

**CHRIS MILES:** Good evening, everybody. I'm Chris Miles. I am a faculty member in the family medicine department over at Wake Forest Baptist Health. I'm also the associate director of Sports Medicine Fellowship at Baptist.

And as part of that, I get to serve as the head primary care team physician for Wake Forest athletics. And allows me to spend a lot of time with athletes of all shapes and sizes and sports choice. And some of the things we're going to talk about today will have a football focus, but I want you to hear that these issues can happen in any sport.

And that was brought to light just yesterday as we spine boarded one of our basketball players during basketball practice. And so there's a big focus to football tonight, but I do think this is applicable to any and all of the sports. Before I get started, I do want to say thank you to Mr. [INAUDIBLE] and the rest of the Children's Institute for the help with putting this thing on.

It's just an awesome opportunity and I love to see so many faces here. Hopefully, you guys will get some knowledge that you'll be able to take with you. And again, use that to keep our student athletes safe. That's the big goal.

So let's see here. Very good. So I don't have any financial disclosures. With all due respect to Tar Heels in the room, I am proud to be a Deacon. And that's something that I will forever be, I think. Good.

So the objectives today. What are we going to try do? Well, we're going to define concussion.

And my hope is this is a review for you guys. I hope that there's been enough concussion discussion over the last few years that most everything you hear today is a review. And that you say, yeah, knew that. And I'll say, great.

That's exactly what we want. If there's anything that you take home that's just an added benefit. So we'll define the concussion. We're going to talk about evaluation techniques.

What do I do to determine if somebody has a concussion? We'll give you some of those skills. We'll talk about when do we recommend that people get transported to the emergency department because I think that's a big issue. When is it safe for a student athlete to go home with their parents and when do they maybe need to go and get some further evaluation?

And we'll also discuss imaging. When do we determine if somebody needs imaging once they get to the emergency department? And then last but not least, we'll talk about how do we get people back safely onto the playing surface when they're ready.

So concussions. This is-- anybody know where that is? Any extra credit for somebody that can tell me where that is?

So that's Zurich. Anybody say Zurich? I didn't-- all right. Well, you get an extra crispy dessert thing back there.

So over the last about 10 years, there have been several different consortiums that get together. And they're neat places like Prague and Zurich. And I'm holding out that Winston-Salem is going to make the list because I think we could find a picture that rivals that. But for now we've got to go with what they're doing. The Zurich Concussion Consensus Guidelines is where much of this comes from.

So what is a concussion? It's a complex pathophysiologic process that's induced by traumatic biomechanical forces. And that's a bunch of big words to say that it's basically the stunning or the disruption of the function of neurons or the brain cells. So the brain gets some force, whether it's a direct blow to the head or a rotation force or somebody gets spun to the ground that causes that brain inside the skull to move and to cause those neurons to lose their function. So it's that stunning of those functions that is the definition of a concussion.

Now it's important to note that it's not always a head-to-head blow. It's not always a head to the ground blow. That it can be in that rotational force.

So it doesn't have to be one of these big hits that he was mentioning earlier. It can be something as simple as getting spun around that can lead to this. In general, very rapid onset of symptoms with a delayed and a progression of the loss of those symptoms. In general, these spontaneously resolved.

Now we do have prolonged cases and what we call post-concussive syndrome. But in general, a concussion is going to resolve in a very systematic way. The thing that makes this a little bit unique and it makes it a little bit harder for us in sports medicine is that in general, there aren't any imaging tests that we can do to say, yep, you've got a concussion.

Now that's changing a little bit. And I think as research progresses, you'll find that maybe we do have some of these fancier MRIs and functional MRIs and things that can be done. But for right now, if somebody gets a CT scan or a standard MRI you should see absolutely no pathology in the brain to consider it a concussion.

I always tell this little anecdote. When I was back-- I was a team physician in Illinois. And we had a young man who had gone to the emergency room after a game. His parents had taken him.

We didn't know that he had had any problems. And the parents took him to the ER and the coach called me and said, well, they went to the ER and he had a CT scan. And they didn't find anything.

And the coach says and that explains why this kid can never remember why he can't remember his plays because they didn't find anything inside his head. I said no, coach, I think what they meant was they didn't find any pathology. And that's a good thing. So the take home there is if you get an MRI or you get a CT scan you should see a very normal brain if it's truly just a concussion.

And then last but not least, in that definition is the graded clinical symptoms. And that's what we'll talk a little bit about as we move on.

So what are we doing to kind of help with the diagnosis? This is just some of the newer things that are coming out. Not so new, I guess, in terms of the helmet systems.

Anybody involved in any of the studies that are going on through our biomedical engineering department? Yeah. So some of the schools locally and some of the youth leagues are being fitted with these helmet sensors. And we think that there may be something to that, using the sensor to tell us how much force is the brain taking at any given time.

We will see how that plays out. Right now, there's a big disparity. Some people can get some really, really significant 10, 12, 13, 14, 15g blows and have no symptoms and some people are coming back with much, much less than that and having symptoms. And so we're still trying to get to the root of what to look for with that. But I do think that that's some technology that's coming down the pipe.

And then this next picture as you guys probably recognized is taken from our press box here. And the ACC last year, as well as the other five power conferences, started something that they call the medical observer. And that's putting a trained professional, whether that's an athletic trainer or a physician, in the press box to watch specifically for injuries. And the ACC has continued that. This year it's got a little bit different complexion this year in that each institution is going to be supplying one observer for both teams.

But it does. It's another set of eyes that can look and see if somebody is acting a little bit differently on the field or gets up after a hit and stumbles a little bit to help us that may not see that on the sideline identify those potential injuries.

So this doesn't project greatly, but I think you can get the idea. This is what is called the SCAT3 form. And the SCAT3, it's available online. It's public domain. If you just go to your favorite search engine and type in SCAT3 this PDF will pull up.

And this is what we use both at the high school level, as well as at the collegiate level to help us diagnose a concussion. And what all is on this form on the left side as you look at it are some history questions about learning disability, headache syndromes, those kinds of things. And then the section with all the numbers here is symptom score.

And I would contend that if anybody in this room has a student athlete after a suspected head injury that has anything but zeros on there I would treat that as a concussion. Let us try to decide and tease out whether it really is. But I think the take home for me is if you ask somebody if they have any of these particular symptoms-- headache, dizziness, nausea, confusion, memory problems, a whole slew of those-- if they say yes to any of those I think it's safe for you guys to say we need to have you evaluated for a concussion.

The right side of that screen are the objective things that we'll do. Some questions about mentation. Some memory things. Some balance things that we'll go over. And this kind of helps us. This is some of the objective data that we'll use to determine if somebody truly does.

So does anybody practice the balance error scoring system or ever seen this in practice? Yeah. Good. So we have kind of a few things that we look at.

We look at cognition. So what is their mentation like? We look at their balance. And then we look at their vestibular system. And we'll talk about that in a little bit.

But this balance error scoring system is something that we've used over probably about the last 8 or 9 years. Similar to when somebody is being investigated for driving under the influence we know that if the brain's not working right with the balance center that people are going to be a little bit wobbly. And so we use that to determine.

Now it's nice to have a baseline. So what we do at Wake is all of the student athletes will go through this. We'll get a baseline. What are they like before an injury? And then we can compare that.

But even if you don't have that baseline, I still think that this can be a useful tool. And so you'll see us potentially on the sideline or back in the locker room having the student athletes go through this. And in the interest of time, generally, at this point is where I have everybody stand up and do this, but since we're running a little bit behind I'm going to spare you. And if we get a break, maybe what we'll practice these things later. But this is one of the techniques we'll use.

And then what we call VOMS or vestibular ocular motor screening. And this is the connection between the brain, the eyes, and the balance system. And this is something that came out of the University of Pittsburgh.

And I think has really, really helped me in the last few years try to differentiate those people who say, listen, I don't have any symptoms. Their balance is back to normal. Their mentation is back to normal.

We'll put them through these tests and oftentimes be able to elicit some symptoms that they wouldn't have otherwise reported. And so things like just following my finger while they hold their head still. And then another one is having them kind of hold your fingers out and having them move their eyes back and forth while they hold their head still, both laterally and then vertically.

Vestibular ocular reflex is kind of holding one spot. So I'll hold my finger up. I'll ask them to move their head back and forth while they stare at my fingertip.

Visual motion sensitivity is incorporate all of that. What you'll see in the picture there. And then convergence or how do their pupils focus as you close in on their nose. All of those can elicit some of these symptoms and make people will feel dizzy or make people have a little bit of a headache. And if that's the case, we don't feel like they're ready to go back to their activity.

So transport. When should the athlete be transported? I think the most important bullet point on this one is the last one. And that is if somebody-- a parent, a coach, or a paramedic or first responder, whatever-- if somebody has a concern transport. Let us decide when they get to the ED or when they get to our office whether or not they need imaging or whether or not they need additional workup. But I think if there is a parental concern or a responder concern it's reasonable to have them transported.

What are the big ones? What would we really want you guys to think about having somebody transported? If there's a prolonged loss of consciousness.

And how do you define prolonged? And I would say that when somebody is unconscious, if it's not you that's unconscious it feels like an eternity. If you've ever been by somebody who's unconscious seconds feel like minutes and minutes feel like hours. And it's just like, oh, my gosh. What's happening?

So I think 30 seconds is kind of the cutoff. But I would say if somebody is unconscious that feels like 30 seconds, whether it's 5 seconds or 10 seconds or whatever, it's probably reasonable to have them transported.

Worsening symptoms. And so if you suspect that somebody has a concussion and you say, gosh, you look pretty good. And you're not having any of the concerning things, the vomiting. You didn't have a loss of consciousness.

Don't just send that athlete over to the sideline and just leave him be for the rest of the game. Have somebody check in with them. How are you feeling?

If somebody's symptoms are worsening or somebody is worsening from the standpoint of their cognition or their speech or their memory, a concussion shouldn't worsen over time. And so if it is I definitely think somebody needs to be transported. Then again, if there's any vomiting.

So what do we do once somebody gets into the emergency department or how do we decide? This is the Canadian CT head rule. And it looks at the Glasgow Coma Scale. It looks at any other signs for skull fracture.

Vomiting. Now they use two episodes of vomiting in this particular rule. I'm a big believer if there's been any vomiting somebody should probably be evaluated.

And so this is kind of what we use not so much for you guys to know what the specifics of the Canadian head CT rules are, but this is kind of what we use to make educated decision on who gets a CT. And so if you transport somebody or one of your athletes comes to the ED and you say gosh, why didn't they get a CT scan? He had all these symptoms. Why didn't he get a CT scan? Then they probably didn't fit into this category of symptoms.

So that's for adults. And then they have looked for children. And so this is just a similar algorithm that is used for children.

All right. So what do we do? How do we manage this once we've diagnosed a concussion and determine that it's not something else, something worse? The first thing is no hitting.

And that means if they've got big brother that picks on him tell big brother not to pick on him for a while. But that certainly means no contact in practice. It certainly means no wrestling matches. It certainly means anything that could potentially cause another head injury.

So riding a bicycle going, ice skating, going to Carowinds. I can't tell you the handful of people who I say you cannot go play your sport, well, can I go to Carowinds? Our church group is going to Carowinds this weekend.

I say no and then they go anyway and then I get a phone call from mom on Monday saying, Bobby went to Carowinds and his head hurts again. I said, well, yeah, he just flew around a roller coaster for six hours. So anything that's going to cause that brain to move around we want to avoid it.

Cognitive rest. Minimum 24 to 48 hours. And cognitive rest means no homework.

It means no screen time. No playing video games. Anything that's going to tax the brain should be avoided for a minimum 24 to 48 hours.

Physical rest. We use about 72 hours typically. And these are a little bit more conservative in younger people, which is probably the group that you guys are going to be working with. And so it's rest both of the brain and the body.

And then we know that there's a vulnerable window. We don't know exactly how long that window is. We think that it's somewhere in the 5 to 10 day range. And that's why we use our return to play progression as we do to get us kind of into the later stages of that vulnerable window.

One of the things that has really gained a lot of traction is getting back to academics. We used to say, well, as soon as you feel better go on back and get back into school. And we know that that's not necessarily the right thing to do. And so we want to make sure that we're working with the guidance counselors and the principals and the teachers to make sure that these kids can have the accommodations that they need to be back in the classroom, but not worsen their symptoms. And then ultimately return to play.

Some of you guys may recognize this form. I think that this has been absolutely groundbreaking and has made the management of these from my standpoint just incredibly-- this thing is just very, very helpful. And I think the school districts recognize this form now legally. They're obligated, which I think is wonderful.

But this form allows us to give not only recommendations about what should happen with school, but also recommendations about PE and then ultimately the return to play. And that's a very step wise thing. We want to gently tax the brain in different fashions as we move forward before we get them back into any contact.

And so this will be five days, six days, maybe seven days. In younger people it's even going to be longer. So I think it's important for the coaching staff to know that an injury on Friday night there's a pretty good chance that that athlete may not be back the next week simply because of the younger brain and for us to start that progression and go through that progression that next Friday may not be when they're back. And I think that's the safest thing for us to do.