Transcribed from Dr. Hallberg's presentation at CrossFit, Inc., Dec. 15, 2018:

Oh good, because I actually might draw on that.

Well, it's still great to be here and I gotta tell you that up until last night when I arrived, I was one of those people who had no idea what was going on here. And so, I am super excited to be here, and this is exactly what I've been working on now for getting close to a decade, which is building critical mass.

Because let's not kid ourselves. This is a David and Goliath situation to solve the problem of health care, and you know the Goliath is the status quo, okay? And dogma. And we don't want to change what we've been doing for so long. So, I want to talk a little bit about, you know, the basics: what I covered in my TED Talk. But before I do that I want to sort of let you all know — how did I get here? Because this is not — This was not in the career plan for me. And, so what are some of the steps that I took as a physician who was just fed up? But, before I begin I also wanted to give credit to someone else who's here today who I always like to give credit to when I'm speaking, which is Gary Taubes. So, Gary and we — When the history books are written on the reform of health care, and I know that Gary will, you know, have his own chapter, and we all owe him a lot for really starting and getting this ball rolling so many moons ago.

But so, how did I get here, and what is my backstory, and how did I deal with some of the obstacles that came up in the road for me? Because I think honestly, you know, hearing who everyone is here, and I love the Derelict Doctor — I mean I can't — that is so fantastic.

I consider myself that from the beginning, actually — Steve Phinney calls us all heretics, which is a good one as well, but so do we learn from each other to sort of fight our own regional battles, right? Because that's what it's gonna take again building critical mass to fight the Goliath and solving our own regional issues and how do we get over our administration's, you know, pushback and our colleagues' pushback? So, I wanted to tell my story because my background — I was actually, medicine was my second career, so my first career was actually exercise physiology, and so for me, every change in my career has actually come from anger. And I'm not really an angry person at all. Like, but it's been that, what has motivated me.

So, I was in grad school, and I was working in cardiac rehab, and I got into a big showdown with a cardiologist who was just frankly an idiot and didn't know anything about exercise, and was prescribing these insane things to his cardiac patients. And after this, you know, argument where there was no way I was gonna win no matter, you know, how right I was because I was, you know, the cardiac rehab exercise physiologist and he was the big cardiologist, was I came on that night and it was if you can't beat them join them. So again, I never grew up planning to be a physician, but I really realized that I needed to do so, and this was after I had actually been accepted for my Ph.D., because I had a plan to go that route so backtracked, went back, took some of the courses that I needed and went on to medical school. I had initially intended to be a cardiologist, but then I had kids and that changes things, so I wound up spending almost a decade in primary care.

And you know what was life like in primary care for me? It was miserable. I was miserable and I was the only income in our house because the deal with my husband had been, you know, we're gonna put the effort into my career and he's gonna stay home with the kids. And so here we had the breadwinner of the family just miserable. I would come home every night and lay down and say to him the same thing over and over again: “I am part of the problem. I am doing nothing helpful here. I am a drug dealer.”

So when we would go to parties and people would say, “Hey, how are you? What do you do?” I say, “I'm Sarah. I'm a drug dealer, thank you very much. I'm a legal drug dealer, That's what I do.” Because that's all I did, right? You pull out prescriptions.

We had no time with people. It was more and more and more and more and more, and I was so frustrated. Again, I saw no way out. And then, something really important happened. The institution who I worked for, which is Indiana University Health, came to me and said — Because they know about my exercise physiology background, and they said, “We want to start an obesity program here. Would you be interested in doing it?” And of course I was like, “Hell yes I will do that,” with just joy, and so I had the opportunity, because they actually supported me to spend a year figuring out what we were gonna do.

So what was I asked to do? I had just been asked to solve the unsolvable problem: treat obesity. And do so at a major medical center, and do so effectively. So I got to spend this year — cuz I had full reins — what we were gonna do, like there was no

one who was telling me how to do it. They said figure out what you want to do and start the program.

So, I spent a year going back to get my obesity board certification and read everything. I had this opportunity to go back and read everything. And you know, in primary care, I was frustrated because I couldn't understand why my patients weren't getting better with my low-fat diet recommendations. Cuz, I, you know, it works for me. Like, why weren't they getting better? And then through that year and reading all the literature, what I realized was: Oh my God, there's not evidence to support what I've been telling people all this time. And you know, where did the idea of low fat come from? I mean, it was just what we were taught, it's just what you did. You don't question anything, right? You go with what your teachers in school told you, what your, you know, attendings in residency told you, you know? What I learned in grad school: This is what you did. There was no questioning it. It was the plan, and it was going to be a successful plan — except for, if there's anything that we know that the literature is full of, it's the failure of that low-fat diet, right?

So I started reading more, and I started coming on to low carbohydrate, and I'm like, God, this is the only thing, number one, that makes sense, because I'd had an opportunity to sit and think about the physiology of it. But number two, that had real data that, wait a minute, maybe this is something that people could do and even stick with.

So from day one when we opened the clinic, we opened it as a carbohydrate-restricted program. And we did another pivot. We did a pivot, you know, within the first year that the clinic was open: We completely pivoted from obesity to diabetes. Because sure, our patients were losing weight, but that really became secondary in its importance to me, because what was so amazing is that diabetes is going away, right? I mean, like these patients were like on hundreds of units of insulin, and within a couple of weeks, they're off of it and it's like, where is that in the literature? Where is that in the guidelines? Where is anybody talking about this?

And so, I got angry again. I was — I just was furious. I just couldn't understand it, like, the difference it was making in these patients right in front of me. And so, what do we do? Okay, well I gotta pivot again and get into research. So, the first thing — We had no money, you know. IU wasn't gonna give me anything. I did an unfunded pilot

study where it was just me spending all night in the office looking at data from our patients to ones treated by the ADA. And of course it was remarkable, you know, our patients did better, but our patients also had huge cost savings, which I'm sure doesn't surprise anyone.

But before I go on to the next step there, I want to go back to how did I handle it within the IU community, right? Because I had a couple of advantages going for me, okay, in how I dealt with physicians not calling me a crazy lunatic that I think are really important because our patients were going to be going back to their primary care physician and their cardiologist, all their specialists within our organization, saying, “Hey Dr. Hallberg has me eating a lot of fat,” and I knew that that was not gonna sit well. I mean, this was a number of years ago, right? So nobody heard of low carb at this point, so what do you do? How do you do that?

Well, I knew we had to be proactive about it. So, what I did is, I put together a 15-minute slideshow — little presentation — and I spent an entire summer going to every single medical specialty meeting within the organization. So, I was at the rheumatologist, right? I was at the primary care meeting. I was at — I was at the hospitalist meeting presenting the science of this because I knew that these people wouldn't be trying to not do the right things for their patients, but they were stuck in the exact same shoes I was: not ever taking time to think about this. Not taking time to think about the physiology of this or the fact that their patients continue to fail, and you know, why, why why? I knew that they didn't have time to stop and do that. It's not their fault.

So I brought this, and then after I started with the cardiologist — Believe it or not, that was the first meeting I went to because I figured they would be my biggest detractors. And they weren't! They weren't. I had the physiology and there I explained it to them, and I was watching, you know, their reactions as I started this first short presentation, and you could see everybody sort of like, you know, thinking and shaking their heads, “Yeah, okay.” And so, I was so excited after that first meeting. I gotta tell you, I was like — You know when you, you feel like you did well and you got success, and you're like, “What more can we do?” So, actually the second meeting, I took it a step further because I was a member of the ambulatory quality committee at the organization, and so what I did is, I said, “Actually, what I want us to do is, I want everyone to agree that low carbohydrate has to be offered as an option to every patient with metabolic disease in the organization.” And so, I would do my

presentation to all the different sections, and I'd end with that: “Here's what I am requesting, that we put in a, you know, rule that says this has to be offered to everybody.” And again, spend a whole summer doing this.

And then the vote came in September. I can't remember the year, but I remember it was in September, and it was unanimous. It passed unanimously. And I had a huge advantage here. I had two huge advantages: Number one, I had been in this organization for almost a decade, so I had a reputation, right? I mean people knew who I was, and that was helpful. But the second thing is, I didn't really give a crap. I was a female internist for God's sakes, you know? I could have thrown my resume in the air, right, and gotten it picked up anywhere. I knew that, right? Like I was not gonna be fired and be without a job and a way to provide for my family. So, I — you know, I was like, do what you think is right and don't worry so much about it. It is the attitude that I had. And I, you know, I was surprised. I figured I would get a lot of pushback, but I didn't.

And then, of course, the study came out and I was asked to give the TED Talk, sort of right in the point in time where I had just gotten done with the pilot study, and the interesting story about the TED Talk is that pilot study was done and I — it was based on that, that I was asked to do the TED Talk at Purdue. But two days before the TED Talk, I was in an Obesity Medicine Association conference and ran into Steve Phinney. And so, Steve and I started talking, and I told him about the study, and I said, “I'm really looking for funding for a larger trial.” He said, “Let's go out to dinner. I'll fund your larger trial.”

And so, believe it or not, this was like a total, like, meeting of fate. And we met that night, and I was flying home early from the conference because I had to give the TED Talk, and this is, like, one of my favorite stories. As we were, like, at the elevators leaving, Steve said to me, “Hallberg, you better be good at this TED Talk. You know the average TED talk gets 50,000 views?” And so, I can't stop giving him crap about that now, right? But anyway, I'm like, “Ye of little faith, ye of little faith,” but um, anyway, that was sort of a big pivot moment. So, I met Steve, and then we had — Seven plus months later, we had almost 500 patients fully enrolled, single site, in the middle of Indiana, trial underway, looking at Type 2 diabetes — ketogenic diet for Type 2 diabetes treatment/reversal.

And so the one-year data we published earlier this year. And the two-year data is currently in review. And so, that trial was nothing short than dramatic and mind-blowing, right? At the end of a year, 60% of the patients with Type 2 diabetes had reversed their diabetes, right? And what does that mean? What does reversal mean? It means that they had brought their A1C under the diabetes threshold and gotten off of all medications with the possible exception of metformin, because we know it's indicated for things outside of diabetes, and we know these patients will forever be at risk. So, we didn't feel that it was the right thing to do to pull them off of that, but we always gave them the talk, and it was their option.

So, some people chose to stay on it, some people got off of metformin as well, but 60% — okay, 60% for a disease — let's think about this: 52.4% of adults in this country have diabetes or prediabetes. Over 50%! Now, we are not excited as a country about this. This doesn't get press. What if for one minute, that was an infectious disease instead of diabetes, a food-driven problem? What would be happening in this country right now, right? There would be no partisan bickering over this. We would put dogma away, because we would collectively get together and we would be working together, and we would be doing all that we could to solve this problem, right? But this is about food and so we're ignoring it. Over half — What is it gonna look like in another five years? And in the last six years, we've gone from spending $255 billion on this to $350 billion a year.

We can't do this anymore. Not only is it impacting people's quality of life, but we're going broke because of it. And not only is it impacting our patients' quality of life, but it's also impacting all of yours, and I'm gonna guess that's the case for every one of you or you wouldn't be here. Because it's miserable to sit and watch the slow suicide. And to know that the slow suicide is under the direction of bad advice.

And so, we want to all do something. I mean, you know, I think (you) would say there's incredibly rare exception that the people who go into medicine do so because they truly want to help people, right? They want to do good and then we're met with all of these barriers, right? All these barriers revolved around the status quo. So how can we gather together? How can we individually, in our own silos, start to make a difference? And you know, again, that's working together — like, I've shared my little canned — I always tell everyone it's way outdated. It's from, like, a decade ago, but I'll share the general idea of what I did. Go and do it with your physician groups. Explain to them and just don't take crap when anyone wants to argue with you. The fact of

the matter is science is on your side. And that's always what comforts me. Like, people can call me crazy.

You know, one of the — my favorite things was after I did my TED Talk, I actually had to forbid my kids from getting on my TED Talk because the comments were so full of vulgar stuff about me. And you know, my favorite thing is that the the comment was, “She's obese. She can't know what she's talking about.” And I was like, okay, you know I'm a woman and I'm sensitive about a lot of things, but you can't get me on this. I'm sorry, you know, you are not gonna get me on this.

But that's the whole idea, you know? It's like this personal attack, right, is the idea and the way that they go when there's not science to back it up. So, know the science, and you've got that on your side. That's a big deal. So anyway, so going back, then, our study came out. It's wonderful. We can't wait for the two-year data to come out because one of the other things that people say is that people can't stick with a low-carb diet, right? You've all heard that argument before. So, 83% retention rate at a year. That's huge, and I gotta say that we had almost 75% retention rate at two years. So, how many people will take a medication you prescribed two years later? Not 75 % of them. So this is doable, and it is a long-term option. And so anyway — But this study never got really talked about, right? I mean, it's mentioned in the press here and there, but there was no big explosion. We have a disease that over half of the adults in this country have, and we have a solution that reverses it in 60% of the cases, and we're not talking about that.

And it's not a — it's not a plan and a treatment that's gonna involve surgery, that's gonna involve one more medication. It's the opposite. It's gonna involve less medications. And it's just food, right? It's just food. It's changing food. Yet everyone will dream up all these horrible things that are gonna happen because you changed your food. Never mind the horrible things that are going to happen because you're taking a medication that we know causes amputations, or you know, you're gonna give people more insulin, which we know leads to worsening outcomes at the end, right?

So, let's go back in now and talk about that aspect of it, okay? So, you guys know the patients, right? The over 50% of these people who are coming into your office who have diabetes or prediabetes. But let's also not kid ourselves. It's not just 50% of the population that we're talking about, right? Because, before the diagnosis of

prediabetes comes in, these people have been insulin-resistant for years, right? And so, I always like to draw this and just kind of be looking at how ridiculous our treatment path for these people has been.

And you're gonna notice here in just one quick second that I didn't miss my calling as an artist, so forgive me, but you've got person A here, okay? And who is a person, and not a gingerbread man. And you've got person B here, okay? And right, I should have been an artist. No, okay? So, you've got two people here, and they're going to consume the same food. It's going to be a healthy carbohydrate, right? Because we've heard that people are like, “Oh, carbohydrates are not bad, because we can eat healthy carbohydrates, and that's what people who have diabetes should eat, you know? We should all be eating healthy carbohydrates.” Like a cup of brown rice, right?

So, we got a cup of brown rice here. Cup of brown rice brown rice has 45 grams of carbohydrates, okay? Which fits in with a typical ADA meal plan, right? Because you should have 45 to 60 carbs per meal, 15 to 20 in snacks, right? Okay, so you got two people are gonna consume the exact same thing: 45 grams. Patient A here, is insulin-sensitive, and so insulin-sensitive, and he has a high carbohydrate tolerance, okay? High carb tolerance. And, patient B is insulin-resistant. He has a low carb tolerance. All right, so same exact food, right? So if we say, “Calorie is a calorie. This is the exact same food. It's got the same amount of calories. It's going into two different people.” But is this response gonna be the same with two people? Absolutely not, right?

So, what's gonna happen? We all know that when we consume carbohydrates, our insulin levels are going to go up. I don't care if you have metabolic disease or not. That's what's going to happen, right? Because when glucose comes into the system, it can't just hang out in the blood and in our vascular system. It has to get pushed into the cells where it can be used. So — and of course there's no path for glucose to go directly into the cells — we need insulin as its carrier, right? So, you consume carbohydrates. Instead of your blood sugar going from a normal blood sugar of say, 100 to a blood sugar of 900, which is exactly what would happen with a cup of brown rice. As the rice is coming in, insulin levels go up, pushes glucose into the cell, and we can keep our blood sugar stable, okay? So we have to have insulin, but insulin-sensitive guy doesn't need much of it, right?

So, insulin is going up. We don't need much to accomplish keeping the blood sugar down, all right? They're sensitive. They have a high carbohydrate tolerance, but poor guy over here who's insulin resistant, who is now the majority of people in this country — the majority of people in this country! — their reaction to this "healthy carb" is this, right?

Okay, so they've got all this insulin around. Now, this person doesn't have even prediabetes yet, maybe. So, all this insulin that's needed to be produced to keep the blood sugar normal is doing its job: It's keeping the blood sugar normal. But here's a problem now. So insulin is our fat storage hormone, right? It's our fat storage hormone. So, who's gonna have a problem? It's gonna be the insulin-resistant guy, right? He's got all this insulin around all the time. This is why weight gain usually comes before someone is diagnosed with Type 2 diabetes. This is a problem, but even bigger and more important is what's gonna happen over time if we're still feeding this person these "healthy carbohydrates." They're gonna have to put out more and more and more insulin, and at some point we're gonna hit that critical point where insulin is not going to be able to be produced enough to keep the blood sugars down. And then, ding! They're gonna be diagnosed with prediabetes, right? Still continuing to do the same thing because "healthy carbs" are what we're telling our patients to eat, and pretty soon it's what? It's diabetes, and on average, when someone is diagnosed with Type 2 diabetes, 50% of the cells that produce insulin are dead. They're dead because they've been overworked for so long.

And so, we're gonna have even bigger trouble, because now what we're gonna do for this person is, in addition to continuing to tell them to eat the healthy carbs, we're gonna take this guy and we're gonna give him more insulin, because that's what we do. That's what we do. So, what did we do? This guy's on fire essentially, and when we prescribe insulin or sulfonylureas, our brilliant medication that we should absolutely forbid being made and given to anyone, we essentially take a lighter fluid on the fire, right? So now, this guy is not getting worse slowly over time. This is like accelerated, right? And pretty soon, what's going to happen? There's no beta cell function left, so we've got an insulin-resistant Type 1. Essentially — I mean it's not an autoimmune disease process — but we get this insulinopenia, and at what point in this process is it too late? Like, at what point can we not resolve and recover enough beta cell function? I don't know, you know? And it's likely different from person to person, but what if we caught it early on here, and we just didn't give them the "healthy carbohydrates"? What if we taught them to eat fat instead?

And you know, catching this early is going to be critical. Now, we have so many patients who have had diabetes for up to 20 years, who have been on loads and loads of insulin, that we get to successfully reverse their diabetes, okay? But again, it seems like the longer that you have it, the more problematic it is, okay? I think that makes sense. Everybody can understand that.

So, we need to be catching these people early, okay? That's going to be really important, and those people who have had it for 20 years and come in and they're on 300 units of insulin or something like that, and you get them off of insulin in a couple of weeks completely, what was that insulin being used for? It was medicating their food only. It was medicating their food. Like, why do we want to live in a country where we medicate food? It's a crazy concept. It's an absolutely crazy concept. So, this idea of a healthy carb is one that I push back on. Do we need some carbohydrates? I mean, I believe that everybody should have some vegetables. I think they're an important source of micronutrients, okay? But you can't eat an awful lot of non-starchy vegetables if you have metabolic disease and stay at a very low carb level. And, you know one of the things that we always tell our patients are, “Consider vegetables a vehicle for fat consumption, and the rule is never eat a vegetable without fat.” So, we're bringing in the micronutrients, but we're also adding the fat to it because what do we know about the physiology of the different macronutrients, right? So, we know that people eat carbohydrates, their insulin and their glucose are going to go up, okay? And when we consume proteins, it’s variable because it also depends — with protein it depends on how much insulin production capacity you have, but you know, it can be — it's better certainly.

But, the big thing is with fat, there's no reaction, okay? And so what is Type 2 diabetes? I mean, for that matter, what is prediabetes and what is insulin resistance? It's a problem of elevated insulin, and then later down the road a problem of elevated glucose. So why in the world would you want to be feeding people what caused the problem in the first place? I mean, it truly makes no sense, and here is the interesting thing: Patients get this.

Like, you know, one of the things that makes me so mad is that people go, “What, you know, patients aren't going to understand this.” You know they make this decision for patients: “They're not going to be able to stick with it.” You know, have you tried? Have you tried to explain this to them? Because you don't have a good 45-minute

lecture with a group of patients, which we do all the time, and patients are like, “Oh my gosh.” It doesn't matter who the patient is. They can be a professor, and they can work the line in the factory. They get it. This is not a different — this does not — you know some sort of astrophysics here, okay? This is a pretty simple concept and given the chance, patients understand it and get mad about it and want to do something about it, okay?

And then when you make these changes and you have a person who is on insulin checking their blood sugars for so long, going, you know, a month later to their pharmacy and not picking up as many medications, that's motivating, man. That is motivating. Because not only do they not want to take them. It's costly, right? I mean, insulin — we all know the stories about insulin. It's a big problem, so you can completely change someone's life, and I gotta tell you, I mean, that's the thing. That's what gets me up in the morning, right — is that you can truly walk on a lifesaving journey with a person and you can be there. I could get emotional about it, you can be there next to them to help them, and it's — it’s such an honor to do that. It really is.

And so, you know, again, we don't do this though, right? We give this person more insulin, and that's the status quo, and that's the dogma despite the fact that it makes absolutely no physiologic sense, and we know clinically it's an abysmal plan because of what's happening in this country.

So, once again, it's the dogma we have to push back at. But this is physiology, okay? This is not some manipulation of data or anything. This is basic human and nutrition physiology. You've got that on your side. We all have that. And so, understanding these problems, banding together for a good plan that's best for our patients will improve so many things as far as the health of our country goes, but also the satisfaction that we have in ourselves, in our jobs day to day.

I am a very different person than I was when I worked in primary care, okay? It's so different to be part of the solution rather than be part of the problem. So, you know, I encourage everybody you know, read about this. Know your literature. I mean, that's a big thing.

So, I'll tell you a story, like, I, recently — this is — I like to call this the “pigs fly moment” that happened to me, which is, I was asked this year to talk at the American

Heart Association, which is — I know! Like, right? Like, what? And so, I was in a session with ketogenic diet for — so, it was, like, which diet for cardiovascular health? So, there was ketogenic diet, which was me, and there was a vegan diet, and there was a Mediterranean diet. And the fact of the matter is, like, you know, without calling any specific anything out, when your arguments are based only on prospective cohort data, okay, you really don't have much to stand on, and knowing the literature and being able to call every flat-out "inaccuracy" is the politically correct word, okay? Flat-out lying is what really happens. And yet, but you're able to rebut that with a real scientific study: date, name, all that kind of stuff. It's great, because people don't have an argument. Because that's bringing science into the story, and it's very helpful.

So anyway, questions.

I wanted to make this interactive, but I wanted to give you my backstory. I thought that would be helpful. So, any questions on anything?

Question: I'm interested in the extent of your success in Indiana. I'm wondering if — you mentioned early on, you're sitting for the board certification for obesity. I'm wondering if the content of that program has changed?

Hallberg: Yes and no. So, to some degree, since I took the board exams, there's definitely more emphasis on low carbohydrate — definitely more. Is it — is it as much as we think there probably should be? No, but I'm actually not 100% convinced, either, that it needs to be like only low carbohydrate as an option. Because, although I think a low-carbohydrate option is the absolute best way to go if you're someone who has metabolic disease, especially Type 2 diabetes, it's not actually the only way to go. So, for example — and so with obesity, you know, people can succeed by calorie restricting, okay? They can. If they calorie restrict, they'll — they'll succeed, and some people just absolutely would not choose to do a low-carbohydrate intervention, and I'm fine with that. It's — the important thing is it's the patient's choice, so I think we're seeing more emphasis because more and more acceptance of the fact that low carbohydrate is an incredibly successful method, but we're not seeing just a focus on that. Because, one of the things that I always give in lectures when we're talking about diabetes is: Here's the thing. There are three ways to reverse Type 2 diabetes. Three.

One: surgery. I mean it works, and if anyone has more evidence to prove that it works, it's surgery. I mean there's just no question about it. Number two is a very low-calorie diet, okay? It works. But, what's very low-calorie? I mean, in the studies, 600 to 800 calories a day, right? So I don't know about you, but I don't want to be on 600 calories a day, and it's — it's so much easier for me to sit here, right? And say I don't want to be on 600 to 800 calories a day, but I'm this guy. I'm super insulin sensitive.

Question: How many carbohydrates do you think are in the 600-800 calories? Do you think maybe it's a very low-carbohydrate diet?

Hallberg: It's a totally low-carbohydrate diet! Right? And by default, right? So, when you actually go in and you look at the studies, right, that are restricting, your 600, 800, and you take a look in the methods that what they're eating and you do the calculations, they're like, "Oh, crap! That's what my patients are eating, but they're eating way more than 600 to 800 calories a day, right?" But, you can do it that way. It's absolutely a patient choice, okay?

And then the third thing is low carbohydrate. These are the three things where there is plenty of evidence in the medical literature for this. So, who decides which one your patient chooses? It's not you, right ? It's your patient, and you know for anyone who chooses one of these — I'm — you know, I'm there to support them. Whatever they want to do, it's gotta be their choice, you know? We can't be dogmatic about anything. We can't fight dogma with more dogma. That is a bad idea, but I think that the vast majority of people are gonna choose to do a low-carbohydrate diet, and we're hiding it from them, right? We're hiding it from them.

Okay, so I sort of went off on a tangent, sorry.

Question: So, you in your system — any data points that trigger referral to you in the PCP world? Is it just they know about you and they refer patients they know need it?

Hallberg: Yeah, there's not a — there's not a trigger. But it's easy now because of — well, I could get up on another bandwagon, which is these, like, picker scores, and you know the — all the CMS stuff that we have to do. But they have to have a plan now, right? For if there is a high BMI so we just get them, it's easy because, you know,

this is a physician trying to deal with the problem of obesity or metabolic disease in a 10-minute visit. So yeah, we just — we just get them.

And guess who's our best referrers in the system? Cardiology. We actually share office space with cardiology now. Mm-hmm. So, you know, because they know — they see — they've seen the results on their patients, so it works. It's pretty funny, you know — where are — we have the big thing that says "I love bacon" hanging up in the halls, and you know, and that's what the, you know, patients walk by when they go to get their echo. Bacon, yeah.

Question: How do you pick up insulin-resistant folks? I've looked at the literature a little bit, and I've seen fasting insulin being used. I've even tried to order glucose tolerance test with the insulin curve too, and that's a little worrisome, to be going through with all that ... .Do you know anything about that, anything we can order?

Hallberg: Yeah so, I have never actually even done that. Insulin — I don't check insulin levels. I go with one of three things. Number one: just presumption. If they're overweight and they're really struggling, you know, every once in a while you'll get someone whose obesity may not be driven by insulin resistance, but it's pretty rare. So what if you treat them like they were insulin-resistant anyway, even if they happen to be one of the rare people? Is that going to be bad for them? It's really not, okay?

Number two: The poor man's way is I just do triglyceride HDL ratio, right? I mean, in the horrifying thing, and you guys know this — if you do these triglyceride HDL ratios in your office, you know you'll be sitting there with a guy and you're like, "37 is your triglyceride." I mean, that's not an uncommon thing. We see this all the time, right? That's not weird, right? But we should be worried of anyone who's 2 or above. My favorite thing is to be able to say to someone is, "Under one," right? "We got you under one." And that's possible. Now, it's totally possible.

And then the third thing is I tend to really like to do NMR lipid profiles on people. We can't necessarily get them all the time, but then, you know, I am okay with going with the LPIR score. So again, it just depends on what you have access to, but the easiest one is do the triglyceride HDL ratio, and I would say that's mostly what we use. And it's not so much that it's going to help you. Like I said, you know, if their insulin-resistant or not, you know, using the same treatment is not going to be a problem, but it's a really helpful thing to help patients understand. So, we sit down

and we'll talk, you know, talk about like the whole triglyceride — and, you know, why HDL tends to be low, and we'll go through all the explanation with people, and it's — it's a very helpful teaching tool is what I find.

Any other questions?

Question: You've talked about getting into arguments with people and using science. Is there a way that you can give us your top five articles, somehow, to share? You're talking to an orthopedic surgeon here, so —

Hallberg: So, I'll tell you what we have and is getting, you know, even more up to date is that I have a list we made, a big table of the low carbohydrate — so it's not just five. It's bigger, you know — a table that says, you know, what kind of trial was it, what was the outcome — this and that. The other thing is for all kinds of things, diabetes and all, and it's online. You can link a link to it from the Nutrition Coalition website. Has anyone heard of the Nutrition Coalition? Okay, so I'm gonna use this — So the Nutrition Coalition — I really encourage all of you guys to join for the newsletter — So the Nutrition Coalition is the brainchild of Nina Teicholz and who is a wonderful, you know, pioneer and worker for a nutrition reform. And so, the table is published there so you can have access. It's super easy to digest from, and the Nutrition Coalition is the first nutrition-focused not-for-profit that takes no industry funding — none. It's funded by angel investors, and it's funded by just grassroots. So, it's funded by its members, and so, the only goal of the Nutrition Coalition is to get evidence-based dietary guidelines — like, that is the single biggest goal.

So, how have we been working towards that and in addition to providing things like this table on there? The Nutrition Coalition, and specifically Nina — if anyone has not read her book *The Big Fat Surprise* — I mean, Nina is a force to be reckoned with. Talk about someone who's put herself out. The Nutrition Coalition was the organization that lobbied Congress — which was really Nina on the hill every day — lobbied Congress to mandate the first — what was essentially a peer review of the 2015 Dietary Guidelines. So, Congress insisted on the peer review by the National Academy of Sciences and funded a million dollars to get it done, actually. And so, that came out just over a year ago, September of 2017, and what did the report say? Our national dietary guideline process is horrid. It is not rigorously done. The guidelines are not put together with the accepted methodology needed when producing guidelines. They're a disaster — we all knew that. But it's important because this was

another source coming out, you know — someone very well-respected. I mean, the National Academy of Sciences are who puts out — how do you make guidelines, right? Here's the process you have to follow.

So that was a big deal, and that was the Nutrition Coalition's work, and so now we have been working a lot on trying to get people who are evidence-based medicine people on the next dietary guideline committee. Because, hold on, hold the phone here, right? Evidence-based medicine specialists guideline committee, how is that a point of contention? It's a point of contention. There's a lot of people who don't want anyone who's an evidence-based expert on the guideline committee. I mean, that's the world we live in. That is — I mean, could you imagine that? Like how can anyone — I'm always like, “How can anyone argue with that?” You're not saying “do this” or “do that.” You're saying we just want someone who's an expert in evidence review. “Oh no, that would be a bad thing. That would be a bad thing.”

Like, so, anyway, so, that's the Nutrition Coalition, and so I encourage everybody, go Google the Nutrition Coalition. Go in, join on our newsletter and that — again we're looking for the masses here to help us out in this endeavor, because there's still a lot of work to be done, right? We know that is why, again, everybody's here — David and Goliath — I could go on and on and on, but yeah. So, and we give Nina — I always do also — a huge shout out because she's been, yeah, a pioneer in this.

Question: To get back to the insulin resistance, how do you come back after people say — because, if you read my records, dozens disagree with what you say, and what they say, of course, is that the fat causes the insulin resistance in the first place, right? That’s their whole argument for low-fat diet. So, how do you come back at those arguments?

Hallberg: I don't necessarily think that's untrue. The question really is, I mean — it might be we don’t — we're still like — insulin resistance, like how did we get insulin resistance is still not really well-defined. But do I think there could be some credence to the idea that it's fat that caused the insulin resistance? I do. However, here's the big question: How did the fat get there? How did the fat get there, okay? So, we eat fat. Is it increasing the fat in our system? You know it's not, like, what causes an increase in triglycerides. It's the carbohydrates, right? And so, it's — it's pretty fascinating, so, you know, you hear this argument all the time: “You can't eat fat. It's gonna cause, you know, it's gonna get fat. It's gonna be in the skeletal muscles. It's gonna cause the insulin resistance.” But then you look at what the science — go back

to what the science says on this, right, and there's some really well-done feeding studies, okay? So, you take people, and you start them at a very low-carbohydrate, incredibly high saturated fat diet, okay? And you — excuse me — you have a baseline right? Then you put people on a very low-carbohydrate, high saturated fat diet, and what happens to the saturated fat content of their blood? Nothing. It doesn't change. So, huge tons of saturated fat and the saturated fat content of their blood doesn't change. Now, over time, again feeding — you're feeding them and you go ahead and start increasing the carbs in their diet and decreasing the saturated fat, and when we go to a very low saturated fat diet, high-carbohydrate diet, what has happened to the saturated fat content of the blood? It's gone up. So, not only do we make fat from the excess carbohydrates, we actually make saturated fat from the carbohydrates. So where is this fat coming from? You know, it's so simple — like, one of the things that I said in my TED Talk was, what if I just gave dietary fat a different name, right? What if we just called it something else, like rainbows and butterflies? Because we think that, you know, we eat fat and it becomes fat, and, you know, that's what's causing the fat in our arteries. But it's not the case. It just seems like it, right? So, we accept that just because it sounds good it must be true, but it's not. It's those carbohydrates that are increasing the fat in the diet. So, you know — and I like, I have a slide of this — of the couple studies on this — and that and the interesting thing is, the people who have put out some of these absolutely anti-fat, anti-saturated fat papers are aware of this data, have cited it in their own papers, yet continue to make the same argument. It's ludicrous.

Question: The 40% that don't respond as well or don't reverse their diabetes, are there particular characteristics of these people that stand out and separate them from the 60%, including the age and the duration of diabetes?

Hallberg: Yeah, so that's something we're gonna — we're doing a lot of, like, post-hoc analysis on right now, to sort of, like, figure out, like, what are the baseline, you know, maybe characteristics of success versus not? A big one, though, is, you know, some people are non-compliant, and they're non-compliant in different stages, which is really what's fascinating to me, just having done this over time is, you get someone with the concept, and they have a life crisis, okay? They have some sort of life crisis — somebody dies, they lose their job, they may go off track for a little bit — but it's not so hard to pull them back in. So, at any given point in time, we have people maybe who are off track some degree, and then, you know, if you wait three months later, it may be a slightly different collection of people, and of course there are some people

who never go off track. So, we've got some of that in the mix, but we definitely know length of time with diabetes is a factor, and why is that? It's because — what degree of beta cell function do they have left, right? As it goes back to this, if we catch it early, I think we could be successful, like, 100% of the time. Because we're still talking about people with decent function. So, that's a big factor. So length of time. Age does seem to be a factor. And then the other interesting thing that seems to be a factor, although again, we're still working on looking at this, is we seem to have people who were not heavy at baseline. Like people who are just overweight, maybe, and had Type 2 diabetes, they're harder. And it's not necessarily that they have LADA, because we can't tell you how many people we screen for LADA and we catch it. It's been missed by everybody a lot, which is the latent autoimmune diabetes of adulthood, but I think there's probably some sort of variance of LADA that we just haven't figured out genetically, and they probably have it. We just are missing the test for it. So, I would say all of those things, and it's still a problem to solve. So, you know, believe me, one of the things I think is really important is, this isn't gonna be the end-all be-all, restrict carbohydrates and you make everyone better. First of all, some people are gonna choose something different, and we can still improve on it, because, the thing is, we cannot not appreciate the fact that everybody is different, okay, and even with a plan that may work for everybody, it's going to work better for some people than others, and so there's still a lot to figure out.

Question: Do you think mainly the non-responders are stress-induced, possibly, which affects cortisol regulation?

Hallberg: Absolutely. Absolutely. I mean, there's no question. There's all these things that were much more difficult to control: sleep, you know, just stress in general. Some people are gonna, you know — high-anxiety people. Some people, you know, are not. You know, we have so many of those factors that come into play that are just really difficult to quantify.

Question: Can you touch on — so for me, the psychological component of just the "D" word in my practice is the desire — how do I motivate the unmotivated? And it's just such an A. time suck and B. personal being, feels like a drain, you know? Do you guys have anything that you use for that?

Hallberg: So yeah, you know, you can — you can lead a horse to water, right? But so — and I would say that is — comes back to sort of the whole idea that you guys are

here, which is support and hitting a critical mass. And I'm gonna use my hometown as an example. So, the trial took place in Lafayette, Indiana. Like, okay, so this is where Purdue is. It's not like a podunk place, but this is not a, you know, big metropolis area, okay? Middle of Indiana. Indiana, lord knows, has an obesity and metabolic disease problem, okay? And getting people to make change is hard, but we have hit in our community — it's a big community — a critical mass, okay? And what do I mean by that? Like, not only in the town of West Lafayette and Lafayette, but in all the surrounding communities, there's not a single pizza place even in the rural communities that surround us that won't make you a low-carb pizza. There is not an Italian place that won't make you zoodles, right? There are grocery stores full with low-carb sections in them because so many people — because the trial we had, you know, 400 intervention patients in the trial. We had my clinic in at IU, which, you know, sees people from all over the place. We have — Virta has come in, available to Purdue, to the county, to the city. We've hit a critical mass. Work parties are different. You see people succeeding, and so, people may not be motivated from the beginning, but what we see is they're like, “Dang, and she looks so good.” “He looks so good. I know he's not taking that medication anymore.” So, sometimes if you've got a person like that, hands off, motivate the people around them and what you'll get is not 100% of the time — some people are just going to be, you know — and that's what I said: It always comes down to patient choice. But, you motivate the people around them, you hit a critical mass, and you can do some wonderful things.

Question: How much hand-holding do you do during a whole process? How much hands on do you do with them? Do you have nutrition coaches that work with them? How often are they seeing people who kind of keep them going?

Hallberg: Um, a lot. There's a lot of hand-holding. Making a lifestyle change is hard. It's hard, okay? Even if you're switching them to, you know, yummy food and all these things, it's tough, and so the way that we do it is we — every patient in the trial and then through VIrta gets their own health coach, and so they're in constant contact through their cell phone, okay? Because it takes — the utilizing cell phone and the telemedicine aspect of it takes down a huge barrier, which is the call, and finding the time to go to the doctor and get the appointment. When they have a question, they know they can get it answered in minutes by asking it. You know what I mean? So, the funny thing is, we'll have someone in the drive-thru line at McDonald's who will be, “What do I do, what do I do, what do we do?” You know? And they'll, you know, get an answer: “Yeah, get out of the line.” Right? Yeah. But so, the idea is that you've

got to bring down as many barriers as possible, and so it's an incredibly high touch. I mean, on the health coach-patient communication, early on is three times a day; that's a high-touch situation. But, one of the other things is that it is not actually a touch so much with another person — is the education that we front-load them with. You know, that concept that patients can't get it, they can't understand — which again, total bullshit — they can get it! We want to help them understand the why.

Question: How is this funded? How is the project funded? How is the study funded?

Hallberg: The study was funded by VIrta, and so you know, that's a venture capital-funded company, yeah. But IU is just, you know — the clinic that I have at IU is just, you know, uh, yeah, it's just a health-care system. The interesting thing I'll say about IU is, although you know I've had success and the cardiologists will refer to me, you know, when the study came out, you'd think that would have been big news. And the IU system in silence, right? They didn't say anything. But that's okay, you know? We're getting there. We're getting there.

Question: Do you have any kids in your study?

Hallberg: We don't. So, we didn't do kids. My partner at IU does have a carb-restricted programs for kids, and in fact, funny because she just texted me, like yesterday. I was at the airport and she's like, “I had a 400-lb. 15-year-old. She left. She lost 17 lb. in the first month. I'm so excited!” So, you know, this does — you can reach kids too, so it's pretty fantastic — but I'm an internist. I don't do kids — but they're important.

Question: I’m curious if is there any literature or media on the effects that we’re talking about, the community? So, the changes in the restaurants, the grocery stores, anything like that?

Hallberg: No, but if anybody has any idea about this, please let me know. Because we've been kind of struggling with this, because we think our community is a great, like, national story, right? But like, how do you quantify this? Like, we don't have everybody's lab — like, how do we actually show it? And we, you know, we’ve kind of been back and forth about this. Like, you know, you gotta really be able to prove it to show a story, and that's just so difficult. You can't come in and say, “Yep, I really did get a low-carb pizza everywhere.” So, if anybody has any ideas on this, I would love to hear them.

Audience: More boxes.

Hallberg: More what?

Audience: More boxes.

Hallberg: There you go! Well actually — so, the police department has their own. I mean, everybody's involved in this, right? The police department is — they, their police department is on low-carb, and they have a CrossFit in the police department. I mean, it's — I'm not kidding when I say the community — it is really the community. So, anyway, yeah.

Question: Can you comment a little on the Type 3 diabetes and the whole early cognitive decline?

Hallberg: Yeah, I mean, so, I think we're again — we're sort of just scratching the surface on the evidence on this. You know, I think there's much more to learn, but you — the thing that you, you know — is that the word is getting out on this. I'll see people now a lot of times who don't have diabetes and are like, “I'm doing it for the cognitive function,” right? And you know we know, like, they feel better when they do. And so, you know, what it's gonna take is it's gonna take a long hard outcome study, which is gonna mean that NIH is gonna have to recognize that this needs to be studied, and finally, have NIH stop putting the stop block on funding anything. You say “low carbohydrate” to NIH and they go, “Out! No!”

It's gonna take a long-term study to look at this — to look at cardiovascular hard outcomes. Cognitive one is a huge one, right? We need to be able to look at that. So, again we're learning more, maybe, about the basic science aspect of this and some ideas in some of our ketogenic and neurology studies, but how is this work in prevention? You know, all those kinds of things — that's gonna take a long-term hard outcome study — and just to — on that note, let me take the advantage right now. Until Sunday — so, you gotta do it while you're here — is the open comment period for NIH goals for the next, like, decade. And they've said that they want to look at eating patterns, and the eating patterns that they listed — none of them was low-carbohydrate. So, everybody, you can just google “NIH open comment eating patterns,” and you get to it, and you can just put in a public comment that says, “This

is really important," you know, and say something, specifically," I think the hard outcomes study is needed because we need to look at cognitive functions," because we do. We need to look at all these things and to do that. That's going to be in the hundreds of millions of dollars and is going to require NIH funding.