Sudden Cardiac Death (Part 1)

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So like I said, my name's Tim Howey and I'm a full time faculty member at Inver Hills Community College, teach in the paramedic program over there. Basically people ask me what do you teach and I say everything.

So by nature EMS is kind of the jack of all trades, master of none. We cover just about everything that there is out there, because when somebody calls 911, it could be for anything.

So in addition to that, I'm still very active out on the streets in my practice, working for North Memorial at the Brooklyn Center. So stay out on the tracks as a critical care paramedic.

So coming into the presentation today, it's kind of nice to talk about something that's a very interesting topic for me, and something that is something that I'm quite passionate about, which is sudden cardiac arrest. So when we start talking about sudden cardiac arrest, we can talk about that in many different formats. And it is quite broad. It is one of the things that tends to end up killing people out there, estimating one in five.

So today we have a particular focus. I'm going to talk about it in athletics. So most of the time that we deal with cardiac arrest, we're dealing with somebody that's usually of an older age, multiple morbidities, so different issues like that. So this is kind of an interesting topic given some different settings for this particular condition.

So when we start taking a look at athletics in general, why is it that people are dying during athletic events? And if you take a look at the pie chart that's up here, you can see that accidents takes a full half of the pie. So 51% are due to accidents.

When we talk about accidents, we're usually talking about bleeding. So oftentimes I'll say, people don't die from sprained ankles, people don't die from stubbed toes. But once when you start having blood come out of them, people die from that. So that's where about a full half of the deaths come from.

Now if you'll go over to the other side of the pie chart, there's some things on there that I thought was actually kind of interesting. I never knew that suicide was actually something they measured in athletic deaths. But apparently 9% come from that. Homicide I thought that was kind of a large pie chunk of that, too.

But when we start taking a look at the topic of the day, cardiac causes of death take 16% of it. And this is information from the American Heart Association. So they published this back in 2011. So it was the most updated information they have.

So like I said, when we talk about death in sports, trauma A number one, usually bleeding to death. By the way, anyone recognize this picture? So this was a hockey goalie, where a skater was coming down to him, ended up falling down on the ice, skate come up, and managed to actually separate his jugular vein up inside of his neck. And then he was bleeding down onto the ice as a result of that.

So absolutely do we have bleeding causing death in sports. Absolutely we do. Not the topic of today, but just because we're going to cover athletic deaths, I just want to say just a couple of things about it. First of all, when it comes down to bleeding, how quickly do you want to stop it?

Yeah, five minutes ago was a very good time to make a stop. How do you feel about tourniquets? I'll give you a couple of moments.

Probably not for this one.

Yeah, probably not going to work for this one. But generally speaking, you know, there's some people that are still under the idea that tourniquets are bad, don't use them. And the opposite is completely true.

So commit to it, commit to it early, get on there. If somebody has a bleed on the extremities down on the legs, especially something that's along the thighs, you've got the femoral artery. Get a tourniquet on there, don't hesitate on that. Get that bleeding stopped as quickly as you possibly can.

So this one would be a little bit more pressure down under-- down the side of the neck. But that's where I'm going to leave that, and move onto the real topic of this, which is when your heart causes sudden cardiac arrest. When it's not due to trauma, it's not-- well, I will say, we have two traumatic conditions that come in here. But when is not going to be a bleeding issue, it's not going to be, you know, a liver, spleen lacerations, things like that. The heart is what's really causing the problem today.

So let's start taking a look at the prevalence. How often does this really happen? And the answer is not that terribly often. We're not talking about something that you can anticipate happening at a sporting event. No, this is something that's going to happen quite rarely.

So according to the NCAA. You know, granted, their ability to rank college softball teams and rank them might be a little bit questionable. But this does seem to be about the best information we have in terms of the incidents of sudden cardiac arrest during sporting events. It's one in every 22,903 athlete participant years.

So that means that you have somebody that's participating in sports for one full year, or two people that do six months, thereabouts. That's what that comes down to actually meaning.

Now in terms of the other factors on it, I would say that, just like any kind of research related to this kind of topic, that the information out there isn't terribly good. It's a very low reliability. Just because trying to get this kind of measurement is really difficult.

So think about this. This number is for people between the ages of 15 and 24. Well how many people out there between the ages of 15 and 24 are playing sports, and the NCAA doesn't know about them. So it's fair to say that, like I said, these questions, these numbers, they're iffy. They're not perfect. But it is about the best that we have right now, and it does seem to be representative of the population.

So 11% of those that end up in sudden cardiac arrest tend to be female. So once again, that might be somewhat factored by participation as far as 29% African-American. We do tend to know that that number tends to be elevated compared to other racial groups. So once again, we kind of anticipated that if we take a look at cardiac disease for African-American men versus Caucasian men. It does have a higher incidence by about 15%.

So once again, that's somewhat anticipated. And 82% of it during physical exertion. So it's when their heart rate's actually up and they're active during sports.

So let's start getting into some specific conditions, then. So what I want to do is I want to go through some different types of conditions, different ways in which somebody may end up in sudden cardiac arrest. So one of the ones we're going to focus on today is going to be different electrical disturbances then cause you to just suddenly drop on the field with no warning.

So we have a 12 Lead EKG up here. So we're going to take a moment and take a good look at this. So if you know EKGs, take a look at the bottom line on this.

So on a projector it's always a little bit difficult to tell exactly where the big old lines are compared to the small tiny lines. But when we take a look at the basic EKG, this doesn't look bad. Does everything look like it's regular following a metronome?

So regularities there, that's good. And the rate. Does it look like everything's really bunched up or really widely spaced? or does it look like it's coming in at a rate about roughly 80? Yeah, it doesn't look too bad.

So a lot of people, when you take a look at this rhythm, you'd say it's just normal sinus rhythm. That's exactly what you should be seeing. And that's true. That's exactly what this is. Looks like a very normal EKG, until you start digging just a little bit deeper into it.

So what I want you to do, is I want you to take a look at V2 and V4. V2 through above V4. And we have a QRS complex, so these [INAUDIBLE] up here. You have a QRS complex, and then right at the end of that QRS complex, we have what we call the J point. So drew the line right down to the J point.

Now if you look at the baseline for it, right before the P waves on this, right before anything starts to happen, that's what we call the isoelectric line. That is the line that says nothing is happening right now. Now, where I put that little red line going to the J point, that should be even with the isoelectric line. But you notice that [INAUDIBLE] would be in V2, V3, and a little bit in V4. It's higher. That's actually a sign of a pretty big problem. How easy is that to find?

Now I will say, too, that is a sign of a big problem. Most people will also misdiagnose that problem, because it looks like something else. It looks like somebody is having a heart attack. All the times we talk about what we call ST elevation, J point elevation. And if somebody has the right symptom set-- if they're pale, sweaty, short of breath-- and they're showing that on their 12-lead EKG, oftentimes we take that being diagnostic [INAUDIBLE] that has a clogged artery inside their heart and they're [INAUDIBLE] cardiac tissue.

That's not what's going on in this patient, though. This patient physically looks fine. They don't have any skin color changes they're not short of breath they're out there [INAUDIBLE] participating just like anyone would.

What we have here is actually an example of a condition called Brugada syndrome. So this is one that's genetic, passed down through families. And oftentimes can't be diagnosed, because the first time that you actually figure out they have Brugada syndrome is because they have sudden cardiac arrest. They just simply drop dead, right now.

And of course at that point being able to assess an EKG isn't going to happen. Now, so oftentimes when we end up running into is that we know that they have previous relatives that have died from this condition. Now this one is, it's particularly difficult because it really just simply kills you at some point.

It's kind of like every time that you have a heartbeat, you roll the dice. Now the odds are heavily in your favor. Most likely nothing bad is going to happen with each heartbeat. But should you happen to get that rare instance when you roll the dice and it comes up bad. You just simply drop dead.

So usually they're presenting [INAUDIBLE]? Has anyone ever heard of ventricular fibrillation? That's the rhythm that you're dropped down to. You just simply go straight down underneath it and stop responding.

So who's heard the news stories where we've had, say, an otherwise healthy high school player that was out on the court and just simply dropped dead of some-- no reason whatsoever. Never got hit, never thrown to the ground. Just went back, sat down the bench, all of a sudden they just side off the bench, and they're dead on the ground.

Oftentimes we're looking at something that's along these lines some kind of congenital issue that turns bad. Maybe it's a structural type issue. Maybe they had a hole in the heart they weren't

aware of. Maybe they had some kind of electrical disturbances due to the way their electrolytes respond, which is kind of the heart Brugada syndrome, it's an issue with the chemicals, and the lack of a particular chemical that [? could ?] prevent something from happening. But that's oftentimes what it was.

So like I said, this doesn't happen in every high school basketball game you go to. This is a rare instance, it doesn't happen often. But there's a couple of thousand different ways in which it could happen.

Brugada syndrome is just one example of this type of electrical disturbance. It's one of the more common ones, and also one of the easier ones to find. And as we just discussed it's not easy to find. So you really do have to go off and look for it.

So, for example, how many people do you think hit high school without ever having had a 12-lead EKG done?

[INAUDIBLE]

Basically, you know, if you've ever had a 12-lead EKG by the time that you hit high school, I would be really impressed. You must really know that you have some kind of cardiac defect for somebody to bother doing that. We don't think about that much with that age group. And it's not part of standard health screening for things like sports either, so it doesn't get to get done.

So that is one example. Now going on from there. There's another one. This one is, it's relatively common. I've seen this one out there a few times. So looking down an EKG again, once again, this is one that you might look at and go, oh, the rate, the rhythms. Everything is looking pretty good with this one.

So QRS complex is where they should be, and everything is going nice and regular like a metronome. But there's something that does kind of stand out on this one. So right behind those QRS complexes, you have what are called T waves. And there's something that looks a little bit funny about that T wave.

It's downward facing. If your QRS complex is primarily up, your T wave should also be up, they should match. And it's also very wide and late. So that's another one that kind of stands out on this one.

Now by itself, that probably doesn't mean anything. In fact, this is relatively common compared to most other cardiac conditions. So this is a condition that we refer to as prolonged QT syndrome. Basically from where the QRS complex begins and the T wave is, it's long. Taking longer to repolarize the heart than it actually should.

Now by itself-- if this is what you have going on, prolonged QT syndrome-- once again, you're not showing any symptoms, nothing's going wrong. You're looking fine all the time until something goes wrong. Now this is another one that in sports does have a pretty big effect on you. Once when you actually get up moving, what happens to your heart rate.

It goes on up. What happens if you run your heart rate faster than you can repolarize your heart? Most of us that wouldn't be an issue. So if you take a look at the sinus node, it does have a match rate. Now it gets a little bit lower as you get older. So if you're good, in good shape, say about 20 years old, having your heart rate of 190. That's probably about what your peak heart rate is, right? Sounds about right? You wouldn't expect to see anyone in a sinus rhythm at 220. Sinus node just doesn't go that fast.

As you get older, you might be saying you have a match rate of about 170. So 65 years old, you're probably not going to get up to 190 off the sinus, [INAUDIBLE]. You see it that fast, probably wouldn't be right. So usually you can't get your heart going fast enough to actually run into when your heart's still trying to repolarize. You can't run those two things together.

Unless you take too long to repolarize it, you have a prolonged QT syndrome. So when I'm taking a look at this kind of a rhythm, I'm starting to think that this is somebody that's going to have some issues if they do get a heart rate pumping.