And as with any organization, sometimes things are done well and sometimes less well. I think that the current guidance that's come out related particularly with regards to some of the apps that we've seen -- I think they've done a very nice job with this. It is a fairly nuanced document and it really makes an attempt to identify what turns out to be like 95 percent of all health apps that they do not want to regulate. They do not feel that that falls within their parameters. So I think they've done a nice job in presenting a sophisticated analysis of the space that we are in and they have also begun to really put up parameters that give guidance

to the kinds of things that our developers and our researchers and our startup companies do and don't need to be considering when moving into this space.

MR. HUSAIN: Yeah, and one of two key points I'd like to make about the FDA as well is, number one is, it at least it shows that it's no longer the wild, wild west. So there's a sheriff in town. There's someone there at least that developers know about, and that's important, because when I initially started, one of the main reasons was because I was seeing applications that were doing absolutely crazy things. There as an application that promised to treat your seasonal depression by taking your iPhone, emitting a blue light and just shining it on your face. I mean, there was just crazy stuff out there. Today there are questionable applications. That application got removed. But it showed someone's here and you can't just use these, some random white paper that was created by some crazy industry to back up this application. Because health illiteracy in America is a big deal. These applications -- you have to think about it -- are available to hundreds of millions of people, just to download on their phone. So we have to make sure these applications don't cause harm. And the second thing was, I think it was great from the innovation standpoint, because we were getting a lot of emails from developers in other companies saying, hey, do you know what's going on

with the FDA? We're holding back right now on producing this application. We're unsure exactly if we're going to have to go through the FDA or not. Actually one other thing as well, is they recognize their own limitations. They recognize -- you know what? We can't regulate over 40,000 medical applications in the Apple store, the Android store. That's going to be impossible to do. So we'll just give some broad guidelines. And one of the biggest things I think is the fear that a mobile device has leads that connect to your chest, and does an EKG or something of that sort -- that it turns into a medical device, and then they want to regulate it. But if you're doing health tracking or if you're monitoring blood pressure and other things, just by an application, not using a device, than okay.

MR. KHAN: I'll probably touch more on the care side of things. I think what we have seen in health care is that, some significant impact, positive obviously, you guys have heard about it as well. Historically we have been volume based health care system. The more people that are admitted, the more people that are on CT scans, the more reimbursements, however the accountable care, hence the word accountable, is value based. How do we keep people away from the hospitals? How do we keep people away from getting sick in the first place, like very proactive? And nobody has figured this out. But to your point, I think there's a lot of innovation going on outside to figure those

pieces out. Evolved thirty day re-admissions that everybody talks about -- nobody has an answer -- but what a great way to start, right? Let's start thinking about it the proper way. A lot of other things that are kind of tied to it is care cold nation. In accountable care, you cannot, realistically, each patient has a lot of physicians and care providers. You cannot have an accountable care if you cannot share information about that patient, right? So shared accountability has to start with shared information. And if you can share information, now you know what the podiatrist is doing, and the podiatrist knows what the cardiologist is doing, and they all know what each other is doing, hopefully that will avoid a lot of treatments, avoid medication interaction adverse effects, and all in all a better outcome. So what we are seeing is just a fantastic way to look at health care. It's like 180 degrees the other way. But I think that's the way it should have been done in the first place.

MR HUSAIN: I have to touch on thirty day readmissions. Because it's a very hot topic among my physicians, especially in the ER, because it's a topic that, it's a bit frustrating as well. We see, on the surface, it sounded a great idea.

MR. WEST: Could you explain what the thirty day readmissions is?

MR. HUSAIN: Yeah, if a patient comes back within thirty

days, you're going to have reimbursement issues tied to it. So just, for example, a heart failure patient who's discharged and they come a week later -- you're going to have -- you're not going to be reimbursed like you would have otherwise with patients, basically. So it's a hot topic, especially in the ER, and especially with a lot of our services. An issue when it came out, physicians were just fuming. They said, well, you're telling me that this patient is going to come back but you're not necessarily providing the support for that patient at home. So I can send home a patient. I can send them home with nursing care at home and set up all this stuff, but then, in terms of a behavioral aspect, that patient's going to continue taking -- eating food with high salts and other things -- have another congestive heart failure exacerbation -- then you're putting that on me. And that's kind of how it was looked at. I think overall it was a great idea, and, but I think better support structure needs to be tied into it.

MR. KHAN: Right and I think you're absolutely right. And I think that, I'll say that, that's why we're seeing a lot of care transition centers opening up everywhere, where patients after they get discharged for congestive heart failure or acute myocardial infarction or pneumonia, those are three things -- is how do we coach these people to number one, better adhere to their medications? Do they really know -- I mean doctors, to your point, they don't really have time to sit down and have a coaching

session for two hours. That's not how we're set up. But that's the innovation. That's where the innovation comes in. It doesn't have to be technology. It's as simple as hey -- there's a care transition center -- let's get the patient in here, teach them for three, four days about -- hey, you got to take these yellow pills in the morning. You got to take these red pills in the afternoon. Coaching, coaching their families, coaching their families about hey -- if your dad is starting to feel like heavy breathing, you better call 911. What are some of the flags in your symptoms? All those things are innovative. They're not all necessarily technological, but they're all innovative. And that's how I think we're going to get to the point. Because when you think about doing the right thing, right things will happen. Right? So --

MR. WEST: And Erik, your thoughts on reimbursement?

MR. AUGUSTSON: Well, because I am no longer in clinical practice I no longer have to worry about reimbursement, so that's their problem. But I will follow up on one of the points that's being made here, and that is that again, at a very basic level, we have an idea about how to do some of these behavioral change things. I have a family member who has Alzheimer's disease, and my coaching her to take the yellow pill in the morning is not going to be a particularly effective intervention for her. But there are technologies that could assist in this process. However, one of

the things that we face in this, is how do we sort out what are the tools that can really help us do this, versus the toys that seem really really cool, and so one of the challenges is, somebody could present me with one of the pieces of technology and I would be like, this is so freaking cool, this is the best ever. I then try to get my family member to use it and it is functionally completely unhelpful for her. And so how do we sort that out? And how do we think in terms of the functionality of our technology, as opposed to, oh, I invented this new technology, what can it do? Let's think about oh, what functionality do I need to be creating? And so, I guess part of this is probably me getting up on my soapbox, which is I think it is so critically important that you never forget about the core behavior that you are trying to intervene in, and the function and the context of that behavior. That that is what will lead you to develop devices that can address some of these very key issues about, how do we keep the elderly out of assisted care? Huge challenge. Or how do we delay that anyway? How do we support this interaction between multiple doctors? How do we help the ER physician who's like -- look, I did everything I could to stabilize this patient, it's not my fault that 72 hours later, they're back in. So again, how do we build support, how do we build tools that really work as opposed to be attracted to the sparkly things?

MR. WEST: Okay, let's open up the floor to questions and

comments. There's a gentleman here. Sir, there's a microphone coming up from behind you. If you could give us your name, and organization, if you can keep your questions brief so we can get to as many questions as possible.

QUESTIONER: My name is Eric Shakor. I've recently retired but I used to direct a division of adolescent medicine, at the University of Connecticut's Children's Hospital. You are really talking about chronic disease here, and methodology to deal with it. I'd like you to think about preventive directions to go in. And one of the best preventive tools that I've found with adolescents is the cell phone. And beginning to think about using that kind of communication to make sure that they do show up and that they don't show up is a relatively sure way of getting to them. And a way to empower them to be part of the system. And hopefully eliminating some of the crowd disease that you're now struggling with.

MR. KHAN: I think you're touching upon something I mentioned earlier, which is, if you can provide tools to people who love a certain person and give them the tools to empower that person, some mechanism whether that's a text message or guidance or what have you, I think that goes a long way, because now you have an unsaid support group, right? So it's not really made as a support group, because you're

not really volunteering for it. You inherently feel about that loved one and you want to make that loved one live a healthier life, so it's like an unconventional kind of support. It's automatic. So if you can create your point, tools that help people to provide a reminder, other ways to manage that person, I think that's a starting point too.

MR. AUGUSTSON: And as a follow up, I think this is an excellent example of stepping back and thinking about the behavior you want to intervene with, and in this case, what is the behavior of adolescents? I'm not even talking about the bad choices they make, because we could spend a whole afternoon talking about that. But what are they doing right now that you could leverage to make a change in that behavior? They are text messaging. They are on social media. I should note, and this will be important for all the parents in the room, they're not necessarily on the social media that we think they're on, so there is a social media they show us as parents. I know this because my daughter has reached an age where she finally ratted out her peers about this.

MR. WEST: But she was saying other people were doing it, not her.

MR. AUGUSTSON: Other people, not her, of course. So where are they and what are they doing in that space? So I think one of the examples that has worked really well for us, and again, mostly I'm in

the tobacco world, although we also do diet activity, we're really moving into that. We have a very very active Facebook site for our smoke free women. And they are engaged in a very supportive, it's very clearly a community to support behavior change. We have repeatedly asked them to do something else in that space and completely failed. We were like, a recipe contest -- we'll do a recipe contest -- nothing -- we had zero submissions. Photos, we'll do photos -- no. But what they do want to do is that they do want to say, you go girl, you're doing a great job. And they do want to say, I'm struggling with this, what have you done to fix it. So again, when we try to impose a function that does not fit into the behavior that is occurring on that social media platform, it does not work. So pay attention to what they're doing. So again, adolescents are a fantastic example, because we know that we can't tell them, well, what you need to do is not smoke and put down the cheeseburger -- but what we can do, and this is what drives our smoke free teen intervention, is to empower them to make health choices. And in fact we even say we actually don't care what health choice you make, but we want you to make a choice.

MR. HUSAIN: And that's key, because you mentioned more the reminders and what not, the support, and you mentioned social media, but really, it's the fusion of -- there's some pretty good literature out there, especially in the pediatric populations about, kids who have liver

transplants and other types of issues where they need to take their medications and maybe before they warrant -- it's not only the reminder but it's also the support group. So if you have that support group, it's that holistic approach really, you know, building in that social group, really helps out tremendously, which is, honestly, when I was reading the literature, I had thought that was surprising, because I thought all you had to do was send text message reminders.

MR. WEST: Okay, other questions. Over here. There's a microphone coming over behind you.

QUESTIONER: Thank you. I am (inaudible), University of Delaware. My question is about how insurance companies approach to these changes -- changes about modernization of all applications, bringing the applications. Do they embrace these and how are they suspect, their process of suspicion? My second question is which country or countries could be a good example of sorts which will offer policy tools to modernize health care in the United States? Thank you.

MR. HUSAIN: I'll somewhat try to tackle the reimbursement model. Because I'm very interested in that, mainly because I wonder how we can incentivize physicians to utilize, really utilize this type of technology. So I spent a lot of time with primary care doctors, and I asked them what prevents you from using these portals to communicate with

patients. And the number one thing they told me was reimbursement. And there are some that actively do engage their patients via email and what not, but a lot of them just don't. There's a large insurance provider in North Carolina that will reimburse for interaction, but there are a lot of caveats for that interaction. So if the patient comes in within seven days later, they won't reimburse, they won't reimburse at the same level as an office visit. So a lot of physicians ask me, so what is the point. And that was one of the inspirations for another startup that I'm creating which in a sense just says, you know what, forget about the insurance companies. Let's just see if patients want to engage with their physician and actually compensate them for that type of higher level care. It's a huge issue, reimbursement, because it's not up to the level of what it would be for an office visit. So what is the incentive for a physician to say, I'm going to incent you for not coming in for an office visit, when I'm not going to make the same amount of reimbursement for it. It's a realistic issue.

MR. KHAN: I think I can take a look at it in a different way. Instead of saying this is the technology and how payers can look at it. I think payers, their incentive is, are you providing good higher quality of care and is it outcomes driven, based on the newer regulations and policy, right? Are you providing better outcomes? And if you do, guess what, we'll pay you, right? So when you think about that, then you have to think

about what are the different technologies that you can bring to the providers that help them meet that requirement. And I think that's the way to look at it. So like, for example, I'll give you an example and in the State of Illinois, you know, Medicare and Medicaid, we're not going to pay you a lot of the dual eligibles -- I don't know if you guys are eligible for Medicare and Medicaid directly, but we are going to have managed care organizations do it, right? So United Healthcare, Aetna's of the world, all those, and they're saying, in the past, government was just paying you lump sum, and it was all fantastic, but now, we are outcomes driven. I want to see what you are doing. I want to see if your diabetic, have you done HP1C test for this person. I want to see if your congestive heart care for your congestive heart care patients -- are you putting them on diuretics and beta blockers and tracking them? This is what managed care organizations are requiring. So now you go to the provider side and they are like, oh my God, I have all these patients and I have no clue. Well what about the alerting system or some type of technology that says a patient has COPD or CHF, I should be tracking certain things on a regular basis, and then provide that to my nurses, provide that to my caretakers or LPNs or lower level nurses. So I think that's the way to think about it. You know, what is the incentive for the payers and then how do you go around and provide the providers the technology that has them meet the

incentive, and then everybody starts -- it's like a puzzle, it starts to fit in together.

MR. WEST: So his second question was which countries are doing a good job? Are there role models out there for the United States?

MR. AUGUSTSON: So I'll jump in first on this one. I really don't feel that there's any country that has successfully really scaled something up on a population level anywhere that has really taken advantage of these. However, there are a number of really nice examples of doing this well for specific problems. And ironically, and maybe it's not ironic, understandably, I think the places that have done this best have been the places that have struggled most with infrastructure. So these are going to be your low and middle income countries. We have seen some outstanding AIDS and HIV management projects coming out of Africa, being done, again, via cell phone and text messaging. We have seen some really good work in maternal and child health coming out of India. We have seen some nice work in really trying to manage chronic disease, at least in the beginning stages of this work coming out of China, coming out of Brazil, again coming out of India. The BRIC countries - Brazil, Russian, India, and China - are very ripe for these kinds of interventions because the penetration of the technology is so deep and the

infrastructure of the health care system there is fragile, and so this really is the kind of environment where these technologies play a very very big role. And again, lots of nice projects being done in different parts of the world, but no one has really fully embraced this. But I, if I were going to, I am fortunate with my colleagues at NCI to be able to be engaged with a number of international projects -- all of our projects that we're doing are in the BRIC countries or the low and middle income countries.

MR. HUSAIN: So if you want to see how this is going to play out, look across the pond at the U.K. This is a website -- 3millionlives.co.uk -- and there you'll see how the NHS over in England is really trying on a broad scale, trying to implement telehealth in terms of using monitoring devices to try to potentially improve outcomes. And right now, the implementation, they're signing up patients for it. There was a study, if you look at it, it's called the WSD Telehealth trial, and that trial was a couple years ago that showed that there is a lot of improvement in outcomes using telehealth devices so NHS thought, okay, let's try this out, let's enroll a lot of patients. And there's a lot of debate going on right now about, was that trial actually a good trial? Did it actually save costs? And then recently in the BMJ, the British Medical Journal, a couple months ago, they launched a trial that said, you know, this is actually not cost effective. And then there are people analyzing that trial. So there's a lot

of conflicting evidence, but the interesting thing is, that the NHS is very cost effectiveness like, quality, cost of life, they're very cost effectiveness driven. They're actually pushing forward with this, so I think really in a year or so we'll see what the U.K. does with this telehealth, and I think that the results of their research and what they're implementing with a broad scale is going to be very very interesting.

MR. KHAN: I can add a little bit more on the aging side of it. I think we are, there are other countries around the world that are impacted by aging population and much worse than U.S. -- Japan, Ireland, U.K. to name a few that have populations growing at a much faster pace than U.S. and it's a global challenge to figure out how to let people age in place and in their own environment rather than having to provide them a higher level of clinical treatments and what have you, medications. So I think it's evolving. We're learning every day about what's going on around the world and I think we'll figure out something. Something better hopefully.

MR. WEST: I like your optimism on that.

MR. AUGUSTSON: Well, and to give a shout out domestically, the Veterans Health Administration is probably the one organization, certainly the one government body within the United States that has been embracing telemedicine for the longest, and really providing

health care to a very large population on relatively restricted dollars.

MR. WEST: But you're not speaking out on behalf of the VA.

MR. AUGUSTSON: I should note that I'm not speaking out on behalf of the VA.

MR. WEST: Let me be clear on that.

MR. AUGUSTSON: Yes, thank you.

MR. WEST: This gentleman here has a question?

QUESTIONER: Hi. My name's Prinsap. I'm from University College and I'm just visiting Georgetown Law School. So there was a time when academics used to read books and then email came along. And now, in my job as an academic, I spend a lot of time answering emails instead of reading books. So I was just wondering whether you could, each of you could say something about what you think the major risks of these technologies are? What are the potential down sides? Because a lot of the discussion's been extremely positive about these things. But actually are there down sides? For example, one I can think of is, we're talking about a lot of data sharing, with people who aren't necessarily trained medical professionals, with your family, who won't necessarily know what to do with that data. Who else is this data going to be shared with? Insurance companies, the companies that own these apps, are they

going to own the data as well? And are they going to be able to pass it on? So there's a concern there about privacy, which I would have if I was going to be, which I have about these technologies, and I wonder whether or not you could collaborate on whatever concerns there might be around these technologies? And also, about the use of these technologies and what unintended consequences might flow from them?

MR. KHAN: I want to start first, because you always have to go last. I think there is a, what I would say is, there is the privacy thesis. HIPAA covers how do you share information? You de-identify the person. There is like certain criteria. You de-identify the person from the data and you can share it. There is that. I think it becomes and, you know, if the part has more data on it, we'll share. But what we see is there is a marginal recurrence in finance terms, you can do so much, but at a certain point, you're not going to get any benefit out of it. So weighing the benefits of doing certain things versus not, is something that everybody that everybody has to weigh. I think that there are positives and negatives to everything. But the key thing is, is the data relevant? Right? So if I'm a family member, I don't want to know all these LDLs, HDLS, I just want to know cholesterol is bad. So it's how do you share data to the right person in the right form, so they can make some sense out of it and make the right choice. I think that's the balance.

MR. HUSAIN: You know it's interesting. We as developers have people come to us and tell us about innovative apps they have created. One of the apps was a smoking cessation application someone developed and patients were actually giving their personal information to this app developer, and he was using analytics and what not, and he had disclaimer forms and everything. But he himself was shocked. He said I can't believe people are just giving this information to me, and you know, asthma applications and other things. I guess we are considered the Facebook generation. Facebook came out when I was starting college and it's one of those things where we -- I guess I feel like the younger population has kind of become an open side of it and said I'm willing to share more information. And I think that goes hand in hand with health as well, where we're willing to be more open. But you're right. We're not really thinking about what is going to happen, and there will be -- there are going to be incidences where people, data, will go out in public. I know there will be. And you know, we're just waiting for that to happen. But it's about us making sure we just do our best to be HIPAA compliant and then we do our best to make sure that doesn't happen. But even further, not even from a privacy standpoint, I'm more worried about it from a litigation standpoint, being a physician. Is, as a physician, am I, if I'm a primary care doctor, and we say, all right, we're going to manage chronic diseases

more from a remote standpoint, am I comfortable just looking at blood pressure readings and have a quick 5 minute video conference with the patient, or not even having that, and changing blood medication? What happens if there is a negative consequence of that? Am I protected? Are we willing to do that as a society? And we've shown in our medical culture we're very, very, very, very risk averse. Because we're terrified of some of the consequences. Even though we know the downstream affects aren't bad. I gave that example with the pediatric population. Even though we're getting all this data, there are downstream affects to that data that we're getting that more testing is not necessarily good. You look at the preventative task force and all. When they come out, they come out with these guidelines that say maybe we shouldn't be doing as much testing, or maybe we shouldn't be doing as many things. So we need to be very careful and think about, be cognizant of the downstream affects, be cognizant of -- oh, yes, that patient's blood pressure was pulling up transiently, they got one elevated blood pressure reading, and now they've come to the ER, they've been waiting in the ER for six hours, they didn't take their blood pressure medicine, now it's even higher and now we have to do all these other tests. And now we've got an inpatient admission, because they didn't understand there are more trends of blood pressures that we look at. But they were completely asymptomatic.

MR. AUGUSTSON: My biggest concerns are within the space of what I think we can call shared decision making, so there's a very strong movement in the medical field for shared decision making, and this is a very difficult and challenging process. So this idea that -- and a lot of the technology we develop is driven by this -- this idea that the informed patient is better able to be actively involved in their care. And I also want to make clear that I'm not representing the shared -- no. That is -- that this is a complicated space though. I'm at the age now that the generation that is front of me and my family are developing a number of medical problems. I have some very very bright family members. I have a nuclear physicist in my family. My nuclear physicist family member has zero interest in making the medical decisions in his life. Very bright, data driven guy, who is like, that's why I go to the doctor, so the doctor will tell me what to do. So how did these technologies then, fit into this challenge, this philosophical challenge, of the nature of medicine in a shared decision making space? And then again, this concept of health literacy. This is a room of very very bright people. And yet, every person in this room, we could provide you with continuous monitoring of whatever health outcome we wanted, and very quickly every one of us would be, I don't know what to do with this data. That to me is really the biggest risks -- that we are designing tools that are making assumptions about the role that patients

will play, and are making assumptions about what patients can do with this data, without being too paternalistic about that comment.

MR. WEST: Near the back there's a question?

QUESTIONER: Hi, my name is Bianca Frogner. I'm a professor at George Washington University. I'd like to go back to the situation of apps. Because I think there is some desire to comment on that. I bring it up because I recently pitched an idea to the Robert Wood Johnson Foundation to develop a rapid evaluation system of that. I'm a researcher myself, a health economist, so I can see that the pace of doing the methods I do is too slow to keep up with the pace of apps that are being developed.

MR. AUGUSTSON: So you have TEAK, I don't know if you're familiar with them, and we've briefly talked to them as well, about how do we robustly evaluate medical applications so we can tell patients and physicians this is a good app, this is not. There are so many nuances of applications such as this application crashed, does it have bugs, and is the literature right or not? We've actually submitted a few abstracts. There's a lot of research and this is a hot buzz. We've submitted some papers recently to journals coming up with a methodology. I can't get into too many details with it but that's a great question. Because we don't -- how can you rapidly evaluate these applications? Because the biggest

issue that we realized is, by the time we evaluate an application, it's updated two months. So you can't do it from an application-application standpoint. What you essentially have to do is tell developers okay, if you're going to use, develop this application, you should follow some guidelines. And one of our biggest issues and gripes is, people will quote medical literature yet they won't provide the simple reference. So that's one of the things that we've been pushing a lot -- to improve the actual quality of medical applications to tell developers, okay, you're creating this application. Why don't you actually look at this literature that's out there? We'll help you with the literature out there. And if you don't even want to do that because you don't want to go on PubMed that's fine, but just at least put some references to where you're giving patients information and where they're going to be getting this. I'm not worried about the patient side of it because I'm sorry, the physician side of it -- I am worried about the patient side of it. The physician side of it; I should if I open up an application or if I'm using it for a drug reference tool, I should have the capability with my training to say that's wrong or that's right. I can just use it as a kind of a reference. But I'm worried about the patient side, and I don't want to act too paternalistic, but I'm worried from a health liturgy standpoint that patients won't be able to make that same assessment.

MR. AUGUSTSON: So I think that what we fundamentally

need to do is develop new methodologies to try to deal with this context. But I'm not representing methodologists at all. But in all seriousness, I think we need new models. And it's going to be complicated to do these models. One of the fundamental things that we will have to do is be able to do research in the context in which we are taking on more risk, and in which we are developing and communicating subtler messages to both the public and our research participants. And so one way we might do this is that we are performing studies that have much shorter term outcomes than what we might want to do and kind of our gold standard, our CT trial. So it might be that we're looking at asthma outcomes at the end of three months, as opposed to at the end of two years.

Now what we could do would be to look at it at three months and then look at it at six months, and then see, are we even using the same technology any more, and so it has to be this iterative process. Well what that means is that we're going to have to be able to somehow effectively communicate. We have evaluated this and this is an approach that is more likely than not to provide an effective treatment for three months. We do not know beyond that. How do we communicate that to, again, to a public, and just as human beings? We're not good with those messages. So I think this is a great challenge and I'm sorry you have to face this, because it will affect your tenure race. But we need new methodologies,

and like I said, some of those new methodologies are going to involve us taking on more risk than we have traditionally been comfortable with.

MR. KHAN: I'll throw in, there's a different approach like in vetting these apps, not necessarily from a consumer facing perspective, but in medicine, I'll give you one example. We recently integrated with Allscripts. It's a big EMR company. They have an Allscripts developer program, they're called ADP. So they vet every single technology that's leveraging data which kind of answers some of your questions earlier. You have all this data hidden in your EHR, how do I make meaningful use out of it in so many different ways? And I think those are again not from a consumer standpoint, but who knows? Pretty soon, these EHR's have patient portals, so why not an app that can integrate with Allscripts and all of a sudden you have a patient in and out in a minute and a half? Which is much more convenient than logging onto a website, so there are a lot of those big vendors that are starting to take, to your point, that risk, and saying -- hey, we are going to open up our platform for other people to access and leverage. One of the ways we're doing, because as the patients get discharged from the hospitals into senior living communities, there's a lot of information that gets lost. So one of the reasons why we integrated with Allscripts was that, as the patient gets discharged into the senior living community, all the information is available, right? So when

the patient walks into the senior living facility, all the information, discharge orders, medications, automatically appear. Cuts down a lot of decision time, cuts down a lot of confusion and hopefully better quality of care.

MR. HUSAIN: So, Allscripts has the open API correct?

MR. KHAN: Correct.

MR. HUSAIN: So they enable other companies to go in and use their data?

MR. KHAN: Right.

MR. HUSAIN: The problem is that you have certain companies that don't open up their APIs. My understanding is that EPIC, which is one of the biggest, does not, right?

MR. KHAN: Correct.

MR. HUSAIN: So I think that's another issue. If you have integration with Allscripts, you have certain EHR's that are not opening up their platform.

MR. KHAN: Right. And I think there's a movement toward it. And I think there are first movers in that. And I think Allscripts fits into that. And I think others will follow suit, because look at what Apple has done with the app. With the app store, you can just go in and build on their platform. It's a successful business model. Well, some people are finding that out in healthcare. We have a lot of data. Let's just go and

open it up, so the people can build on top of it. It just makes me stronger and more valuable to my customers.

MR. WEST: Front.

QUESTIONER: Hi, I'm Phil and I'm retired. And although this is a session on technology, it's clear that the technology is only as good as the behaviors that are being used. How much research is going into the behavior? How much support or support mechanisms for the behavior to use the technology appropriate?

MR. AUGUSTSON: So within the sphere that I function in, that's the primary focus of the work that we do. So I'm from the Division of Cancer Control and Population Sciences within NCI, which is the primary home of all behavioral scientists within our institute. So our focus tends to largely be in trying to understand the behaviors both in terms of how are people using these things, and how these things are influencing their downstream behavior. But the bottom line is that that's a tiny sliver of the research ocean. The research pie, I guess, that would be the right metaphor. And I would love to see a lot more of that.

MR. HUSAIN: Yeah, the short answer to that is there are not enough. And that's why, Erik, the stuff that you're doing is so important.

QUESTIONER: Donald Barnes, South China University of

Technology. There's been a lot of talk about some very exciting things that describe the relationship between the doctor and the patient, and it's a patient focused thing. What about the larger public health issues -- gathering data for epidemiology studies, and looking at the broader spectrum, rather than just the individual?

MR. AUGUSTSON: So the focus of the work that I do is population based intervention work, so that's one of the reasons that it's very attractive to be in the m-health space. And in addition to that, Heather and I, at NCI, have a number of colleagues who are very interested in the epidemiological perspective and how can these kinds of tools be used to I guess you could say, take the place of our traditional, we're knocking on doors and asking you questions. So they're looking at how can these kinds of technologies be used, especially over an extended period of time, to gather epidemiological public health data.

MR. WEST: In the very back.

QUESTIONER: Hi. My name is Jean. I'm an intern and research assistant here in Foreign Policy. And my question is, in a lot of the technologies we've heard about are long term monitoring, chronic care applications, but for shorter term responses to not only natural disasters but international crises of refugees, for instance in Syria, a lot of people affected by that are affected by chronic health issues, and a lot of deaths

are a result of that. So is there anything on the market right now that's targeted to short term response? Things like International Red Cross, organizations like that might find of use for shorter term responses and finding more facts on the ground?

MR. HUSAIN: You do have commercial vendors, you have Company Video, it's not spelled the traditional way, but they worked in Haiti and they did work by -- they provided a platform to enable physicians here to take care of people in Haiti. And then in Syria, recently, they're using Skype. So the nice part about is it you don't have to worry as much about HIPAA and other types of things when you're taking care of someone remotely. So plastic surgeons and other folks in Michigan, Detroit, Michigan, were talking to people remotely in Syria, about, okay, this is what you need to do -- this patient requires surgery, this patient does not. They could triage just using widely available tools. I would say that's one of the nicer things about having exiting technology to take care of that.

MR. KHAN: So I'll just add something to that. At Caremerge we are getting requests from outside of the U.S., from Europe of South America, where people are saying, hey, can we use this in Mexico for having the patients, having the providers capture all this information and then having the physicians in the U.S. provide second opinions. Because

there's a lack of qualified physicians in developing countries. So I think at this point we're saying no, but I think if the technology is in the cloud, it's accessible via mobile apps, and you can capture a lot of information and take pictures, add information and then just share it and have a chat with the other physician on the other side of the world. Why not? So I think we're going to see a lot more of that global, again, going back to the shortage of physicians and the shortage of nurses around the world, but population aging globally in so many different ways -- how are you going to manage that? And I think there are tools that are going to help close that gap in one way or another by quickly accessing information in the right time, right place and make the right choices.

MR. WEST: Other questions?

QUESTIONER: Thank you for your comments so far. I'm Jennifer Atrie. I'm at the American Association for the Advancement of Science, as a policy fellow and I'm currently stationed at the National Science Foundation. My question is back to the preventive health end of things. So a lot of these devices are geared towards measuring chronically ill patients. What is being done to market some of these same applications and tools to the healthy population, so that we can get an understanding as to what healthy looks like, and also so we can use that to understand when intervention is needed?

MR. HUSAIN: I think with that you have an explosion of things like Fitbit and other fitness types of devices that are really marketed towards patients. But again, I think one of the underlying things with that is, in the future, I see a time when patients will be able to use their Fitbit information, go to their doctor's office, and say, hey, look, this is my weight, this is my fitness level of activity, what should I improve on? I have a Bluetooth wireless scale at home. You can track this and tell me what I need to improve on. And I foresee a time where doctors say, okay, instead of prescribing you a blood pressure medication that you're eventually going to need, if I don't do this, I'm going to prescribe you a fitness app. Your weight is starting to creep up. So I'm going to prescribe an app instead of prescribing a medication. And why don't you try using this application to track your calories and other types of things, and other types of activity and let's come back in two to three months and let's see if we've made any progress. So I think also a big part of this is physicians taking ownership and saying hey look - these are the tools that are available. Let's start using them with patients before we need to start intervening and starting somebody on blood pressure. Let's optimize their physical fitness and let's optimize and at least give it a shot before we just rely on that blood pressure medication to help out.

MR. WEST: I like that idea of prescribing an app.

MR. USAIN: Yeah, exactly, and I think that's one of the things out of my medical -- that's why we were kind of looking at this and telling physicians, hey, these are the applications you can use, and when the new site re-launches rule, be showing -- we'll have this patient specific portal and say, hey, look, if you're going to your doctor's office or if you want to lose weight this is what you do, these are the applications you can use. But also for physicians side that says you don't know much about technology and that's fine. But here are a couple of practical applications you can get your patients using and here's how you can interpret that data. I think that's important. But again, for physicians, there has to be that incentive to say, yeah, my patient emailed me their Fitbit information and I evaluated and reviewed it, and these are the suggestions I have for them. There has to be some sort of incentive for them to do that.

MR. KHAN: It's a great question actually. Because I think if you can answer that, we'll have better health across the board. I think clinical is one aspect of it, but it's really driven by lifestyle, right? How did I grow up, where did I grow up, what did I use to eat, did I eat a lot of donuts, or did I eat good whole wheat bread? I don't know. And then socially, which places -- there's so many elements to it, it just seems like impossible to kind of figure out what is the right recipe for it? What we have tried to do is, in elderly population, it's easier to do, because there

are in a place where the providers are required by law and regulations to track all those lifestyle choices. So are you eating your breakfast or are you not? Are you going to play scrabble or not? How active are you in the community? How many offsite visits do you go to? How is your skin look like? And there's all kinds of regulations and assessments that these people have to do and the providers have to do and this helps us, at least in that kind of mode where people, providers, are capturing this information on a daily basis for about every single elderly. And then out comes a great trending capability that now we can use to say -- hey, wait a second -- this person has just stopped eating or slowed down eating his favorite meal which is very healthy and what's going on? Which is very hard to do if you look at it from a consumer's perspective because nobody wants to keep track of it, unless Fitbit comes up with every single different pieces that's like we're consuming and this brings all those pieces together. Then I think it will be just fantastic.

MR. AUGUSTSON: So the primary focus of the work that I do is on health behaviors and on people who are theoretically otherwise healthy, so we really are fundamentally prevention oriented. You did bring up a really interesting point though, that was, is there a way to use this data so that we can better define what health is? And I don't know the answer to that. I know, I'm being very helpful on this panel today, right?

But you talk about if we were tracking data on a large group of people across time and we began to see changes and values of whatever we think is the appropriate bio marker, does that then allow us to start to make a prediction about an elevated disease risk as that has changed over time? That would be, and I could foresee that happening. That would be an amazing step forward in the biomedical sciences.

MR. HUSAIN: And Erik mentioned a lot of the people that are using this data aren't necessarily the ones we are worried about -- the ones who are using Fitbit and other things. That's why it needs to come more from a provider centric approach, saying, hey, you're at risk. I'm going to talk to your insurance company. They're going to reimburse you the ten dollars for the application that you downloaded that I prescribed to you, and then we're going to have a chat about how you're using this application, and how you are using it to monitor your health, you know, it's a calorie counter, et cetera, et cetera. I think that's the key. It's not necessarily the people who are using it, which is great, because the people using it right now are a kind of experiment to figure out how to best capture this data, but I think in the future, from a health care organization standpoint or even an insurance company getting involved and saying -- and they are right now already -- insurance companies are creating applications for better health living and what not. It makes sense to them.

MR. WEST: Okay, we have a question up front here.

QUESTIONER: Hi. I'm Rachel Rogers. I'm with (inaudible) and I wanted to ask you -- it sounds like things are happening a lot faster. We can talk to people all over the world on Skype, whereas before we had to send them a letter or something. But I'm also hearing about a lot of problems that it seems to me have existed for a long time. Getting people to actually change their behavior, even if you get the doctors to prescribe these apps, are people going to use them? And so I guess I'm wondering about how to qualify how effective they're being, because a lot of these issues are -- we got it stated but, are we seeing changes? Are we seeing these positive results that we could?

MR. AUGUSTSON: Outstanding question and yeah.

MR. HUSAIN: The jury's still, like, yeah.

MR. AUGUSTSON: It's kind of like, one of the problems I'm reminded of back when I was an undergrad. The university professor said, you know, this would be a really great university if we didn't have all these damn students here. And that's kind of like the space we're in here. We could do all this really cool stuff if we didn't have to deal with human beings in that. And so I feel like one of the things we have to constantly come back to, is recognizing the fundamental behavior of people, and this wonderful idea that if you build it, nobody will come. And so we have to

think about and so this would actually be kind of, I know that we're actually running a little bit short on time, but my parting plea to you is to think about how you can use the functionality within your technology to more effectively engage what in my case are patients, with the group I'm with. How can you more use that technology to more effectively engage them in your technology? And a closely related issue to that is to be thinking about how can get them to use that technology over an extended period of time such that it would be more effective? You know it's so clear from -- you can pick any clinical intervention you want -- and what it comes down to is, if you can actually get people to do the intervention, then the treatment group does really great. But a huge chunk of our clinical trials, both in the treatment arm and in the control arm, are non-compliers. And we never calculate that in to our analysis. So basically, it's like I'm a clinical psychologist. If you will come to my office once a week for, pick a time period, 3 months, I can help you. Am I going to do anything amazing? No, you're just going to come to my office. And just the fact that you're the kind of person that would come to my office makes it that you are more likely to get better. So again, how do we -- we can't forget these fundamental human behaviors in this technology.

MR. WEST: I mean this is my problem. I'm still waiting for the app that will do exercise for me.

MR. AUGUSTSON: That's what I need, yeah.

MR. HUSAIN: It's coming in about a year.

MR. AUGUSTSON: A little app, it goes off at your bed at five o'clock in the morning and it runs off and it runs a couple miles for you. Yeah. Yeah.

MR. WEST: Absolutely.

MR. KHAN: My thought is that going back. We care more about the people we love than ourselves. And that's, I think there's some thought process that needs to -- because what we're seeing is if people love somebody, they care about them and they're going to make the right choices for them or help them. But as human beings, we're just stubborn people. We just don't care about our health, we just go along unless something happens, I'm not going to go see a doctor, no matter how educated you are, no matter how well educated you are or whether you're from one field or another. It really just boils down to human beings don't care about themselves as much as their wife or their kids or somebody else. And that inherent love tries to push -- like my wife pushes me to run every single day. So I actually do that because of her. But if it's up to me, guess what? I will never do it.

MR. WEST: And you call that love?

MR. KHAN: Tough love.

MR. HUSAIN: I don't think there's one magic bullet, just a holistic approach, kind of what we talked about before. I think these tools help out but if you look at the literature again, it shows that you need that holistic approach. You need the social media aspect. The peer pressure aspect is absolutely amazing. I'm sure you've seen that as well. But you need kind of that peer pressure aspect. And you can use technology to help do that. And you use technology to remind people to do things. But again, there are certain things that are just very hard. You know, the way people are -- I'm from Winston Salem, Wake Forest, that's my training, but we see a lot of obesity, the folks are -- how can I change that person's behavior? The way they were raised, the culture they're around -- you know, they don't know the smart phone. You know, it's hard. How do you reach those patients? And that's a lot of the stuff that you're working on as well -- text messaging and other types of things. But it has to be this broad holistic approach. Technology is cool, but it's not going to be this magic bullet.

MR. AUGUSTSON: So I'll put in one more plug and there will probably be one more after that too. But when we're thinking about fundamental human behavior, we have to think about what is motivating behavior. And we have a very good science that demonstrates that there are certain kinds of motivations that are super awesome good for short

term change and behavior, but they don't work in the long term. And we also know we can prime certain behaviors that are much more likely to sustain those. And so I think we really do have to be giving careful thought to what are we doing within our technology that is helping to develop sustainable health behavior change?

MR. KHAN: I'll just add one last thing too. It just occurred to me. We've actually seen some behaviors change if you give them incentives, right? That's one thing we all know. And there are lots of employers who will self-insure. They've started to provide these policies that say hey, you know, if you reduce your cholesterol level to this, guess what? Ch-ching, there's five hundred bucks for you there. If you reduce your waist line by two inches, then there's this in a reward waiting for you. And we are seeing that again and again, it's been very successful in a lot of organizations.

MR. AUGUSTSON: And this is the classic challenge we face -- that incentives are super good at the short term changes, but we need a different approach for the longer term changes.

MR. HUSAIN: And education right? So key -- because even in the ER I'll always look at it as teachable moments for my patients. And I'll ask them, very blunt about it, with patients I'll say even if it's not related to why they're there, I'll say, what are you doing about your weight? And a

lot of times -- well, I don't have a primary care doctor. And I'll ask them very briefly, this takes literally about a minute to do, and I'll say -- okay, do you go out? Do you eat fast food? And they'll say yes I do. And I'll just pull up an app and show them the calories that they're getting from their fast food and they're shocked. Wow, I didn't know. And it's very simple things that we take for granted, and we assume that everyone knows, but hasn't necessarily been taught to them. Hey, if you reduce soda intake, you can lose several pounds, and things of that nature. I think education is a really big part of it.

MR. WEST: I do think these incentives are very important, but I'm reminded of the story about Warren Buffet and his son, who is overweight. And this is a true story. So Warren basically offered his son several hundred thousand dollars if he would lose a certain number of pounds. The son could not do it. So there are some limits too. We're out of time, so I want to thank Erik, and Iltifat, and Asif, for sharing your views with us. Thank you very much.

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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