ROUGHLY EDITED COPY NINTH ANNUAL USH CONNECTIONS CONFERENCE CHICAGO MARRIOTT DOWNTOWN MAGNIFICIENT MILE 540 N. MICHIGAN AVE. CHICAGO, ILLINOIS SATURDAY, JULY 15, 2017 8:00 A.M. - 5:00 P.M. CT

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>> MARK DUNNING: So if everyone could take their seats, we're going to get started in just a minute or so.

I'm a little worried about how wide that lens is.

This is a great crowd. Right on time, everyone is seated and quiet.

So thank you all for coming. This is the ninth annual Usher syndrome connections conference. And it is by far our largest. We have almost 300 people here today. Although a whole bunch of them went out. The kids went out. So thank you very much for coming.

I'm going to start off with some housekeeping stuff for everyone so that everyone knows how to get around out here.

The most important thing that we start off every conference with is the bathrooms are out that door and to the right. So for those -- if you have a guide dog who is looking for the bathroom, there is a guide dog relief area up on the 9th floor. So if you go up there, you'll find it on the terrace up there a spot for guide dogs.

There's a play area in the Armitage room, which is back out that way again if you want a break and for those of you who have hearing loop, we have this room -- for those who have a T-coil, this room is looped, so you can use the T-coil. There are receivers for those who don't have the T-coil out on the table out there. And you can see -- go see her and she can help you out with the receivers.

We have -- this is sort of like the UN here. We have a whole bunch of interpreters up in the front helping us out, and every 15 minutes or so, we're going to swap out the interpreters, so we'll take just a tiny little pause in the presentations to swap them.

We have a number of speakers who are going to be coming up here today. For the speakers, I just suggest that you try and talk as slow as possible for the interpreters and the CART people, would really appreciate that when you do.

We have as you've seen going by over here, we've had a number of different sponsors here today, there's a bunch of those going by up on the signs over here, but I wanted to thank the Decibels Foundation who sponsored the kids program. The kids are all off to the Shedd Aquarium for the day. The kids program is always one of my favorite things from this conference because the kids, it's one of the first -- one of the few times in their lives where they are the majority, kids with Usher syndrome are the majority and every kid in there, all the siblings they know how to deal with kids with Usher syndrome, so they have a very enjoyable time and they all look forward to coming back.

I also want to thank Cochlear Americas, Hear See Hope, Walk in my Shoes and Two

Blind Brothers and we have a number of tables set up outside, so on breaks if you have an opportunity to go out and visit some of the tables out there, that would be great. And I think you'll learn a lot of good information there.

So my name is Mark Dunning. I'm the chairman of the Usher Syndrome Coalition. I was one of the founders of the coalition about ten years ago. And along with Bill Kimberling, Heidi Rehm, Marly Kenna and the McKittricks who are here, in the back.

I want to say a few words about the Usher Syndrome Coalition. I think it would be helpful to explain my reasoning behind starting the coalition in the first place, and the needs that we were trying to fulfill are basically the same needs I had at the time I found out my daughter had Usher syndrome. I felt very alone when I found out that diagnosis. I was very scared, and I felt powerless. There was nothing I could do to help her in any way. And so the coalition tries to address those three issues that we all face with the diagnosis of Usher syndrome. I am -- when I first got diagnosed, when Bella first got diagnosed, I was told we probably would not meet anybody else who has Usher syndrome. As you can see by this room, that's a lie.

(Laughter.)

But for a long time, that was -- not for a long time but for several months we didn't know anybody. We spent a long time to find someone with Usher syndrome. Eventually we found the McKittricks. They were the first family that we found. Miraculously their son Connor was the same age as Bella and had the same type of Usher syndrome as Bella, and that was an incredible relief to us to have the opportunity to meet somebody who is in the same, almost the exact same position we were, even though they were halfway across the country.

So we spend a lot of time within the Usher Syndrome Coalition trying to connect families, and trying to give people an opportunity to meet someone who is just like them in exactly the same situation they're in. And today at this conference we have almost 300 people here. And the vast majority of them have Usher syndrome or some connection to Usher syndrome. We also -- the Usher Syndrome Coalition represents families in 56 different countries now. I know hundreds of families in this room and I can be in touch with them fairly easily and we can put you in touch with other people with Usher syndrome. We run a Blue Book, which is a family network, an opportunity to connect with other families to discuss your issues. We run these conferences. Next year we'll be running a symposium in Meinz, Germany. You're all invited to Meinz, this is going to be a little bit bigger than today's conference. The Meinz conference is a three-day conference. All the Usher syndrome researchers in the world will be there so we invite you to come out to that and it's a great opportunity to connect with different researchers as well as to the other families.

So the Usher Syndrome Coalition tries to address that concern too.

We also try to address the fear that people feel when they get diagnosed with Usher syndrome. So when you go to our website, we try to present you with an overall sense of hope because there is a lot of hope. There's a lot of hope in the research that's being done and you'll hear that from Ian and Michelle today, all the different research that's being done and all the great things that are in the pipeline, but that is -- I was saying yesterday to some people, there's this great John Lennon quote that says life is what happens when you're making other plans, and if you're waiting for the research to get here and that's when you're going to live your life, you're going to miss a lot of your life. And so we try to encourage families to meet some of the people who are older and have lived with Usher syndrome for a while. And I have been fortunate enough to meet many of my heroes just through this -- through the Usher Syndrome Coalition. I know Mani is here someplace.

Hi. Mani is one my heroes. He developed the Usher trust, the USH trust, our registry. Even though he had lost the majority of his vision, and had -- was looking for something to do, and so he programmed the registry character by character. And it has been instrumental in connecting families around the world.

(Applause.)

And the more I meet people with Usher syndrome, the more I realize just how full of lives people with Usher syndrome can lead. My own daughter who is 18 jumped out of an airplane a week ago. I was just talking to JC over here, he told me his son was the first deaf-blind certified scuba diver recently and I can go on and on with a number of people who live incredible lives who have Usher syndrome. So it's not a death sentence. We try to get that across to people on a regular basis. We have a blog that we post stories on. We have news about people with Usher syndrome. We run these conferences, we have an opportunity to meet people with Usher syndrome. We have all our family networks and connections, all of that stuff is intended to not only not make you feel alone but not make you feel scared, because you can see just what is -- what people with Usher syndrome are capable of accomplishing regardless of what the signs are.

The third thing that I faced was feeling powerless. As someone who had just had his daughter diagnosed and was told that there was -- that she was deaf, was going to go blind, and that there were no treatments, and that they didn't know anything about the research that was being done or if there was any research being done. So we tried to connect that as well. And first of all, we were able to connect families with all of the leading researchers around the world. You won't see anybody better than Ed Stone and Michelle and Ian and the research they're doing. They're going to come up here and talk to you today but they'll also be out in the lobby to talk to you. One of my favorite pictures that we have is from our last symposium of Ed sitting down having a glass of wine with a family from Australia. So those type of things give you an opportunity to really feel like you have direct insight on the research that's being done.

You also have an opportunity to directly impact the research. The researchers learn from you. They learn from you directly, when you speak to them about what your conditions are and what you're dealing with. And they learn from you by visiting the researchers, having the opthalmological tests done, the genetic testing done. The Usher Syndrome Coalition is partnered with the University of Iowa and the Wynn Institute at the University of Iowa to do a genetic testing program. So if you are interested in getting genetically tested, you can go to our website. There's information about how to get genetically tested. Ed may be speaking about that a little bit more today.

And we also are no longer powerless because we have knowledge. One of the things that when Bella was diagnosed that I thought to myself was how can I ever make a difference? I'm just one guy. I don't have any particular science knowledge. I don't have a lot of wealth. I can't really impact research directly on my own. How can I have any sort of a greater impact on what my daughter's future is? But the truth is that as an individual, I don't have a lot of power, but as a group of 300 individuals, we have a lot of power. When we talk about the thousands of people who are in the USH trust registry, we have a lot of power. And there's 400,000 people worldwide who have Usher syndrome. We're able to connect with all 400,000 of them and speak with one voice, that's good. To give you an example of the type of power we have these days, we've been called one of the best grassroots organizations in Washington, D.C. because when we try and do any sort of advocacy work in Washington, D.C., you guys jump up, grab your phones or take a ride down to the court house and state house and meet with people in Congress and one of my

favorite stories, I was talking with Danay a couple of years ago, she was diagnosed with Usher syndrome when she was 32. She's now 35.

(Laughter.)

Roundabout. And so it took her a while before she was willing to really kind of face the fact that she had Usher syndrome. And it was several years later, before she finally found the opportunity to meet people with Usher syndrome and really come out as someone who has Usher syndrome. She has been phenomenally involved ever since then, and in just two years, Danay went from not being involved in Usher syndrome at all to knocking on the Mississippi governor's door and meeting with him, having the Mississippi governor sign into law a proclamation declaring the third Saturday of September as Usher syndrome awareness day while she stood there and he was wearing one of her Usher syndrome bracelets. So that's the type of power that you guys have. And just individuals and when we multiple Danay times 400,000, we can really make a difference.

We've reached the stage now with the U.S. Congress where Congress people are calling us ahead of the budget and asking us what language we would like in the budget. That is a big change from where we were just a few years ago. And then that just demonstrates the power that we have in this community.

So thank you guys all for coming. This isn't solely just an opportunity for you to learn. This is an opportunity for you to become part of this community, and to no longer feel alone, no longer feel scared, and feel empowered. And if you want to learn more about what you can do to help out, come visit our website or you can corner Krista at any point today or grab me.

I do want to take a moment to thank a number of people for putting this event on. I want to thank Krista who many of you know.

(Applause.)

Julia organized the majority of the conference here today. So thank you to Julia for that.

(Applause.)

We also have Maria and Nancy, who are kicking around here someplace, there's Nancy back there.

(Applause.)

And they had a lot to do with this and one of my favorites parts of this, I mentioned her last night, is Lindsey Whyte. Lindsey used to work for the USH 3 initiative. She doesn't have any family or personal connection to Usher syndrome. She used to work for the Usher 3 initiative but she has moved to a different job. Yet she took time out of her schedule to organize this and she still feels like she's part of the Usher family, so thank you, Lindsey, for helping out.

(Applause.)

We're going to switch interpreters.

One more thing I want to do before I invite Ed up here to speak. We have been presenting an award called the Foresight Award for the last several years. The Foresight Award is aimed at recognizing someone who has had a very positive impact on the Usher syndrome community. The first recipient was a gentleman by the name of Bill Kimberling. Bill is someone you know. For a long time he was the only one doing Usher syndrome research and now all the researchers doing research on Usher syndrome have some connection to Bill as the grandfather of this stuff. Nobody likes to be called a grandfather of Usher's. So Bill is one of the first recipients. We've also honored Barney Skladany. And also Hill and Knolton which is a PR firm that has donated hundreds of hours of time to tell about Usher syndrome. We really appreciate that.

So this year we want to honor a family that was one of the first families to really do any sort of Usher syndrome fund-raising and one of the first -- started one of the first Usher syndrome organizations. They also saved my life ten years ago, and it was back when we knew nobody. They were there for us. And they're still here today. Hear See Hope has raised millions of dollars to help families with Usher syndrome and to fund research for people with Usher syndrome, and Lane and Todd have done tons of work for Usher syndrome over the years. So we would like to award Lane and Todd McKittrick the Foresight Award.

(Applause.)

>> Thank you so much.

>> MARK DUNNING: Did you guys want to say anything?

(Laughter.)

>> TODD: Well, I wanted to -- on behalf of my wife who should be taking most of the credit who will be -- she'll run from this microphone if she's forced up here to talk, but -- and it is her birthday today.

(Applause.)

When we met Mark, it seems like almost a decade ago, it was Bill Kimberling who actually introduced us and said we have this other parent who is very involved in Usher and wants to do it and we were in Boston for a trip and Mark and I met at a hotel and had a beer, and wow, you've got a lot of the same inspiration, the same energy we have, you know. We said how would you like to -- he said how would you like to join -- we said how would you like to join our board? He joined our board, Hear See Hope and that one beer at that hotel has morphed into what we're all seeing here today, so it's been a pleasure working with the foundation, with the coalition, and now we kind of support Mark and the coalition as much as we can. And we appreciate more for our son Connor who is in the back. He has Usher 1B who is on the field trip today. We are more excited about the research, the direction, everything that the coalition and everybody in this room is working for. We got an exciting time ahead of us so we appreciate all the help. We appreciate this award. This is totally unexpected. I would have worn pants and not shorts today.

(Laughter.)

I would have tucked my shirt in. I was saying I could sit in the back and enjoy the conference, but thank you so much.

>> Thank you.

(Applause.)

>> MARK DUNNING: Okay. So I'd like to introduce our first speaker, our keynote speaker. Ed Stone is -- works at the University of Iowa, the Wynn Institute with the University of Iowa. He has a long, long list of accolades. But I won't go into those, so I'm going to tell you instead a quick story about Ed.

Back when we were trying to learn about Usher syndrome and find out exactly what it meant to have Usher syndrome, we met with doctors who felt like they were 10,000 feet above us and didn't view -- they viewed us as a number and looked at us as guinea pigs or just another patient. We heard numerous times that they never heard of Usher syndrome or they didn't know anybody who was an expert on Usher syndrome and we felt tremendously alone. We heard about these -- this group out in Iowa, of all places, that was doing research on Usher syndrome and so we arranged to go out there and meet with them, and I still remember Bill Kimberling when I called to ask him if we could come out and meet with him, and he said why would you like to meet with me? Just because he was so humble about this stuff and he didn't feel he was all that important. But we went out to Iowa

and took a long lonely ride from Chicago to Iowa and we met with the people out there, and I was introduced to this doctor who refers to himself as Ed and just Ed. He wasn't Dr. Stone. It wasn't 3,000 miles above us. He dealt with us like we were part of his family, like we were just another -- not just another person he was dealing with, and it was wonderful and it really empowered me and gave me great opportunity to feel like I could be involved in this.

So with that, I'd like to introduce Ed Stone and have him come up here and talk to you.

(Applause.)

>> DR. EDWIN STONE: Thanks, thanks very much, Mark. It's a fabulous, fabulous opportunity to be able to be with you today. I have a lot of friends in the audience, and it's great to see all of you, and it's just such a wonderful thing to be able to talk to a whole bunch of people in a room at once who all have exactly the same goal, the same mission and it's very energizing and everything for me to be up here. I noticed that whenever people talk about coming to Iowa, they go, Iowa of all places.

(Laughter.)

I came from Boston. I moved from Boston of all places.

(Laughter.)

But it does keep you humble when nobody knows exactly which one of the little square states it is.

(Laughter.)

They have to look it up on the map. So nothing that I'll talk to you about today do I have any financial connection to.

So we were mentioning Bill Kimberling a moment ago. I spoke to Bill a few days ago on the phone. He's doing very well. He wanted me to tell everyone here today that he really wishes he could be with you and misses all of you and misses the work, and so I'm actually recording my remarks today so that Bill can hear them, and so I think we should all give Bill Kimberling a tremendous round of applause for everything.

(Applause.)

Well, I have exactly one objective today, and the -- you know, this is a pretty hopeful bunch of people, and despite the hopefulness that's already in the room, my job today is to increase the amount of hope in this room by at least a hundred percent. And that's it. That's what I'm going to try to do today, and it's not just, you know, this sort of wishful thinking kind of thing. The kind of hope I like to call realistic hope, and what is realistic hope? Realistic hope is when you actually have a plan that will work written down, defined plan that will work, and you have a bunch of people, a team of people who understand that plan and have committed and devoted their lives to executing that plan. And so when you have a plan and you have the group of people who are committed and devoted to executing that plan, then that's what realistic hope is, and so I want to share some of that with you today and that's where our hundred percent increase in hope is going to come from.

As I said, I have a lot of friends in the room, and I hope to speak with a bunch of you today, but I probably won't be able to speak with all of you, and so I thought that what I would do is just answer just three questions that you would ask me if I did speak with you.

(Laughter.)

And I know what those three questions are because I've done this once or twice before.

(Laughter.)

And I thought we would just address these questions, you know, and get them out of the way, and then when we talk, we can talk about other stuff.

So the first question, the most common word in my receptive vocabulary is the word “when”. So the first -- when everyone speaks to me, the word is when.

So the answer is as soon as humanly possible, and I want you to understand that that is not a deflecting answer, okay? Because if there is something that has never been done before, if there's something that does not exist in the world, and you're talking about making something exist in the world, you do not really know when that's going to occur until it occurs, because there are certain things that are beyond your control as you're working.

But what you can do is you can talk about the degree of commitment and motivation you have to it, and you can basically say to the person, we understand this problem, we understand this problem to the same extent that if one of my own children had this disease, and we're going to be basically doing everything every day that you would be doing if you were sitting in this chair or in this laboratory or in this room or on this phone call, we're going to be doing that and then this outcome that we're going to talk about is going to occur as soon as humanly possible. And that is actually the answer. Whenever someone puts a specific date or time on the answer, that is an estimate, not an answer, and it causes harm if you were not accurate about that. And so that's why this is the real answer to the question.

Now, the second question and we're going to speak about this a little bit later in the talk, is that, you know, you're going along and you're doing pretty well and you kind of got the hope up and all that and then you hear something that is concerning, okay? And that you know what I mean about that. You get an email, voice mail, and then they go, but what if? What if that thing that we were counting on working doesn't work? What if the FDA doesn't let you, dot dot dot. There are a million questions that begin with “what if”. And the answer is the same to all of them. We will fix it. Okay?

So whatever it is that happens that this thing happens, it happens all the time these days as you're trying to do something that's never been done before, and something unexpected occurs. It is the job of the professional scientists who have committed themselves to this mission to identify the problem and correct the problem. So I just want the catechism in your mind, when you think that “what if”, I want you to know that there are a bunch of very knowledgeable, energetic, committed people who will correct whatever that thing is and oh, by the way, they already know the problem. It may be surprising to you if you learn about something that we already know about it. We already know about it. We know everybody in the world working on this stuff and we already know about it.

So what's the third question? The third question is the first question over again.

(Laughter.)

Because whenever you're talking to somebody and you have impassionately told them as soon as humanly possible and all that, they like to take that, sort of, and they reformulate it thinking that if they don't use the word “when”, it won't count, okay? And then we will say something different than what we said before. It occurred to me that I needed a different answer, you know, than the first one to go with the different question. And as I was coming into Chicago, you approach Chicago from the west when you're coming from the state that we talked about.

(Laughter.)

Iowa. And so you're driving along, and it's just highways and, you know, little hills and valleys and everything, and then you come around this corner and look over this last rise, and you can see downtown Chicago. It's still about 15 miles away or something when that happens. And then the taillights start all being red and everything slows way down and you're wondering whether you're going to make your dinner reservation or something. But

then what comes into your mind is you go, well, it's actually close enough to walk. Okay? I mean you can see it. You can walk three miles an hour. So if, if actually they just would not let the car go anymore, okay, if the FDA showed up and would not let the car go anymore, you could simply get out of the car and walk downtown, and that is actually where we are on the development of cures for Usher syndrome. We're close enough to walk. We're not there yet as you know. We're not in human beings, the treatments that we want which I'll tell you about some more. But we're close enough to walk and we were not that close just two or three years ago, okay? There were still some fundamental technologies that had not been developed, but now all the fundamental technologies are in place, and it is a matter of just assembling them and importantly assembling them in a way that they can be delivered inexpensively, because if you can't deliver them inexpensively, they won't work.

So the rest of the talk today is going to be divided into -- sure [Interpreter switch].

So the rest of the talk is going to be divided into three sections, and the first is sort of building a vision of success, because what my goal is in this realistic hope deal is I want us to get as much positive thinking going as possible. It's very easy, as Mark was saying in a discussion this morning, using words like fear and so forth, it's very easy to be fearful if a doctor says that you're going to go blind and there's nothing you can do and you don't need to even come back and use up one of my appointments, you know. It causes fear. But where we are now in this undertaking, we need to as much as possible let go of that fear, let go of the anger, because neither of those are helpful. And instead we need to latch on to a crystal vision of what the success is going to look like, what exactly it's going to look like, and think about it and believe in it and to the degree that we all think about it and believe it, it will happen sooner and to the degree that we don't think about it and believe it and are frightened and worried and angry its going to happen more slowly. It's going to happen either way but if you ask yourself what can we do to make this go faster, it's to have a crystal clear vision of this success that's close enough to walk to and think about it and believe in it.

So the first part is I'm going to tell you what this vision of success looks like. And then I'm going to tell you a little psychological stuff that I've learned about how research into inherited eye disease works. Yeah. Research into inherited eye disease works, and how the psychology of the patients that have Usher syndrome and similar diseases and the psychology of the physicians and other scientists who work on the condition, I can tell you a little bit about that. And then I'm going to end by going point by point in a very specific summary of the roadmap that I think that's going to take us all the way to the cures that we want.

So this vision of success is going to have two parts to it. It's going to -- I'm going to show you a family that has -- has recently been diagnosed with Usher syndrome. They still have a lot of vision left and what is the treatment going to look like for a family like that. And then I'm going to show you a patient who has had Usher syndrome for a long time and has very little vision remaining and we've got to get that person some vision back. I'm just going to show you just how that's going to be different for those.

So to start with these 14 year old twins. They had hearing loss first noticed when they were newborns, and they both received cochlear implants. Their vision today is about 20/25. They're having some difficulty in dim light and a little bit of difficulty with their peripheral vision.

But their visual fields are still quite good, I mean the vision would stay like this, it would be fine, so what could be done to keep the vision good?

This is what their retina looks like. Very normal. Just a little bit of abnormal pigment there that you can barely see.

So the clinical diagnosis of course is Type 1 Usher syndrome. The cochlear implant tells you that. A very specific molecular test, $557 days was done and found their mutation was USH 1C. That's important because the most favorable viral vector for carrying a new gene into the retina today is the adenoassociated virus, and only three Usher genes will fit into that virus, USH 1C is one of them. Most of the other genes is too big for that. So this is favorable for this type of gene therapy.

Mark mentioned to you that the University of Iowa has had for a number of years this thing called Project Usher which is a testing program for those who can't afford a genetic test. We have philanthropic money and you know someone who can't afford a genetic test, they can get it free through the University of Iowa through this program.

You have the diagnosis, what can you do? You need to make this viral vector in a way that the FDA will let you put it into a human being, and this required a laboratory that's called a GMP facility. A good manufacturing practices facility and a very generous philanthropist, Steve Wynn gave us money a few years ago and we developed a GMP facility at the University of Iowa so we could manufacture this stuff ourselves very inexpensively and have complete control over it and make the treatments for dozens and dozens of different genes. So this is a key component for this.

A number of gene therapies for a number of genes have already been synthesized including the backbone for the USH 1C project has already been made in this facility in the University of Iowa.

Here is Dr. Steve Russell at Iowa performing one of the first gene therapy surgeries that we did there. It was for another disease called RP65, but Dr. Han my partner will tell you more mechanics of how the surgery works later on in the day, but I just want to for this purpose have you imagine that it's just you're inside the eye, it's an extremely fine delicate needle and you can inject this viral containing solution under the retina and bring a new gene into the retina that hopefully would forestall the disease but we don't know. How are we going to know? The way we're going to know is put this virus initially in the first patient, out in a part of the retina that is endangered soon by the disease. In other words we know from the natural history that that part of the retina would be injured and so we put this virus out there, and then we compare the outcome to the treatment in that eye to the untreated other eye and go forward for a few years, and then if God forbid the treated eye didn't do better or did worse, then the untreated eye, then of course we're not going to put that in the center of the retina. But if we do that in several people and gather convincing evidence that it is helping, then we can put it in the center of the retina, which of course is the thing we want to preserve forever because that's the retina that we need for communication and awareness of our environment, that sort of thing.

So we believe that we can do this entire thing as I described it to you for less than $20,000 a patient, including the ten years of follow-up of the surgery that would need to be performed. And that is just a dramatically different number than some of the corporate models that you'll hear today.

So what about our other patients? Well, here, this lady is 59 years old. She also had hearing loss in childhood that didn't -- wasn't at the cochlear implant level. She was treated with hearing aids successfully. RP was discovered when she was 15. So now at age 59, she has what an ophthalmologist would call hand motion vision because she can see a little bit of movement, some light and a little bit of movement. So obviously that's not enough vision.

So this is what her retina looks like, and the key for this is that the optic nerve is still pretty healthy. The inner retina, the part of the retina that talks to the brain is still there and still works but the photoreceptive layer, the layer that catches the light and turns it into the initial impulses that the brain listens to have been injured by the Usher syndrome.

So what we need to do is use this miraculous new technology called induced pluripotent stem cell so that we make the cells out of the person's own cells. The body's immune system will see the body's own cells and not destroy them. The cells are about 80 more times likely to survive. And then we need to put that little graph under the macula to get vision back in the center.

So this is what skin cells look like in culture. When you treat them with some specific growth promoting factors, they turn into these induced pluripotent skin cells and then there's a concoction, a growth factor that basically allows scientists to artificially cause the normal developmental program of the eye to take place in a plastic dish, and after 150 days of doing this or so, there's this little eye shaped structure in the dish, which is a human eye forming in the dish with retinal cells in the middle of it, which are beautiful, brand-new retinal cells, exactly what we need to go back inside the eye, and so then you harvest those, dissociate them, and then grow them over the surface of some type of dissolvable polymer. Here you see this stuff called polycaprolactone, which has been used in other medical applications, and then this makes this five millimeter graph that we want to put in under the macula and if those cells will come back up again, then we think we're going to get vision back, even if somebody had already fallen into complete blindness. So we think we're going to be able to get vision back even if somebody had completely lost vision before we were able to treat them.

So right now, we make these things by hand. They're sort of like the Stradivarius violin and we can only make a few of them a year, which is not a big deal if you're flying across the Atlantic the first time. But once it starts working of course, you need thousands of them. So the other thing that's happening is we're roboticizing the entire process so we can make as many of them as we want and we can make them in places other than the University of Iowa, so we want you to know that this robotic process is so cool. These devices have 20micron resolution. They can go over and over again, and this robotization is under way right now and one of the purposes of the throughput, meaning we want to be able to treat everybody who needs it, not just a handful of people, but we also need the costs down. The same as I was talking about, the costs have to be low enough or it just doesn't matter for our community, and we think we can get the cost of stem cell transplantation of the type I described to you down to less than $50,000.

Now, let me just add to that, these figures, 20,000, 50,000, they still sound like huge numbers, I realize that, but the difference is you can go to a philanthropist and say would you give me a million dollars and we could potentially restore the vision of 20 people? You can raise money like that. Okay?

At the million dollar per patient level, it's just not something that's going to happen. So we want to make it as cheap as possible and we think if we can get down to that 20 to 50,000 range, that that's something that will be philanthropically reachable.

So I want you to imagine now, I want you to imagine that we can make gene therapies like this for all patients that have early retinal disease, regardless of what it is, not just USH1C, any gene, but any gene. And then for patients that have lost the majority of their vision and need their vision back, we think we can make new photoreceptor cells for them and transplant those photoreceptors and get vision back.

How big are these goals? How big are these goals in a population scale? We recently

did experiments in which we looked at a thousand families from my clinic just to see how many people can we find there in 2017. What do the diseases look like? The answer is we could find 76 percent of patients, which is a fabulous thing. The average cost of the test, even the most sophisticated one, when averaged across the entire population was under a thousand dollars, and there were 104 different genes, eight of which were Usher genes. And so this is how they're distributed. In other words, the frequency of the gene is shown on the up and down axis, and then they're just put in order of decreasing frequency. So what you see is there are only a few genes that are common in this group. One of them is Usher's gene, USH2A, but the vast majority of the genes are just ridiculously rare, just a handful of people in the United States with them. So again this is just why, and I'm going to touch on this in a moment, this is why a sort of nonprofit mission driven thing is going to be required, because if there is a gene that affects literally 10 or 12 people in the United States, that's not going to be a corporate target. It's never going to be a corporate target. It's going to a vision target. Somebody is going to do it because they want to do it.

So what I'm going to do now is tell you a little bit about the psychology of the deal, okay? And a combination of psychology and strategy and I'm going to start by telling you three separate perspectives that you could have on this body of work that I just laid out for you. So you can think about it as a perspective for the problem, or you can think about it as a perspective for the solution. But in each of the three perspectives, the three elements are the same. The elements are money, science, and the treatment itself. And the thing that differs between these three perspectives is which one is the driver, which one is the driver. And I want to just tell you at the outset that it's not that one of these perspectives is good and the other ones are bad. They're just different, and it's important for us to understand how they're different and how some of the perspectives would accomplish a certain thing that we might want and then some of the perspectives, some other perspectives would accomplish the other things.

So let's talk about the one where money is the driver first. This is one we're familiar with. Here a company would go into a room and say, hey, do we want to be in this gene therapy space? 'Cause it's a happening thing, you know? It seems a big deal. A lot of press got that. We want to be in the gene therapy space. They decide they want to. And we'll go out and find some technology that we can own to get our foot in the gene therapy space and they find something to work on and it's a cool tool and they're going to work on it and they're going to work on it exactly as long as they think they can make money in their company. And the minute they decide that this is harmful to their company to work on this, they're not going to work on it anymore. And that's just how companies work.

Now, that isn't a bad thing. The phones that we have in our hands, the computers that we have, the cars we drive, many things, good things in our daily experience come from that process. So it's not that that's some sort of evil process, but it's important for us to understand because if you call the CEO of that company up and tell him how you really need this or that for your family, that's neither here nor there because that isn't what the driver is for that company.

So the second perspective is one from science. So, you know, a lot of scientists want to be the best scientist that they can be, so what does that mean? The best scientist. Well, the best scientists get Nobel Prizes and stuff, right? Big poster, best science. Well, there's a lot of hierarchical stuff in science. Did the journal take your article? Do you get promoted to be a professor at the hoity-toity university, blah, blah, blah. Okay?

And so if you get up every day wanting to be the, quote, best scientist in somebody's estimation, then working on the fifth gene on the list isn't how you do that. You don't get to

be the Nobel Prize winner working on the fifth gene or the “this” or the “that,” right?

So again this induced pluripotent stem cell technology came out of that kind of science. Science for science's sake. It is not a bad thing. We have gotten lots of stuff that's good for our mission out of that. But there are parts of that that are not -- part of our mission is not going to be carried with people that perceive it as, quote, trying to do the best science for science's sake.

Are we good with the interpreters?

>> INTERPRETER: We're good with it. We have people coming in.

>> DR. EDWIN STONE: Okay.

So you might imagine that the third perspective then would be the perspective for treatment is the driver. Treatment as the driver. And the people get up in the morning and all they want is the same thing that you want, which is they want this treatment to occur no matter what. And they don't care whether they're in the fancy scientific organization and they don't care whether they get this amount of money or that amount of money. You know, money is still on the triangle, right? Because you have to pay people to work for you and you have to keep the lights on and all that. But the money is not the driver and the science isn't the driver. The treatment is the driver.

So I'm going to tell you about these last people, the treatment people. The treatment people are basically just you guys in laboratories. That's what I want you to understand. The treatment driven scientists have exactly your personality, and they have exactly what you want. They just work in laboratories, and you'll see what I mean by that in just a second.

I thought a lot about putting this into the talk, and then I decided it needed to be in there. So what I have noticed over the years is that many patients and many families who have one of these inherited eye diseases basically have a form of posttraumatic stress disorder. And the reason is they were minding their own business, you know, with some kind of symptom. They thought they might need some new glasses or something, and they go in to get their glasses, and somebody looks in there and sees an abnormal pigment or something, and they turn and say, well, you know, you have, fill in the blank, retinitis pigmentosa, Usher syndrome, whatever, and they say this thing, and you go, well what is that? What does that mean? And they say, well, it means you're going to go blind, and if you told someone out on the street that some doctor said that to somebody, they wouldn't believe you. They would not believe you. And yet every single patient I see has been told that at least once by somebody they see, just like that, you're going to go blind. Well, what are we going to do about it? Because, you know, you have a ruptured appendix, you're expecting the doctor to say we'll rush upstairs and fix the ruptured appendix. No, you have a ruptured appendix. Go home.

(Laughter.)

What? Look it up on the web. We'll get somebody to print it for you on the way out. You think I'm kidding. They go and look up something on the web and print it out on a dot matrix printer and hand it to you and you stagger out to your car in complete and utter disbelief, and it is exactly the same as witnessing an automobile accident where somebody is killed or a combat injury or something like that. It's exactly the same, and it has all of the same symptoms associated with it. It's associated with anxiety and depression and poor sleep and these uncontrollable thoughts that you think you've got it all tamped down but you don't have it all tamped down because there are these triggers. What are the triggers? Well, some well meaning soul sends you an email because they just found this thing, you know, they were reading this thing and they found this thing that says that maybe CRISPR

won't work or something, and then suddenly it just floods back to you exactly you remember vividly everything in that room that that doctor said and you're right, doctor, it's just like posttraumatic stress syndrome. But you know what? The war correspondents, the helicopter pilots, the medics, the doctors back at the far away base taking care of the soldiers, they have posttraumatic stress syndrome too, they have this too, they want this outcome as badly as you do, because when they get the question or the email and the anger, it wakes it up in them too.

Now, I don't expect all of this to go away by me telling you about it. I would be happy if five percent of it went away, because if five percent of it goes away, that's five percent more positivity pointing us towards the goal that we want than we had before today.

So what I'm asking you to do is think about this email thing, think about these conversations. Don't amplify negative messages, because -- I'm not going to tell you these specific things. I'm just going to tell you one of these things I'm calling the loud noises, recent loud noises, which is like a starting pistol shot over the head of a Gulf War vet. There was this article that CRISPR won't work. So for those of you who don't know what CRISPR is, CRISPR is a gene editing method that we think is essential to our skin cell strategy and CRISPR does work. And there was this article that came out, CRISPR doesn't work, and in basically two weeks, more than a hundred million dollars changed hands after that flurry of emails from -- that rocketed around the earth, and it was based on three mice, and that study has been widely derided as flawed and untrue.

So what are you supposed to say if somebody tells you that CRISPR won't work? But what if CRISPR won't work, what are you supposed to say? They will fix it. They will fix it. They will find whisper, lisper, I don't know, something. Okay? For a long time we had this gene editing method called talen, we thought that was the greatest thing since sliced bread. CRISPR made that look like a mud fence by comparison. That's what we call them in Alabama. Mud fences.

This is something you didn't hear about it. This is what I wanted it to look like. This is what skin cells look like when they're healthy and growing in culture. See those beautiful cells there growing in culture?

So Mr. Wynn gave us all this money and we built this fancy GMP laboratory that was going to be the portal to treatment. Portal to treatment. And it took us about a year to make it, and we're so proud of it and we opened that thing up and we took all the cells, you know, from these very powerful people, and we're growing their cells. When we moved them over to the fancy new multi million dollar GMP facility and they all died. Every one we put in the new facility died. The cells all died. Can you imagine? I mean we thought, is there a toxin in the tubing? Did they hook the tanks up backwards? Are the sensors turning off at midnight? What was it?

Well, it turned out that the people we were trying to grow were older individuals. It turned out that when you used GMP grade chemicals, the older you were, the cells wouldn't grow. This was not known before because no one was trying to grow cells per person to transplant, so you get some 20 year old and they would grow in distilled water, but when you tried growing these older people, they wouldn't survive. So we went oh, my God. This is where if you were a for profit entity, you would have a press release or something about that because you would want to rev everybody up about this thing, so it distinguishes your company from the other company.

And so instead what we did is we went out and bought one of everything in the tissue culture world and mixed them all together in 800 different combinations, and within three weeks, we had the old guys growing better than the young guys, the word for this in the

laboratory, we call this the Abe Lincoln juice.

(Laughter.)

Because some supporter of ours was asking me how that was going. I said we can grow Abe Lincoln if somebody will just go dig him up for me, right?

(Laughter.)

So anyway, it is a solved problem, it is a solved problem, and you know what we did with that discovery? We published it freely so that anyone else in the world who wanted to grow cells from older people in a GMP environment can do so. Okay? So that's what we did. We didn't send an email around revving everybody up. We discovered the problem, we addressed the problem, we fixed the problem and published the results so everybody can use them. And that is what we have to do from here on out.

Just very briefly to finish, I'm going to itemize what we see as the path to the cure.

We think it needs to be a nonprofit thing, because I think that nobody's going to work on certain ones of these diseases in a for profit way.

We think we need to share everything freely as we do it so that others can copy our useful things and find what's wrong with our stuff and tell us about it if it's not good.

This is really important. We need to leave no one behind. The rarest one of those genes, if you have the rarest one of those genes out of the 104, you want a treatment for that as badly as the person who has the most common one. We're all in this together, we have to stay in this together, we have to make a treatment for everybody. We need to reduce waste. We need to look for anything we can do to get the overhead down, any person that is not paddling toward the mission, they need to get out of the boat. Okay? We can't afford it.

We need to confine our discussions to meetings like this where we come out and we talk about positive stuff. We need to publish our work. We need to not have this big drone of emails and phone calls, everything upsetting everybody.

We need to use animal models as little as possible, and use cell culture as much as possible, not only for the animal rights kinds of reasons because they’re important, but also it's much cheaper and much faster to use the cellular methods.

We need to have good genetic tests. I told you that.

We need to have this GMP facility, we have one. The blueprints are available to anybody who wants to copy it. So if any other institution in the country wants to copy that thing, they can do so.

When we get a strategy working for one gene, we just need to do it over and over and over and over, just repeat that like Eli Whitney and the cotton gin, reusable parts. Make all these treatments available.

This last one, we need to use all this data that we've already got to develop our natural history ideas. How rapidly do these diseases progress? Where should we put that gene therapy and that specific disease? We can know that by looking back at our data. When Bill Kimberling retired, we worked with Boystown National Research Hospital to move all of his records, all of his samples from his 40 year career, we moved all of it to the University of Iowa and wrote letters to every patient he had ever seen, so that we now have this huge collection of 2300 Usher patients and all their clinical information.

And in there are clinical data, like Goldman visual fields and that Goldman perimeter is the same today as it was in 1945 and the data that was captured in 1945 is exactly the same data captured today. The difference is we had to convert it into digital data so the computers could think about it. And this is the team at the University of Iowa who has perfected the ways to take these all analog data and to turn them into digital data that

computers can think about in our natural history study.

So finally, the last bit, the last movement towards this thing is we want to work on mostly phase one and two trials for these rare things. We're not going to make for profit products which is what a phase three trial is and we want to view every single aspect of the work, every single day not from the perspective of will we get paid for it, not from the perspective of whether this is going to look good on our CV, but does this work at advancing us towards the outcome that we all want, and we have to do every single thing we do with the sense of urgency that everybody in this room feels. So the summary, we want to offer a genetic test for everybody that needs it for a thousand dollars. We want to offer gene therapy for everybody who needs it for less than $20,000. We want to offer stem cell therapy for everybody that needs it for less than $50,000. And the overarching thing that everybody in this room can do to help us get there faster is to have as much positive thinking about these goals as we can possibly, possibly muster.

And I just want to thank everybody again for letting me speak with you today and thank all of my colleagues back at the University of Iowa that made this work possible. Thank you.

(Applause.)

>> MARK DUNNING: Give me a second to get this hooked up. Okay. Well thank you very much, Ed, for that. Our next speaker is Bill Barkeley. He's a deaf-blind adventurer, advocate, and storyteller. He's going to be our featured speaker from the Usher syndrome community. So you heard Ed from the science side of things. Bill is going to share information about his hike along the Camino de Santiago and he was with our Own the Equinox campaign last fall and today Bill shares stories about his adventures on Mount Kilimanjaro, the rain forest, the Boston marathon and he'll give you some insights and lessons he learned along the way on that journey. As I said before, people with Usher syndrome can accomplish great things and there is no better example of that than Bill Barkeley.

(Applause.)

>> BILL BARKELEY: Good morning. How are you?

>> Good.

>> BILL BARKELEY: There you go. Well, it's an honor to be here. A real honor in terms of what I might share today, most readily identify with. I do this, in talking to people around the world literally, corporations, schools, kids, hearings, organizations, basically anyone who will listen and have me.

So I probably won't share with you anything you haven't heard, but I do want to share with you some thoughts and perspectives about where you are in your life today, and what you can see as the challenges and some of the things that Usher presents to you as you move forward in your life.

As I travel, I talk to people about my adventures to people and people also expect me to talk some about Bill Barkeley. But really the bigger message in all of it is that it's not about me. It's really about helping other people get to a better place in their lives, and by doing so, that's where the reward and the payback and the fulfillment comes from.

So when I'm talking to people, they just think I'm going to talk someone with deafness, blindness, or a combination thereof. Sometimes maybe a disability. But what they end up finding is this, whether they have those challenges, any challenge or not, they realize that as a human and as a person, we all face challenges, and it varies, and probably the biggest question is what do you do with it? Where can it take you? So I'm a firm believer that it's possible for anyone to establish a full vision of themselves. I also believe that each one of

us has to do it on our own and drive that process to move forward. And I thought I also believe that we're all raring to aspire, that as humans, go higher, go for new skills and new experiences, and then I also believe in hope, that little by little, step by step, as you move forward in some kind of direction, that it makes the journey worth it, and sometimes when you look back, it's amazing to see how far you've really gone.

And last but not least, really developing faith in yourself as a person. And faith in your friends, your families, communities like the Usher's Coalition and others, and in our world. There's really a difference between the impossible and possible, and it's really you and bringing everybody else into what you need to move forward.

So ten years ago, I was in a dark place. In 1989, I went to an optometrist, an eye exam in 2000, visual test. Optometrist said you are going blind. You need to go see an optometrist immediately. So my wife and I went into the parking lot, and in shock and in fear of something we never heard of. No Internet, no scientific publications. Very few doctors in the world, we didn't know where we would begin the journey.

And then the next time that doctor said for example, are things we have to decide years later to no longer drive, to reinvent yourself in your ability to travel and move. I up until about eight years ago, was a Fortune 500 executive in sales and marketing. I traveled to Canada and Mexico as my territory. I was on the road, and progressive challenges kept coming at me. I was getting tired and I didn't know what I wanted. But when I lost the ability to drive, I had to change my whole focus and make that happen and I did.

But when I finally got ten years ago, I was in my mid 40s. Three teenaged sons, all ready to go into college, and I needed to do something but I didn't know what it was. And what I'm talking to you about and why I'm mentioning this part of it, is the process of going through Usher syndrome is that constant readjustment. And what I've come to learn that the darkest of my life is always going to keep coming but the darkness is not just my vision. That includes my mind and how I'm reacting to the stage of where I'm at and trying to build to the next transition. So as I go from diagnosis to losing my independence and then moving into what would be the next chapter of my life, I've learned that I have to go through it. I have to feel it, and then I have to build and I have to grow from it.

So I'm climbing, when I did Kilimanjaro ten years ago, we talked about campers and climbers. Campers are close, and when it's cold, they divide everything out. Climbers keep going regardless of what the elements are. So Kilimanjaro taught me to keep going. I thought that assistive technology was starting to change the way people with vision and hearing loss work and play. I had a first generation Bluetooth hearing device. I found out that I could get a prescription for military grade technology. That would allow me to still play. So Kilimanjaro was about starting a journey, but I was still working in my corporate capacity, and I didn't know where I was going. Most of my friends said here's a guy in his mid 40s, three sons, decides to go to Africa, climb Kilimanjaro, never climbed a mountain before. The guy is having a serious mid life crisis.

(Laughter.)

And to boot, he's deaf-blind. He's crazy. Well, I'm used to those kinds of conversations, and as we go through, you're only as crazy as you want to be. But it doesn't mean I'm going to do it the same way, but I can do it if I choose to move forward and there are ways to work on it.

So the thing for me, by the time I got to Kilimanjaro, had a friend who helped me. He's a famous blind person. His name is Eric wild man. Some of you may have heard of it. He was the first blind man to summit Mt. Everest and I told him I had to talk to some groups and do some inspirational speaking, till we found out we were going to be friends as we

move forward. So he said I'll help you get up Kilimanjaro and by doing that, he had helped me do something that I had never thought possible, and that was to be on TV to share the message.

So I'm walking through, to take up a little bit of time because I'd then like to have the ability to sign the message. But the main message on good morning America was that anything is possible if you choose to go for it. And in choosing to go for it, is having faith in other people, building the system of people around you. But at the end of the day, you're not just by what other people think about you. It's about you defining yourself. And you are only limited by how you see and perceive yourself.

So if you meet a lot of -- so we need a lot of people to help us, especially in our life journey and the interesting thing is culturally, we're all aware of the independence from day one and that we don't need people or have to rely on people, but the older you get, the wiser you get and the more experienced you get, you realize you need independence and interdependence.

After I came back from Kilimanjaro, I thought about it. I started getting phone calls to do public speaking around the world. I went to South Africa to talk about apartheid and I also traveled to Australia and other places around the world to share the aspects of my journey.

So after good morning America I started thinking, do I want to do this for the rest of my life, what I've been doing in my standard career for 25 years. In going for the goal of Kilimanjaro or any goal that you have, what happens is all these other doors open up that you can't possibly predict or imagine. So in going for it, sometimes it's about what's beyond that experience that really opens up the next and richest chapter of your life.

So I started, I would leave my traditional job and career. Went into my office in my house and I rebranded myself. Rather than being director of sales and marketing for a Fortune 500 company, ten years ago I became a deaf-blind advocate and storyteller. Basically I try to do an adventure every 18 months or so and it's about getting people to a better place.

My next priority after myself is how do we get young people to face the challenge they face? So what I did was a series of expeditions of which we've done three so far where we take deaf kids between the ages of 14 and 21 and take them to the rain forests of the Amazon, and then we take them on a separate trip and then trip for six days down the Grand Canyon. But it's about getting them to embrace their challenges while they're young and then build on their various lives moving forward. And many teenagers as you know, mainstreaming on the hearing side into large high schools. Imagine one deaf kid in a 3,000 student high school. And so we're trying to build this community and where social media and getting them together, we realize that we can help change people's perceptions and help give them confidence.

So I'd like to share with you what they talked about after they come back from all of these adventures.

(Video playing.)

(Captioned video.)

(End of video.)

>> BILL BARKELEY: I look forward to having someone with Usher syndrome on another journey.

The Boston marathon -- switch? Yeah. Thanks. Good? Thanks.

So what we in 2012 was got a group together to raise money for research because after 20 years of going there every single year, they had done tremendous work and it was a helpful opportunity to try to give back to people who helped out, like Ed Stone and so many

others in the scientific community that are here today.

After that in 2014, I said I was never going to do a marathon again after 2012, but the bombing hit in 2013, and a lot of people lost limbs. But 93 people also lost hearing and vision in the bombing and required lifetime care. So I was recruited to be a part of the team that came together with 55 people and we raised $50,000 for people to get the care they needed from the bombing itself.

I was also invited to go to a deaf-blind papal audition in Rome which was an amazing experience like some of the things I see here today. Imagine 5,000 people in a huge place. They had deaf, deaf-blind and blind. It sent a powerful message and the message was that they had never had one before from what they could tell through all the records. But there were two cultures in the world, and one of them was the culture of inclusion and the culture of (inaudible). Inclusion was getting people with different races, incomes, but the culture of encounter where each person, meeting where they are at each day and by working with each other each day that's how we build community and by building community that's where love comes from and that's where hope and our potential of our future is. So he encouraged everybody to take on the challenges, keep marching forward and always try to be a person that encounters any person you see and helps them on the next step.

I also found out I wasn't a bad photographer either. I got the only good picture of the Pope.

(Laughter.)

So one of the other things I've been involved with in chairing the blind group I told you before is no barriers USA. We've met people from all disabilities and backgrounds, wheelchairs, blindness, deafness, cerebral palsy, anything, you name it and we've built our community around it. We're based in Colorado and we have a number of people that have helped us figure out how to face challenges in their lives and I'm going to share with you a couple of ideas that came out of that work.

First I want you to see the people. The gentleman on the far side here is Tim, in the jacket, kind of cloudy picture here. He's Tim, a cancer survivor.

The second one is -- you might recognize her. She's on America's got talent. Her name is Mandy. She's on America's got talent. She's doing quite well.

Kyle Manning. No arms, no legs when he was born, he climbed Kilimanjaro. Literally he cut the tires off, put duct tape around his limbs, it took him 17 days to get up Kilimanjaro and he got an ESPY award from ESPN. And from the military, JC watts, he was in the Middle East, a tank blew up and he was burned over most of his body. What we've done is talking to people with these challenges and say how do you do it? What's happening? How do you push through?

So we have three program platforms, and I want to share them with you, where we take kids, we take about 150 a year now from around the world and help them with the challenges they face. We also have a warriors program. We have wonderful resources like wounded warriors at Walter Reed. Things like PTSD, the long term implications of returning back to your various communities a changed person from when you left is very difficult. And so some are blind, some are deaf, some have horrible memories of what happened. So we provide programming to help them get to the next level.

And then every year, we bring over 1200 people together. Telluride, the last one was Lake Tahoe. We have outdoor clinics, you want to do something, swim, scuba dive, anything. Regardless of your disability, we provide all the adaptive resources for you and your family at a very low cost and it's powerful work to help us help other people figure out

how to get through their challenges.

So I'm here to talk to you about barriers really and the barriers I found in you helping me to do things that I never thought possible. One of the first things when someone says barriers, it's difficult, it's hard, can't get around it, immovable, just give up. But I have to tell you that the fruits of barriers and taking them on, the darkness and the challenges that I've always faced from diagnosis to giving up driving to giving up work and trying to figure out what the next chapter is, that it makes you resilient. The fruits of the struggle are things like community and finding out who your friends are. It's about innovation, finding that when you don't have something, you get highly creative, and as a result of it, there's a lot of great fruit to barriers, if you choose not to let the barriers stop you. The barriers start usually in our mind first but if we let it go and wash over, we find out that maybe it's not so bad after all. So then I was kind of thinking, we want to assert. We can't deny it's hard and difficult and it gets depressing at times, but there's also great beauty and things that have come forward in my life that have not come forward for me, like all of these adventures if I didn't take on my deaf-blindness. It many ways it provides the potential because of what I have that is allowing me to do these things that really are exciting to me.

So I'm here today to tell the messages that people have been telling me for the last ten years, have a vision for yourself, and find something that inspires you. I got this great bracelet from a new friend. I'm so proud to be here today.

The first equinox one, I was bummed because I had just gotten back from Peru, when the second one came around I was thinking about it. That's when the Camino came into play. It was a 500 mile hike and I asked three friends to do it. We signed up and did it. We never hiked before. We never spent 33 days walking.

But somebody introduced someone to me just before we left. Three months before. Turned out to be a CEO, vision service plan, one of the largest vision organizations, 80 million members. 30,000 optometrists, contact lenses and glasses. I told him the story of what I was doing, he said great project. I want to walk with you, and the next thing you know, for the last part of the trip, we went from four people to 11.

So when we put that stake in the ground and you're doing this, you see the same world, but it suddenly takes on a whole new perspective, and in that it starts to make you think in how you're going to do it and make it happen and the first thing you have to do is reach. How am I going to do it? I am deaf-blind. How am I going to get there? But in reaching I found out that it was a long process to hike that long. That many days. Checked out some rooms, no souvenir shopping, no nothing, just getting up and walking each day. Hiking that long is really about endurance, and it's not about Usher syndrome. It is about endurance. It's realizing that there are good days and bad days, but it's a game changer. It's not game over.

Most people probably want to send the message of telling you it's game over but the ones living with Usher's for a while know it isn't. It's about using your senses a new way. Helen Keller said it best, pity the man who can see that has no vision. It's important to have an inner vision for yourself regardless of what you may see, regardless of what your constraints are.

The other message that people have been telling us, is pioneer. Every day as an Usher's person, you're a pioneer. You're trying to figure out how to get on the bus, how you're going to make that phone call, how you're going to be able to get this test done or something else or advocate on your own behalf but I have to tell you it's worth it and a lot of people say oh, deaf-blind. You just think it's hard and different. But for me I needed it as a platform for my opportunity and my potential as I move forward. So I believe in climbing

mountains, doing river runs, run marathons. It's all about in taking it on and it's hard to share with people what it's like in our journey, so for example how do you tell people, unless you can show them pictures that you're getting up at 5 in the morning, I need a vision. Headlights. I need a wireless microphone. So the person who is guiding me can tell me every step of the way to go. I have to avoid holes and ditches and make sure I don't get into trouble. What are you going to do in if it rains for eight hours and you have the hearing technology on and the Bluetooth technology and how are you going to recharge this stuff as you go day by day. Some people say, hey, time for me, that's fine. But what's important is how are you going to cross the street, grab your pack and move forward and do everything you can for 33 days.

So it was fun, it's rewarding, and it was a cool process to go through medieval city which are not ADA compliant in any way, shape or form.

(Laughter.)

Low overheads, no ramps, but at the end of the day, it was very special.

One of the things that I've learned is I'll always have adversity, and every time you hit a barrier, there are three solutions, run from it, avoid it or embrace it. Run from it and say I should have done it. Avoid it, maybe I'll be lucky and it won't come back. But taking it on is the most risky and most fearful thing you can do. Mostly the sun comes up in the next morning and there is a better and good day ahead of you.

So I encourage you just do it.

The rope team I talked about earlier is you need a lot of people. Can you imagine a deaf-blind person saying I want to hike for 33 days, and you never met him before? We'll get lost? Why am I getting into this? But it's important to know why you're doing it and where you're going. So that's important for me to share with all of you.

Climbers have a metaphor, when you're going up, we're all on ropes, there's one person in charge if it gets tough. You're part of a team, you can't let your individual desires hurt others.

So you have to ask for help and bring that help in and bring it forward.

I found four crazy people to walk and then I found another seven people to come in and a CEO who also brought in a filmmaker from South Africa, and a lot of this is doubt, as you start to do this and share your hopes and dreams, people want to start to help you and it's kind of like an attraction. So we all have this thing where we can be optimists. If you think of deaf-blindness for example, it can become how can I convert it to goal and my thing is I'm not going to deny that I'm deaf-blind. I'm proud of it. I think it has provided possibilities for me that are far beyond what I could have imagined from the initial diagnosis and having to come to terms with it. I thought things were going great. Boom, blindness becomes part of the picture so I learned that I suffer, I suffer well, it brings people closer to me and in bringing people closer to me we find ways of getting help and get through the next day but I know that everybody around me will give me a pass, if I'm angry, bitter, I push them away, I've done it and go through that process many times. But I encourage you to say forgiveness is always possible all the time and nobody is perfect. Embrace it, suffer, and you realize there's a lot out there.

And so you start to see things, and you start to have a new vision. And sometimes you just turn it all over. Nobody can control everything. So at that intersection of the possible and impossible, sometimes you just say, God willing, there's something bigger than all of us.

So the last thing I wanted to share with you, if you do these adventures, it helped me tremendously and it builds me up. One of the things is giving me all these gifts an

opportunity to do these things, it's not about testosterone building or self-fulfillment. The greatest fulfillment and beauty in getting through my journey has been serving the other people. So the reason I did the expedition is 85 percent of deaf people and 90 percent of blind people do not have jobs in America. We need another generation of ambassadors and we need to breakthrough stereotypes and societal norms about what it means to be deaf, blind, and/or deaf-blind. We need to continue that work. Not give up.

The other leadership piece is that no barriers. After that Boston marathon, we invited Emma, who was one of the Boston bombing victims, you may remember her, her brother was one of the ones killed, and we gave them a new prosthetic so she could go to the beach and run. You need a different prosthetic for athletic activities than regular activity. So by giving back and being involved you can see how to move forward. The biggest thing is when I do it, a lot of people think all the work in getting it out is the planning and blogging, and that's where the message comes out. What I found was Jim, that CEO, who donated from South Africa, if we could get in Santiago Usher syndrome world awareness day, we were able to create a film, and that film is a film that has gone out to 80 million as part of the services plan global reach. So a simple idea, we recruit people, meets another seven for them to become filmmakers who takes it around the world.

So I want to thank you guys for giving me the brilliant opportunity to get a story together and here is the film that came out of this.

(Captioned video.)

(End of video.)

>> BILL BARKELEY: So thank you for letting me come in and talking about this project. I think it ended up donating $25,000 and we were fortunate to have Krista and Mark and give this money for the campaign. So thank you so much for everything you've done for me and the opportunity to come in and share, and I look forward to getting to know everybody over the course of the next couple of days.

So thank you again.

(Applause.)

>> MARK DUNNING: So thanks, Bill. That was terrific.

As Bill mentioned early, the Own the Equinox campaign, we will be running that again this year. We'll talk more about that a little bit later. But the third Saturday in September was actually declared by the U.S. Congress as Usher Syndrome Awareness Day, so we'll be running events on that day and I hope you guys join us.

Right now we're going to take a break. One of the things that we've been doing to raise awareness is we've been doing a program taking portraits of people with Usher syndrome, and those portraits have been posted in various places around the world. And we're looking for people who have Usher syndrome to get their portrait taken. If you're interested in doing so you can see Nancy and Jan outside and they will get you hooked up with Evan McGlinn. He is a photographer for National Geographic, the New York Times, he's a good photographer and his portraits are fantastic. If you're interested in doing that, find Nancy and Jan outside and you can ask them about that.

Otherwise we'll reconvene in 20 minutes or so. So thank you.

(A short break was taken.)

>> MARK DUNNING: So we're going to get started again in about five minutes, if you guys want to start making your way back to your seats.

If I could ask everybody to take their seats, we'll get started.

If you give me a wave when you guys are ready.

One of the great things about this conference is that everybody makes friends and

spends a lot of time talking and networking and it's wonderful. It also makes getting back from breaks very difficult.

(Laughter.)

So we're running on Usher time right now. Hopefully we'll start in just a minute here.

So how are we doing here? Are we ready to get going? Good.

So our next speaker is Dr. Ian Han. He's also at the University of Iowa at the Wynn Institute for vision research there. He works with Ed. And he's a professor of ophthalmology, assistant professor of ophthalmology at the University of Iowa. He's going to talk to us about gene and stem cell therapy for Usher syndrome. As you heard Ed talk earlier, there's a lot of potential here for treatments for people and these guys are about as advanced as they get towards these treatments. So with that, I'd like to invite up Dr. Han.

(Applause.)

>> DR. IAN HAN: So good morning. It's nice to be with all of you, and I just want to say a few things up front, the first is it's just a remarkable privilege to be here and I know a lot of speakers will say that at any conference but I mean that, and I'll illustrate that. Yesterday I was operating in the operating room at -- all the way through the night and into the morning, I was busy all week and I got in the car with my wife and daughter, came to Chicago, dropped my daughter off at the in laws, which is always great.

(Laughter.)

And then came over here late at night to check in, prepare the talk and be with you all. And I got a call saying my sister-in-law had been admitted to the hospital overnight and we were planning to visit with her tomorrow. And the whole point of sharing all this is that this is how important this meeting is to us as it is for you in terms of researchers and clinicians, because echoing what Ed had said earlier, the message here perhaps that you need to take home from even my talk, even though it's more nuts and bolts science, is that there's a lot of realistic hope and the flip side of that is for those of us who are treating and seeing you all, the hope comes from you as well. So I love just outside, several of you, shaking your hands, hearing your story about your kids, so that's number one. That's the key part of my talk.

The second most important thing is I know it's customary to thank organizers for meetings, but I think it is super critical that we take another moment and thank Mark and Krista and all the people organizing this conference because I know it takes a lot of work to do that, and so not perfunctory at all, thank you Mark and Krista.

(Applause.)

And then the third thing of course is the most important thing is to thank you all for being here. So I hope I can provide a little bit of information for you. I'm going to talk about gene and stem cell therapy. The science is involved but the science is not what's important. The message is that there's a realistic hope that really drives us to do this every day, even when you're a little bit tired, and need a little bit of coffee on the side.

(Laughter.)

So that's kind of the gist of my talk. The science is hopefully interesting to you but that's the gist.

I have no financial disclosures either.

There are a few nuts and bolts objectives. The overall is to describe our treatment strategy in more detail for curing vision loss from Usher syndrome. I'll do that by covering these few points as an outline. I know many of you are well educated from retina cell biology perspective and some may not be. So if you'll bear with me, I'll give you a couple of minutes on basic eye anatomy from a clinicians perspective. I know some of you know

about cell biology and genes but I'll give you the basics of what you need to understand for gene and stem cell therapy. The third is to outline treatment strategy again and talk about each of these gene and stem cell therapy in slightly greater detail than in Ed's talk. And then lastly as a surgeon as I mentioned, to show you what the surgeries are like, because in talking with some patients with rest pig, I get that -- retinitis pigmentosa, I get that question a lot.

This is an eyeball, it's super basic. It essentially is a globe and I like to think of it as a lot of focusing mechanisms up front to direct light from the world back to the retina. We don't have film in cameras anymore, but the retina is like a film in a camera. It's this thin delicate nerve structure which collects all the light coming into the eye. I'm specialized because I'm a retina specialist because I think it's the most beautiful and sophisticated part of the body.

This is a wide angle photograph of a normal retina. This is the center of the vision, the macula. Anatomically it's five or six millimeters, but in real world it's all the important stuff in here. It's living tissue, so you have blood vessels running through it, and there's an uplift cable if you will from the retina to the brain, the so called optic nerve and that's this yellow orange disk here because it's a wire that inserts into the macula. And to give you a sense of scale, this is 1.5 millimeters big on diameter in general.

There are lots of great ways to think about the retina and I like to think of it as a light sensing nerve tissue with an amplification and really there are three neuron connections that help you do that and if you were to take a slice of the retina here, you could see the retina in a two dimensional profile.

Many of you have heard about rods and cones. What the cones are the color photo receptor sensors. They are actually ironically on the outermost layer of the retina. So light has to pass this way through all these optically clear cells to trigger the photoreceptors which then are linked to the other cells to amplify the signal and that's essentially vision in a nutshell.

I showed you a normal picture earlier and obviously this is markedly different from before. This is retinitis pigmentosa. Pretty advanced and it's called that because there's pigment throughout the retina tissue. Instead of the retina tissue being optically clear you see what we refer to the bones limitation throughout and that's a signal that the photoreceptor cells are not as healthy as normal.

So we know that most inherited retinal diseases that we see tend to affect a bunch of different layers but the most common one is the photoreceptor. So why do they degenerate in a variety of these conditions such as retinitis pigmentosa? It's kind of genetically dictated by genetic variables.

The best treatment strategy for Usher syndrome depends on the severity of the disease and I think this is a key concept that Ed alluded to earlier by showing you the two patients early with good vision, good center vision, full peripheral view and one with already lost quite a bit of vision.

As just a pictorial depiction, if you categorize by mild, moderate and severe, gene therapy tends to work best when there's living cells. When you replace the genes with the cells, you want -- you have to have the genes produced in the cells themselves, so the cells have to be viable. So it is mostly for mild or moderate disease.

For severe disease when the cell is lost, you need something to regenerate and restore the cells that are missing so that's basically stem cell therapy and if you will, moderate, somewhere in between, you might actually have the potential for either of those strategies.

So that's the basics of retina and cell biology in a very brief nutshell. But then we'll step to gene therapy in a little bit more detail.

So the concept is very simple. From a cell biology standpoint, you have millions of base pairs and DNA. And sections of those DNA are genes, and those genes make these molecules we call protein that have certain functions, and those proteins make cells and the cells make tissues. So if you have a gene variant from very beginning on the DNA gene side, then it can affect the protein generation cellular function, tissue function, all the way down. So gene therapy is very simply is to correct the disease at its source, if you will.

As I mentioned earlier, it requires viable cells to make the gene products, otherwise known as proteins and there's several different ways to deliver gene therapy. One of the ones you heard about from Ed and I'm sure you'll hear from other is from a viral delivery system, and essentially it's weird to think about viruses as being helpful. But they're actually really nice, because they know how to enter cells. And if you can engineer a virus, which we can, to have certain genes packaged into them, then you actually don't have to on molecular level yourself, with too small of a needle to enter each cell. You have these viruses be the mechanism by which the gene is delivered. So this is just an artist's rendition of the adenovirus vector. This is the depiction of the cell. You have the gene within the virus, it binds with the gene itself, and it enters into the cell to replace the missing gene.

There are a bunch of different genes we deal with as you know. Usher syndrome has a lot as well and most of them will fit into what you hear the most, it's AAV. Adenoassociated virus. It is pretty efficient. It's really well developed. It's already in clinical trials as Ed mentioned for additions including RP 65. But the downside is it's small and as Ed also mentioned only the smallest genes will fit into them. The remainder are too large to pack into this tiny virus and I'm showing you here that this is one of these what if moments that we hear a lot. Well, what if the virus doesn't work? Or I know that my child has Usher syndrome, but I've been told that viral gene therapy won't work. Well, we'll fix it. There are other delivery mechanisms, such as HDAd here. That you can see is a lot bigger than the AAV. There's some challenges to it, but you can package a much larger gene into a helper dependent adenovirus than AAV. It's a busy slide. Everyone was falling asleep at the tables, but here are the Usher genes that you may have heard about or actually know you have. The key column is over on the right here. Many of these genes are larger than the 5,000 or so that will fit in AAV, and as Ed showed you earlier, the most common gene being USH2A is actually quite a large gene. It's 15,000. So that will not fit into AAV delivery systems. But we can fix it. So one of the things we're working on is helper dependent adenovirus.

Here's a slide to show you 92 percent of the Usher genes won't fit into the AAV vector.

That's gene therapy in a nutshell. Let me just tell you what we actually have at the Wynn Institute. We're able to basically manufacture every Usher gene and we're testing each of the gene products for safety purposes for the FDA so it can go to humans, in cells, tissues and animals models, so I'm a clinician and a scientist. I'm in the clinic two days a week, and on Monday and Tuesdays those are my favorite days because I think of you all and try to test these things toward a cure and just a couple of weeks ago, we were testing the USH1C, a smaller gene, that fits into AAV, injecting these into a rat model to ensure that they weren't toxic and the retinas look great after these injections which is good.

We're also testing helper adenovirus gene delivery. One of the main challenges with that is it requires and tweaks the immune system, but we have a lot of different solutions that we're planning for that and just a couple of weeks ago, we were injecting helper dependent adenovirus vectors to test some of the inflammatory reactions in some of the animal models.

Go ahead. It's coffee break.

(Laughter.)

As kind of a transition -- I should wait.

As kind of a transition because I think it highlights the power of patients as well as what the science is, and bridges from gene to stem cell therapy, we have just a wonderfully developed human donor eye program at the University of Iowa, where generous patients, including those with retinitis pigmentosa, will donate their eyes, and this is one of these things which just is super science fiction, but it's real, as I'm showing it to you, but you can take a donor eye, harvest it very quickly, put it in a dish and actually have a viable retina tissue that's there, and what's amazing about that is a couple of things. Well, one is you have human tissue that you can test some of these therapies on, and the other is it's teaching us a lot and as Ed kind of mentioned earlier that we know even though the outer photoreceptor layer cells deteriorate over time, that the inner layer amplification cells that I mentioned earlier actually stay alive. How do we know that? Because we can grow it in a dish and see that after years that the photoreceptors wear away, they still are alive in the dish.

This is a beautiful picture of an example.

I think I'll kind of go through this very briefly to say this is kind of the when, question number three, one and three that Ed mentioned. When is the stuff coming and we want this to go as quickly as you do. It's as quickly as humanly possible is the answer. But there are obviously safety hurdles that we should get through and we want to follow the right protocols to do that so obviously there are a lot of FDA regulations to make sure things are safe. And we have this wonderful team to be able to systematically go through those roles.

Here's what we're doing. While we can package, we can actually package right now one gene product per month, as good manufacturing practices level, in as Ed mentioned to you, a good manufacturing facility, that's already built. The nice thing is when you have the strategy of leave no one behind, cure all these different diseases, as well, you can actually minimize the paperwork, because a lot of it is the same. So you can reuse some of the paperwork that's there, because the rationale for the design of all of this is very similar so that can be streamlined. And as a more specific question to the answer to the when question, is the rate limits on these steps is not the science. The science is there. The rate limiting steps are actually testing all this in preclinical data so we can make sure this is safe before you it goes into you or your family members and it's important to take the time to do that.

This is a video that I think I'll just bypass but it's one of our colleagues dressed in a space suit, and coming into our facility to show you that it's a high level of regulation that you need to meet good manufacturing practices, and this thing is real. We have it. And the blueprint is out there to share.

So what about treatment for more severe disease? Well, that gets into something even more science fiction. It's stem cell therapy, so again to show you the retinitis pigmentosa, the pigment is cellular loss in the photoreceptors and again to orient you, we have different strategies based on the severity of the disease.

Here's another artist's rendition as before. The photoreceptors are on the outer layer. These cells are functioning for most of the retinitis pigmentosa patients because we can grow it in a dish. If you have gene therapy but the cells aren't there, then the genes can't go into cells to work. But we can fix it. You go in and you replace the cells that you need, and that's where stem cells come into play.

So very briefly, scientifically on stem cells, there's a lot in the news out there, you

probably read a bunch. I'll just streamline to highlight the basics of what they are.

They're essentially multi potent cells that can change into specific cells in the body. There are a lot of different sources of them. And when we decide what to do with these cells, we have to decide where they come from, how you're going to put them in, and then who you're going to test these in.

And just as far as our strategic decisions, very briefly, it seems most reasonable to take stem cells from the patient him or herself because it's your own cells without having to fight the immune system when you transplant these things. You need some support for these cells because as you saw the retina is a very delicate, well oriented structure, you can't just inject cells in there. Not only that, but they have no structure, they won't survive and we know that. So I'll show you a few of the polymers that give them support and as a test, you could treat patients that have sight, but you have an end point in those that do not have sight in the sense that there's maybe a little bit less to lose in that case and additionally if you put in the stem cells and they can see something, you know they work.

So this was mentioned by Ed earlier, induced pluripotent stem cells, there's a lot of text here. I'll summarize it. You can take a piece of your skin, which is very regenerative tissue, put it in a dish, hit a few molecular buttons and reprogram it so it can grow in other cells. Cool, then you can hit a best of your knowledge of other molecular buttons, as long as you hit it at the right time, which we figured out, and basically turn those cells into a little eye cup, and into a retina in a dish. So now we have a couple of things here where again you don't have to take stem cells from inaccessible hard to access places. It's right on the skin. You don't have to take it from embryos, you can take it why your own body and grow your own cells.

There's been lots of delivery strategies devised for stem cells and we know that cells don't survive unless you put them on -- they don't survive well without proper structure. So I'll show you briefly what we have in terms of polymer support.

Cells actually have a 50 or more rate of survival when you put them on a support, instead of just injecting them pluripotently and this is one of those science fiction super cool science things but this is a 3-D printed cellular scaffold that you can print, adjust the size of these little holes and pores, actually put these cells on to grow to have them actually get the proper nutrient flow and have them properly oriented in the retina tissue. That is a slide showing some of these 3-D printed graphs and to give you a sense of scale, these are red blood cells, seven microns or 7,000ths of a millimeter big.

And here's what I love. If you look through the pores and how well formed they are and see the cells sitting through there.

This is the exciting part. This is actually one of the scaffolds with cells in it so it's kind of a top down slide view and you can see that the cells themselves actually sit really nice through these pores all the way.

And why is this important? Well, it's hard, actually, to get these cells into proper place because ideally you put it in the center of the vision, which is most important. You have to have a large enough size to be useful. And you have to transplant it where the cells belong, which is underneath the retina tissue. You have to go through the retina tissue to do that and I'll show you that in just a second.

But the size is very doable and you can put a ton of cells there and you don't need a whole lot of cells to survive to have good vision there. We know that. It's just looking on some of these tests that you get when you come to clinic. Sometimes we're just totally mind boggled at how a patient can see 20/20 with just one photoreceptor hanging out.

So here's the summary slide again. Skin, dish, buttons, reprogram, grow a retina,

polymer, then we get to the part of putting it in the eye so I want to show you that.

Modern retinal surgery is really cool. It's why I do what I do. It's the ultimate in surgery, and we're using surgery instruments that are smaller than your typical IV needles to enter the eye.

So foundation for all this is something called vitrectomy so this is an artist's rendition of it. Here's your eyeball as you know. The retina lines the inside of that wall of the eye. So how do you get to the retina? You got to put in a little what we call infusion to keep the eye pumped up at a normal eye pressure. You have to look through a microscope. You have to be able to see inside the eye. It's kind of dark in there so you put a little light pipe with a LED light on it so you can see. And then how do you actually access the retina? There's a lot of stuff in the way, like all these floaters that many of you see that are in the vitreous gel. You can't go tugging on that, it'll cause damage. You have to move it out of the way. And you use a needle-sized instrument that not only cuts that, abrades 5,000 times a minute or more but actually vacuums the stuff out of the eye at the same time.

Here's another artist's depiction of how we deliver these therapies. On the right side here you see that the stem cell injection can be delivered through the retina, through a tiny incision underneath the retina tissue, which is a lot trickier than your traditional delivery methods that we use for a lot of conditions that are common, like diabetes or macular degeneration, but we can squirt this stuff in the eye and numb it.

Another funny question I've gotten from some patients is what are you actually doing in this surgery? So I'll show you, because I think it's cool. Here's a surgery, one of my good friends and colleagues, who is sitting at a microscope operating. So what you have is the surgeon. You have a team of nurses. You'll actually have a microscope that actually lets you see in the eye. The surgeon holds an instrument in both hands. It's actually four limb surgery. The surgery itself is controlled by two pedals and the other to control the instruments themselves. It's the ultimate minimally invasive surgery which is actually four limb surgery. The microscope and instruments here.

A lot of this sounds like science fiction, but there's a lot of science going on. This is Steve Russell who you saw in Ed's talks. He shows these still images. This is a 41 gauge needle. It's half the size of IVs, injecting a slow rate, this little sub retinal solution with the gene vector in it. Underneath the retinal tissue very safely.

This is the view through the microscope. Here's just another more central view. You can see the needle entering the retina through this tiny incision.

Stem cells just to rap up here are a little bit -- wrap up here are a little bit harder to get under the retinal tissue because you have a larger implant and have you to stick it in a delicate place and you have to make a bigger incision, so how are you going to do that and what if it doesn't work? Well, we can fix that.

So here again, center of the vision, you need something about that big to be useful. We are thankfully at Iowa, we have a lot of pigs in the state. It's way more than humans, and we actually have a retinal generation model where pigs have some photoreceptor disease and a thin retina to actually test a lot of these polymer support structures. So here again, this pig operating suite you'll see in as nice as some other human operating suites. This is probably Dr. Stone, that's me assisting part of our surgery team.

Here's a polymer actually, one of the earlier polymers we tested and you can see this size is about five millimeters in diameter, and it takes some special instruments to actually get this thing on there, but we're devising ways by which you can print these polymers in a flexible fashion so that they're firm enough to hold but flexible enough to fold. So here's one of those specially homemade designed instruments that we're coordinating companies

to make commercially now. You can put this polymer into the instrument itself. You see it just slides in there nicely and it's obviously wider than these forceps tips.

I hope this video comes out. I was having trouble earlier. If you'll forgive me I'll actually take the time to show you.

Oh, sure. More coffee.

In action. Okay.

So this is a surgery video from some of our pig models, and here again, I don't know if you can see here, but we're making actually the same type of thing as you do with gene therapy. This is actually a little thin what we call dia thermie tip to make sure there's no blood leading from the retina as living tissue as blood vessels running through it. We make a little slit in it. Here we're using another one of our versions that's specially designed instrument. In this case it happened to be one of these polymer bars instead of a round polymer. I don't know if you can see that, it's just the polymer being slid underneath the retina tissue very safely in a controlled fashion, where we want it.

I'm almost done.

And these are I think some of the coolest videos to show you that we're walking distance from some of these cures or getting into humans. You know, you can put these polymers underneath the retina tissue. You can barely see the outline of it here in this black and white image. And here's a cross-section al view. You can see it's nicely under the retinal tissue. It's super exciting when you do stuff and it seems to work. Here's a 3-D polymer in a pig model, where you can see the beautiful pores, well organized underneath the retina. You can see the cells diving into the pores, which is what you want, and importantly you can see that the retina around it doesn't look like it's all damaged. So it's walking distance.

So just to take a moment to summarize, there are strategies for all stages of diseases. And that includes gene therapy for milder stages, stem cell therapy for more severe stages where the cells are already lost and something in between for patients specific situations in the middle.

We can do molecular testing to identify many of the genes these days. So put it through cells. You can take skin biopsies, we can evaluate the mutations that are needed, customize based or not patient him or herself. And for stem cell therapy, actually grow retina tissue in a dish to actually put underneath the retina tissue.

So I hope that gives you a little bit of understanding of the nuts and bolts of what we're doing. I do have to obviously thank everybody who is involved. I'm super biased because I'm on the team and I'm happy to be on the team. There's no question in my mind that we have the best team working on this, and the reason is because of you all. We're thinking about therapies, working tirelessly and with a sense of urgency, because we're talking and hearing about your son or daughter or you who used to be able to see and feel like things are going down and you want to know when. So that's why these meetings are important. I hope you feel the sincerity in my voice today. It's such a privilege to be here, and thank you.

(Applause.)

>> MARK DUNNING: So thank you, Ian. That was terrific. I hope you guys can see how close we are on this stuff. Thanks to all the pigs in Iowa.

(Laughter.)

So our next speaker is Dr. Michelle Hastings. She's an associate professor of cell biology and anatomy at the Chicago Medical School at Rosalind Franklin University. She's just around the corner here. And she's going to come up and talk about, well, let's see if I

can dumb this down. Anti-sense molecules that have been able to rescue -- excuse me, hearing and vestibular function in mice. So this is actually a treatment that is actually in mice, and she's going to come up and talk about that. We have to take two seconds to get her connected, but if you can welcome Dr. Michelle Hastings.

(Applause.)

>> DR. MICHELLE HASTINGS: Thank you for inviting me. It's a pleasure to come and talk to you about our work that we're doing on anti-sense technology for the treatment of Usher syndrome.

So as I start, I want to remember to thank the people really that did the work in my lab, Fran Jodelka, and Anthony Hinrich. We collaborate with a lot of people, particularly Jennifer Lentz, who many of you know. Our molecules come -- are synthesized by Ionis pharmaceuticals and we work with Frank Rigo, Tim Jones. At Harvard, and I'll mention them as I go along but I don't want to forget to print out the important role that they've been playing in this project.

So I'm going to give a little bit of background 'cause I want you to understand sort of what anti-sense technology is. It's a little bit of a newcomer to the field of therapeutics. The very basic level, gene expression is really the process of making proteins from your DNA, and it goes through an intermediate through RNA which is something we study a lot of. This step between the DNA and the synthesis of the RNA, which is the message that is then delivered and read to make our protein product.

And this is a little more complicated. Your genes which are made up of DNA, have to be read by the cellular machinery, and they make a message or a copy of that gene called the RNA. The RNA actually needs to be cut apart and put back together into a readable message called the messenger RNA. And there's a lot of questions as to why this happened and it's a very complex process and it seems to be not clear exactly why it has to happen, but it is a process that if it doesn't occur correctly, you can see that you will not have the appropriate message given to make a protein.

A lot of times this process, however, does go wrong, and mutations that cause disease in Usher syndrome in fact are mutations that affect the process of making the RNA into a readable message. If we don't have a readable message, then you have a defective protein.

So we call this process slicing. Slicing out of parts of the message to the appropriate RNA. So I'll mention that along the way.

So anti-sense technology is basically a small -- they're small pieces of DNA, like molecules, and what they can do is they can be designed to very specifically base pair interact with the message, with the RNA message, and it binds to that, so you can design them and know exactly where they're going to go. They form a duplex with the message and in many cases as I'll tell you today with a defective message, and they can modify gene expression, so if you have a mutation, that's affecting the way your RNA is being read you can in some cases mask it by targeting one of these short pieces of DNA, modified DNA. And that can then author improved protein expression when you have a mutation.

And I'll talk to you specifically more about how we're using that approach. But a little bit more about anti-sense oligonucleotides and why having this really beacon that you can direct and design to very specifically target a sequence in a gene or in a RNA, it's very powerful. These anti-sense drugs, they're very small, so they're not like delivering a whole gene. You're just delivering a very small piece of it. They're very specific. You know exactly what they're doing. So unlike a lot of cell molecule compounds in drugs, the mechanism of action, what they're doing in the cell is very clear and straightforward, and

we can direct them and control it in a very specific manner.

When they get into the cell are very stable. We don't exactly know why but when they reach a cell, they seem to stay in there and elicit their affects for a long period of time and I'll show you that in the project we're working on.

Thus far the type of modified nucleic acid, we're working with the oligos have been very well tolerated and exhibit low levels of toxicity so they seem very safe and the deliverability is high so there's no need for viral delivery vectors for the type we're making and they seem to be taken up directly as oligos into many types of cells. Although delivery to specific cells is something that can be worked on in terms of packaging.

For our purposes, these are simply very easy to synthesize, make and inject into an animal and get them to the tissue and the cells of interest as you'll see.

So these technologies as I said, they're sort of a newcomer to the therapeutics but there are several of the drugs of the type that we're using that have been FDA approved, in particular in the past year, it's been very exciting for anti-sense technology and in the treatment of neuro diseases. The spinal muscular atrophy project is where I got started in working with anti-sense technology and it was extremely exciting and an incredible experience to see the drug approved last December for this devastating neurodegenerative disorder.

There have also been anti-sense technology approved for treatment in the eye, through injections. In this case it was for a CNB sensing oligonucleotide.

So transitioning then over to how we can apply this type of technology to Usher syndrome, we started looking at USH1C because in particular this form of Usher syndrome had a fairly prevalent -- prevalent for Usher syndrome mutation that we thought was easily targetable by the anti-oligonucleotide but this type of technology can be modified to potentially target other types of mutations in genes that are causing Usher syndrome. So we began working on targeting the mutation commonly known as the C216G mutation that accounts for nearly all the cases of Type 1 Usher in the Acadian population in Louisiana. USH1C codes for the scaffold protein called harmonin. I'll refer to it as USH1C and harmonin as the same. So how does this gene mutation cause Usher syndrome? So here -- it's a little small to see but here's the gene again that has the boxes representing the pieces of information that we want to keep and then the lines are the things that need to get cut out or spliced out, removed and the boxes need to be put back together and so this is that message and then the protein. The mutation actually introduces a change early on in the gene, and results in a defective process of putting the boxes or the message back together, and the result of that is that you don't make a functional protein anymore.

So again this is in a little bit more detail, just showing the box which is box 3, exon3 as we call them, and this mutation creates a new site for cutting and putting back together the message and that results in something called aberrant splicing, splicing together is not happening correctly anymore and it results in a truncated protein, where we want to make this good protein. And so what happens when --

>> INTERPRETER: Excuse me.

>> DR. MICHELLE HASTINGS: So here is a -- this is a cartoon of the ear, the inner ear and the cochlea. We do a cross-section through the cochlea, and look -- we have some EM images of that structure, the spiralling, shell like structure, and if we then show a closer picture, zooming in here of the hair cells and the stereo cilia on the tips of the hair cells which are really responsible for a lot of the hearing function, you can see that if you look even closer, there are these beautiful structures with very defined morphology, they look quite organized, and they're very important for the sound waves to transition the sound

waves into a mechanical information that the brain can process. So harmonin is expressed at the tip lengths and this is holding those stair cilia together, so harmonin is important for holding the stereo cilia at the tips together so they can keep that structure and respond to the sound waves appropriately.

When you have harmonin mutated and these are cochlea from the mice that we worked with, you can see that you have those stereo cilia have now lost their structure and function and they're very disorganized, shortening, oftentimes missing all together. They start to get hair cell death. This is just looking in the larger plane of the entire basilar membrane. You can see that there's a good reason why now you have hearing loss in the case of these mutations, because we've really lost functional structures for hearing in the cochlea.

Likewise in the vestibular system, there are also -- it's a little less clear the function of harmonin in the vestibular system controlling balance but there are also stereo cilia in the hair cells and it's important for the structure and function in the vestibular system.

So our approach with these small nucleic acids was straightforward. We have this mutation that's creating this aberrant cutting site in the messenger RNA and essentially resulting in a message that can't be made into a protein. So our idea was simply to design a shortened acid base pair, come in and recognize, and as sort of like a piece of masking tape and cover up that mutation and now it's hidden from the machinery that makes the cut, and since you have the perfectly normal correct sight here, since the machinery that makes the cut can't see that new cut anymore, it just corrects it and goes to the normal site, and so that was the approach for trying to correct the expression of harmonin when you have this mutation.

So our collaborators in Louisiana made a very important contribution by creating a humanized mouse model of this form of Usher syndrome. She knocked the human portion of the gene into the mouse gene and it recapitulates the features of the disease very nicely. The mice have a very severe vestibular dysfunction. They're hearing-impaired. They never develop hearing and they have visual deficits.

So our treatment strategy after spending a long time actually designing the best oligo anti-sense molecule in tissue culture, we went and took that molecule and put it into mice. We reasoned that we probably would have to treat the mice fairly young if we wanted to have any effect on the hearing and the vision. We weren't really sure how, because nobody had tried to target the cochlea or the eye and the vestibular system before with this type of technology, so we rather again naively went in and decided to do a single injection and put the peritoneum in the first born.

So the just general strategy again and the summary is these small oligonucleotides base pair to the mutation site. We're injecting that into our pups when they first born, just by a simple inter peritoneum injection and into the hair cells and restore it into the tip.

And I'll tell you again we went in -- this is really almost our very first experiment with this. Making these oligos and deciding let's just try it when they're first born by injecting into the peritoneum. We were thinking that we were going to have a molecular expression on the gene.

This is a normal heterozygote mouse that doesn't have Usher syndrome and this is one of its litter mates that does have Usher syndrome and you'll see clearly the most profound behavior that you notice about the mice that have the mutation is they run in circles, do you to that vestibular balance deficit and this is something that they do mostly all day long when they're awake. So they have very severe vestibular deficits. And what we noticed right away, so you can start seeing them circling around two weeks of age and what we noticed, now we have again our mouse here is the Usher mouse with the mutation that we did the

injection with the drug, with the anti-sense drug and here is a non-Usher mouses that injected with the drug and what we noticed right away after two weeks was that our mouse that had received our anti-sense drug, when the bottom right here had absolutely no evidence of circling behavior, no head tossing, they were indistinguishable from their non-Usher brothers and sisters in the litter. And so this was really probably the easiest experiment I've ever done and probably one of the most exciting experiments I've ever done because we went down and looked in the cage and none of our animals were doing this profound circling activity after two weeks and we knew we were on to something important.

These mice, we can quantitate the number of rotations that they do over a certain period of time, and this is the video I showed you is one month old animals. We quantitated this every month. This is looking at six months and again they've only been treated one time when they were first born. At six months these animals that received our drug looked normal, similar to non-Usher mice. No circling, no rotation activity, compared to their -- the mice that had the mutation and didn't receive the drug.

We've observed these mice for up to a year or more and they never developed any type of balance disorder, so we're confident that we have essentially cured the balance deficit associated with Usher syndrome.

Of course we're interested in the hearing, whether the mice could hear. And Jennifer Lentz then set up an auditory evoked brain stem response system that she could test the hearing in the mice, and basically it's the same type of hearing test we can give humans but it's designed for the mice and what we found was we basically give them a tone of a certain frequency and a certain decibel level and test whether or not you get a response from the brain. And in a normal mouse you see these response levels at a fairly low threshold with the sound that's been provided. The mice with Usher syndrome that don't receive the drug have no response at all. They're profoundly hearing-impaired and the mice that received the drug, you can see again they're much similar to a non-Usher mouse. They have pretty robust hearing responses at similar decibel levels as a non-Usher animal. And so that was again very encouraging that this type of technology was going to be useful in the treatment of hearing as well as the vestibular.

This again is just graphical quantitation showing the rescue of hearing at different frequencies. We didn't rescue the high frequency in hearing and we're not quite sure why that is. We're investigating ways to get all frequencies of hearing, but we did rescue hearing for a fairly long period of time so the effect was enduring, although at six months, we are starting to see some hearing loss in our treated animals. So we're working on ways to do repeated treatments, more directed delivery, in particular we're working to do direct injections in the inner ear with our anti-sense technology.

So one challenge with the hearing aspect is that in humans, hearing develops in utero early in gestation and so really to make this a viable drug for the hearing loss in Usher syndrome, we have to investigate how we can get the anti-sense to the animals early, and so we undertook a study at Oregon health sciences university where they were injecting oligonucleotides, this anti-sense drug into embryos, we're naive into how we want to do this. We don't want to risk having insult or injury to the developing fetus so we decided originally to put it into the amniotic cavity, a reverse amniocentesis. This shows it going into the amniotic cavity and we were able to show that the effect on the expression, the correct expression of Usher syndrome, this is just raw data showing basically our quantitation of the messenger RNA, and again without the drug, you don't get any USH1C expressed, so there's no band here, but when we put into the amniotic cavity or this is

when we did the IP, when we rescued the hearing in the vestibular, we get equal amounts, very similar amounts of recovery of an appropriate gene expression, and so we're really excited that these oligonucleotides can be delivered that simply and relatively hopefully safely or very early in development, which is a project that could be utilized for -- in humans.

Where John is then pursuing this and we're working with him to look at again the hearing rescue as well as the vestibular and retinal rescue that is accompanying these amniotic delivery.

And finally I want to tell you about some unpublished work that we're getting ready to report on in the raw and exciting drug in restoring vision or protecting from vision loss, so I'm not going to go into very much the anatomy. Ed did a nice job of showing the anatomy of the retina but I did want to point out that the raw harmonin and the development in the photoreceptor and the retina is not very clear, there are cilia, connecting cilia, a modified type of cilia, so they could be involved in the structure or central maintenance of the connecting cilium.

So our approach here and Dr. Lentz at LSU is doing these intra vitriol injections that we heard about directly into the eye of the animals, the first step was to see whether or not the anti-sense drug gets into the retina in this manner. This is just a picture following intravitreal. The anti-sense is labeled in green and the green is showing the nuclei itself. So compared to an untreated eye, we get a large, fairly good robust infiltrates of the anti-sense drug into the retina, so we're confident that this mode of delivery is getting the drug where we want it to go.

We see again after one treatment, at three weeks of age, at three months later, we still see the green oligonucleotides in the retina shown here compared to the untreated. If we do four treatments, treat every three months, we see the oligonucleotides or high levels in most regions of the retina at one year of age. So it's getting into the cells. Again this is a naked oligonucleotide. Treatments even three months in the very small mouse eyes seems very well tolerated. We haven't observed toxicity. This is the project. We wanted to know whether harmonin is being expressed and if we're rescuing harmonin expression when we treat with oligonucleotides, so here in this case, harmonin is labeled in red. This is a non-Usher mouse so it's showing you the normal levels of harmonin that you would expect to see. The Usher mouse, you don't see --

So you don't see the red indicative of the harmonin protein, and at one month of age after treating at three weeks of age, you start to see more robust harmonin expression. At three months of age. So three months or two months, and a week after that initial injection you can still see the endurance of harmonin expression. If we then again treat every three months, we see very nice high levels of harmonin expressed, so this indicates that the oligo can get into the retinal tissue, either the cells restore harmonin expression. It's fairly long lasting and it's quite receptive to repeated administration.

The mouse eye is not a great model for assessing vision. And indeed we have fairly subtle visual deficits in the mouse model but nonetheless, this is just a graphical representation of an electroretinography that Dr. Lentz does and the Usher mice are shown in this red bar. You can see that there's a decreased relative to normal mice, which are in the black bar in the A wave response, and at three months of age, we get a recovery of that response in our treated mice. Also at six months and nine months, we do see a significant recovery or a protection against the loss of photoreceptor function when we're treating the animals, and so that's very encouraging that we're getting recovery of harmonin expression and protecting the photoreceptors from loss. Likely harmonin may be involved in

maintenance of photoreceptor function and we are indeed preserving that function.

So in summary, the oligo technology, anti-sense technology can target the cochlea, vestibular and retina, taking them a very good drug platform for treatment of conditions affecting these systems, such as Usher syndrome. Remarkably one dose of these anti-sense drugs in life can rescue balance and hearing as well for prolonged period of time. They can reach the desired, at least the cochlea and the inner ear through -- in utero after amniotic treatments, and they preserve visual function.

In the future what we're working on going forward is to apply this technology to additional forms and causes of hearing loss. We've been working with someone with GPR98 and many others and so we're really eager to see how far we can push this to different types of mutations and different forms of Usher syndrome.

We're also working to optimize the treatment regimens and pushing forward ASO29, the anti-sense drug that I've talked to you about. And we're working to push that forward through discovery and development. Again being a rare disease, we are really in terms of the money, the corporate side of things is tough. We're eager and we think that we have really great potential here for effective treatment.

I've already mentioned most of the people on this slide, other than the people in my lab that have been helping out and just thanks to my support. We have a lot of different foundations that have contributed to this project, that especially in the beginning when nobody really believed in it and then later on, we had a lot more support from other organizations and NIH, and I can't say enough how important it is coming to talk to you guys and your support, your advocacy. It does make a difference going to DC and talking to your Congressman and getting these things on the radar so that when I put in a grant, there is some money perhaps set aside and there's some prioritization given to these types of rare orphan diseases.

Thank you very much.

(Applause.)

>> MARK DUNNING: Thank you, Michelle for that. So now we're going to break for lunch. So a couple of things. There were a number of people who asked about wanting to get their portrait taken and I've been told that the easiest way to go and find the place to get your portrait taken is to go straight out that door, in the back right side near where the technology people are. That will put you right in the portrait area.

So that's your best tip for that.

We also have an addition to the family panel that I noticed was not on the list, but she's come all the way from Australia, AnnMaree Yee, so we'll add her to the list of the family panel and she's a great addition.

And now we're going to break for lunch. Because of the number of people that we have here, which is a good problem, we have an additional problem, which is trying to get everyone through the buffet line, which I know is like the worst possible choice for eating, people who are deaf and blind with their dogs and their guides and everything else, but we're going to make an attempt at it. The best place to come back and gather is in here for -- to eat, but straight outside where you've seen the water and other things in the past is where all the food is going to be. Help yourself to as much you want and come back in and we'll talk.

We'll start up again at 1:00, just so you know.

(Break for lunch.)

>> MARK DUNNING: We'll get started again in five minutes.

Okay. So we're going to get started again. So if everyone would like to take their seats.

So I hope everybody enjoyed lunch. It's great to see that people are late getting back, because people are out there talking to each other. Our next speaker is Ben Shaberman, who is with the Foundation Fighting Blindness and he's been writing stories and publications for 12 years. Some of the stuff that he's written has been in the Washington Post, the Chicago Tribune, he's been on National Public Radio and he was this close to running the Equinox marathon this year. So please welcome Ben Shaberman.

(Applause.)

>> BEN SHABERMAN: Well, thanks, good afternoon, everybody. I hope you had a good lunch.

Can everybody hear me pretty well? People with relative hearing ability? Thank you. It's a tough question to ask an Usher syndrome crowd.

(Laughter.)

So I'm going to be talking about our USH2A natural history study funded by the Foundation Fighting Blindness but we've had this theme of hope throughout the conference and I wanted to give a perspective on research history that I think really backs up this hope theme, and if you go back to about 1971, that's when the Foundation Fighting Blindness was formed, and I think in terms of FFB, for obvious reasons, but also the National Eye Institute, which funds a lot of retinal and eye researchers. So that was 71, and I mark that as kind of a time when things started to get serious about retinal diseases. And it took, imagine this, it took 18 years to find the first gene that caused an inherited retinal disease. 18 years for one gene. Now if you include all the retinal diseases, including Usher syndrome, we've discovered more than 250 genes. So 18 years was a long time.

So that was 1989 when they found the first RP gene. Then it took another 18 years until a clinical trial was launched for a gene therapy to replace the bad gene with the good gene. So that's another 18 years.

36 years, just to get something into a clinical trial. But in late 2007 we started -- 2007, we started having clinical trials launched and now there are more than 20 studies. So over the last decade, there's been this tremendous acceleration of human studies.

So we're at a new time, like you heard Ed and Ian and others talk about, the science is there, and thanks to advanced technologies and our knowledge of the genome, things are really taking off.

Not everything is going to work in a clinical trial, we know that. As Ed said, we're going to have to go back and fix things sometimes, but we're at a really hopeful juncture. So I just wanted to talk about that historical perspective.

But I'm not going to be talking for the most part about treatment and cures. You heard a lot about exciting things happening in that realm. I'm going to be talking about a natural history study for people who have mutations in the gene USH2A, and the study is called RUSH2A and it's not about that classic rock group of the 70s. The R stands for rate of progression and while I'll be specifically talking about a natural history study for USH2A, please keep in mind that the idea of a natural history study is important for everyone. We have to remember that these retinal diseases, whether you have Usher syndrome, RP, they're all rare. There's a paucity of human data, and the more that you can be a part of providing data on your disease, whether it's through a study or a registry or just by seeing your doctor or researcher, the better, because we need human data to understand these diseases and launch clinical trials.

And one more thing. Before I launch into RUSH2A, I want to talk about a registry that the foundation has launched. A patient registry called My Retina Tracker and it's available on the Internet at myretinatracker.org. It's free, it's global, you as the patient and the family

control the registry and the idea is you upload your disease information, and then we allow pre screened researchers to come in and look at the data, whether it's genetic or it's about your vision, so they can better understand these retinal diseases, be they Usher syndrome or whatever.

The researchers never see your personal information, so keep that in mind. There's a very distinct fire wall. Your information about who you are is kept confidential. But they can see your personal information -- I'm sorry, they can see your disease information.

So the other thing that's happening with My Retina Tracker is that companies are coming in and looking to see how many people and who might be available for clinical trials, whether they're clinical trials that are imminent or even if they're planning for a clinical trial in a few years, and knowing that you have this available critical mass of people available for a clinical trial is very important if you are intent on getting a treatment off the ground. So I encourage everybody to get involved and register on My Retina Tracker, and if there are other registries that you're interested in, such as the one launched by the Usher Syndrome Coalition, those are great too. Ours is simple and confidential.

So that's My Retina Tracker pitch.

So let's talk about RUSH2A, and I want to give you the reasons why we launched this natural history study, and our goals are to understand the rate of progression of vision loss, because as you say know for people with USH2A mutations, there can be a lot of variation, and there are literally hundreds of ways that USH2A, the gene, can be mutated, and so we're trying to understand which mutations cause what severity of disease. So that's very important through this study as well, we call this the genotype phenotype correlation. And obviously by enrolling people in USH2A, we're identifying people that could potentially be participants for future clinical trials.

And then one other challenge when you're trying to design a clinical trial and evaluate a study in human is evaluating an outcome measure that's both sensitive and precise, because things like your standard eye chart aren't very sensitive or precise. They vary a lot, those tests, and as you may know, with a condition like Usher syndrome, your visual acuity may stay constant for a long period of time, while your peripheral vision is shrinking. So we need very reliable, precise, and sensitive outcome measures, and I'll be talking more about that later in the presentation.

And really the most important thing is by collecting information on people with USH2A mutations, we're going to publish that and make it available to any researcher or company who is looking to advance. So we want to share this information, it's not proprietary and hopefully that will boost the development of therapies for people with USH2A.

Why did we select USH2A first? It's actually not our first natural history study. We just concluded a natural history study for Stargardts disease, which is an inherited form of macular degeneration. The study is called Prog star and we had about 350 people in that study. We're just analyzing the data now, and we'll publish the results.

And USH2A will by no means be our last natural history study. We're already thinking about what our next retinal disease might be. But USH2A mutations are a large unmet need, based on some research from the Netherlands, there are at least 400,000 people affected by a USH2A mutation or mutations around the world. It's a leading cause of USH 2, and it's a very common cause of retinitis pigmentosa without hearing loss.

And one of the challenges that you've heard about with USH2A is it's a big gene, making it difficult to develop a gene therapy for, because the vectors can't carry the big gene. We're starting to overcome some of those hurdles, but by providing more information on USH2A, we're hoping to inspire the research community to try to get around that barrier.

And then as I already alluded to, there's a lot of variation in mutations for USH2A, so there's a lot of work that needs to be done to understand those variations.

So this study is being led by Jacque Duncan, who is a clinical researcher at the University of California, San Francisco. She's very knowledgeable, very personable and enthusiastic. She's actually chairman of the foundation's scientific advisory board and so she's well connected and we're very excited to have her leading this effort.

And then there's a coordinating center that handles a lot of the administrative and contractual activities. They work as kind of an administrative hub for all the sites that I'll be talking about in a moment and that center is called the Jaeb center for health research and they're out of Tampa. They too are very experienced and qualified to lead an international study like USH2A.

So I'm listing the different study sites. This slide has the U.S. sites. I'll be listing the sites for outside the U.S. I'm not going to list every institution, but I will mention the cities, just to give you an idea of where they're happening.

In terms of recruitment, that comes toward the end of my presentation. So don't worry if you don't break down every city. I'm going to give you the process you can go through if you're interested in being part of the trial.

But the cities are, in the U.S., are Houston, New York City, Bethesda, Maryland, Dallas, Milwaukee, San Francisco, Gainesville, Florida, Boston, Ann Arbor, Michigan, Salt Lake City, Atlanta, Baltimore, Raleigh, Durham, North Carolina, and Portland, Oregon. And then outside the U.S. our sites are London, Germany, Toronto, Paris, the Netherlands, and Belgium. But again I'll give you more information about how to find the right site for you if you are interested in being a part of USH2A.

Let's talk more about the study parameters. We'll be recruiting a total of 120 people, and those people will have to be at least eight years old, and for most of the participants, it'll be a four-year study. People will go annually for a fairly comprehensive visit. And the outcome measures that will be captured during that study include best corrected visual acuity, which is like your standard eye chart, your visual field, your peripheral vision, and it's a more sophisticated test than your typical visual field test. I'll be talking about that in the next slide. Microperimetry, which is kind of a functional map of your retinal function, electroretinograms, which measure your retina's sensitivity to light, full field stimulus testing, which tests the function of your rods. Rods give you night vision and peripheral vision. And then we're also capturing a structural measure called EZ area, and I'll be talking more about that in a couple of slides.

Okay. Changing of the guards is complete.

(Laughter.)

So on this slide I have an image of a visual field captured using a technology or an imaging approach called hill of vision, and instead of getting just a two dimensional representation of someone's peripheral vision, this is more of a three-dimensional topographical map, and it sort of looks like terrain, if you were looking at a map of mountains or valleys or something like that. And the topography shows how much visual function is left in certain areas of the visual field, and the higher elevations indicate more retinal function. And I know this is -- even if you have good vision, this is kind of tough to see. But again it is a topographical map, and the research that's been done on this approach shows that it's relatively precise and stable and reliable as well.

So this measures visual function. And then the structural measure that we're most excited about is called EZ area, and the image that I have up now is obtained using optical coherence tomography. This is a side view of the retina. Every ophthalmologist has this

available to them right now. It's very commonplace. And what EZ area measures is the area of essentially viable photoreceptors. Photoreceptors are the cells that process light and give you vision. And so in this image, between the arrows, is the area of viable photoreceptors, and what foundation funded researchers have been able to do is see that that area is a very sensitive and quickly changing parameter. It's more stable and precise than many other functional measures of vision, and we publish papers on it. We talked to the FDA. They're unofficially and formally okay with it. I think they'll accept it in a clinical trial if the trial is designed appropriately. So we think this might be a good measure to quickly and accurately measure changes in vision.

So a little more on who can participate in RUSH2A. You need to have been genetically diagnosed with two USH2A mutations. Now, going back to genetics 101, you have two copies of each gene. So you have two copies of USH2A. In order to qualify for the study, you need to have confirmed that you have a mutation on each copy. Some people get results back. They know they have two mutations, but it's not clear whether they're on the two copies. So if you're not sure of that, additional testing may be required, and we will help you with that.

The primary group, the primary cohort will be a hundred participants with vision of 20/80 or better and a visual field of greater than 10 degrees. And those are the people that will be followed annually for four years. And then a smaller cohort of 20 people will be people with more advanced disease. They'll have 20/100 vision or worse and a visual field of less than 10 degrees. And again we're only capturing a baseline measurement for those folks.

Now, also for everyone, even though it's not the major part of the study, we're going to do a baseline audio -- audiology test, as well as a baseline olfactory test to see how well people smell. Not how good they smell. How well they smell.

(Laughter.)

This isn't about your personal hygiene.

(Laughter.)

So that's who -- those are the parameters for the participants.

So if you're interested in being part of the RUSH2A study, this is the process you should go through. Go to the website, clinicaltrials.gov. It's hosted by the National Institutes of Health. It has virtually every clinical trial under way in the U.S., many overseas, and if you go there and search on RUSH2A, you only get one hit, that's our study, and there will be a long listing of inclusion and exclusion criteria, some of which I gave you today. There will be other things, like whether you have cataracts or glaucoma, and if you feel like you meet those criteria, there will be contacts at the Jaeb center, an email contact and a phone contact that you can reach out to, and they will hook you up with a center, if they feel like you could potentially qualify, they'll connect you with a center that's closest to you for referral.

So again go to clinicaltrials.gov, search on RUSH2A and that should give you the information you need to inquire.

So just a couple of final notes about this study. Our clinical research institute, which is really just a fancy name for the translational part of the foundation fighting blindness, we're sending 8 million dollars on this. The data we get from this we'll openly share. And we anticipate that this will boost research and treatment development for Usher syndrome Type 2A. And then obviously we're going to launch more natural history studies in the future. But I know this audience is very interested in treatments and cures, so I'm going to stop talking about RUSH2A for a moment and finish up with just some of the foundation funded USH2A studies.

Shannon Boye at the University of Florida is developing a gene therapy for USH 1B. The USH 1B gene is big, so she's working on a dual vector platform, so the gene is split up and delivered in two different packages. She's making good progress on that. In fact I think you guys had a USH talk that was sent over by email where Shannon goes into some really nice details about how that gene therapy works.

David Williams at UCLA is working on a USH 1B CRISPR CAS9 treatment. We just started funding him for that and as you've learned today, instead of gene replacement, this is going in and editing the patient's mutated gene. This is for Usher 1B.

Uwe Wolfrum in Germany is developing a gene replacement therapy for USH1C, and he's also developing a mini pig model. One of the big challenges with Usher syndrome are the animal models, the mouse models, don't have a strong vision loss phenotype. They don't get a lot of vision loss and that can limit our ability to test treatments for vision. So we're hoping that Uwe's mini pig model will do a good job of replicating the human vision loss.

Franz Cremers is coming up with an anti-sense on the ground low tide therapy.

Luk Vandenberghe is at relatively early stages with gene therapy for USH2A and USH1C. And then finally Jacque Duncan in collaboration with Joe Carroll at the medical college of Wisconsin, is doing photoreceptor structure and function studies for people with Usher syndrome as well. They have some very high-tech imaging technologies to better understand retinal changes and vision loss.

And the other thing that I think is important is while for obvious reasons you're focused on Usher syndrome therapies, it's important to keep in mind that you fall into the RP world as well, because Usher syndrome is really RP with vision loss, and there are many crosscutting RP therapies, stem cell therapies, neuroprotective drugs, optogenics which may be studies initially with people only with RP, but if they're successful there's a good chance that most of these will apply to people with Usher syndrome as well, so the RP folks are your brethren on your cousins and I encourage you to stay on top of that research as well.

And so finally, I know -- I think we're going to have a panel shortly after I finish up here, so you can ask questions then. Feel free to email me if you want, bshaberman@fightblindness.org, and I have my card so you don't have to write it down, and I appreciate your time and look forward to your questions -- forward to your questions at the next session. Thank you.

(Applause.)

>> MARK DUNNING: So Ben already alluded to it. We're going to do a question and answer session with the speakers who you heard this morning, so great opportunity to ask anything that you want of these guys. So Ed, Ian, Michelle, if you guys would like to come up here and join Ben, and we'll do a question and answer session.

All right. So I have the microphone. I'll come around for anybody who has questions, if you just want to raise your hand. I see someone already in the back. I'll come back there.

>> AUDIENCE MEMBER: Thank you guys so much, first of all, I have a daughter with Usher 2 and just heartfelt thanks for all the work you guys do. It means a lot.

I really appreciate it when you guys talked about the research in the morning, and the idea about how much it costs. As a parent who has lots of expenses coming in my daughter's future, I want to ask you guys, what do you think the possibilities are that the treatments for Usher will be covered by insurance at any point?

Thank you.

(Laughter.)

>> DR. EDWIN STONE: Well, I'll give you a few numbers to sort of calibrate your question. The question, for those of you that didn't hear it was the likelihood that these sorts of treatments are going to be paid for by insurance in the future.

I think the short answer is high, okay. Because they have to be, ultimately, right? Well, we have to do to drive the costs of the things down the point that they'll be paid for, like a knee replacement or a bone marrow transplant or something like that. But let's just think about what it's going to take to get there.

So last year, our department saw about 75,000 patient visits. So that would be all the people coming to the clinic, for surgeries, everything. 75,000 patient visits. The total amount of money collected by all payers was $10 million. So imagine a treatment that costs $1 million per patient. The likelihood that an institution is going to treat ten patients with that does 1 million per patient treatment and tell 75,000 people to go home with their diabetic retinography treatment, and this is not going to happen.

So if there are any medical economists in the room, it's simply not going to happen.

And what's so hard for me, is I have patients call up and say they can't afford $140 this and $110 this, which is the reality. Is to then go to a meeting and hear people say, well, a million dollar treatment is okay because that's what it costs for hepatitis C. Well, in my view what it costs for hepatitis C is irrelevant. I'll tell you another shocking number. What do you think the median net worth in the United States is right now? The median network? It's about $60,000. So not the income. Net worth. So if you took your home, your car, your clothes, everything you own, have it all compiled, the median person, the middle person in the United States is $60,000.

So anyway, I think what all those numbers tell us is that we have to make it as inexpensive as possible. So what we think is that for the near term, we shouldn't hold our breath that insurance is going to pay for any of these trials or anything like that. We have to go out and get the money for that. We have to pay for that with basically philanthropy because basically the government isn't showing at the moment any signs of weighing in on that. And then when we drive the costs down to something where the incremental costs are like bone marrow transplant, knee replacement, standard stuff, and we show that works, they're going to pay for it. So in the future they'll pay for it, but between now and then, we have to pay for it.

>> AUDIENCE MEMBER: Thank you. My name is Cathy Miller. And I want to express my heartfelt gratitude to Ben Shaberman. I called him about six months ago, and asked him where to go for this very, very best treatment in the world, because I was hopeless. He said if you possibly can, you can go to this place, you can go to that place, but if you possibly can get to Iowa --

(Laughter.)

And my husband brought me to Iowa, Dr. Stone took a skin sample, and I had so much hope.

(Laughter.)

(Applause.)

And I was there for two days of every test you can imagine on my eyes, and insurance paid all except $50 for each day when I saw the doctors.

(Applause.)

>> DR. EDWIN STONE: Thank you, Ben.

>> MARK DUNNING: I'm coming over this way.

>> AUDIENCE MEMBER: So a big thank you to each of you on the panel to come meet with us today and share your knowledge and your hopes to help inform our own.

My question is about stem cell therapy. So as we heard today from Dr. Han, the basic process is to bring out a polymer and then insert it at the correct place in the retina. For those of us who have more advanced deterioration of the retina, would stem cell therapy be just restoring a very small field of vision in the middle, or is it possible that it can be used to restore a larger field and give us, you know, a lot more degree to work with?

>> DR. IAN HAN: So thank you for the question. If everyone couldn't hear it it was about stem cell therapy and about the location to restore vision.

I think that's a fantastic question. I like to think of the retina as being very location based and I tell patients that it's kind of like real estate. Your location really matters, and so what we obviously know and what I mentioned this morning is that the anatomic center of the vision which we call the macula is about five to six millimeters in diameter, and that's the very basis and foundation for the size of polymer in stem cell transplant that we're planning. And again that just correlates to where the light in the world is focused most centrally. And it correlates to detailed refined reading figures, communicative vision, these sorts of things.

Side vision is very important. Night vision is very important, and that it's primarily the role of the -- what we refer to as the peripheral retina. And obviously the focus right now, because of useful vision being more central, is to develop a therapy for the center vision. But when we fix retinal detachments, and have various aspects of the retina that are affected with that condition, for example, one of the more routine conditions where we see where there's a hole in the retina and there's fluid underneath the retina and you fix it, that can be in any location at all and as I showed in the video, you can choose the location whereby to put these transplants. So let's say for example one of the visual fields in a patient shows pretty severe disease outside of the macula. Theoretically you could target that area where the vision is the least and put the stem cells there.

>> DR. EDWIN STONE: Let me add to that that the initial -- remember that the initial treatments are going to be placed in completely blind people for the reason that we don't want to risk useful vision that someone may have for a completely unproven thing, and it's going to be much more believable if the person has no light perception, regains some kind of form of vision. There won't be any question that that actually came from the transplant. And the key for that happening is that the new photoreceptors that are transplanted into the rote that have to -- that grow into the retina have to grow into the retina and for the same functional reason that Ian just referred to, there are a lot more receptors in the very center of the retina than there are out in the periphery. So if you imagine the targets for those axons to grow up and reach are richest right in the center, so that's the other reason that the initial treatments will be done right in the middle.

But in the future, you know, whether that works, we're imagining that you could put one in the center and one corresponding to the peripheral retina, or one in the center, one corresponding to the inferior retina and one corresponding to the peripheral retina in both eyes, that sort of thing, right? So each additional one of those things you put in the eye makes the surgery more complicated, you know, a little bit riskier, et cetera, et cetera. So the way -- the thing we're sort of envisioning is we're going to start with this five millimeter circle which with that whole disk wired back up again, it would restore vision and it would be awesome. And when that becomes perfected enough that it reliably works. Then you could put the other thing in.

Two more things I'll say about this which we left out this morning. What if you put one of these graphs in and it doesn't work at all? Like oh, my God, you know, it didn't work at all. You just shudder to think you go through all of this and it doesn't work out. Well, probably

because these are living cells, they're completely biocompatible polymer and everything, the cells could hook up and just die the way the original photoreceptors did in place, but not harm the inner retina. So the idea is you could try again three years later with a vastly improved process. So it's really different than like a heart transplant or something or if -- where if it doesn't work, you die. It's all or nothing. We think you can actually get other surgeries in the future, till you might actually get a graft put in the center initially and then something added later to add additional fields. So to summarize all that, the central area is where the greatest number of targets is and it's where the most useful vision would be, and in a completely blind person, that's where we would start.

As the therapy shows efficacy at all, then there will be all these different modifications where you add additional parts and how many things can you put in safely and blah, blah, blah and that's going to be the evolution of the technology in the future.

>> AUDIENCE MEMBER: How are you doing? I have a son who is seven years old that got diagnosed with USH2A in December, so we're really new to the game. So we're on the other side of the spectrum from what you just heard.

When I look at some of the research that's been done, and I hear what the doctors have told me in December about how it's an inevitable thing, you don't need to worry about coming back every year. You'll know it when it happens. There's kind of a big chasm between what you guys are talking about and what I'm hearing from the actual practicing medicine field right now. So my question is, is there something that we should be driving to as parents of people that right now my son has perfect vision, but he has moderate to severe hearing loss. Is there something that we should be driving to that we should be driving our medical care to say, hey, I need an annual checkup or I need some sort of scan or something that would help us then plug into the research as it comes along, because right now we don't -- I don't hear that kind of concern coming from the practicing medicine community.

>> BEN SHABERMAN: I'll make my comment about that. I get a lot of calls from people who are looking for doctors, and I've just come to the conclusion that the best thing to do is to go to a clinical research center. It's going to take the time -- that's going to take the time to really give a good thorough exam and a realistic view of what's going on, and for Usher syndrome, as we've already heard Ed's about the best, I mean there are other good centers around the country and around the world, depending on where you want to travel. And I just encourage people to start there and maybe they can follow up and a more regular basis with a local ophthalmologist to make sure there's no cataract or glaucoma or something else that's going on, other complications that may be treatable, but my experience is the average ophthalmologists or retinal specialists in private practice just doesn't have an appreciation or the time to interact with these conditions. I don't want to generalize too much but that's my experience.

>> DR. EDWIN STONE: Well, I think there are a number of excellent people across the country. I agree with Ben that they generally are found in university settings. They generally have a research component. I think that the doctors that are saying curt things and saying you don't need to come back, I actually don't think they have any idea of the degree of harm that they cause with that or they wouldn't do it. And slightly in defense, I mean like seven point type, all lower-case letters.

(Laughter.)

And maybe I'm going to take it back after all that.

(Laughter.)

Is that there's this terrific pressure in the United States right now to see more and more

patients for less and less money with more and more onerous documentation. And so lots of doctors are leaving the practice of medicine because they can't stand it anymore and stuff like that. Now, again if they're in the practice of medicine, they need to do their job, and et cetera, so that's why it's a small taste and everything. But some people are seeing 60, 70 patients a day, and so if it's a routine thing, if you're just trying to decide whether this person needs a drug injection or laser or something like that, that's not a big diagnostic dilemma. You can have a non-physician extenders help you with that and you can have this really deft and polished machine, and then a very stressed, tearful couple is sitting there with this thing, and they really need somebody to sit with them for a long time and just keep sitting there and answering the questions until they're all done, and those practices just cannot -- cannot do it. They can't physically do it. So that's more of a societal problem that we have right now. We're grappling with this in our country right now. Just to get even basic health care where we're trying to decide and the problem whenever we're grappling with something like this as a society is the rarest and the hardest and the weakest and the most vulnerable are the people that feel, you know, the crush of that first, and so to come back to Ben's point, there are people who are dedicating their lives to the study of these diseases, but in a university you can usually figure out who they are by calling and asking to get a referral or something. And I think it's worth the travel. You don't have to go that often. Some patients are stable and can be seen every two years, and see someone locally in the off year and to have somebody who will spend time with you is really, really important.

>> AUDIENCE MEMBER: Hi, I'm Stacy. I have a --

>> DR. EDWIN STONE: We're just going to switch the interpreters for just a second.

>> AUDIENCE MEMBER: Okay. I'm Stacy, my son has Usher 1F and he's 18 years old and I'm fascinated by the research you're doing, but my question is about there was a discussion this morning about not waiting for your life to start and now the only solution for people with peripheral vision loss (inaudible) the iPhone in my pocket. Do you know if anyone would be willing to give me (inaudible) movement in the periphery just rather what's in front of them on the ground.

(Laughter.)

>> DR. EDWIN STONE: I do.

Well, so there's actually a lot of research under way for, you know, what is basically the same type of technology that's being built into automobiles today, to be built into something that that person can wear, and a rudimentary version of that has already been built by my partner, Steve Russell at the University of Iowa. It's got some cameras on it that can detect objects as you approach them, and then it's a vest that you can wear under your clothing and it's got some vibration cues, and so it is not sophisticated at all as the stuff in automobiles, but there's the idea that -- let me just give you an example of the type of patient. We have -- we take care of a patient who has Usher syndrome who is still working as a chef in a large busy high end restaurant. So the kitchen is sort of a dangerous place. A whole bunch of action is happening and the way that information is usually conveyed to the chefs is some kind of paper ticket put up on a little board or something like that, but that's out of his view and he can't see it. And so very simple things where if he had a little vibrator so that the system just, as his next task was coming up, it would tap him like my fit bit taps me or something like that, would change a very frustrating thing for the other workers in the condition who are struggling to interact with him into an effortless sort of thing, and then if there was something that would likely hit your head on or bump into routinely, if you could just design a sensor for that so it would just effortlessly

warn you as you were moving around. And so this was -- this idea was originally conceived by a person working for the Intel corporation that was a visually impaired engineer, and he built one of these vest kind of things. They were the surest of the enabling technology that they gave to us, but he would say when he was in let's say a bar on a business trip, he could still see, you know, like straight ahead, but the confusion of the noise and stuff was such that he couldn't pay attention to the person he was interacting with because he was so afraid that he was about to trip over somebody or knock somebody's drink out of their hand or something like that, and he was just absolutely transfixed, but with this thing he could tell when somebody was approaching from one side or the other of his body and everything, and just that simple thing allowed him to enjoy standing there and interacting with other people because he didn't have to feel like some collision was about to occur.

Anyway, if you're interested in being in on Dr. Russell's design of this thing. It's an obstacle course. I put it on and walked down a long corridor and I could tell if I was getting closer to the wall on the left or the right as I was walking down the hall. You're right, you see this kind of technology all around us in other things we're doing, so just adapting that technology to the problems faced by the patients in this room is a clear thing that someone should be working on.

>> MARK DUNNING: I hear a lot of things like that coming up. I was just talking to Bill Barkeley last night. He's got these glasses that are based on Google glass, similar to see my eyes, where you connect with somebody who sees what you see through the camera on the glasses and he used it to navigate to a restaurant about six blocks away. They talked him through it. So there's a lot of great technology coming that will help with that stuff.

>> AUDIENCE MEMBER: Hi. This question regarding genetic testing. My name is Janice and I have Type 2, and I'm one of three in my family with Usher syndrome and we are three of six. And I wanted to know what would be the process for me to have a genetic test done, and do I go to my insurance or -- that's part one. And part two is should other members of my family get genetic testing myself and if so would it be my siblings with Usher syndrome or my siblings without Usher syndrome as well?

>> DR. EDWIN STONE: I feel badly, I feel like I'm monopolizing the panel here.

Okay. So the question has to do with the mechanics of genetic testing. The likelihood of having a genetic test paid for varies from zip code to zip code and varies from carrier to care year, and as -- carrier, and as everybody in this room as probably experienced with other aspects of your health care, sometimes an insurance company will pay for things that you were surprised that they would pay for, and sometimes they won't pay for stuff that you can't believe that they won't pay for.

So you start off by contacting your insurance company, telling them you have this condition, asking them if they will cover it, and blah, blah, blah, and that pre certification process dramatically increases the likelihood that they'll pay for it.

At the end of the day, if they won't pay for it, and if you can't afford it, that's what the project Usher system is based for, because we want everybody in the United States who has this disease to know what their genotype is so they can participate in things like the natural history studies and so that they're all ready to participate in the clinical trials and the treatments when they happen. So I think we should work together and one way or the other figure out a way how to get your family tested.

So then different people who do testing sort of think about it different ways. Our group tends to think about the family, the people as the unit, instead of the individual as the unit.

And so if we could get all the siblings all at once, we would basically test that whole collection of people all as one thing, all as one thing, because the samples from each of the individuals actually inform the other ones in different ways that I won't go into.

But I would say all of the siblings being tested would give us the best information.

>> BEN SHABERMAN: I just wanted to add a couple of things that I think Ed would agree with, if you were tested a few years ago or longer, it might be a good thing to get retested because the technology has changed. So I think that's something to consider if it's been, I don't know how many years would be your --

>> DR. EDWIN STONE: Well, yeah, it depends on how the testing was done. So I have every blood sample that I've ever drawn dating back to 1987, that's 70,000 samples. And so unless the sample was exhausted in the course of the original testing, we actually recursively test those if new things are discovered. And so we're still finding stuff in these old samples, and when we find it, we track the people down and tell them what we found.

So I called this guy a little while ago, and he had come to the University of Iowa one time in the 1990s, and, you know, had a blood sample drawn so he was in this box of people, and we kept studying and studying and finally we found this mutation, we tracked him down, he moved twice and we called him up and we said Mr. Smith, are you guy who came to the University of Iowa in 1995, blah, blah, blah, there's this pause and he goes you? We thought you were dead.

(Laughter.)

Not dead, found your gene. I found your gene. Not dead.

(Laughter.)

But the point is, if your sample was given to Bill Kimberling many years ago, we may actually have a result for you, but we lost track of you and we can't find you. So the first thing to do is to radio in and see if that sample is with us, and a person approached me earlier today from some testing that they did in our lab years ago and we actually have a result for you back from the 80s, so it's that sort of thing. First call the lab. If it's a commercial thing, they don't do that. They test whatever, and if they didn't find it, it's done and then you would have to have the blood drawn again.

The last thing I'll say about this is that -- and this is maybe getting a little bit off the beam of this question. There's a type of genetic test nowadays that's called the next generation panel, in which the genes that are known today are arrayed on a panel and tested and if it's positive, that's great. If negative, there's no remaining data. The other type of test, the thing called the whole exon test, and if you did the whole exon test, that provides sequenced information for all 20,000 genes in the body. I said that to a patient last Tuesday, he said dang. I wrote it down. I wrote it in his chart, the word dang down at the bottom.

(Laughter.)

But the advantage of this whole exon thing is if something is not found, that data set can stay live on the computer system, and now whenever a new gene is discovered anywhere in the world, say in the Netherlands, when that thing hits the wires, we infogrammatically look at all the patients that had this test. So I think that's going to be the way it's done in the future. So you do a conventional test like this $575 test first, if that's positive, which for Usher syndrome is positive 75 percent of the time. You write the report and it's over. If it's negative, I think you should go through a full exon sequence in most cases and then have that data live on a research computer system with people that are going to recursively analyze those data until your mutation is found. And that's what I think the strategy should be across the board.

>> BEN SHABERMAN: And if people have questions about genetic testing, obviously Ed has a great lab, feel free to call the foundation as well. If you're struck and you're not sure what the next step is, we have folks who can help guide you forward.

>> AUDIENCE MEMBER: I have a question about the genetic therapies under (inaudible) or other gene therapy that would fix a gene and what the possible incidental effects would be. For example my daughter has Usher 2A, so I know already that it's acting abnormal because she has that. If you fix the gene and it turns back on, the rest of her body is working without that. Will it affect other areas of her body like her heart or kidneys or liver or do we know if there's any type of unwanted affect that would happen from repairing the gene?

>> DR. MICHELLE HASTINGS: So I mean it's a good question to focus on the organs that are most, you know, predominantly affected. A lot of the approaches with the anti-sense are being performed systemically so they're being designed to hit other organs throughout. So I don't know that they would be expected to have anything negative with other parts of the body. But in terms of being toxic, it's dependent somewhat on the chemistry of all the different types. The ones we're using have shown low toxic levels especially in directed delivery. So it's relatively new in humans so it's not known, but in terms of any benefit -- I mean it's one thing to consider also when we think about delivery directly to the eye or directly to the ear versus giving a systemic delivery of the drug. So on the one hand it could be safer because we can limit exposure to the rest of the body. But also we might miss other important targets.

I hope that answers your question.

>> DR. EDWIN STONE: The thing that I would add to that is that one of the very time-consuming and essential parts of the FDA preclinical data that Dr. Han alluded to a number of times this morning is this question. So for example, we're doing all these animals right now, and even for treatment that is delivered only to the eye, I mean we put it only in the eye, the FDA wants us to analyze 22 tissues in the bodies of all these animals. Okay? And so we know from what we've done so far that there are no effects anywhere else in the animal's body from this retinal surgery, but the point is the FDA is going to require us to know that before we put this thing into someone's body so that's part of the reason why they do it is actually the question that you asked.

>> AUDIENCE MEMBER: Hello, everyone. I have Usher syndrome Type 1C. I'm not going to discuss that, but most of you who are parents that have children, young children who have Usher syndrome, I'm speaking really more about older people, 60s or 70s, above, those of you who are here who are age 60 or 70, there's a lot of research going on with therapies that can help people, older people, the old -- to help the older selves, to help the older selves. So what kind of therapy will be developed for that? Will that be any good? I don't know.

I know that you've been working with older people, and it might be a silly question, but it's more challenging for people who are older, especially if they have other complications.

>> DR. EDWIN STONE: So I have to say that older Usher Type 1 patients who use tactile signing only are the most -- single most motivating patient that I see in the clinic, and I mean if you want to feel like you need to do something for somebody, you just have to, you know, be in the room with somebody tactile signing for a little while as they try to express themselves from their perfectly normal brain to this very challenging methodology.

So we know as Dr. Han alluded to earlier today, that because of patients who have donated their eyes to us after death who have retinitis pigmentosa, we know that even in extremely advanced disease in people that are 90 years old, their inner retina still has living

cells in it. So at the moment we don't believe that there is any age limit to someone that the transplant patient would work in. That's what we currently believe. And that's why that Abe Lincoln juice that I was sort of kidding about that I wasn't kidding about, I mean we were very worried initially when we couldn't make the cells grow from, you know, people over the age of 40, that there might be some kind of cell biological limit or something that just wouldn't let those cells be turned into stem cells. But now with this new tissue called for strategy, basically these tissues are brand-new, like you're an embryo. So we think it would be possible in any -- in a person of any age, once the technology is fully functioning, to restore vision to, you know, people that were of any age, as long as they were healthy enough to undergo the surgery itself, and we think that people that, you know, have to have tactile signing would be the people that would arguably benefit the most from that sort of treatment and we're highly, highly, highly motivated to make that happen.

>> AUDIENCE MEMBER: Thank you.

>> AUDIENCE MEMBER: Thank you for putting these conferences again. This is my second one. I went to one two years ago to hear the research that's been done from two years ago to now. As you said, Dr. Stone, we are just a walk away. Two years ago I didn't have a sense for what was going on. When you put your presentation together today, I feel like there is hope out there now for me. You make it sound like you know what you're doing.

(Laughter.)

My question to you, since you're on the panel, everybody keeps talking about the Boston marathon, what help is out there for guys like me that want to run a marathon but really are afraid because running into people or tripping over something on the way. So that's your question.

>> MARK DUNNING: I get a question. Excellent.

So a couple of years ago, for the first -- on the equinox event, a bunch of us went up to Fairbanks, Alaska, and ran the equinox marathon in Alaska, and that's why we do our all equinox event over 26 days, because there's 26 miles in a marathon.

But there was a guy who ran with us named Brian Switzer who was from the Boston area, had never run a marathon before and had Usher syndrome and very poor eyesight and he ran with a sight guide, and the equinox marathon is one of the ten hardest marathons in the world. It's all trails. It's up a mountain and down another side of the mountain through like gravel and stuff and he ran with a sighted guy, completed the entire marathon and he said he didn't think it would happen. But the sighted guy works extremely well for people, once they're in training and get used to doing it. Once you have someone you trust, it's helpful to have someone around you who knows what the surroundings are like. So I know a lot of people who have severe vision problems who have been able to run marathons. You may also want to talk to Bill Barkeley about it.

>> AUDIENCE MEMBER: This goes back to what Dr. Stone was just talking about. My question is how -- maybe it's understandable if you know the science. How does the optic nerve retain the viability when there's no input? Explain that to me. And if there's things we're supposed to do to encourage that stainability.

>> DR. EDWIN STONE: The question is how does the optic nerve stay alive if there are no photoreceptors talking to it?

I think that the optic nerve is injured some. I don't think that the optic nerve is perfectly normal and it's certainly not perfectly normal in an 85 year old person who hasn't had light perception in many years.

As Ian talked about, the thing I find so stunningly encouraging in the clinic, you'll see a

person come to see you that's functioning very well, they're still running their business, they're doing fine, they're not driving, but they're still, you know, doing okay. And you look at their retina and just go, oh, my God. There's no retina here. I mean there's just nothing in there. You do this OCP and there's just a few cells in it so what's apparent is that the brain is such an incredible computer receiver of information that it just takes literally a few thousand cells connected to provide this rudimentary data that the brain can then -- can reuse to work. So I don't think that what we're saying is that this 90 year old person with the beat up retina and the beat up optic nerve would get normal vision back. I think what we're saying is that we are hopeful that there is a sufficient number -- so you have about a million axons in a normal optic nerve. If you had a thousand axons still left in the optic nerve and you could talk to every one of them, I think that that would give you potentially very useful normal vision. To put it in perspective, the retinal prosthesis, the current one, the Argus 2, has 66 channels, 66 spots of light, and people can get very useful vision from 60 pieces of information radioing in. So if you had 6,000 channels coming down, 6,000 axons, and that's just a tiny fraction of what a normal eye would have. So to restate all that, I think the normal eye would just -- we just reflect on it all the time. A normal eye, if you sat in a darkroom this large and put a single birthday candle on this first table there, and you sat in the room completely dark, after 30 minutes, you could see about -- you could see like a ten foot circle of outlines from that one birthday candle. And then you could get up and walk out on to a beach at Fort Walton Beach, Florida, at noon and you could put a white terry cloth towel down and you could see it's terry cloth, you could see the texture, and there's a billion times difference amount of light in those two intense its. So the normal eye is just hugely over engineered to be able to function in all these different light conditions and everything, and this kind of graft put into an aging eye would not be able to do all that stuff. The idea is that it would generate useful vision in a certain favorable lighting condition and stuff like that.

Now, for younger patients with even healthier nerves and stuff, we're hoping that in the future that it's going to be quite normal vision, that we could be able to rebuild. But I'm just struck every single clinic that not very much vision is so much better than no vision, it's just indescribable. And so that's why we're excited about even the first investigations of these transplants.

>> AUDIENCE MEMBER: So what -- are there things that we can do to promote the health of that?

>> DR. EDWIN STONE: So this is an excellent, excellent question. The question is what can we do to promote the health of the optic nerve while we're waiting for this stuff to happen.

Number one, do not smoke cigarettes. Cigarettes are bad, they're bad for your whole body. If you smoke, stop. Stop smoking.

Number two, don't say, oh, I got really poor vision. I don't need to go to the eye doctor anymore, I have terrible vision. Because what if you have a pressure in your eye of 30 or something like that, so you have glaucoma, you don't know you have glaucoma because you're not going to eye doctor anymore. So you need to at least go periodically to make sure the pressure in your eye is normal. There isn't any other treatable disease in there that's going unrecognized, because if you have glaucoma for ten years in this unsighted eye, then that nerve would not be able to see.

>> AUDIENCE MEMBER: I want to add my thanks to the groups for the panel's work on research about Usher's. My question relates to Mr. Dunning's earlier statements about the power of this group and I want to ask you what can this group do to help you help us?

How can we best focus our lobbying and advocacy efforts at the federal level? Who should we be targeting?

For instance, we can each call our individual senators, maybe three or four might call an individual state senator, but if this entire room would call one person, they would listen.

So is there somebody at the federal level, Trump, what is the best surrogate for our voice at the federal level to help you?

>> DR. IAN HAN: Well, there's so many ways to answer that question, actually. I think the power of this meeting group is semi fold. One obviously is to connect people to share experiences. Two, which we have alluded to which we may not think about very much is you really inspire us a lot and that's a super helpful gift to us when we hear your stories.

On a federal level, on the government level, it's really difficult as Dr. Stone talked about, because when you have the economics that was mentioned from 75,000 patients to 10 patients getting treatment, even though we live in this democratic society with great government, there are funny priorities that are there. The other thing that I will say is that the loudest bird, the early bird kind of does get the worm still, and so you never know. If you go with a lot of effort to kind of keep knocking on the door to see what you can find.

But the other way to answer this though is that a lot of our work now is through philanthropic funding and not through the government. It's not to say that the government doesn't care about the condition, but when you talk to guys who are running NIH funds, they're focusing on how to allocate even what they consider the limited funds for huge problems, such as diabetic retinography and the folks who are running those efforts, they're struggling to find the money.

On the other hand, having the ability to have philanthropic giving for dedicated diseases, the government may not be paying as much attention. I think that's a very helpful avenue for our institution and others and it's represented by Ben here.

>> BEN SHABERMAN: One thing I just wanted to add just to clarify, when it comes to federal funding for inherited retinal diseases, the national eye institute is really the big funder of that research in terms of taxpayer money, and I wanted to give a shoutout, is Moira Shea here?

>> I'm here, Ben.

>> BEN SHABERMAN: Hi, Moira. Moira and Bill Kimberling, I don't remember how long ago it was came to capital hill and gave a really compelling heartfelt talk in front of, I don't know, it was a few dozen congressional staff, and we at the foundation work with different advocacy groups on Capitol Hill to get folks like Bill Kimberling and Moira in front of Congress and staff, and I notify they met with different -- I know they met with different congress people afterward. So there is some work being done, and, you know, if you visit Washington, try to visit your local senator or Congress person or I know Denae knocked on the door of her governor in Mississippi and got his attention. So do what you feel you can do at whatever state or federal level. But I think the combination of hearing loss and blindness, deaf-blindness, is very compelling, and you have a really strong story to tell. And so get out there and tell it, and if you can get in front of government officials, great, or whatever other funding source. But I just wanted to make those observations.

>> DR. EDWIN STONE: I'd like to add something to that note. The annual budget of the national eye institute right now, if it isn't cut, is about $800 million. $800 million. So we were down in Fort Lauderdale a few years ago where we had our national eye research meeting and there's an article in the newspaper because they were fighting locally about something or other, and I was shocked to discover that the annual budget for the Broward county sheriff's department was $800 million. So annual budget of the Broward county

sheriff's department is the same as the annual budget of the National Eye Institute of the United States of America. So I encourage you to, when it's not too time-consuming or stressful to you, to put in an awareness pitch for Usher syndrome. I think that's what you put the pitch in to government, ask awareness -- is awareness, you're awareness day and that kind of stuff. They're not going to increase the budget a thousand fold, you know. I mean if they increase it, they're going to increase it from 800 million to 900 million. And there are a zillion scientists in the United States, as Dr. Han mentioned working on every conceivable thing.

Also down there, while I was reading this story about the sheriff's department, I walked across this little bridge and I looked to my right, and there were about 150 yachts that are about the size of this room to my right. And I looked to my left, and there were about 150 yachts about the size of this room to my left. And I said, hm, what I ought to do is get off this little causeway and walk down that dock and knock on some yacht doors.

(Laughter.)

So my vote is to spend at least some of our time just, as I said, exhorting everybody, is instead of talking about what the government isn't doing, turn to that person next to you in the airport lounge and, you know, tell your personal story to them, because who knows? They might have the time and capacity and they might just not know where we are today and how much good we can do with their philanthropic help. So we're really focusing a lot of effort on just getting the word out to those yacht owners, because -- I'm dead serious, because there is a ton of wealth in this country. There is a ton of wealth in the country. And it's not in the hands of government at the moment. And there are no moves afoot to put more of that wealth into the hands of government at the moment, so I think we ought to really redouble our efforts to find new philanthropists to talk to.

>> MOIRA SHEA: Thank you, Ed, for that comparison with the sheriff's department in Florida.

My name is Moira Shea, and I've spent five years working on the Hill and when I became involved with the Coalition, we went up I think four years ago to advocate to make Usher syndrome a higher priority for research at NEI. I went the first time and met with the director of the National Eye Institute and the National Institute of Deafness and Communication Disorders and then the following year, we had a briefing, a congressional briefing and Dr. Stone spoke very eloquently at that briefing and afterwards we met with senators and members of their staff and we targeted it to appropriations and the health education labor pension committee. And we kept getting our language in. We also had the assistance of a very, very well-known, well-respected firm in Washington, D.C., by the name of Akin Gump.

Two years ago or maybe a year ago, Mark tells me -- two years ago we went back to NIH and we met with the director, and literally nothing had been done to put in language with the appropriations bill. They were just doing ongoing programs, nothing had been done to specifically address the language, and we really were disheartened and the next day we met with the senators and their staff, we conveyed our findings and they said it happens, and it was back and forth. Funding for Usher syndrome is -- it was like 16 million one year, and then the following year, even with our language, it dropped to 11 million, and it's not specific Usher's, but I would say guesstimate, NIH, maybe they spend 5 million a year on Usher syndrome, specifically targeted Usher syndrome, and they tell us they're not getting grant applications, and I know there are researchers with very well thought out grant applications have been denied, and I hear over and over again that the whole place is very political, personality based, and, you know, very difficult to work in. So I

would, you know, encourage you to contact your members, but I wouldn't discourage you from contacting NEI and asking them what have they done to make Usher syndrome a higher research priority.

Thank you very much.

>> MARK DUNNING: Just to add on that, if you contact -- I'm way over here on the far left-hand side now.

If you do contact your representative and they seem -- it may not seem like it's not a lot, it is a lot. They do remember. Especially if you call back every year, they remember you. We bug our representatives enough they call us so they preempt us calling. And Moira is right. Talk to NEI and make sure we're out there and we care about what they're doing with their priorities.

>> AUDIENCE MEMBER: Thank you.

Hi. I have two questions. One is more general and relates to what we've been talking about with the lobbying effort, but on the funning of research level. -- funding of research level. Given that we have limited funding and limited time, are there efforts to coordinate research efforts and what's the strategy for that and the sharing of information so that we're not duplicating efforts.

And then the second more specific question is related to cataracts that were mentioned a couple of times. How prevalent are cataract among Usher's patients, and what's the implication for cataracts and gene work and cell therapy?

>> BEN SHABERMAN: Well, one thing I wanted to mention is my presentation on RUSH2A is a great example of how we're working to increase knowledge of that form of Usher syndrome, of people with USH2A mutations and make it available to anybody that's interested in research or developing therapies.

Part of the foundation's mission is really to share and collaborate as much as possible to get information out into the world and into the public domain that it's available to everyone. My retina tracker is another great example of that. By you putting your information out there in a patient registry about your disease, it's available globally to any researcher that has the screening criteria. That's another great way to access that and make that information --

>> AUDIENCE MEMBER: That happening on the flip side where the researchers are doing that too?

>> BEN SHABERMAN: Sure. Ed referred to a research conference that occurs all over the world now, it's called association for research in vision and ophthalmology, and researchers publish thousands of posters on inherited retinal disease and share that information, and then foundations like ours and I'm sure Ed has his activities, you often bring researchers together with different areas of expertise to share knowledge. We do a lot of that, because everybody's got their own area of expertise. Nobody knows everything, and we understand that very well. So we're constantly having meetings where we pull in researchers from all over the world to discuss -- like a couple of years ago, we had an Usher 1 C meeting and pulled in people from all over the world to discuss approaches to Usher 1C. Michelle's colleague was there. Uwe Wolfrum was there from Germany, people from his team were there, people from the Netherlands. So yeah, that's happening on a pretty wide scale.

>> DR. MICHELLE HASTINGS: And having a relatively small research community right now is good and bad, but we all kind of know each other in Usher 1 C and we collaborate and share information about research tools. I work closely in the anti-sense technology but also with the people that are doing the adenovirus, gene therapy, really it's now working

and applying my outfit to their samples, so I think it's a very -- in that way, people are very, you know, willing to share and we communicate very regularly and also because as you said, we have to find levels of expertise with the vestibular and auditory system, the visual system, so you really need a big team of people that are working together so they can have a more successful approach.

>> DR. EDWIN STONE: I think another example -- so another example of that is Susie Trotochaud and Scott Dorfman who have an interest in USH1C have supported the genetic testing efforts for USH1C, and so Jen Lentz's acquisition of families in Louisiana, we defined a specific Louisiana Usher test that is extremely efficient and inexpensive. We're doing that. And those samples directly benefit Michelle's work. That sort of interaction.

Another thing that I think people don't think about very much but we thought about a lot lately is the advantage of trying to bring mission aligned people under one roof. So if you could get a whole bunch of people together at one institution, it turns out that that is a very powerful deal, because whenever you try to send samples back and forth between institutions, they're not unovercomable barriers, but that's why we recruit people to put them under one roof and make them more efficient, so that's something that can be done to foster collaboration.

Regarding the question of cataracts, cataracts are extraordinarily common in all forms of retinitis pigmentosa. I think there are two people sort of dimensions about them that are worth thinking about. A lot of times the cataracts are not visually significant, which means the person's vision is actually limited by the retina problem and not by their cataract, but because the local doctor takes cataract stuff for a living and wants to help the patient and they don't have a lot of experience in judging that, they'll sometimes do cataract surgery, you know, genuinely hoping to help the patient, but the patient is disappointed that it doesn't help them and occasionally the patient can actually be more (inaudible) after the cataract surgery. So what I generally do is encourage our ophthalmologists to never offer cataract surgery to a person with Usher syndrome, but follow them for a little bit and make sure you have a good understanding of what their visual function is and compare that to other people with similar retinas.

Regarding the ability because of cataracts to participate later in any of the gene therapy trials or anything, if the person had only hand motion vision but you could still see through the lens well enough to assess that there wasn't glaucoma or anything, I don't think you should operate on that eye now. But then at the time that the treatment was read, you could actually remove the cataract as part of the same operation that did the gene therapy or the (inaudible). Retina doctors do these combined procedures all the time where there's something in the front of the eye that's limiting view, so you do that procedure as the first thing and then follow with the rest of the procedure. So I don't think -- the bottom line is everybody that has a cataract doesn't have to come out, and they should be thoughtful about it because sometimes you can actually make the person more light sensitive and it can be a procedure that endangers the eye a little bit without any benefit. And then secondly, in general the presence of cataracts do not impact the future ability to participate in trials one way or the other.

>> MARK DUNNING: I think we have time for one or two more questions.

>> AUDIENCE MEMBER: Hi. My name is Laura, and I have a young child with Usher syndrome Type 2A, and I am -- I wanted to ask a question that hasn't been touched on yet and that's a little bit of a game changer for us young families of genetic testing, and I wanted to see if you had any thoughts or insights on -- we have children, many parents

here have children who haven't started having any of these eye conditions yet. And then there's genetic testing I know my son gets one gene from me and one gene from dad, but those two genes together in combination have not been seen together before. Can you talk to me a little bit about how you counsel parents who are new to this diagnosis that don't have -- they can't see anything in the eye right now, a baseline of RE. And then on top of that, what can we do for our young children now to help, if there is anything to help slow the progression?

>> DR. EDWIN STONE: Well, the subject that you touch on I think is a very important one, a very serious one, because every Usher gene has the potential to cause only hearing loss or only vision loss or the combination. So if you had a completely safe and completely effective treatment, completely safe and completely effective, then hyperdetecting it at age, you know, six weeks or something, so family screening, you go through genetic testing and find all these people with possibly disease causing variants, might be a good thing to do, because you have this totally safe, totally effective treatment that you could start giving to people early on.

On the other hand, if you don't have that at the moment, and if a person actually has variants in the gene that only cause deafness, only cause deafness, and will not harm the retina, then turning to somebody and using words like blindness and stuff when they're child is one year old, I'm actually very, very worried about that. And I think that we have a real issue with the way genetic results are presented to patients in the United States right now because there are not enough very knowledgeable counseling people, and so a lot of people -- I was struck by the question, because it said this combination hasn't been seen before. So that sounds like a counselor who has looked up, you know, in the literature to see if they can find a published case to be the basis of their counseling for you, which is what they do. It's a reasonable thing. But there is a ton of uncertainty about that, and so I've actually done a whole bunch of calculations recently about the likelihood of getting along with that type of counseling in young family and it's unacceptably high. So what I would say is I would take -- if there was two abnormalities and an Usher gene in my child born with a hearing impairment, I would say, okay, I understand that there's a chance of a vision loss, because of that. But there's not a guarantee of vision loss right now. And we will watch the child carefully and we're going to react appropriately. And then maybe the one benefit to that is that you won't have that peanut allergy reaction, you know, many people in this room had to go through this twice. So it's of a -- they've lived through the hearing loss first and they thought they were through it, and then discovered the vision loss later and got hit a second time with frightening things. So at least you know that there's something that you're on the lookout for, and maybe that will end up being better but I'm not sure if it's better if the person uses the word blindness when your child is one year old and then it turns out that that genetic combination doesn't actually enter the retina after all.

So to summarize all that, I think that the -- we don't have a good -- the technology is changing faster than the clinicians can handle the information load, and I think that undercurrent all through today is that there is room for improved education among all the clinicians of these patients and we need to encourage our colleagues to become more and more knowledgeable about the disease, more and more knowledgeable about genetic testing so they give patients better and better, more accurate information.

>> MARK DUNNING: We have time for just one more question.

So just so you know, we didn't get a chance -- if you didn't get a chance to ask your question, I know that some of the doctors will still be able to be around during the break to take your questions. And if you still haven't had a chance to catch up with them, just let us

know and we are in contact with all of them. We'll be happy to pass your questions around to them.

So the last question here.

>> AUDIENCE MEMBER: Hello everyone, my name is Scott. First of all, I'd like to thank all of the researchers, as well as the research team from the University of Iowa. I appreciate everyone talking about these situations. I would like to point out about the DNA. I know that there's some people who have yet to actually be diagnosed with Usher syndrome, or they're late diagnosed. I'm not sure if it's because (inaudible) local doctors or researchers or if there's a connection between the two. So if I can clarify, I actually (inaudible) my local doctors and their diagnosis. They were quick to actually label what I was, what I had, and I feel as though they're quick to judge without actually having documentation or blood test or true evidence of what an individual truly has. So I'm just hoping that from my experience or other's experiences, that they have (inaudible) for all these, how they can give anybody a label without having the true DNA testing.

>> MARK DUNNING: If I could add a little bit more to that too. His question about how people get diagnosed with Usher syndrome without the genetic testing, and that it is not uncommon for people when they get the genetic testing later, they don't actually have Usher syndrome. So I wonder if you guys can comment on that.

>> DR. EDWIN STONE: So I think that there are two dimensions to this question that are both important. The term Usher syndrome is historically not a molecular diagnosis. It's a clinical diagnosis, and what a doctor means when he or she says that is that it's the combination of hearing loss and retinitis pigmentosa of a pattern that has been previously described. So that's all the term means. The shorthand term to mean, you know, this thing.

Then it turned out after the late 1980s when the gene started being discovered one at a time, many, many times you can in fact find a molecular gradation for that clinical diagnosis, and the thing that is upsetting to patients is they expect there to be a one to one correlation between that original clinical diagnosis and the ultimate molecular one, and there are numerous, numerous examples through all of medicine in which the clinical diagnosis doesn't often match the final x-ray answer or something like that. That doesn't mean the doctor was wrong or was bad or anything. It just means that there was something confusing about it that resulted in that disagreement, and sometimes we have one family here in the audience today that actually has two completely different diseases, one causing hearing loss and one causing retinitis pigmentosa mimicking Usher syndrome that was ultimately figured out.

But the thing that I sort of sense as an undercurrent to the question though is one of dissatisfaction with the degree of seriousness that the physician took the situation to be. And again this goes back to my seven point all lower-case letters, maybe I'll take it back, but just so that some of you in the room will be a little more forgiving, just a little, not a lot, you know, I'm not asking for total forgiveness, a little forgiveness, but ophthalmology is a surgical subspecialty. Ophthalmology is in general somebody comes in with blurred vision. You give them glasses or contact lenses or do a cataract operation or whatever and you change them back to normal. 98 percent of the practice of ophthalmology is like that. Okay? You have a red eye, you get drops, your red eye goes away, you're all back to normal, you don't have to go back to the ophthalmologist anymore.

So this Usher syndrome, retinitis pigmentosa, things like that, is a lot more like general medicine or pediatrics or something like that where there are more chronic conditions where you develop a relationship with a patient for a long time and manage them and so

forth, and so I'm just saying that a lot of personalities that gravitate into the field of surgical ophthalmology like that aspect, if they have a big practice and people are coming to them and they're making them all better and sending them back home. And those people don't sometimes do very well with this condition. They don't know a lot of about it. They're frustrated with it and whatever, and then that comes across as curt, you know, and it is curt, and it comes across as hurtful and it is hurtful. And so I think the thing is that was alluded to a number of times earlier today, is what I think everyone in the room needs is they need a doctor that they like and they trust and feel that is acting as an advocate for them and if you feel like you don't have that now, we need to find you somebody else that you can go to that you feel like is giving you the support you need, because this is a very important part of your life, and you need to feel like the physician that's caring for you is taking it seriously.

>> INTERPRETER: One moment.

>> MARK DUNNING: So thank you, guys, for coming up here and answering all these questions. We're going to take a break right now. We're going to get back together at 3:15. We are actually looking for an envelope that may have been lost. If anybody sees a white Usher syndrome envelope that says Matt on it -- hey, look at that, we found it.

(Laughter.)

Perfect.

So there we go. So problem solved. And remember again you can get pictures taken back there and we'll get back together at 3:15. Thank you everybody.

(Applause.)

(A short break was taken.)

>> MARK DUNNING: Hi, so if we could get everybody to take their seats and we'll start it. This is generally everybody's favorite part of our conference is the family panel up here. So we'll give everybody just a minute or two to get settled. There's a lot of talkers out in the lobby. It's a good problem.

Okay. So I'm going to hand this over to Moira Shea who is going to moderate the panel but thanks everybody for getting back here. Here's your --

>> MOIRA SHEA: How is everyone doing?

(Applause.)

I want it louder.

(Cheers and applause.

This has been a great conference and as Ed said we don't leave anyone behind. It sure as hell is inclusive and diverse, and we have a mom, we have a person from Mexico, a person from Australia, a person with cochlear implants, a person who does tactile. We have a guide dog named Finnegan who is up to some shenanigans.

We're going to talk briefly about themselves. Why they're here today, and I'll ask a couple of questions, and then the panelists will ask questions of each other, and then at the 45 minute mark we'll take the microphone away from me and we'll take the questions from you, so we're going to let it go, and at the far end, we'll start.

>> KEVIN RICHMOND: Hi, everyone, my name is Kevin Richmond. I am deaf-blind. I have Usher's Type 1B. I'm from Vermont. I work at the University of Vermont. I am a teacher there, I'm teaching American Sign Language and deaf culture.

The reason I'm here is because I work with Nancy O'Donnell, and she convinced me to come here.

(Laughter.)

And I grabbed this opportunity so I thank you, Nancy.

>> DIANA VELARDE: Hi, everybody. My name is Diana, I'm from Mexico. This is not

my native language. I have Usher's Type 2. I was diagnosed nine years ago. I do have a bachelor's from a university and a master's degree also.

>> LINNEA HAGA: My name is Linnea Haga, I have Usher's 1B, I'm from Tampa, I'm a senior going into my senior year of high school, I'm 16. My family is an Usher family and we like to reach out to other Usher families and hear everybody's experiences and how people cope.

>> ANNMAREE YEE: I am AnnMaree. I'm in from Australia. It took 48 hours to come here.

(Laughter.)

Because American Airlines, thunderstorm out of New York. So I feel like somewhat exhausted. I have Type 2A. I was born with severe hearing impairment. But my parents didn't believe in intervention, but I taught myself to read. And bizarrely enough I put myself into a university of medicine, so I became a physician. I found out in my last year of medicine that -- well, I knew I couldn't see properly but I couldn't see the ophthalmologist of that, so he referred me to a physiotherapist because my specialty was falling into ponds. If there was a pond anywhere, I fell into it. (Can't understand) it's really hard but I wanted to be a pediatrician, but I realized that was a daft thing to do because as my vision got smaller, the patients got (inaudible), so I went into mental health, I went and got a psychology degree, and now I had a patient come to see me a couple of years ago who was one of my deaf-blind patients and he got renal failure in the hospital because nobody fed him for four days. And I thought how are we going to stop that, so now I've gone back to the university and I'm doing a Ph.D. in how to basically -- how our hospitals get deaf, blind and dumb, and how can we fix it. How can we make our hospitals safer and less traumatic for people.

>> DERRICK PHILLIPS: Good afternoon, everyone. My name is Derrick Phillips. I have Usher's 2, Type 2. I'm born here, right here in the City of Chicago. I have done so much with my life. I'm currently superintendent of a group for blind and vision impaired. I'm also on numerous boards. I'm an author of two books, one is titled I'm blind, so what. I'm an ordained minister. I'm a motivational speaker. I do almost everything that -- except sell popcorn.

(Laughter.)

So I tell you all that the reason why I'm here is you heard my sister mentioned earlier, I'm the first one, she's the third one. She called me and told me about this Usher syndrome coalition and I went yea, yea, yea, I got too much to do. She said you're here in Chicago. I want you to come. And Nancy, who came out (inaudible) State of Illinois some ideas about these coalitions, what it means, and I'm really grateful that I -- and I'm really grateful that I participated and I came, because I know listening to the participants, I want to be a part of them. Thank you for inviting me here. Thank you.

>> LYNNE MURPHY: Is there a pass around microphone?

Hi, I'm Lynne Murphy Breen, and I am a parent of a five year old that has Usher's 2A. When she was born, she did not have newborn screening. Had to go for several tests because she was diagnosed with moderate hearing loss. Then about -- we had to wait for the genetic testing. We found out that we had to wait for the audio genome. She was about 16, 17 months old when we got the results of that, that she had Usher's 2A. I can tell you that she is fabulous. Much thanks to not only the people that put together the Usher syndrome coalition, but also at the decibel foundation and the hearing loss program, I'm lucky enough to be in that. My daughter is been called by her preschool teacher as the best listener, and in time their speech model. So (inaudible) never talk, I guarantee you

you will be saying my kid never stops.

(Laughter.)

>> MOIRA SHEA: I would like to ask Linnea, the young girl that is going to be a senior in high school, if she has had other conversations, what does she want to do in her senior year, what does she want to do when she grows up, and does she have anything to share with other kids who may also be going into senior year.

>> LINNEA HAGA: Well, as far as the school system goes, I've been mainstreamed all my life, since preschool. So you know, I faced my fair share of challenge in the school system. People not understanding my condition. People not -- people forgetting that I have it, always have to speak up for my accommodations. Going into my senior year, I feel like awareness about deafness in general has definitely increased. So that's a good thing for many younger Usher kids who are starting to go into the school system.

As far as where I want to go to college, so far I'm thinking of the University of Florida or University of central Florida. I want to get a degree in animation and both of those schools have a very good animation program.

And when I go into college, I will carry over the accommodations from high school, and you know, it is definitely a different environment. The classes are bigger. The professors are less personal than the teachers, but I feel like it's something I'll have to roll with the punches in that scenario. My goal is I've always been in different situations, you have to stand up for yourself and what you need so that's I think my biggest piece of advice for other kids that are my age or other kids that are going into school programs or maybe you just found out you have Usher's. You have to stand up for what you need and what you want because people aren't going to know from first glance, she has Usher's. She needs things to be repeated to her sometimes or she needs to like when I'm in a group, people have to repeat themselves, you have to stand up for your accommodations and that's a part of life when you have Usher syndrome.

When I grew up, I would like to be an animator because art is one of my main passions as well as horseback riding and that's a challenge because the whole thing with balancing with Usher syndrome. I fell off a horse numerous times but I deal with it. I get back up and I get back on the horse. I think that model applies to life in general. You have to gets back up when you fall down.

>> MOIRA SHEA: When I was growing up, I used to ride bare back all the time and I would get up and get back into the saddle, even though there wasn't a saddle.

(Laughter.)

I think that really is such an important lesson.

From the university of Vermont, is there anything you would like to add to what Linnea said about college?

>> KEVIN RICHMOND: Absolutely, yes. As you spoke, I remembered about my college days and I remember going to Rochester institute technical -- Rochester Institute of Technology in Rochester, New York. They have a very good program with good services for deaf people and deaf-blind people in general. And it's a good support system. We would ask for things. There was no problem. I never had to really advocate for things, but again if you're with people who work in the deaf community, they tend to already have the awareness, but for deaf-blind, it's easy for them to identify if you're deaf-blind. This is for sure, it's easy to identify a deaf-blind person in that area.

Now, I am a professor, and I do have some challenges and struggles and I do have to advocate for myself. I've been teaching for five years, and my vision has slowly decreased, so I have to ask for extra accommodations, maybe more lighting, a different kind of setup.

Maybe I need an assistant, which is called a visual assistant, or a visual interpreter. So right now I have someone behind me who is a visual assistance doing tactile on my back. That is called a pro tactile person. It's abbreviated at PT. So what she does is tells me what's going on in the environment. I focus on the interpreter for communications, but if you laugh or you look confused or if people get up and walk around, she lets me know by doing different things on my back, which is so cool. So I am -- I have full access with both of these services, and I want you all to think about pro tactile. You don't have to know American Sign Language. This is for anyone with a vision loss can use this type of service and it's so beneficial for you to know what's going on in the environment around you.

>> LINNEA HAGA: So since you went to school around the deaf community, I can see how our experiences might be different. For me, I've always been mainstreamed, so as I said, I've always had to be around hearing people, which is very -- that's a challenge sometimes, but in general once you explain your condition to them, they will be very understanding and will even help you sometimes. Oftentimes in school, sometimes maybe I have a substitute teacher and they're calling attendance and they call my name, one of my friends will pipe up and say she's here. She just didn't hear you.

It's very helpful when you're in a situation where there's not a lot of people with your disability or not a lot of people know about it, it's good to have your group of friends know and help you out.

But you can't always rely on them. You do have to be independent and stand up for yourself a lot of times.

>> KEVIN RICHMOND: I would like to add to that. When I was growing up, I did go to a deaf school and I did switch over to a mainstream situation, and I had a termer in front of me -- interpreter in front of me the whole time. I do warn people about my vision loss. You just have to tell people about that, and I did go into a private university, and I had to let people know and make them aware of what I needed, make sure that I had paper with large print. When power points are projected, if you sit far back, then I had a screen close to me with the same Power Point so I could see it close up. There was very beneficial for me. So yes, I do understand what you're saying. I had to advocate for myself. Really anywhere you are, because of who you are, you have to advocate for yourself and communication access.

I worked at Starbucks with all people who could hear, and so I had to communicate and use visual access, so I did have the same struggles, yes. I understand.

>> LINNEA HAGA: I completely agree. It's very important to tell people your condition. I met way too many people who are shy about it. They sit in the back of the classroom all quiet. I don't want to tell people I'm different. You do have to tell people you're different and that's okay. They have to adapt to you. I completely agree.

>> DERRICK PHILLIPS: I would like to add --

>> Derrick, hold on one minute.

>> INTERPRETER: Thank you.

>> DERRICK PHILLIPS: Okay. I'd like to add to that. (Inaudible) all my life and I lost my sight totally at the age of 31, so being hearing-impaired all my life, all through my childhood, I was teased in school by kids about my inability to hear. I didn't go to a special school. And so I was always a little stubborn and mean because of the way people were receiving me with my hearing impairment.

Then when I got no high school, it pretty much was the same thing, but then after I lost my sight totally at the age of 31, I had to change my life strategy completely upside down. I had no longer I could say -- before I lost my sight, I was pretty much in denial, you know. I

would pretend like I could see. I would run into poles (inaudible) I didn't know she was behind me. There were visuals that I didn't realize that you can't see and you don't admit it. You don't come out and tell people you can't see. Maybe because I was truly in denial most of the time. I wasn't working with the real world.

When I was 16 years of age when I was first diagnosed with RP, it wasn't advertised, when the doctor told my mother I had RP, I said what's that? I thought RP was real people.

(Laughter.)

And that's why what I had to do to inspire myself to interact with the world. I refused to accept the negative things out there. By being a real person, I can handle anything.

(Inaudible) they can be the best they can be. So don't let people telling you you can't be.

>> MOIRA SHEA: I'd like to ask Maria from Mexico what she thinks about this conversation?

>> Diana?

>> DIANA VELARDE: We talked a lot about the attitude (can't understand) like when you speak to people, (can't understand) but then people say that. But when we come up with more ideas for how we can cope with all of the things we face every day, we're actually in a better way. (Can't understand) it's a lot about that, you know. About the attitude. So I even laugh sometimes about things that happen. To be able to stand and say, you know, I do have this. I do have a problem with my sight. I have a problem with my hearing. But I just cope with it every day and I'm fine. We are not normal people. We have a difference but we are normal people.

So but I think if you talk them down, you know, like if we have a negative attitude, people will react in a wrong way. It's hard for me and it took a long time for me to understand that, but once I said, okay, this is what I have, and this is what I need today, and this is what I might need tomorrow, then people say, good. And things are working in a better way.

>> MOIRA SHEA: So Lynne, what do you think about all this?

>> LYNNE MURPHY: I think it's great. I think it's great how you advocate for yourself and especially Linnea talking about that it's okay to be different. I know for our daughter, she's mainstreamed and we're lucky to have a very strong school system and it's different I think now a little bit than it used to be, and hopefully she won't -- I hope she'll never run in it, but if she does, hopefully not so the same extent that Derrick ran into. Because schools have students who are different and embrace differences. My daughter is in an integrative pre K and is transitioning into kindergarten. We have a lot of children in our schools with hearing loss. So it's not unusual for other kids, and they get the services. So I hope that that is also something that's positive, and I love hearing that, you know, you've done so well and the young people have done so well, that it will be more accepted because young children don't make fun of your child. It's not in them at three and four and five to make fun of your child wearing hearing aids or cochlears, that's usually something that comes later. And I think when they're exposed to it at a younger age and they become your friend, those kids in pre-K and kindergarten that my daughter will have will also be your allies, will also be the people who speak up for you and be on your side. I hope that's true. I don't know, maybe somebody can add to that. Maybe your experiences as a young person.

>> ANNMAREE YEE: I think things have changed. When I started at uni, I went to mainstream school, and when I went to uni, this was -- there was no assistance, this was a long time ago because I'm really old. I also knew I was fine until I got this mental -- then he found out that I had a hearing loss and went absolutely nuts. He went to see the dean

of the faculty, to say we cannot have this person studying medicine. We can't do that to the profession. We're a noble profession. We don't do that. But my dean just said, well, you know, it's a community of different people, and I liked her. So I stayed.

But that was a really negative -- that taught me not to tell people, so I spent a long time not telling people and just compensating and oh, my goodness, I was much happier.

So I have to say coming out, is a really great thing to have done, because people are really, really nice and really helpful if they understand. When you don't tell them, then you never give them the chance to understand, and this time at uni, now that I'm back at uni, (inaudible) because it told me what's happening with where people are. I have an accessibility assistant, and she goes with me wherever I go at uni, legal guide, interpreting, mentoring the technology as well because when you can't see properly, well, when you can't see notes, it's really hard to take care of technical problems in class or at uni, so that's been incredibly helpful. And I also found sitting down, planning things with the university, it's an education process for them. I'm the first deaf-blind student at my university, and so, yeah, so they thought they could just take -- we help the blind students with seeing things and we help the deaf students to hear things and if we get them all together, it will be fine. Well, it didn't work because the blind students use their hearing to cope and the deaf students use their vision to cope. So we're making progress. But it's a completely different environment now because you have to look at them and say the more kids and then they usually get (inaudible).

>> LINNEA HAGA: I would like to go back to what you were saying about your daughter. No, it doesn't come naturally for young children to kind of pick on their peers and that won't happen when your daughter is older either and why that won't happen is what Diana said about attitude, as long as your confident and open about your disability, people won't find anything to make fun of. So it's important to teach children at a young age how to accept your differences and how from a young age stand up for themselves and I think that's really helped me. And the attitude is a very, very important part of it. You know, if you're negative about what you have, if you're negative about having Usher syndrome, being deaf-blind, anything like that, other people will also perceive it negatively. You'll get those pity responses, where it's like oh, I'm so sorry, that kind of stuff. But if you're not negative about it, people will quickly learn it's okay to talk about it, and you're obviously fine with it. So there's nothing really to make fun of and they'll treat you as one of them. So the attitude is very important.

>> DERRICK PHILLIPS: Also too, I think to my experience in life is that being visually impaired later in my life, hearing-impaired most of my life and when I became visually impaired, advocacy is difficult at an early age. And you don't really know how to do it. And when I lost my sight totally at 31, there was no -- it was no longer that I could act like I couldn't see. I know I couldn't see. And I think that's a big difference especially from a person with no sight. You find people with some sight have no accidents. They pretend that they can see. I'm at a school where I'm the superintendent of the school and I have room for people who are hearing-impaired and deaf-blind. And we have support groups and I think support groups are very good especially for people who are deaf-blind and hearing-impaired because they can share each other's ideas, and I'm always among them, to let them know that they can do it. Don't worry about it. Advocate for yourself. When you want something, don't be afraid. A lot of people are hearing-impaired are afraid to ask for something a second time. For example, people may say Derrick, would you repeat this? When they do that to me I go hm back. I went to a school and I spoke to a group of kids who were hearing-impaired. And I said never, ever apologize about your inability to not

hear. If you can't hear, then ask them to repeat themselves. If they don't want to repeat themselves, you have to make sure you gain your confidence in yourself. Don't let anybody put you down. So if they don't want to repeat themselves, then don't be afraid to say speak up or shut up.

(Laughter.)

Because otherwise they're going to -- you'll find a lot of people that's hearing-impaired, they will become more introverted. They stay away from people because they don't want people to feel like they have to repeat themselves. I will tell you in a minute, say it again, say it again, say it again. I am not going to feel and apologize because I am hearing-impaired. Does a person who ran into a wall say I'm sorry, I ran into a wall? So that's why we sometimes even professionals, we have to encourage people that deaf-blind, lift your head up and feel good about yourself.

(Applause.)

>> LINNEA HAGA: You know, somebody told me one time, you don't live life as a disabled person. You live life as a person with a disability. What that basically means is, you know, you don't let everything you have, whether it's Usher syndrome or anything else, you don't let that dominate your life. You go ahead and live the life you want to live, and just kind of add to your disability into the equation as part of a background thing. Maybe sometimes you'll need something else that comes with the disability, but you shouldn't let that influence everything. That is what he was saying, it's very important to feel good about yourself, whatever you have and to not be afraid to ask for help. You know, I'm not ordinarily a person who likes to ask for help, you know. I like to think of myself as independent, you know. I like to try to do things on my own, but sometimes I can't. Sometimes it's dark outside and I need an arm to hold on to, or sometimes I need someone to tell me what somebody said in a conversation, and that's perfectly fine. It's okay. You don't have to be afraid to ask for help. That's just what you have to do as a person with Usher syndrome.

>> MOIRA SHEA: I think we all must stand up for our civil rights in all aspects, in housing, education, employment, and so many people have worked so hard before us to get us to obtain these rights and I feel like we really, really need to protect them and not let anyone get away with discrimination.

Do any of the panelists have a question of another panelist? Anybody?

>> ANNMAREE YEE: One thing that I think would be really nice is when you say, oh, where are you, if people didn't say, here.

(Laughter.)

Here is not the name of a place.

(Laughter.)

It's a thing I say to my children, all the time. Where are you darling, here, over here. And I say, no, I don't know where that is.

(Laughter.)

But I just think one really simple syllable, it would make life so much easier.

>> LYNNE MURPHY: At least they didn't point in the direction.

>> LINNEA HAGA: I get that all the time, where are you in the house? Here, what room. My brother likes to ask me, what room are you in, tell me. I don't have directional hearing.

>> MOIRA SHEA: I'm going to pass the mic over to Mark and we can take questions from the audience.

>> MARK DUNNING: I'll come for it.

And does anybody have any questions? There we go. There's a question.

>> AUDIENCE MEMBER: Hi there, my name is Dave, and we have a son, 18 months, Ezra. He's got Type 1B. It was interesting, someone mentioned that they found they're deaf early on and then there's the shock later on about Usher syndrome, so we found that out back in September, and we were kind of processing what that means. But we did have a little interesting question about so if he's young, 18 months, but it seems most of you were diagnosed later, so maybe when you have a perspective on this. But how do you go about telling your child without -- you know obviously you want to be encouraging to them, but age appropriately, you know, when do you tell them this news and you don't want to scare them but you want to set expectations and that kind of thing.

>> LYNNE MURPHY: I think that's a great question and it's something that my husband and I have struggled with, because we know about my daughter's vision loss before we really had any impact on her vision at all, and she's not blind now. She has fantastic vision actually, and so you don't want to take away her childhood by scaring her about the proposition of being blind in the future, but you also don't want to have a shocking sit-down, like the shock that you felt when you were told that your son had Usher's. You don't want to stare her down at 13 and say, guess what. So what we try to do is we try to introduce tidbits of things at age appropriate times so that we can build upon it. So she obviously knows she has a hearing loss. She obviously knows she wears hearing aids. She asks some questions about it. We always answer fully and honestly in appropriate terminology -- appropriate for her age because she's five. For her vision, she goes to the eye doctor. Now, we go every two years now, so we're going to go again. So I think now my daughter is at a very different point. She's almost six, so I think there will be more questions, and what we will probably tell her is, you know, yes, you have -- you know how that affects your ears, and, yes, it can affect your vision. I don't plan to use the word blind, and -- but just like we bought you hearing aids and just like we get things that help and just like things are helping to make that better, the same will happen to your vision. And we will just continue to build on it.

That's how my husband and I approach it, but I agree, it's very -- it's something that I have laid awake many, many, many nights thinking about.

>> DERRICK PHILLIPS: My parents have six children. Three of us have Usher syndrome. My parents never favored us or babied us. They told us, you can do anything anybody else can do. I didn't realize I had a problem. I was doing everything that everybody else did. And of the three of us, all three of us have (inaudible). We're doing well. So we participated in every activity. My father was a boy scout master. He put me in the Boy Scouts, I didn't know who was out there and who could hear me or not. But my point is as a parent, you can't baby them. You got to allow them to grow up. And I'm glad that my mother didn't tell me at an early age that I probably would go blind, because I probably wouldn't have done as many things I did. I played softball, even though I missed a lot of balls because I couldn't see them.

(Laughter.)

But I enjoyed -- I had opportunities, and some of you who are parents who are fearful when they say they want to drive, don't be afraid. Let them go ahead and try to drive. When they drive, they're going to find out they can't do it anyway. You're not going to stop them, because when you stop them they'll be mad at all. So when they find out they can't do it, they'll come back and say to you I can't drive. And you say to yourself, I knew it.

(Laughter.)

There are some things as parents we have to let go, and let our children be children, let

the chips fall where they may. Some of us parents, we're so fearful. I heard many times during the day, many of us, we want miracles. I understand that. When I first lost my sight, I wanted a miracle. I went to every church in the City of Chicago, everybody where they could heal my eyes. I brought my whole check. I brought everything. When I left out of here, I was broke and hungry.

(Laughter.)

So then now I teach and tell everybody, be the best you can be. Now I know you want all these things, but in the meantime, what can we do to be able to do to be effective in life and build on going on in our lives. Let's take advantage of all the technology and opportunity you have and be the best you can be.

(Applause.)

>> KEVIN RICHMOND: I would like to add, I was thinking, that's a very good question. If I apply it to myself when I was a child, and deaf-blind, what would I do, I would integrate, see an environment where there's already deaf people and deaf-blind people so that it's a friendly environment. You don't have to tell them. You just have to be in an environment where it's ready. That's the first thing.

And secondly, encourage them to socialize with other deaf-blind children, other deaf-blind kids and they will figure out things and like Derrick said perfectly, to speak honestly to them. Never say you will be blind, and before that -- let me back up. On the other panel I was thinking about how I could express myself. I know some of you parents are hoping the doctors would hurry with a cure and pushing them. There are things that you can take advantage of and resources that you can use in the meantime. For example, technology. We have technology. You know that deaf-blind people consider themselves a culture. There's a culture there. Take advantage of that. These are things that we have, there's support there, interpreters, pro tactile, signing. It doesn't matter if you read lips or have a cochlear implant. There's all these resources. As a group we're accepting of each other. It doesn't matter, and remember as parents, you're not alone either. It's interesting, because when you talk about parents asking how soon will this happen, and a lot of if's, a lot of the deaf-blind people here that are 30, 35 and older, they're looking at each other and thinking, hm, I can wait for that.

So the perspective is very different. I'm a survivor. I'm deaf-blind. And when I hear about things and I think, oh, that will be here in five years, I know I can wait. I know as parents you want to make sure that your child is safe and has the best life they can. That's what you envision. Don't change that. Keep that. But as an acceptance, provide the culture to them. And all of the resources. It's important that you accommodate your child. Don't leave them out but don't ignore it. If there's a communication problem, learn a new way to communicate. You could sign, it could be a cochlear implant, it could be a hearing aid, try all of your avenues, that's really important to empower your child. It's important that they have communication access. So emotionally and mentally they can thrive. That's very important. That's my biggest advice to you.

As Derrick said, let your child be a child. Take advantage, do whatever they want to do. Don't say no. Don't say no to this, no to that, no to this. Just say go give it a try. Give it a try.

>> LINNEA HAGA: I would like to say --

(Applause.)

>> KEVIN RICHMOND: Thank you.

>> LINNEA HAGA: I want to add to the whole how to tell your child thing, I didn't find out I had Usher until I was 13 and I found out all at once in very quick succession.

Obviously I knew I was deaf since -- as long as I can remember. I got my first implant when I was one, so that's always been a part of my life. So I think the same logic can be applied to Usher syndrome in general. My parents were very good about handling this. You know, they never treated me differently because I was a deaf. I have a younger brother who is fully hearing. He does not have Usher syndrome. And they've never treated me differently than him. And, you know, they've always never told me you can't do something because you have Usher's. I didn't learn how to bike. -- I learned how to bike. I can ride a bike. And not because my parents never told me I can't. When I was learning how to ride a bike, I had plenty of tumbles and scraped knees. At one point I had a very bad fall and I didn't do it but eventually I did. It's very important to do things like that. Let your kids try everything. Even you as a parent have concerns, maybe they won't be able to do that, let them try anyway. Even if you think they won't be able to do it because they might surprise you. And when it comes to tell them about the different parts of Usher's, as I said, I found out very quickly and in quick succession, including the fact that I may or may not go blind some day. But for me, that wasn't a real huge shocking thing. It kind of just made sense. You know, it made sense that maybe sometimes I didn't see things that all the other kids seem to see. It made sense that I was deaf, it made sense that I had the balance issues. Everything just kind of fell into place and I accepted it, and I was very lucky there finding out how I did, but that's it should be for the Usher kids, because that's the best possible scenario, is just acceptance and I think the easiest way to harbor that is to build it up from a very young age as everybody else is saying, taking steps, tell them oh, yeah you have hearing and maybe you can't see as good adds other kids and -- as other kids and then graduate to the specifics and when they're old enough, you go into what can happen with the condition, but not in a harsh way. Just to know for the future. Your kids will be fine.

>> DERRICK PHILLIPS: If I can add to that, I strongly recommend that the family members who try to interact with your child when somebody else is doing something positive and doing something with their lives. I work hard to make sure that I advocate for all the deaf blinds. And when a student comes to the facility where I'm the superintendent, it blows their mind. Wow, you're superintendent? I would tell the people, I see many of the deaf-blind get involved with technology and making some unbelievable changes. We have had in the State of Illinois four or five individuals that went into the vending program. You know, as managers. There are people who become employees. I see them use this telecommunication and interacting like never before. We have to let people know you can do it. (Inaudible) professionals, can they do it or can they not do it. Then we all have limitations, we all have boundaries. When I first moved back home with my mother when I lost my sight, I heard her on the telephone, saying my son moved back home. He's going to live with me for the rest of my life. And I'm like, oh, no, I'm not.

(Laughter.)

And I went out and got my own place and lived by myself for a while. I was a motivational speaker, I got caught using my own words, (inaudible) if you want to run a marathon. He said try it before you say no.

(Laughter.)

And I got bit. And I'm glad I did. I ran four marathons. When I ran the first one, someone said are you blind, he was waving his hand in front of my face to make sure I was blind. How do you do it? And I said there was nothing to do it but to do it. I did it with my eyes closed.

(Laughter.)

>> DIANA VELARDE: The question about how to tell your kids. What I can say from my experience is I noticed I had a problem when I was like five years old. But I'm from a very small city in Mexico, and that was almost 30 years ago. We didn't have the Internet then. We didn't have the resources. When the doctor saw my parents in that moment is that (inaudible) that kid won't be able to go to (inaudible) she may go to basic school, but don't think she may be able to go to high school or to university or something like that. She won't be able to develop any skills. (Inaudible) I mean of course I heard about the idea that they didn't know because we were in Mexico in that area, they didn't have enough information, but what was important about all of this was that my parents didn't send me out. I found out about that from the doctor when I was already -- after my college. After I got a college degree. And they didn't tell me because they didn't want me to think (inaudible) no, I mean what they did was right. Instead they went to other cities, went to see more doctors, they knew (inaudible) when I got my first hearing aid when I was seven, it was like why can't I go to school? Why can't I go with my brothers and sisters. So I think what was important here is that, okay, yeah, that's a luxury we have. (Inaudible) that was the only thing I have. Like my parents never told me, okay, you won't be able (inaudible) they found the resources, they found their way to support me and (inaudible) so yeah, maybe today we won't have -- we'll have to make a decision. It doesn't mean you (inaudible) forever. Just think, (inaudible) I won't try to achieve things. So don't say you can't.

>> DERRICK PHILLIPS: I was listening to someone mention earlier about the interactions of deaf-blind, what's deaf-blind, and at the school that I'm at, we're moving away from that. Because we're finding out that when we try to put deaf-blind, what we're doing is we're putting them with the other people as well, and what we're finding out is it's good, because now they're teaching us sign language. (Inaudible) I thought I didn't know one was the wrong way. I have to do it the other way, but sometimes you got to -- you don't want deaf-blind people to be (inaudible) they're good to interact with them, but also trying to let them interact with other people, because if you don't, you're going to cause them to be in isolation and you don't want to do that.

>> MOIRA SHEA: Any questions out there?

>> MARK DUNNING: Another question? A question in the front here.

>> DERRICK PHILLIPS: Earlier it was mentioned about running a marathon earlier, and I was going to comment on it, and it was asking about running the marathon.

>> AUDIENCE MEMBER: David, this is Steven Erhlich, I'm in Utah and I'm the author of a book about Usher syndrome called walking in my shoes and I wrote it with another author, so I just had a quick question for you, Derrick, I know you had talked about running the marathon and you had mentioned doing it several times. I was wondering, do you run with somebody that's leading you or how exactly do you see where you're going to go on those marathons when you're running them?

>> DERRICK PHILLIPS: Good question. What I did, we put a rope in our hand and the rope was about three feet. The gentleman that I ran with, he had ran about 25 marathons. And he had a dream that he would run a blind person in a marathon, so I told him that wasn't a dream. That was his nightmare.

(Laughter.)

So we -- and eventually he got me to do it, and I tell you, it was a grueling event. That first mile was rough. Getting back in shape, and I told him that I was too old to run. I better stop doing this. He said how old are you? I was 49 at the time. He said oh, you're a young man and I said how old are you? I'm 55 and so I thought I got to keep going. So eventually

we ran the first marathon. It took me about five hours to do the first marathon, and I tell you, if he hadn't had the patience to run with me, I probably would have never done it. And holding that rope -- in 12 years I might have fell twice. What we did is we ran through the park where we avoided curbs and we ran up hills and we ran downhill. We ran in the snow and ice. I thought I couldn't run in the snow, I found a good way to do it, but it was very interesting and we ran all year-round. It took me 20 months to get ready for the first one.

>> MARK DUNNING: Are there other questions out here for these guys? Oh, Rebecca.

>> AUDIENCE MEMBER: Hi, everybody. I'm Rebecca Alexander. I have Usher 3A. So I was just going to tell you that there's an organization that I'm very actively involved with called Achilles international, and they provide escort runners for people who are both visually impaired, visually impaired and blind -- I'm sorry, and deaf so the deaf-blind and they also have guide runners for people with any type of disability, TBI, traumatic brain injury. So they're all around the country, and I'd be happy to tell anybody more about them if you wanted to do something active and didn't necessarily want to try doing it alone.

>> MARK DUNNING: Thank you.

Other questions of the panel? I see one up front.

>> AUDIENCE MEMBER: Hi. I just have a comment to make. Lynne, I commend you for what you're doing for your child. And I love, Linnea, how you've talked about your experience and Kevin, I mean every one of you has something to say that is very inspiring. I have Usher syndrome Type 2. I owe a lot of credit to my parents. They -- I live in the suburbs of Chicago, and one day I was curious to go to the library on Michigan Avenue. I talked to my parents, and not knowing it until not a little bit ago, I talked to mom about it, they let me go on the El all by myself when I was in junior high, all the way to Chicago and back. They let me do different things. They didn't stop me. My mom would threaten and crying and worried that she would never see me again. But because of what they have done, I am the middle child of seven children. So what they have done, they built confidence in me, gave me strength to try it, try anything, like peddling too. Just try it. Like Linnea said, she skinned her knees, what they did made me who I am today and I'm a go-getter. I don't say oh, well sometimes maybe I do. For the most part I'm a go-getter so I commend you all and I tell all the parents out there, go for it with your children. Let them try it for themselves. There's so much to do out there. Like Kevin said, people say, it must be really hard on you living life with limitations, and I said, you know what? Maybe I can't drive. I stopped driving six years ago, maybe I can't do some of the stuff I love but there are thousands and thousands and thousands of more things I can do. So it's just a matter of finding it and people to help you go for it.

So thank you all so much for what you're sharing.

>> DERRICK PHILLIPS: You know, I appreciate what you said.

(Applause.)

>> MOIRA SHEA: I also feel my parents paid a very big role in my life. They never stopped me from doing anything. I talked before about going horseback riding and actually riding my horse in the jungles of Laos. By the time I had finished high school, I went through 13 different schools. And some schools said I didn't do so well but every time I came back to the states and went to school, I did much better and looking back, I just was like I couldn't understand my teachers with their accents, you know. I would be in school in Manila in the Philippines and my teacher spoke English with a Filipino accent and I couldn't understand what she said and it really affected my education. But once I came back to the states and I went to college and started working, everything fell into place, and I was born

with moderate to severe hearing loss, but my hearing was never an issue. And I was diagnosed with Usher's when I was 15, and other than tripping over things, that was not an issue until I was much older. But I feel like I had a very normal, average childhood with the exception of seeing the world, and then I finished -- I retired, and these past years, I have to tell you, last October -- last summer was I have to travel. I just can't stand not traveling. So last October I signed up with a company located in Boston, and Finnegan and I flew to Rome where we met up with about ten other Americans that we had never met before, and we spent ten days hiking in the hills of Umbria, and it was just so empowering. And it was like I can do this. And this past October, I did it again with a friend here in this room, Martha, and we took our dogs, and we went to an island in the deep Atlantic, and we hiked on this island for a week, and we hiked with, you know, 15 other people we never met, and there was no issues, no issues. No issues. Everybody accepted us, and it was just so empowering. And so I like doing these hikes. I love swimming. I try to swim a mile a day, as often as I can. And what I did when I retired, I pursued a dream that I always wanted to do, and that was to learn guitar. And I'm taking guitar lessons. And nobody in my family plays a musical instrument. But I loved the guitar. And, you know, at first I was like, oh, my God, no hand to eye coordination. How am I going to know where my fingers are. But I put dots on the neck of the guitar and I can't hear the difference when my teacher says EDBG, and so he's going E, Edward, G, George, D, dog, B, boy, so I can follow everything, but it has been an amazing journey. And then in closing what I'd like to say for my part is I had -- I always was scared of losing my vision. It was very, very scary, and those adjustments to vision lost is really, really painful. And then I lost my final vision in 2011, and I had to learn a lot of new skill sets and my own. I had to learn to listen to traffic differently. To go by the floor to the ground. And I realized, you know what? I think I had an aha moment. I'm no longer scared of going blind because I am blind. I don't have that fear. I'm okay. I'm better off than so many of my friends, and my other aha moment is I didn't have to adapt to changes anymore. You have to go from the wearing the sunglasses to modification, modification, modification. I'm at the end of my journey. I have gotten to my destination and the journey is far scarier to me than the destination. That's what I'd like to say.

Anybody have any other comments?

>> DERRICK PHILLIPS: I'd like to add that -- okay. What I'd also like to recommend is that whenever you have individuals that want to seek employment, encourage them to go and seek. I recall when I first was seeking a position as a manager, I heard people say, he's deaf-blind, can he hear now? So what. And when I got the job, everybody was surprised. And when I got the position in 1997, and 2005 I was appointed to the superintendent, and what I'm saying to all of you is to make sure that if you have anybody in your family that's deaf-blind, whatever it is, encourage them. Let them know you can do it. But sometimes we put negativity in our own children by having that. Let them figure it out. Don't you hold them back. I remember telling my parents once that I was going to apply for a position at the Chicago lighthouse, they would say you think you can do that job? That's nothing. I can do that job. But you're hearing-impaired. What does that have to do with it? I know it. You don't know that? And she said, don't you feel you'll have problems hearing? And I said that's why they got technology out there. That's why they got all kinds of accommodations out there, reasonable accommodations. We have to utilize our resources and recognize our strengths. And if we don't use our resources and recognize strengths, that's why I'm looking at what's going on with the Usher syndrome coalition. I didn't know you guys had been around so long and to know what you guys are

doing in research, first of all, it's going to be a tremendous help to the people in our future and I'm definitely going to be a part of this coalition because I want to make sure I can encourage and inspire many, many other deaf blinds throughout the nation. That's my biggest goal is to be a motivational speaker nationwide, not just for deaf-blind. To all people of all different disabilities, to let them know, yes, you can. You can do it.

(Applause.)

>> MARK DUNNING: So Carlton had a question, but before I get to your question, Moira was talking about travel, and I know with the exception of Derrick, all of you guys have traveled here. And AnnMaree, since you had to come the farthest, I'm curious what you found to be the biggest challenges coming here and any way that you may have adapted to help yourself with travel to get here and that question is really kind of open to everybody. But I figured I'd start with you.

>> LINNEA HAGA: I'll go ahead and start it. For me the biggest challenge in airports is it tends to be very crowded and I do have tunnel vision. So it's kind of hard for me to look around and see all the signs and all the people, so I pretty much constantly run into people in the airports. But as far as like actually traveling goes, I usually do find it's not really ever been a huge problem, is that one thing is crowded situations and how to read the signs is a little bit difficult and maybe when they announce. Like a lot of times they announce over the intercom that your flight changes or it got moved to a given gate or something like that. I'll probably miss that. But my parents will tell me, so I think in the future when I'm traveling by myself, I probably will have some kind of traveling assistance. That is a resource that is available at airports.

>> MARK DUNNING: Australia, you want to answer that?

>> ANNMAREE YEE: I came a long way here. I love traveling. And I always have. I find now sometimes (inaudible) but I did catch a flight from London to -- all my myself, there's a variety of circumstances that nobody could come with me and I had the nicest flight attendant. They catered to my almost every need and brought me extra champagne.

(Laughter.)

And -- but I do find (inaudible) you know you're going to stay in certain hotels. I email I say I want extra bedding, large print menus, and I checked out what's around in my location, and we as a family do find -- try to schedule traveling in such a way that for short periods we try and stay somewhere really, really nice, and there's two reasons for that. When we went to Tokyo, we booked this real dive, its a real dive, real dive hotel. Stayed there for three months, then moved to the Hyatt for a couple of nights. What happened was if it's a really nice environment, my family get a break because they can leave me in the hotel for a morning or afternoon, and I'm okay. If it's beautiful or it's not -- if it's a nice environment, I can get room service and more champagne.

(Laughter.)

And it gives my family a bit of a break from constantly explaining to me what's going on. But other than that, we just go out there and do it. It's just like, hey, even if I can't hear what people are saying, I love to hear the babble, babble, babble.

(Laughter.)

>> AUDIENCE MEMBER: Thank you to everybody on the panel. You've all had some great experiences to share, and I think they're great food for thought for all of us, no matter where we are in our journey, whether we are new to the Usher community, or have a family member in it. Or whether we've been living with it ourselves for a number of years.

So here's a question that I'll try to keep succinct. I bet you each have different answers, and I'm sure a lot of us would love to hear some of them. It's about goals. I think each of

you on the panel has spoken about a goal you've chosen for yourself. I think that some of the goals you choose just to show that you can surmount some obstacle or you can prove that you're just as good as some other person you have in mind maybe, or maybe it's just something that makes you happy, or something you've always wanted to do.

So the question is, what do you see as your next goal, and how are you going to make up your mind about it? How are you going to approach it?

>> DERRICK PHILLIPS: My goals, I'm always setting goals. My next goal is 2020, I plan to retire. I plan to be a motivational speaker. I plan to take it easy. I plan to do more ministry and I plan to write another book. So those are some of the goals that I have and how I plan to do it. I take one step at a time, I know I'm going to get it done and I'm planning to set aside time to get it done. I'm full on my plate. I'm on too many advisory boards, I'm on the Lion's Club. I'm on the board of superintendent of schools, so I'm hoping to kind of downsize some of that and (inaudible) other areas. That's my goals for the future.

>> ANNMAREE YEE: Well, I was going to finish university. So yeah, I think I can do that. I almost need to -- one of my other goals is that to learn sign language. My father was very famously opposed, and then later on, I don't need it. So I'm learning deaf-blind signing and tactile, and I want to keep on doing that.

I also really want to get (inaudible) three books in Braille. (Inaudible) because I think I need to get as many skills as I can before I need them in some sense. And my other goal is to go to Iceland. So in order to achieve that, I have to persuade my husband.

(Laughter.)

To go and buy warm clothes.

>> LINNEA HAGA: At the moment, you know, I'm at a part of my life where I have a lot of goals. First and foremost, get accepted into the college that I want. Which I mentioned was the University of Florida or university of central Florida. That's really the most immediate goal. And then a more vague goal of mine is to raise awareness of Usher syndrome, for deafness, for blindness, all those types of things. I've already kind of done that in my school. My day-to-day events a while back was to raise awareness to Usher syndrome. To draw in all the people. We had a basketball game with a nearby university, and because of that, Usher syndrome is known about at my school now. You know, people approach me all the time and ask questions, which that's a major plus for awareness and I want to keep doing that in other areas, and that will benefit all of us in the long term. And I think those are my two major goes. Another goal is to learn sign language. And I would like to learn sign language to kind of interact more with the deaf community, because I go to a lot of events where I meet those people and I have a hard time communicating with them and I would love to be able to hear their stories and to be able to effectively talk to them, so learning sign language is another one of my goals and I think those are my three main ones at the moment.

>> DIANA VELARDE: About me, right now I'm very focused on my family. Right now in my town (inaudible) what is good about that is that (inaudible) I have access to self-management at the company. Some people (inaudible) from other people, and from what I have seen, is that when that is done, I can identify with them. I can play (inaudible) what is possible for someone with a disability, with deaf-blindness (inaudible) I need accommodation, but in spite of that, I can develop into my career. I can speak to other people, I can develop other people, I can manage a team. So -- and I think (inaudible) about that. Unfortunately everything in Mexico (inaudible) around disabilities, and I have heard people comment that will she be able to speak the language? Well, I do. Then when

we have to get (inaudible) they say, okay, she can do it. You know? So my goal right now is focusing on that change to live in the moment (inaudible) to create that environment. (Inaudible) this is what I have. I would like to create an awareness, so it's important for some people to say okay, this is what I have. I have something (inaudible) and this is what I may need someone to do. This is what I'm getting. (Inaudible) people are understanding that (inaudible) that we can work together. (Inaudible) so we have to develop that, and that's one my main goals. And other one is (inaudible) I love to travel. I have (inaudible) to come here. Last Wednesday I was in Panama, because of my job. I was there working with a project, and then I went to fly to Mexico City and another flight to come here. And I love (inaudible) related to my job. (Inaudible) and see the places where I am. Then that's part of my goal, to keep traveling and (inaudible) with my family and with my son.

>> KEVIN RICHMOND: Okay. Wow. All these things we were talking about, my fireworks are going off in my head what we were thinking about, what I was thinking about as everyone was talking. Yes, I'm ready to change and start a new chapter soon. I'm still teaching, but my vision loss is a challenge, and I think it's time to start a new chapter. My goal really is I want to continue presenting. I love to present. I would like to travel the world, and be a model for other deaf-blind individuals in the world, which I think is needed. Someone to look up to, to raise everyone's self-esteem. When my self-esteem was low, I was embarrassed to be deaf-blind, until I met other deaf-blind people in Seattle. When I met them, my world opened up. I was inspired and I was inspired to go on and I felt good about my whole self. That's a gift I received and I'd like to give that gift back, now that I'm free, I have no burdens, I'm ready to go anywhere. It's a big step. So where I want to go and how I'm going to do it is what I'm figuring out. So maybe you don't know, but I have a son that I adopted. I was a -- I fostered for three years and then I adopted my son who's deaf, so I'm feeling a big responsibility to advocate and change and get better support for deaf people and deaf-blind people, and children who need a home and need love and communication access, that's a big goal, and of course I love Starbucks. I'm going to continue with Starbucks in advocating and educating.

I don't know if you saw recently, last year, Starbucks put out a film in sign. That was me, the person signing on that. And I emphasize deaf-blind right there and said what I do. So I would like to continue to show that exposure that we can do it. We just need a little accommodations. That's all. And yeah, I'm hoping for everyone to have goals and opportunities without obstacles to obtain those goals.

(Applause.)

>> MARK DUNNING: Thank you. Well, thank you, everybody for participating in this panel. It's always everybody's favorite part of all of this stuff. So thanks again. If you can give one last round of applause.

(Applause.)

Thanks. So at this time I'd like to ask Randy DeWitt to come up. He would like to say a couple of words.

>> INTERPRETER: Can we do a quick switch?

>> MARK DUNNING: Okay. So Randy -- how are we going to do this? Randy is going to sign to you.

>> RANDALL DEWITT: All right. I know this has been a long day for everyone. We had so much information, a wealth of information, but a great conference. I like everybody getting together. I know some of you have probably seen me milling about the room. I know some of you know me. Some of you may not. Let me introduce myself. My name is Randy DeWitt. I have Usher syndrome 1B. I'm completely deaf, and I do have some

vision. Actually I hail from Boston, Massachusetts, big Red Sox fan. Got to cheer them on. I know this is Chicagoland. I figure you guys are all Cubs fans. We have to cheer them on because after that 108 years of a losing streak, they finally have their big win, so we give them the credit where credit is deserved. They had an amazing run last year. Not so much this year. They won the seven games so we will give them their due.

So my vision for Usher syndrome is essentially a country. A country of Usher syndrome. It's essentially a community. We would call this country Usher.

I'd like to start with a quote from President John F. Kennedy. That quote is ask not what your country can do for you. But ask what you can do for your country.

So that's the topic I'd like to discuss. So in this country of Usher, with a diverse mix of individuals with varying degrees of vision and hearing loss, we have English speakers, we have Chinese, we have Hispanics, we have Mexicans, just like we have a diverse group of individuals here today. We have blacks, we have whites. We have all those representations in our community of Usher, right? We can see the comparisons. We have Ushers, 1, 2, Type 1, 2, 3. Usher's A, B. We have some who are completely deaf. Some who have some hearing. Some who have some sight. Some who use sign language, some who do not. Some who have cochlear implants, some who have hearing aids.

The point is all of this diversity, we have to come together and have unity. It doesn't matter what type of -- how you define yourself, who you are. We are all members of this community, we are members within this country. We all need to come together.

So Usher syndrome historically can be devastating. We think of it as a fault. Think of other countries. They always have faults, right? But essentially we can fight a foe. We can fight an enemy. We can continue to strive, continue to do good things, and how we do that is working together. We all know Abraham Lincoln, right? 150 years ago he made the statement, a house divided against itself cannot stand. These are wise words that we need to take to heart. We need to heed his advice. We cannot let this foe divide us. We cannot allow it to segregate us. We have to have our families come together. We have to support each other. We have to have emotional support. We have to continue to maintain and become a community. We have to fight. We have to overcome together.

Another issue within this country of Usher, just like in America, is unemployment. Essentially in America, the unemployment rate is about five percent, but for those with Usher syndrome, it's 82 percent. 82 percent of individuals with Usher syndrome do not have employment. We need to work on that. We need to make sure that those individuals with Usher syndrome have the ability to find work. They have the skill set. They have the ability, so why aren't they being employed? We are able to have jobs. We are able to do it. So why is there that disparity among individuals with Usher syndrome? We need to work on that. We need to continue to improve on that.

So these possibilities can no longer become possibilities. We need to come together. We need to work together.

So in closing, this is such an honor to be together, for all of us to be together, an opportunity to have and work together to continue to do research, to share information, to gain new friends, to feel faces, to develop relationships, connections, to have a sense of pride in who we are. We're an amazing community. We are worth every ounce of money that is spent on us, so we need to continue to have this. You know, you think about how small this coalition was and how it continues to grow. We need to continue to do this. I think everyone for your time, your devotion, your attention, we are making a difference. Everyone here is making a difference. You do, please continue to do that. Continue to be brave. At any time to be strong. Continue to make all of these additions to our country of

Usher. We are a community, we are a country. Please continue to make sure that we are a success. Please continue to try to overcome. Keep if up. Be strong. Keep going. Be brave. We are one.

(Applause.)

>> MARK DUNNING: So thank you, Randy.

And then actually I wanted to also ask, is Rebecca here? Rebecca, would you like to say a couple of words?

>> REBECCA ALEXANDER: Okay. Hi, everybody.

>> AUDIENCE MEMBER: Hi.

>> REBECCA ALEXANDER: I'm Rebecca Alexander, I have Usher syndrome Type 3A and this is my -- excuse my language, bad ass side kick Ava, she's going to introduce herself.

>> Hi. I'm Ava. I am 11 and three-quarters, and I have Usher syndrome Type 1B.

>> REBECCA ALEXANDER: I should mention I'm 38 and a half.

(Laughter.)

I just want to thank Randy, who could not have more perfectly summed up our message, and hopefully what everybody is going to come away from today from this conference, we are a rare disease, as you know and within this rare disease, we have subtypes, and it's so difficult, A, to be a rare disease and B, to be a subtype of a rare disease, because it means that we are all so much fighting for finding treatment for each one of our subtypes. And as Randy so eloquently said, I love the idea of Usher syndrome as a country because it's just so perfectly summed up who we are. We're such a diverse community.

Having said that, we really need to come together. One of the things that I've noticed in my very long years of being in the deaf-blind community is a sense of division. And so Ava and I really want to bring everyone together and one of the things we've been doing is taking pictures of people standing who have Usher syndrome, standing with their subtype, and we are going to announce on Usher syndrome awareness day or a specific date for everyone to post it on social media, and have a hashtag one community. So that we can all sort of be represented together.

The other thing we have is a video challenge, and we'll tell you more about that later in the coming weeks, but essentially we're trying to get Usher, the artist, to do a dance video to an Usher song. And in order to do that, we need to get as many people as we can to make their own dance video to an Usher song. Our own Mark Dunning hates dancing.

(Laughter.)

He hates being seen dancing, and yet he did a video.

(Laughter.)

So for those of you coming to Lucky Strike, we would love to connect with you. Again our hope is that on Usher Syndrome Awareness Day in September, we will be able to get 400 people on the same day, at the same time, to post their dance video, and if we're able to accomplish that, we will go viral. And that will hopefully get Usher's attention and get him to do his own video and raise awareness and if we have another sort of exciting part of this challenge that we will tell you about at a later time. But more importantly, we'd like to get as many people's contact information as we can.

Ava, what do you say?

>> Do it.

>> REBECCA ALEXANDER: You have to see Ava's dance moves. They're killer. Thanks guys.

(Applause.)

>> MARK DUNNING: Thank you, guys.

So that's it for today. And until next year. We hope to see you all in Germany next year, the first time trying to go overseas with this. It will be a three-day symposium in Meinz, Germany. We'll have all the leading Usher syndrome researchers in the world. They came to Boston a few years ago for the symposium. It was a great event. So we hope to see you guys in Germany next year and I also want to see you at 6:00 o'clock over at Lucky Strike. It's about a 10 to 15 minute walk. And for those who are heading over to Lucky Strike, would you like to just talk here?

>> INTERPRETER: Hi. I'm LJ Meyers and for the people using sign language interpreters, we will be your SSPs to Lucky Strike. Could you please when, before you go on your break to your room, meet us here in front of the stage, and we can talk about who your partner will be and where to meet them to get there by 6:00 o'clock. Thank you.

>> MARK DUNNING: Excellent. Thank you very much. So we hope to see everybody at Lucky Strike at 6:00 o'clock, and Krista is aiming -- pointing at me and telling me I should do something else.

Oh, if you have the transmitters, if you leave them on the tabling just outside the -- table just outside the door on the way out. So thanks everybody, and we hope to see you in Germany next year.

(Applause.)

(End of conference.)

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