



**Defense Centers of Excellence for Psychological Health  
and Traumatic Brain Injury (DCoE)  
Webinar Series**

**April 9, 2015; 1-2:30 p.m. (ET)**

**“Prevention and Management of Concussion/  
Mild Traumatic Brain Injury in Youth Sports”**

Good day, and thank you for joining us today for the DCoE Traumatic Brain Injury April webinar, "Prevention and Management of Concussion/Mild Traumatic Brain injury in Youth Sports." My name is Major Pamela DiPatrizio and I am the chief of the Office of Education Outreach for the Defense and Veterans Brain Injury Center. I will be your moderator for today's webinar.

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I will now move on to today's webinar, "Prevention and Management of Concussion; Mild Traumatic Brain Injury in Youth Sports." Closed head trauma is one of the most commonly reported injury complaints in pediatric emergency departments and is a significant cause of pediatric deaths and disabilities worldwide. The Center for Disease Control and Prevention reports that among the 38 million youths who participate in organized sports in the U.S., concussion is the most common injury and has risen 57% among children ages 19 or younger.

The events that lead to a TBI are usually predictable and preventable. The CDC wants to ensure the health and safety of our young athletes through their HEADS UP campaign initiative by informing athletes, parents, and coaches about prevention, recognition, and response to concussions. Providers can take an active stance to reduce and prevent brain injury through educational efforts.

Injury prevention, education is one of the most effective approaches to decreasing the number of pediatric concussions. This webinar will address concussions truths and myths, tools for concussion identification and diagnosis, and management and concussions rehabilitation. At the conclusion of this webinar, participants will be able to discuss public health and clinical approaches to concussion management, explain the elements of a four-corners approach to pediatric concussion care, a corporate injury prevention and educational resources for health care, providers, coaches, athletic trainers, parents, school nurses, teachers, counselors, and other stakeholders into current practice.

I now have the honor and privilege to introduce our guest speaker for today's webinar, Dr. Gerry Gioia. He is chief of the Division of Pediatric Neuropsychology at the Children's National Health System where he directs the Safe Concussion Outcomes Recovery and Education Score Program. Professor of pediatric and psychiatry and behavioral sciences at George Washington University School of Medicine, he's contributed to the development of pediatric post-concussion resources, including the Center for Disease Control and Prevention Heads Up toolkit and the Defense and Veterans Brain Injury Centers; A Parents Guide to Returning Your Child to School After a Concussion. He's participated in international concussion and sports groups consensus meeting, American Academy of Neurology Sports Concussion Guideline panel, and the CDC Mild Traumatic Brain Injury Guideline Development Group.

He's worked with the Washington Capitals, Baltimore Ravens, and numerous youth sports organizations. He has earned his PhD in School Psychology from the University of North Carolina at Chapel Hill. Please welcome Dr. Gerry Gioia.

Thank you, Dr. DiPatrizio. And welcome to everybody who has joined us here for this talk today. I'm going to be very excited to have a chance to talk with you all about this very important issue that many of you have probably heard in the media over the last number of years. Let me first start out by asking that our group give us an idea through this polling question of what discipline you might represent as a health-care provider, recognizing that there may be folks other than health-care providers as well, but I'll be very interested in knowing who we have online today.

Okay, it looks like the "others" are winning. It's sort of like looking at a horse race in front you as the votes come in. So it looks like we have a nice representation of social workers, nurses, psychologists, some rehabilitation providers, some primary care providers as well. So this is nice to see this. Okay.

So we're going to move forward with our talk here, and you heard about the general goals of this webinar. As we look at this issue of this concussion or, really, mild traumatic brain injury over the last 10 to 15 years, we've seen lots of changes. So, you know, 15 years ago there was very little understanding of mild TBI, and not that many treating health-care providers were even interested or trained and familiar with what sort of practice guidelines there were. We had few medical tests and tools for us to even operate with, and at the time, our research funding was fairly minimal that also resulted sort of from a broad perspective and little public awareness of the risks associated with this. We also had very few kind of societal rules out there, if you will, to protect the brains of kids.

So where are we today? We're going to fast forward now, and it's very clear and no doubt resulting in your attending today, the public awareness of mild traumatic brain injury has just gone through the roof, and we also recognize that this whole issue within a sport-related context is very important. But I do want to put a shout out here to all of us to recognize that this injury is not just sport related despite all the media attention. This is an injury that occurs in many different ways through motor vehicle collisions, falls, assaults, being struck by objects or running into things. So I want to recognize that today we may be talking, to some extent, about the sport-related concussion, but the principles and the ideas really apply broadly.

Certainly our research knowledge is beginning to expand around this issue. We still have a long ways to go. But we certainly have much more information available to us now to guide our understanding, and that, then, allows us to both recognize, diagnose, respond to this injury more effectively. There are now, depending on where you live in the country, many more health-care providers and clinics coming online to both evaluate and treat this, and we're hoping as well that the emergency departments, our primary care systems, are really on board, as I believe this is an important place where the evaluation must begin. We're also developing more clinical tests and tools. So those who are practicing now have available to them a number of different methods, and I'll talk about those in my presentation here. And then we'll also close the conversation today in talking about the state laws that now exist in all 50 states and the District of Columbia, implementing rules now to protect kids from, hopefully a worse problem here.

So let me throw out polling question number two, which is I'd like you to decide whether it's true or false that parents and coaches must play a critical role in identifying youth sport concussion. Okay, so what we can see here with our votes is that it's virtually universal, universally true that parents and coaches must play a critical role in identifying youth sport concussion, and I would agree with that view and will explain that point as we move forward.

So, really, as we think about mild traumatic brain injury, I would like to argue, as would the CDC and others, that this really is a partnership; that when the injury occurs, regardless of whether it's at home, it's in the neighborhood, it's in the back wood, it's on the road, it's on the athletic field, that injury doesn't usually happen with a medical provider sitting there, so we have a responsibility now in our identification to include our non-medical partners here; the parents, maybe a teacher at school, possibly a neighbor, a coach, a friend, a teammate, maybe even a bystander, knowing that we need to identify these injuries, and then make sure as that -- well let me just clarify that the job is to recognize and respond, not to diagnose but to say there's an alert, something doesn't seem right, I have a concern, I am wondering whether this might be an injury, and get them over to the medical provider. Whether it's at the early stages of the emergency department or whether it's at a specialty care level, we need to be sure that we have both medical and the non-medical folks really working together to identify this injury, and, of course, on the medical side, there job is to diagnose and to treat.

We talked about the four-corners approach of concussion care. Now some of you heard that my background. Actually, I went to the University of North Carolina, so I choose this four-corners model, in part, paying homage to our wonderful basketball coach, Dean Smith. But more importantly and relevant to concussion as we think about partnering, again, this is an injury that can occur anywhere, and we want to be sure that the family is prepared and understanding this injury. They may be the first ones to identify the problem.

But there are also clearly parents, and even siblings playing an important role in helping that injured youngster recover. The schools, we know that that's where our kids basically earn their living, so to speak, where they go to work each day and so the school must understand how to support someone through recovery. Our medical systems is, as I mentioned, from the pre-hospital emergency medical systems all the way through primary care and through to specialty care when needed, very important that we are on board in terms of how to diagnose and treat. And then the sports and recreation world, and, again, we're going to talk about some of the things that are available now through the Heads Up program for coaches, for league administrators, and even for parents who may be on the sideline watching their son or daughter. So the four-corners approach really is that partnership in supporting that child or that team who may be suspected of having a concussion.

When we think about what we would like accomplished, I like to think of these three action steps, that everyone, whether you are a medical provider or a parent, a coach, a teacher, anyone in those four corners needs to learn how to recognize a concussion. And this is a big part of what we do with our CDC program. We must understand that there are 12 danger signs that would suggest a youngster be taken directly to the emergency department, and that's listed in many of the CDC materials. I'll even show you the Smartphone app that we developed that can also help with that.

In using the tools to guide you, there are a number of signs and symptoms we're going to review together, and it's not always easy to remember which ones you're looking for. We've got some great tools through the CDC Heads Up program that we'll review that include pocket guides, clipboard stickers, and even some handouts that could be even tagged onto your refrigerator to remind you. Again, we developed the concussion recognition and response app several years ago. It's a free app that's available through iTunes and through the Google sites, and then acute concussion evaluation that is part of the CDC's physician's toolkit that I'll review with you. So we've got some good tools available to us now that really help us to recognize and diagnose this injury that we didn't have 15 years ago.

Number two action, if you suspect an injury, you've got to be sure that you remove that child from risk. Take them out of the line of fire. We know that a second injury, when that brain has just been injured, can result in far greater problems, either an extended recovery, more significant symptoms, and in rare cases,

it could even result in death or significant disability. So it's very important that we remove the child if we suspect an injury.

And then the last piece here is to support the proper treatment. And we'll talk about some of these treatment ideas so that we can be sure that we are doing what we need to do to help that youngster recover. And certainly for parents, and even for schools, we can monitor and we can record those symptoms so that the medical providers, as they are adjusting and readjusting the treatment protocol, have good current available data.

So I want to go to polling question number three. This, again, is a true/false. A concussion is not the same as a TBI. Go ahead and respond. Okay. So what we see here is about 80% of say false, that a concussion is not the same as a TBI. Okay, so we're going to clarify this point as we move forward here.

What is a concussion? Okay, so a concussion is a bump, a blow, a jolt to the head or body that causes the brain to move rapidly back and forth. And I'm going to even show you a little video of that in a minute. What it does is causes the stretching of the brain, causing chemical changes, and it affects the cells and damages them as a result of that force. As a result, that causes the brain to change in its function, and that's where the signs and symptoms now come about. And once these changes occur, again, this is the reason for why we want to remove someone from that risk, is that the brain is now much more vulnerable and sensitive to further injury and increased stress. So it's very important that we manage that carefully. So it's a blow to the head or to the body that moves that head rapidly back and forth that causes that stretching, that straining, and the chemical and electrical changes.

So a concussion is, in fact, a form of a traumatic brain injury. Many of us have heard the term "concussion" and oftentimes not associated with the term "traumatic brain injury," but it is a traumatic brain injury. It falls into what we talk about as being on the milder end of the spectrum. Although if you've had a concussion, it may not feel so mild in terms of the effects that it's had on you. Okay, so we're going to see a video that demonstrates, again, what happens when the head is struck and the brain moves back and forth, and as you can see, there is actually a stretching of the tissue as that brain that is inside the skull with water surrounding it and it is now in that stretched strain model.

Okay, we're going to move to another video that is presented to us by Dr. Joel Stitzel at the Wake Forest University School of Medicine, and we'll see that one come up, where this video shows, again, a biomechanical representation of that stretched and strain of brain tissue. And that will come up in just a minute. And, again, what you'll see is these are forces that move that brain back and forth, as you saw, inside the skull, and the tissue itself actually literally is moving but not necessarily at the same rate. I'm not sure if that video is available to us. You think it will be available? Yeah, okay, we'll just take a minute here.

I oftentimes talk about the injury as being somewhat of a software injury, as opposed to a hardware injury. At least -- here we go. What we see here is how the brain moves in various ways, particularly rotationally, so you can see how the top of the brain tissue may move at a different rate than the bottom portion of the brain in sort of that rotational almost overlapping kind of way. If we move to the second one, we can see it even up close more so. Again, what we think that is happening there is that the cells and the cell walls are distending. The chemicals that come in the cell at a certain rate may be coming in at an abnormal rate. Those that move out of the cell are moving out at an abnormal rate, and the electrical conduction along the axon during the electrical cords, as we say, are not generating that electrical activity in a normal way. So the software system is impaired.

So here is an example of just how some of the movement of that brain tissue may stretch and strain the tissue and the cells. Again, the thought is that, for the most part, we're not carrying these cells and damaging them permanently, but certainly there is a temporary process of impairment here. Okay, good. So we're going to move on to our next slide here. That's just a representation of what we believe is happening inside the brain.

This is actually a slide that shows some of the chemical changes. And, in fact, what we can see with the horizontal black line is that that is the norm of the amount of glucose and potassium and calcium, and what we see is that those elements have fallen off the line of normal and now are abnormal in the percent that they are now represented inside the cell and outside the cell. And so we've got this impairment now of or this cascade now of neurometabolic factors that impair the cell's ability. At the same time, there is a significant need for energy to repair this, and so more glucose comes in initially, but we see that Carolina Blue Line down below where the cerebral blood flow has reduced in its flow, and so it's not able to supply the glucose at the rate that it's needed to do that brain repair, and that results in this, again, energy deficit and this problem with the brain repairing itself immediately, and so what we see is over time, and in this particular case, as our UCLA colleagues have demonstrated, it begins to normalize out to about six to ten days. Now that's in their animal models where they see that.

Again, the point here is that this is a metabolic process, it's an issue where we believe those cells are actually ultimately recovering back to normal but over time. So, again, we think the software system of the brain is affected. The neurochemical, neurometabolic physiologic processes, as opposed to the structural hardware damage to the tissue.

I like to look at this timeline here, because I think it's valuable to understand sort of the different factors that play out, and I think it's very important for those of us who are clinicians to sort of recognize how the concussion unfolds and some of the things that we want to be assessing to be sure that we are covering our assessment basis here. So when the concussion occurs, in this case you have a Lacrosse player, there's a stick, they may take a blow to the head. What we know is that loss of consciousness occurs relatively infrequently, and instead what we see relatively more frequently, but certainly not universally, is an impairment now in the ability of that brain to both consolidate information just before the injury in memory -- we call that "retrograde amnesia" -- as well as to store new information in memory after the injury, which is [indiscernible]. So surrounding the injury, there's an impairment of that brain's ability to process and store new information and memory, also known as the amnesias.

We see, then, a set of other factors. Cognitively kids could be impaired, post-concussion symptoms that come on, and we'll be talking more about those in detail. And that can happen usually within a matter of minutes to hours to days to weeks in terms of duration. So this is a process that is quite variable, as you will see in a few minutes here, in terms of how long those impairments can manifest. What we also have learned is that what you come into the injury with may also modify how you manifest that injury, how long it takes you to recover, and we'll talk more about that. So as we think about, as clinicians, evaluating this, we want to characterize the injury itself, what happened, did it have these various kinds of key elements of loss of consciousness, amnesias, early signs and symptom, and then later, how have those symptoms progressed over time? What is recovery? What continues to be persistent? That helps us to develop our management or treatment plan. And, again, we want to know are there certain risk factors that may tell us that it's going to take it longer to recover in this particular case or not. So that's the timeline and the factors within that I think are very helpful for us to understand how to proceed with our evaluation and management.

So I'll see if you were paying attention. What percent of children and teens lose consciousness with a concussion? I'll let you answer. Okay, what we can see is that the majority say 5 to 10%, and some are saying 25%. So we will leave that with a mild traumatic brain injury, which by the way, is the vast majority of brain injuries to individuals. We say that it is probably about 10% or less that occur.

Okay, so let's talk about what manifests, the signs of a concussion. So this is what you observe, what you might see after a blow is taken to the head. Cognitive kinds of signs, the person appears dazed. They appear stunned. They may be disoriented, confused, not quite sure of kind of where they are. If they're in a sport, they may be out of position. They forget the play. When you talk with them, you might find that they're speaking much more slowly, difficulty even producing some of their language and speech. They may even be repeating questions over and over again, asking the same thing, what happened, where am I? What is about today that I need to remember? Or they may have trouble remembering events that happened even before. You know, when you ask them, "So, you know, what

happened before you had that injury," and they don't remember. They might not remember the game that well. Again, those are the amnesias that come up.

Physically you might see vomiting, you might see a loss of consciousness. Again, those two are relatively infrequent. Vomiting, at least in our data, suggests that it's probably 15% or less, losing consciousness, again, 10% or less, balance problems, moving more clumsily, kind of a drowsy feel. But you might also see behavior or emotional change, things that are uncharacteristic of that individual, such as a person that usually is pretty jovial, pretty happy seeming very sullen. Or someone who is typically pretty even keel becoming very emotionally explosive or over-expressive, things that just don't fit their personality.

When we then look at -- now this is actually the symptoms of a concussion, so what they feel and report. And so here headache is a very common symptom, fatigue, visual problems, such as blurriness or double vision, again, some nausea that you might not know about, balance problems or dizziness, experiencing troubles sort of maintaining that upright position, may be very sensitive to light and noise that is in their environment. And sometimes numbness and tingling, although that usually is less associated with the concussion and maybe more of a neck injury.

Cognitive issues, so people talk about feeling foggy, having trouble concentrating or remembering, or just being slowed in their thinking, and emotionally, again, you might see somebody who is much more expressive emotionally than usual. But oftentimes we see an irritability, and other times a sadness or a nervousness that occurs post injury. And, again, what we look at here is are these kinds of signs or symptoms more than what is usually expected from this particular individual. So it's very helpful for somebody that knows the individual to be a part of that process. And then sleep, so sleep is going to be impaired. Oftentimes because of the energy deficit in the brain we see them sleeping more. But there are other kids that have troubles falling asleep, and now they're sleeping less than usual, and that's creating its own issues. All of these, by the way, these signs and symptoms, many of the things I'm talking about, you'll be able to find on the CDC's newly reconstructed website for the Heads Up materials, and we'll show that in a minute.

So here is a slide that I think is very useful to show, why one of my colleagues says concussions are like snow flakes, there's no two that are alike. Here what you see in the recovery is a curve for a set of lines, really, and on the X axis you see the numbers 1 out to 40-plus, and that is the number of days to full recovery. And on the Y axis you see the percent of the total sample that is recovering. And what you can see in this particular case this is of a study that Dr. Collins did in Pittsburgh of 134 high school athletes with diagnosed concussions who were not allowed back onto the field once it was diagnosed and allowed out to full recovery. We had some kids within one week, about 40%, that recovered, but you could see some recovering as early as one day, others that took out to seven days, and then, again, about another 30%, or so, out to two weeks, another 10% out to three weeks, and so forth. So you see there's a fair amount of variability in terms of the time to recovery.

And then you also see that there are two lines, and that yellow line dips a little bit below the blue line and shows a group of kids that had one or more previous concussions, and it seems to take a little bit longer for them to recover as a group. So, again, what's important here is we must evaluate and manage each concussion individually. There is no simple prescription of the number of days to recovery although, obviously, we have group averages, but for the individual we have to monitor them carefully. And if we don't properly recognize and manage these concussions, what we see is significant risks that increase here to the youngsters. A player is more likely to be reinjured. That brain is more vulnerable now to injury.

Those second and third injuries then are more likely to be severe, meaning that the symptom burden is much higher and it takes longer for them to ultimately recover. It could cause permanent brain damage. There is such a thing called "second impact syndrome." Although it's very rare, there is the general view that you have an early injury, the brain is more vulnerable, you take that blow before the injury has fully recovered, and now that vulnerable brain engorges with blood, it squeezes down the brain, and it kills half the kids that have been recorded. The other half have permanent injury. So we want to be sure that we are protecting kids from either the catastrophic or the more prolonged injury problem. Also for the

athletes, these multiple injuries increase the risk that they may be retired from the sport, so we want to really do everything we can to properly recognize and manage these injuries to prevent these kinds of adverse effects.

So now I'm going to talk about the tools that can guide one's recognition of a suspected concussion. And this is where we talk about our Smartphone app. Again, it's a free app that is available on Apple, Android, Smart phones, and the whole idea here is for it to recognize -- help an individual to recognize a concussion. And we like to talk about you're looking for, really, two things; and you want to use your tools, Smartphone app, maybe that sticker. So number one, identify a suspected or a likely blow or force to the head or body. Now if you're a coach and you're on the field and you're watching a youngster, you can pretty much see that happen. Although, we like to also educate kids so that a teammate might recognize when their teammate takes a hard blow so they can let the coach know. But then the second thing that we pair with it is a change in that function and behavior.

And what our tools now do, whether it's the Smartphone app, or whether it's the clipboard sticker, it helps to guide us to remember what are the signs and symptoms we're looking for, and it's really the two together, the one plus two that then tells us, I suspect this injury, and then next is our response. So, again, think about using our tools. On the left-hand side, lower left, we see that that is an example of the clipboard sticker. It has the signs and symptom, as well as the Smartphone App, the concussion recognition and response Smartphone app.

Okay, once you suspect, next is your action. What do you do? So if you suspect, if you're in doubt that this youngster is right, you sit them out, you remove them from the sport. You protect them from further injury. And, of course, if you're a coach, you notify the parent. And for parents, you need to make sure that the youngster is medically evaluated. This is not an injury that we want anybody to be guessing about. We want a medical professional to be there to help and confirm the diagnosis and to put a proper treatment plan in place. And for approach, we want them to support recovery by telling the youngster, "listen, when you're ready to come back, we'll be happy to have you back, so get better and we'll see you when that happens." It's not to be saying, "We really need you back because the big game's coming," and pressuring someone to feel like they've got to be back there. That doesn't help a youngster in their recovery. And at the same time, you want parents to really help support by providing the proper conditions, and we'll talk a little bit more about that in a minute, in terms of the kinds of treatments that we can put in place.

On the clinical side of things, what are the things that the medical profession can use? And so here we want in our clinical exam to put in place a protocol that is going to standardly assess the injury characteristics, the history and risk factors, and then do a thorough functional assessment of symptoms, of cognitive functioning and balance. And so we developed the Acute Concussion Evaluation as a protocol to go through that, and also, there's available the Sport Concussion Assessment Tool, which is now in its third revision that has come out of our international concussion conferences. So there's some good tools available to the clinician for that early evaluation.

The essential elements here of this assessment and management; number one, we want to be sure that we are recognizing the functional difference, and so as we are evaluating and asking the youngster, it's very important that we ask them or their parent, are they different than usual. Lots of us can have sleep problems, can be worried about something, may have some troubles concentrating on certain days, but is this more than usual? And, really, being able to detect reliably that that change is out of the typical range of that individual's functioning.

We want to make sure we are assessing all four symptom categories, the cognitive, the physical, the emotional, and the sleep. It's not good enough just to ask if you have headaches and maybe a little memory problem. We've really got to go through a thorough symptom assessment. And then the key, especially as we're looking for recovery, is monitoring those symptoms over time, making sure that we are really identifying real change over time. But also noting if there's a persistence of symptoms that may require us to put a different intervention in place, a more active intervention in place.

You'll see in a few minutes, we've developed a care plan that's part of the CDC Heads Up toolkit to help guide recovery, to educate teachers and parents, and even the sport personnel to what they can and not do to assist recovery, and then following and making sure that we're detecting positive reliable change back to normal or usual functioning. And this becomes really important, because we want to be sure that we put in place the right kinds of treatments and that we are erring on the side of caution, but also making sure that that youngster is truly back to their baseline levels.

Now when someone has symptoms that persist beyond two weeks, we do get concerned, and that's when we want to look to refer them. They might have headaches that need a more specific treatment plan. They might have cognitive difficulties or emotional difficulties. They may have dizziness or balance problems that require more active intervention, and, again, we'll talk a little bit more about that.

So I'm interested in knowing from the group if -- obviously prior to this webinar -- you have received explicit training in your field in terms of the assessment and diagnosis of concussion in youth. Okay. So interesting. It looks like about three-quarters of you have not had explicit training, so it is great that you're here today. There are a number of opportunities, and depending, of course, on where you are to get this kind of training, and, again, I'm going to review some of the tools, and I think it's very, very helpful to grab these tool, which you will see, are files that we have put associated with this webinar, including the acute concussion evaluation, the care plan. I've even got some article that is I've written that review it. So on the one hand it's nice to see that 25% of you have been trained. I'd like to see a hundred percent of us in the very near future.

So here's some of the materials. So this heads up brain injury practice, as we say is the historical source. In 2007 Dr. Micky Collins and I were two co-authors with Dr. Jean Langlois at the CDC. And we helped to revise the toolkit for medical providers, for health-care providers to diagnose and manage. And this was the cover of the book back then. It's been updated now to the 2015 materials. And you'll see the Heads Up to Health-care Providers.

This is the web page right here. There's an online concussion training course. It's about a 45-minute training that, again, goes through some of the things we're talking about today, but also gives you a little bit more information on signs, symptoms, and management. Again, you'll see the tools for provider, including, concussion evaluation our ACE care plan, and then some of the other kinds of handouts that you can give. Some discharge instructions; this is for those in the acute medical field, you know, things you can hand out to your patients coming out of the emergency department, or even on the field. If you're somebody that is a coach, these instructions can be very helpful to guide that family in the first few hours as to what they should be doing. And then the return-to-play protocol, how do you manage someone in their return to play?

And so we've got the tools for provider's page here, and we're going to go into some of these materials. So here's the Acute Concussion Evaluation the ACE. Now we started developing this back in 2004, realizing that there had not been a standardized protocol of questions for providers to ask. And so the whole idea here was approve that early diagnosis and help guide management, but also from the public health perspective, let's identify this and understand how much mild TBI is out there. We need to know that in order to put good prevention programs in place.

And so we also modified a version of this for the emergency department, and on the left-hand side is the emergency department version. It's a bit more of a condensed version, because in the emergency department, really, the purpose is to get that initial information about the injury and the primary signs and symptoms. A little less about the history, although we've got some history built into that. And then the primary care system has the full acute concussion evaluation, and I'm going to go through that in a little bit more detail.

So it's a clinical protocol is to assist in the diagnosis of mild TBI or concussion, again, in both the emergency and pediatric office setting. Although, I will say, if you're a psychologist or a social worker and you have a patient that comes into your office and you're suspicious that maybe there is a case of a mild TBI or concussion, you can pull this out and use it as well to help guide you through the questions you

want to be asking. The ACE was built for basically ages four through adults. We included the elements that had some research behind them, and, again, we link to follow-up care with the ACE care plan. So the patient, or potentially if you have a younger child, the parent can be the reporter of the signs and symptoms. And you see that we assess for the four category of symptoms, 22 symptoms, and in our study in 2008 that we published in the "Journal of Head Trauma Rehabilitation," with 354 patients, the length of time to complete this was about five minutes. So it's not an exceedingly long process by any stretch of the imagination.

The key elements here, define the injury characteristics, assess for those 22 symptoms, identify the risk factors for prolonged recovery, and then if you're seeing somebody acutely, you want to assess for the red flags or the danger signs for neurologic deterioration that would send somebody to the emergency department right away. We want to establish that diagnosis, you know, do they have those injury characteristics. Do they have those signs and symptoms. Let's make sure we put the proper diagnosis down, and then, again, that follow-up plan using the ACE care plan. So those are the key elements. And here we are walking through it.

So the injury characteristic, just to remind you that timeline that I showed you, injury characteristics was that centerpiece there. And here you can see you're describing the injury, you're indicating whether there's evidence of forcible blow to the head, and then we're going through the kinds of questions; where did it happen, what part of the head, and you can just have them point it. You can just check off whether it's the right temporal region or frontal or posterior. The cause; was it a motor vehicle collision? Did somebody get struck by a car. Was there a fall, an assault, sports-related injury, or some other kind of reason.

And then you go through the amnesias and the loss of consciousness. For the amnesias you're asking the question of the individual are there any events just before the injury that you do not remember, and so you don't have to say, "Did you have retrograde amnesia." They won't know what you mean. Any events just prior to the injury that you cannot remember, it's kind of like a blank spot in your memory. And you ask the same thing about events after the injury.

And then usually with the reporter you might ask, you know, is there any evidence of these early signs, because these are the things that someone else would have observed, as opposed to the action themselves. And then you can ask about seizures as well. Although that's pretty infrequent. We find that less than 2% of individuals have anything resembling a seizure with a mild TBI.

We then go through the symptom checklist. And now for the ACE we just ask is it present or is it not present, zero or one, any more than usual, and you can go through these ten physical signs, the four cognitive signs, the four emotional signs, and then the four sleep signs.

We then ask the question, "Do these symptoms seem to worsen as you're doing more physical activity," you know, somebody walking up the steps, if you're jumping around a little bit, or with cognitive activity, when you're reading, when you're trying to concentrate on things. And then we ask the person or the parent to rate how different do you feel from your normal self. And that just kind of gives a global impression of how they're doing in their post-concussive state. So that gives us kind of a good functional symptom assessment. And here is just an example of how you might fill this out, circling the symptoms that are reported and totaling up the subcategories here, and then eventually you'll see the total score that you can generate. And you can use this, then, to track somebody over time, and again, demonstrate whether they are improving, or not, in their symptom presentation.

Again, the risk factors for protracted recovery, you want to ask about concussion history, how many they've had, what was the longest symptom duration. It's very important to also note the timing or the spacing of those injuries. I am most concerned when there have been more than one injury within the period of 6 to 12 months. You know, if somebody is 14 and had an injury at age 4, at age 8 and now that age 14, that's three injuries and we need to pay attention to that. But there they're spaced out, and chances are, based on your interview of course, you want to know have they recovered from those injuries. And today is this a new injury or is this something that is, you know, kind of continuing from the

previous injury. If somebody had an injury, say, you know, in April of this year, they had an injury back in January of this year, I am going to be much more cautious in how I manage that injury, because of the concern about the potential of overlap.

We want to know if they have a headache history. You know, and particularly chronic headache like migraines, and a family history of that. It seems that their own personal history or family history of headache seems to contribute to longer multiple track recovery. Developmental disabilities, such as learning disabilities, ADHD, here now we have conditions where the brain is a little bit different in its processing of information, and it seems like the injury, together with that, can sometimes take longer to recover. And then the psychiatric history, anxiety, depression, or even problems with sleep seem to have, again, this interaction where it takes longer to recover. So those are the important risk factors that we want to be including in our assessment and are part of the ACE.

What you'll see next are the red flags, and these are just reminder of things you want to watch for in your evaluation. Now usually these kinds of things are not going to be seen 24 to 48 hours after the injury. I mean these are usually more acute kinds of problems that would send you back to the emergency room right away, such as headaches that just continue to worsen and worsen with no good reason for that; seizures; increased in confusion or irritability, slurred speech, and those are the kinds of things you want to send back the to the emergency room right away, because there is a possibility of some swelling, possibility a bleed. But, again, usually after 24 to 48 hours you're not going to see these kinds of things. But when in doubt, seek medical care. So we want to be sure of these things.

And then the diagnosis, this is the CDC saying, "Please use the proper ICD codes." So we were sure to put these on the forms. And it's the 850 concussion diagnosis. We can go in and we can see the actual criteria. Positive injury description with evidence of forcible direct/indirect blow to the head, evidence of active symptom related to the trauma, no evidence of loss of consciousness, no skull fracture or intercranial injury. Those would be the criteria for 850.0, which is concussion; no loss of consciousness, and then of course, with loss of consciousness it becomes an 851. If you don't have that information, it might be unspecified. And then 854 is intercranial injury and usually is moving up in terms of moderate or severe traumatic brain injury, and then our follow-up plan.

And, again, for the health-care providers, we strongly encourage a regular reassessment and monitoring of symptoms to track how that youngster is doing over time. And so now we want to think about our care plan here, linking diagnosis to treatment. And so we've got the ACE care plan, and, here, what we have is something that whose purpose is to really to education someone about their recovery, making sure that they understand that they cannot overdo it when they're recovering. The brain may not be able to support your regular activities; physical, cognitive, and emotional. So we really want a guide and manage their activity and be safe.

We give some guides in terms of how they should be returning to daily activities, and we talk about, on the one hand, getting lots of rest, but also to manage their physical and cognitive activity such that they don't worsen their symptoms, and as the symptoms decrease, then what you do is gradually increase your activity level, bringing yourself back to normal, but making sure that there is no re-injury during that recovery period.

Returning to school, I want to talk a little bit more about this in a few minutes here. But we give some guidance about what the school should know, the kinds of things they should look for, and then we give a variety of recommendations for accommodations to allow that youngster to have an effective return to school. And then for those who are working, are there certain safe safety requirements or certain accommodations one wants to make because they may not have the same kind of stamina, they may have headaches that interfere, their concentration may be more of a challenge. So how do we manage kind of their work across the day, you know, possibly putting rest breaks in or other things in to allow them to be somewhat productive, but also not doing things that would be dangerous, such as drive or using equipment that, you know, could be dangerous, or climbing or other kinds of things like that.

Neuropsychological testing: So what we know is that this injury produces an impairment of neuropsychological function. That's a kind of brain-related behavior and cognitive function. But tension, memory, speed, [indiscernible] function, emotional response, these are all reasonably common impairments associated with this injury. And so a neuropsychological assessment can really help to provide a measurable information about how that youngster or that adult is doing functionally. But it's very important to recognize, and this is where the clinical art comes in, to understand what is concussion-related and what might not be concussion related but possibly something someone brings in prior to that, and many times these things interact, on somebody that tends to be more depressed, you know, and now I have this injury, can really feel a lot more depressed. And so, you know, what we know is that our target is to get them back, dare I say, to their typical depression, it's not solving all their depression just post-injury. So it's all about how we understand the history, combined with that injury to treat and manage. Also, it's important to recognize -- particularly in the sports world -- so baseline testing has now become a common kind of occurrence -- is that these kinds of test findings are one tool in the toolkit, as they say, one element of a multidimensional, multidisciplinary model of understanding brain injury. Because somebody passes a test, meaning that their scores post-injury are the same as their pre-injury test scores doesn't mean that they're necessarily recovered. We still have to look at symptoms and lots of other functional problems.

It's also very important that one is trained in how to administer these tests, especially with kids, so that we get valid testing. So many times -- I shouldn't say many times -- sometimes someone is put into a room with 25 other kids and someone who is proctoring the test is not familiar with the test, doesn't have training in the administration of neuropsychological tests, and that now is likely to result in invalid findings. So it's very important that proper administration is followed and someone is trained to do that. And then interpreting the results, these are complicated injuries, as we've talked about here. And the results of the testing is not as simple as the score equals pre-injury score. There's a lot of factors that's going to be interpreting these testing, so it requires, really, a higher level of expertise.

So we're going to move into the treatment side of this as we sort of move toward our final stage of our webinar here. I want you to respond to this question or this statement. Rest is the best medicine to treat concussion. This is great. This is like watching a horse race. As I watch the results come through, it's like the bars moving in various ways.

The race to the finish.

The race to the finish, yes. So it looks like we're just about done with our responses. So, interestingly, it looks like about 90% of the group says true, rest is the best medicine to treat concussion. All right, let's go in and talk about that. So what I'm going to do is to suggest that rest may be useful at a certain stage of the recovery, but we're starting to now evolve in our process of management here. So let's talk about the new management strategies. We are very much proponents of active rehabilitation. My early history was actually working with kids with more severe brain injuries, and part of that process was really to get those kids into a normalizing environment, doing the social kinds of things, the cognitive kinds of thing, the physical kinds of things they could do, but knowing they had some impairments and working to improve and rehabilitate those kinds of deficits.

Concussion is not all that different. But in terms of the general principles, number one, we want to make sure, as you've heard me say several times, no additional forces to the head or brain, as it's more vulnerable. Number two, we want to initially rest the brain over a matter of a few days and definitely get good night sleeps throughout the entire stage of recovery. But we then want to introduce more of this individualized and a moderated and monitored symptom management plan, where we gradually increase the amount of activity that the individual can tolerate while reducing the amount of rest time. And so what I talk with my families and patients about is we want to find that sweet spot. We want to know how much activity can I handle such that it doesn't significantly worsen my symptoms. And so I teach the not too much not too little principle. I don't want you to do too much that it worsens your symptoms, but I don't want you to do too little, such that now you're bored and now you're inactive, and some other kinds of problems begin to emerge. So it's that plan of graduated physical and cognitive exertion or activity.

And let me indicate there are three ways that we can exert, or that we can over-exert; physically, running, running, running, and, oh, my God, my head. I'm tired. I'm dizzy. Cognitively; you know, I'm studying five hours a night. I'm going all the way through school six hours a day without taking any kind of breaks. But emotional stress is also an exertional activity. It takes a lot of energy. So we want to make sure we help kids manage that emotional piece to their recovery as well, because that can also interfere with recovery if we're consuming a lot of energy because of stress.

So we have been putting together what we call now what we call now, the progressive activities of control or exertion, or the piece model of recovery as we help kids recover. Number one, setting a positive foundation of recovery. I tell every kid that walks into my clinic, "You are going to get better, and I can tell you are going to get better. What I can't tell you is the exact timing of it is," but I say -- and then we go into the next stage, we're going to figure out what you do during the day, how much you can do, and what your limits are, and we're going to teach you how to monitor and manage your activity so that it doesn't worsen your symptoms. But we are also going to bring you up to the level that you can handle. So, again, the not too much, not too little principle. And then as the individual is getting better, we're going to reinforce the fact that they're really showing some good positive recovery. So, again, it's that activity, rest, management system. In fact, I even started to use the word "rest" less so and say we're going to manage your activity.

So there was a study published in the Journal of Athletic Training, now, 2008, where it looked at the activity levels and symptoms and cognitive functioning, and what they found -- this is the Majewski Study -- is that people that were doing a lot of activity, but also people that were doing very little activity. It was those two groups seem to do work in their cognitive recovery, whereas as those who did more of a moderate amount seemed to do better in their cognitive recovery. So this, again, it was an observational study. It was a chart-review study, so it was not the most controlled study, but it was a good start and suggested that maybe we should look into this not-too-little not-too-much principle further.

So we have been teaching kids to pay attention to when their symptoms worsen or the exertional effect. And we care about that because we, first of all, it hurts when your headache worsens. It's hard when you can't concentrate on your activity. So we see that as a possible signal that the brain, again, that neurometabolic system, chemical, electrochemical system, is not able to support the level of activity that that you're doing. It's being pushed beyond it's tolerable limits. And the child's sensitivity to that, symptom worsening is maybe an indicator of their injury and recovery status. So we see that as a possible target now for us to in the recovery process as we help them progress through with their activities.

So we use a tool we call the "exertional effects rating scale," and we use it to basically help teach a youngster when their symptoms are worsening. And so when they come into clinic and they do some testing, we actually, ahead of the testing, ask them to rate these four symptoms. And then after the testing, we ask them to rate the symptoms, and we can look at the amount of change that has occurred. And so I'm just showing you that the way that we use this and the way that it's recorded, and you can see that in this particular case there's been an increase in all four of those symptoms, and we can actually sum that up into what we call the "exertional effects index." In this case it's a 12.

Well we've done some studies where we've looked at kids in their recovery. And what you can see is that their first visit, which is usually somewhere between 10 to 14 days, there exertional effects score is high, and it begins to improve over time across those three visits. You'll see, though, on the right-hand side, that .52 is the score of uninjured individuals, and so you can see that in this particular sample the kids had not come back to what would be the typical range.

I also want to give a little bit of background to why -- the question as to whether rest is the best medicine, or maybe I should say the only medicine for recovery. And the argument that's beginning to emerge is that rest is not the only and should not be the sole focus of our treatment for concussion. And the reason for that is that there's some compelling evidence that it becomes an adverse effect in other kind of health conditions. It may worsen depression. It may contribute to chronic fatigue. And so the issue here is that

too much rest may be harmful, and so we want to think about, again, gradually resuming activities that can be tolerated, meaning that they don't worsen our symptom over time.

Also, there's some good work that's been looking at supervised exercise after -- you know, if somebody is two to three weeks out post-injury and are feeling symptoms, really start to activate them, and we'll talk about that in a minute.

So this is a study that was just published about three months ago by Danny Thomas up at Medical College of Wisconsin. And here what they were interested in looking at is kids who came into the emergency department were either assigned to one of two groups randomly. You're going to have rest for just two days or you're going to have rest for five days. And the hypothesis was that the kids that would rest for five days would actually do better in their recovery. As it turns out, that five-day group, the strict rest group, offered no added benefit in terms of the improvement. And, in fact, adolescents actually reported that there they had more symptoms and it took them longer to recover when they had five days of rest rather than two days of rest.

So the point here is that there are going to be some limits in terms of the benefits of strict rest, and we have to be very well aware of that. I mentioned again this aerobic or physical rehabilitation, and this is something that Isabelle Gagnon out of the of the Montreal Children's Hospital published a paper five years ago, and now is actively studying. When they start to put a structured and monitored exercise program in place that is a progressive controlled exercise program, again, where the youngster does not go beyond their symptom tolerances.

There's also another program that Barry Willett and John Letty out of the University of Buffalo have going that is very similar. It's progressing somewhat and showing some nice benefits. So in our clinical program, if somebody is now not progressing after two to three weeks, we start to activate them physically with this progressive physical activity program. So there's some new things to be done in a more active way that I think are important.

All right, return to school. So let's ask polling question number seven, students should not be sent back to school when they are symptomatic, true or false? Okay, looking at our -- it's sort of a 50/50 split. All right, this is great. That means that we've got some good debate that could be going on should this be a live audience. So let's look at what the evidence is. Well actually I will tell you there's not a whole lot of evidence right now but there's some general thinking, and we've written some papers, and I believe one of those papers is in your files that you can access.

So here, this is some really nice work done by DVBC and this Parents' Guide to Returning Your Child to School After Concussion is a really nice guide that a parent should really read. And I would argue that health-care providers should really guide the parent with. And the simple statement I would like to make is that it is okay to send a child back to school when they're symptomatic, as long as the school is prepared to receive them and support them, and that's what we're going to talk about.

So in this you can see that we reviewed the signs and symptoms, how a parent can support their youngster through recovery, what they can do to return them to school, and what happens when kids have longer recovery times. So it's a really nice resource. And we talk about the stages of return in school, and so the DVBC handout and then our journal of Child Neurology article, we actually that has just been published this year, actually goes through the gradual stages of recovery and how we want to help somebody return back. In this case, we talk about three general stages, kind of the rest stage, which is really those first few days, and then getting somebody up, getting them ready, starting to reenter them into school, maybe on a partial day and then a full day, but building important accommodations along the way.

Making sure that medical providers are assessing, again, the symptom profile of communicating that to the school, making sure that your child's teacher and the school knows what kinds of accommodations can support the youngster. For example, if somebody tends to get headaches after about 20 minutes of

concentrating in school, well let's break up the day so that they work for 20 minutes, they take a rest break for, say, 15, 20 minute, then they come back, and they reenter.

We talk about the expectations, that if someone is having some pretty significant symptoms, then the expectations for productivity ought to be lower during that time period. And then we just increase those expectations as the individual is making a better recovery. So all these kinds of issues are, I think, critical for us to think about as we're supporting the return.

And so this is a very nice chart that looks at the kind of symptoms and the kind of problem and how it might manifest in the elementary school, and the kinds of supports that you can give someone. So, for example, if you've got dizziness or balance problems or headaches, you know, you might give them preferential seating in a classroom. You might give them a break. You might allow them to wear sunglasses because the light is really affecting them. Some cognitive problems, you might give them extra time or reduce the homework demand. You might have someone take notes for them. In other words, there's a variety of things you can do to support the youngster to engage them in their academic program, but not with the same level of demand as they're recovering.

We also have the CDC's Head Ups up to School; Know Your Concussion ABCs, which, again, also go through a variety of kinds of issues -- and I'm just going to kind of open these up -- where you can see that it helps to educate the individual as to how does this affect learning. What can we do to support the youngster? What kinds of problems might someone have? What are the kinds of accommodations and strategies that we can put in place? Those are very important.

I'm going to just show you this last -- we have a few more slides, and then I want to get to questions here. We've done some work. We actually are publishing a study next month in Pediatrics, where we looked at this group of kids that came into our clinic with concussions, and asked them about the kinds of problems that they had. And you can see the high percentage of both high school and -- actually we have middle school is that first group, 66% that show headaches are interfering, and at the high school it was 68%. 54% saying they're too tired, too fatigued; 58% of the high school, and so forth. So these are things that obviously are going to adversely affect one's ability to perform in school, and we need to accommodate them so that they can properly handle the demands.

So there's some literature, as I mentioned. That Ransom, et al., article is one that I mentioned coming out in Pediatrics next month. We have included in your articles -- or in your attachments to this webinar "Our School and the Concussed Youth" article, and then there's the American Academy of Pediatrics article on sport-related concussion as well.

Here's that gradual return to school chart that I mentioned that's part of our journal of child neurology article, and you can see that we basically walk you through stages the first few days at home, where you're not returning, and then partial day, and then a full day with maximal supports, and then you begin to wean those out over time. We talk about the kinds of activities, the kinds of expectations, and the kinds of criteria that would allow you to move to the next stage. So, again, we find that if you can gradually improve or support that allows the person to gradually improve over time.

Heading back to sports; so it's very important that we realize that you cannot come back out onto the field until you no longer have any symptoms or medications that help your symptoms, so if you're taking medicines for headaches, that medicine's got to be gone; that your cognitive functioning, your balance is back to normal. Again, we think a formal assessment of this is important. And then you have that clearance by a medical professional to start to gradually return back, and we have a whole gradual protocol where you begin to increase your activity, your movement, and then eventually, if you're in a controlled contact sport, you take some controlled contact to make sure you can handle that. If no symptoms occur after going through that full gradual protocol, that is our best way of understanding your recovery at that point and allowing you to go back.

Now with kids -- and by "kids," I mean youth below the high school level, but even high school -- we're going to be fairly conservative. If there's any evidence that that youngster has symptoms, we're going to

hold off on putting them back out on the field. And ideally you would have a certified athletic trainer that could help guide that recovery, but that's not always possible, so the medical practitioner needs to work with parent and coach and monitor that carefully.

So let's just say, if you leave today, how are you going to remember all this information? Where can you go? So we've got our cdc.gov concussion website where you can get all the Head's Up materials for high school youth sports, for the medical provider, and for school. So that's a very, very good website for you to go to. And, again, we've got information for parents and coaches. We've got, for the medical providers and the school personnel, we've got clipboard that you can get. You have pocket cards you can get. So there's lots of good materials available to you.

Okay, our final polling question, I am very familiar with my state's youth concussion law, yes or no? Okay, so what I can see is about three quarters of us are not as familiar, not familiar or very familiar with your state youth concussion law. So depending on where you are, I would Google your state and put in "youth concussion law" and pull that up. But there are three basic premises to this, to these laws, and it's important that we know. So the laws are basically developed to make sure that we educate people about concussions, okay? So the first core principle is that coaches learn to recognize and respond, and, again, that's where we have all of our CDC materials, good stuff there. Number two principle is that you must move and protect the youngster that is suspected of a concussion. So when in doubt, you sit them out. And number three, it requires medical clearance in order for youth to return to play. So the youth concussion laws are really meant to identify the problem better and then manage it and not allow return back until they are safe to do so. So very important.

And as you can see from this one map here, all 50 states and D.C. now have concussion laws, and they passed them in lightning speed, in quick time, in, literally, I think it was a five-year period. So I'm really proud to see that happen. So let's finalize by understanding the myths and truths surrounding concussions. I'm going to ask you to respond with a truth or a myth. Concussion requires loss of consciousness? That's a truth or a myth? Go ahead and respond to that. My state has a law promoting concussion recognition and the response in sports, and then a student shouldn't return to school until fully asymptomatic? The only way to recover from a concussion is to eliminate the screens and rest. Students with concussions frequently report multiple areas of difficulty with learning, and only medical professionals can identify a suspected concussion. Okay, good job on the voting there. And we definitely have moved to the majority of folks really having good -- identifying both the truth and the myth.

Okay, so we want to move on to our last questions. Football is responsible for the majority of concussions in sports. A CT or MRI is important in the diagnosis of concussion. Well this is the state of Maryland, but in any state, only a physician can clear an athlete to return to play. Recovery from a concussion is bested accomplished by a balance of moderated activity and rest breaks, and baseline testing is necessary for the treatment and management of concussion. I realize that I didn't touch on a few of those points. I will tell you real quickly, football is not responsible for the majority, although it tends to be a higher incidence as a sport, but if you put all sports together, football is only a certain percentage, a small percentage.

CT or MRI is not necessary for the diagnosis of concussion. They identify hardware problems. And as we said, the problem with concussion is more of a software problem. Actually, it varies from state to state as to who can clear an athlete. And I would definitely recommend that you check your state to know that. And then, yes, the recovery, we've already talked about the balance of moderated activity. And baseline testing is necessary for the treatment and management of concussion. Actually, I haven't talked about that, but that is not necessarily the case if you know what you're doing with this injury, but it can be a big benefit if you have it, but it's not a necessary condition. So, great job folks, really nice responses there. And what we're going to do is have time to take a few questions to respond to, so.

Thank you, Dr. Gioia. That was actually an awesome presentation and a lot of great information for all the providers and everybody on this webinar today. Definitely loved a lot of the videos, sir, so thank you very much for your presentation. If you have any questions for our presenter, please submit them now via the question-and-answer pod. It is now time to answer some questions from the audience. If you

have not already done so, you may submit them in the question-and-answer pod located on your screen. We will respond to as many questions as possible, and I already have some, sir, as they were coming in as you were presenting. The first one that I have is "When should a parent seek a 504 plan to return their child to school?"

Yeah, so a 504 plan, you know, is usually something that schools are willing to do when the problem is persisting for a period of time. Now I say that somewhat generically. And state by state and school district by school district will vary. But generally speaking, my experience is that school districts don't want to put a 504 plan in unless the youngster is three or four weeks since their injury and they're not getting or they still need the support. They then want to put that in place.

I will tell you that because we use the ACE care plan in our clinic, that serves as almost a quasi 504 plan, because it details after every visit what kinds of accommodations we are recommending. So by using the ACE care plan we tend to have less of a need for a 504 plan. But, again, I've shared with you my general experience.

Okay, thank you, sir. "What tools do you use to diagnose children under the age of four years old?"

Yeah, so that's a great -- you know, the same principles apply, you know, where, again, blow to the head, signs and symptoms. But obviously the ability of the child to report those symptoms is going to be substantially reduced, and so what we do is we really rely on the parent to tell us what's different about your child or what's not different about your child since they took that blow. So it really now becomes an issue of parent observation and report more than anything. But, again, you can go through the signs and symptoms for those things that may apply to a preschooler and ask the parent to respond to those. That's the best we have at this point.

Awesome. Thank you, sir. And the next question is, "Is a child who has a mental illness more susceptible to prolonged symptoms?"

It seems that that is the case. Kids with anxiety and -- well let me just say this, when we studied adults, there's not so much research in kids. When we studied adults, those with anxiety and depression seem to take longer to recover. General experience with adolescents is that that same principle applies, but I can't say that we've had the controlled studies. But we do see that as a possible risk factor, and so we do watch out for that.

Okay, thank you. And then this will be my last question. "How do you define what a full recovery is?"

Hmm, so a full recovery, as we kind of had that one slide that may have flashed by a little too quickly, is that we basically look to see if functionally things are back to normal. In other words, are you cognitively able to think and act and perform on testing and school, at work as you normally do? Are the headaches, the fatigue, the symptoms of light, are the symptoms basically gone or back to their typical states, any problems with balance, you know, dizziness? Are those basically gone? So we're using those kind of functional indicators.

At this point there's a lot of research going on, looking to see if there's some way our advanced imaging through MRI might be able to help also with that question, but that's still in the research phase and really doesn't provide us with any information. But, again, the other part that we do in athletics -- and we even do it outside of athletics -- is we start to push the kid some. You know, to get you physically activated, you know, start to get your metabolism running. Let's get you back to your normal school activity, and does that produce any symptoms, and if it doesn't, again, that's telling us that the brain and the body seem to be able to handle normal activity without any symptoms. That's our best definition right now of recovery.

Thank you. Very good answer, sir. After the webinar, please visit [dcoe.cds.pesgce.com](http://dcoe.cds.pesgce.com) to complete the online CE evaluation and download or print your CE certificate or certificate of attendance. The online CE evaluation will be open through Thursday, April 23rd, 2015. To help us improve future webinars, we

encourage you to complete the feedback tool that will open in a separate browser on your computer. To access the presentation and resource list for this webinar, you may download them from the files pod on the screen or at the DVBIC website. An audio recording and edited transcript of the closed captioning will be posted to that link in approximately one week.

The chat function will remain open for an additional ten minutes after the conclusion of the webinar to permit attendees to continue to network with each other. The next DCoE Psychological Health Webinar, "How Child [indiscernible] and Impacts Development Implications for Clinical Practice is scheduled for April 30th, 2015, from 1300 to 1430, 1:00 to 2:30 p.m. The next DCOE TBR webinar topic, "Impact of Caregiver Stress" is scheduled for May 14th, 2015 from 1:00 to 2:30 p.m. Eastern Time.

Thank you again for attending and thank you, Dr. Gioia, for having such a great presentation today, and have a great day.