Dr. Kendall Williams: Welcome everyone to the Penn Primary Care podcast. I'm your host, Dr. Kendall Williams. If you were watching Monday Night Football a few days ago or a week ago you saw a scene that was very uncomfortable to watch, early in the game a player for the Buffalo Bills of DeMar Hamlin suffered a cardiac arrest on the field, probably as a result of, what otherwise looked like a relatively benign chest blow.

He was down for seven to 10 minutes. The teams gathered around him, getting chest compressions, and then he was put in an ambulance and taken to a local Cincinnati hospital. And the entire nation, if you were on Twitter, was asking questions about what is happening to him and, what's his prognosis in particular. So, it brought up a lot of very good questions about cardiac arrest, how to manage cardiac arrest an d what we as physicians can do to promote cardiac arrest knowledge within the community.

So in order to explore those issues, I brought on an expert in cardiac arrest at Penn. Dr. Ben Abella is the director for Center for Resuscitation Science at Penn. He is a Professor of emergency medicine and critical care as well. his areas of research are in cardiac arrest and all of the issues that were discussed tonight. Thanks, Ben.

Dr. Ben Abella: It's my pleasure to be with you tonight.

Dr. Kendall Williams: So, Ben, let's just start it. And this is just gonna be a conversation between you and I and probably a relatively short one, but let's just start with the situation that happened when DeMar Hamlin went down. Reports are that he was watched closely by trainers. They watched the event occur. The trainers reported very early among themselves or on walkie-talkies and other devices that they were very worried about a situation and they got out there quickly. And when you first encounter a patient that goes down in an awkward way and you're worried about cardiac arrest, what do you do?

Dr. Ben Abella: Yeah, it's a remarkable story and it certainly has captivated the attention of many. So when someone collapses like that, there's always a concern that cardiac arrest could be the issue at hand. And, you it has been known for quite some time that many arrest events, when people collapse, suddenly they're missed. That is to say people don't recognize cardiac risk for a period of time. A few basic facts about cardiac arrest, I think for context. So cardiac arrest strikes around 400,000 people each year in the United States. So it's certainly common, you know, over a thousand people a day in the US suffer cardiac arrest.

What's remarkable about the disease is that it is the most time sensitive disease know of medicine. So what I mean is a hundred percent fatal unless CPR and or the use of an AED automated external defibrillator, or both are done within minutes. Every minute spent in cardiac arrest without the initiation of CPR survival drops by 10%. Now it's not exactly linear, so it's not that at 10 minutes. There's no hope, but it's asymptotic. So survival if CPR started 10 minutes later is single percentage points. Survival if CPR started within the first two minutes can be as high as 50 or 60%. So it really, really matters to get CPR started right away.

Dr. Kendall Williams: So I didn't mention this up front and probably should have that DeMar Hamlin is doing fine and he is one of the success stories. Has been discharged from the hospital, and I assume that's mostly because he was almost in the ideal place to have this event because he had professional trainers there who were on the scene immediately and a minute I think he was getting CPR.

Dr. Ben Abella: That's exactly right. So he had very prompt recognition and of his arrest event, and then prompt CPR delivery. And those are the first two links in the so-called Chain of Survival, a Paradigm for thinking about cardiac arrest that involves five links. First, the prompt recognition follow early aggressive CPR followed by the use of a defibrillator, followed by advanced care, usually by ems, emergency medical services, if it's an out of hospital arrest. Then finally followed by post-arrest care, and that’s a whole topic unto itself that we can touch on later.

But yes, those first two links in the chain of survival are so important to prompt recognition that someone's in trouble and someone's having cardiac arrest, and then the initiation of CPR. And by all accounts, he got CPR started aggressively within a minute or two of his collapse. I don't know if we'll ever know exactly but it was that quick. And one of the things that was so remarkable about this, is that in many cases people are slow to recognize it because people may have signs of movement or quote unquote life that will be confusing. What do I mean by this?

Well, some young healthy victims in the first few minutes of cardiac arrest will have agonal breaths or gasping breaths, so that might confuse a bystander to think they're very much alive and just having a breathing problem. And some people have seizures full on seizures, as many as 10 to 20% of. Young people with cardiac arrest will have seizures in the first few minutes of their arrest event. And this is not just from brain ischemia, but it also is confusing because people might think, oh, they must have a seizure disorder or not. But for

whatever reason, they're being a seizure. In fact, those things can be immediate signs of cardiac arrest, especially in young healthy victims.

Dr. Kendall Williams: So the first thing is to check a pulse.

Dr. Ben Abella: Well, it's interesting, yes and no. so the old teaching was, yes, the first thing would be to check a pulse and certainly for trained providers, that is reasonable. The current American Heart Association guidelines actually for the lay public anyway, and, I guess we're speaking to sort of a, both a professional audience and a public audience. In the late public, it's recommended not to check a pulse. And the reason why is checking a pulse is actually harder than it sounds, especially in one of these crisis situations where someone might just be feeling their own heartbeat and not feeling a pulse and confused and thinking there's a pulse.

And so for the lay public, it's felt that the key algorithm is to see if you can shake the patient a little bit, get their, wake them up. Hey, hey, are you there? Are you there? And if they don't respond to, then look for breath. Chest rise, air nostril, flaring or movement of air, which is also not necessarily the easiest thing, but if someone does not seem to be arousable and they do not seem to be breathing, to start CPR and assume it's cardiac arrest,

Dr. Kendall Williams: So, my experience checking a pulse as a medical student was I knew how to do it when a fully patient was fully alive and having a pulse, but it was a little bit different situation to say that the patient has no pulse. Because You're always asking yourself, am I checking in the right spot? And I had at least had some training at that point of where the pulses should be. But the, as you said, the average lay public. So that sounds very reasonable. So if a patient doesn't look like they're breathing and is not responding to you appropriately, just go right to CPR.

Dr. Ben Abella: Yeah. that's right. And in fact, someone listening might say, well, what if you're wrong? What if you're doing CPR and someone who's not in cardiac arrest? Well, that's been studied actually. There are several case series published of people who got CPR for syncope or drug intoxication, a non-cardiac arrest reasons were just a well-meaning person just was wrong. And it turns out they did fine. The incidents of injury are small, the most commonly reported side effect if you do is chest soreness, which certainly makes sense, but it is pretty hard to cause substantial damage to someone with CPR.

So the teaching is better to be wrong and gives CPR to someone who doesn't need it, rather than the opposite. And in fact, most people who are not in cardiac

arrest, will find CPR so noxious that they will move or swat at your hands even if they're intoxicated or, hypotensive or some other condition. It's pretty rare for someone not in cardiac arrest to have no reaction from someone pounding on their chest. So the general teaching after much deliberation at American Heart Association meetings to go through all these data was pretty clear. Best to start CPR because the bigger problem is people not getting CPR promptly late recognition of cardiac arrest, which generally leads to poor outcomes.

Dr. Kendall Williams: So that leads to the next question, and even for us as doctors who have taken BLS, and I've taken ACLS several times, I've taken ATLS, I'm not sure in a critical moment where it happens right in front of you, and you're not thinking about it at all, that, I would remember exactly how many compressions I'm supposed to give, how often I'm supposed to give breaths and so forth. I know those numbers because I looked them up, but in the it sounds like you are saying that the most important thing is just get there. Start CPR and then work it out from there. Right?

Dr. Ben Abella: That's right. And most importantly, to deliver chest compressions. There's very good published data from a number of studies now showing that the breathing part is less important. Now, the traditional teaching, of course, is repeated cycles of compressions, breaths. The current iteration of that is 30 compressions, two breaths, 30 compressions, two breaths. That said, the evidence is pretty clear that if you only deliver chest compressions with no breaths, survival is statistically the same. If there's professional response within five to seven minutes.

What does all that mean? That means that most people who have cardiac rest do not have a lung problem and they do not have an oxygenation problem. And it turns out that your blood oxygenation can persist fairly well for minutes. And so the biggest lesion in cardiac rest is the lack of blood flow. And so that's what you need to restore. You need to restore the blood flow. And it is chest compression only that can do that for the victim and so there has been this large movement, especially for the lay public, to teach what's called compression only CPR or hands only CPR, where you just deliver compressions.

And you can imagine this is a very attractive option. It's easier to teach, it's simpler, you get away from the icky factor of putting your mouth to some stranger's mouth. And so we actually, from a public health perspective, may save many more. If we just teach Hands Only CPR, and that's what is being done in many places. For example, in many high schools they have CPR as a requirement for graduation and they teach Hands Only CPR.

Dr. Kendall Williams: And let's go into CPR chest compressions and how to do them well, because the quality of it really matters. What is the teaching here?

Dr. Ben Abella: Yeah, so it, it's true and there's very good evidence that the quality of CPR matters quite a lot. And we've done some of that research at our team at Penn and what we know is that you want to do compressions at about a hundred to 120 beats per minute. Too fast as bad, and too slow is bad. And we see in actual practice a wide range of chest compression rates because people don't have a deeply inherent metronome in their heads. And so, if you had a metronome, you would set it to a hundred or 110 and do that. Now some defibrillators actually do have metronomes baked in.

So you can hear a sort of a prompt or a clicking noise to synchronize your compression. Some do not. those who are of a certain age on this, listening in will know that the metronomic beat of Staying Alive as recorded by the Bee Gees is about a hundred per minute. There are newer songs with the same Metron geek for those who are younger. But suffice it to say a hundred to compressions per minute is what you want. The hands have to be right over the sternums, over the center of the chest, and you want to push hard. what do I mean by hard? Well, officially the recommendation is two to 2.4 inches of chest deflection.

Now, the problem, of course, there is no one has a ruler. No one gets outta ruler what is two inches? So the AHA says push hard, because in truth it's pretty hard to push more than two inches. Especially more than 2.4 inches. Chest wall compliance is such that the harder you push, the harder it is to keep going. And so the vast majority of recorded compressions in public CPR are too shallow. So you really wanna push hard and survival actually correlates very strongly with depth. So depth really matters.

Dr. Kendall Williams: Because you're trying to, compress the heart which is obviously, several centimeters below the surface of the skin, and you're trying to use the chest to push that and get some blood out of that. Using it as a purely mechanical pump, right?

Dr. Ben Abella: Yeah or said another way. Chest compressions are just not the way we were designed to move blood throughout our body. We have an internal pump that's the more efficient way. So these external compressions are the best way to do it. And so you just have to push really hard to have it work because already it's, at its most effective with excellent depth and rate. CPR can generate blood pressures that perfuse the brain, but no one is norm intensive. They've

actually looked at this and you can generate with excellent CPR pressures of, you know, 60 over 40 or 70, over 30.

So hypotension that might be very well viable. And in fact, there are cases, amazingly of people who regain consciousness during CPR, flutter their eyes and look around with terror in their eyes, wondering what's going on. Now it's not very common, but it has been reported. So, it's not enough to keep you going forever. So CPR is really thought of as a bridge. It's a bridge to definitive care and that definitive care might be defibrillation if someone's in a shockable rhythm, it might be other interventions. But CPR when delivered well can be very effective to profuse organs and keep that person alive until the definitive therapies are.

Dr. Kendall Williams: So I wanna highlight a couple things just on CPR before we move on, and that is just to highlight what you said about using the beat to the BeeGees song, Staying Alive. That actually really helped. I was teaching my wife how to do CPR for purely selfish and I told, her that I said, you know, uh, Uh, uh, uh. Staying alive, that's your beat, right? And so it was actually very helpful and she still remembers it to this day and what she needs to do. And it was just it helped galvanize her in doing it and feeling comfortable with it. So that's very helpful. I had a friend, a physician who cardiac, arrested in his living room and, a perfectly healthy guy.

It was a mix of a variety of things that happened. He was probably over caffeinated and some other things had just gotten off a long flight and just had an arrhythmic event. And his wife who's not medically trained at all gave him CPR for 10 minutes and was able to keep him alive and now he's back practicing. So that story sort of, led me to teach my wife how to do CPR, and really I told her press. Hard as you can and do staying alive. But I wanted to just ask about the time that you're giving CPR and how much that matters. So you mentioned there's a time interval before somebody gets CPR and how critical that is. It's lack of, reduction by 10% per minute of survival rates. But how about the length of time that people get CPR? How much is that, associated with prognosis?

Dr. Ben Abella: Yes. and it is to a certain degree, less so than time without CPR, because after all, it's harder. CPR quality varies so much. It, sort of depends. That said, we think. Certainly we know of cases where excellent CPR is provided where people can have a 20 or 30-minute resuscitation and still make a full recovery. The most amazing example of this, there was a soccer player, or if we have any listeners from the United Kingdom a football player

on the soccer, on the football pitch in England in Bolton United Kingdom. This is all on YouTube and around social media. His name was Fabrice Muamba.

He had a cardiac arrest in the middle of a football and, had an arrhythmic event, ends up with an ICD. Eventually, he had 78 minutes of CPR. He had refractory v-fib and they just could not shock him out of it. 78 minutes and he made a full recovery. Now, that's very unusual, but it does provide proof of concept that if CPR started promptly and aggressively, that it is certainly possible to have a viable patient. And so one of the big questions is how long do you go before you call it? And that is one of the hardest and most fraught questions I think in resuscitation science, we really don't know.

What we do know is that many cardiac arrests are probably called too early. And because just because someone's had CPR for 15 or 20 minutes does not mean the case is impossible. Especially now we have so many more advanced therapies to offer, for example, in many centers we're doing rescue ECMO, which we call an A pulseless patient, eCPR for endovascular CPR. We're basically people are put on ECMO circuits while dead, while getting CPR. And that allows them to be sustained for long periods of time while the problems are sorted out. So, so the point being that you really want to give it a solid effort, 20, 30 minutes and that's what's sort of taught in emergency departments around the country.

Dr. Kendall Williams: So let's talk about the role of the AED. You mentioned shockable rhythms and so forth. That's a new thing for many of us. At least the deployment of AEDs in the public spaces, which is obviously some of the results of your work I know. But let's talk about AEDs. First of all, what is the benefit to them?

Dr. Ben Abella: Yeah, AEDs are really a remarkable thing. So automated external defibrillators or AEDs are sort of have become ubiquitous, you see them in train stations, airports, gyms, but this explosion of AEDs has really only occurred just in the last 10 to 15 to 20 years. I mean, it's, really quite recent. They're amazing. What they are is they're defibrillators, but their secret sauce is it's all automated rhythm analysis so that you don't have to know ACLS, you don't have to know anything about rhythms. But, the computer circuitry is such, and the quality has gotten high enough that they can very rapidly analyze the heart rhythm and determine if a shock is required, and then they will deliver a shock therapy.

Through pads on the chest. And this is absolutely essential for people in shockable rhythms of arrests. So ventricular fibrillation of ventricular

tachycardia, which are probably in most centers that have looked at this, about 30% of all arrests. It very much depends. In young, healthy people, it's much higher. So DeMar Hamlin certainly had a ventricular fibrillation arrest. If someone has a non-shockable rhythm and the AED won't do anything, that doesn't mean it shouldn't be hooked up. Indeed, you, we still wanna do that to make sure you can treat a shockable rhythm, but it will simply say, shock not advised, and then the AED does nothing.

But for people with shockable rhythm arrests, the early application of an AED is absolutely lifesaving. And indeed, in DeMar Hamlin's case, an AED was used and that was the definitive therapy. So he got CPR until he got a shock. The shock restored his pulse and the rest is history.

Dr. Kendall Williams: I think he had a pulse before he left the field, which, you know…

Dr. Ben Abella: Yeah. It's, amazing. And that's not uncommon when AEDs are employed. So, for example, I work in the HOP emergency department hospital, university of Pennsylvania, here in, in center City, Philadelphia, well, west Philly but in the city we every so often get patients transported from the airport. And the airport is a, place where there's a lot of witness. And there's a lot of AEDs and so it is not uncommon for us to get cardiac arrest survivors from the airport who are shocked by the AED at the airport and come in very much alive.

Dr. Kendall Williams: You know, I looked online to see how much they cost because I thought, you. Doctor, I should probably have an AED in my car in case I need to grab it. looks like they're about a thousand dollars for a reasonable model. Is that what?

Dr. Ben Abella: Yeah. Prices have climbed a little bit with the covid and interest rates and supply chain issues and all these modern problems we suffer so, so often they're 1200 to 1400. But yes, there's sort of within, the zone for, things that one might have as lifesaving equipment. And yes, I think they can be very, valuable. one of the things that's very exciting is that recently some newer generation AEDs have been developed that I'm fairly bullish on full disclosure, I have no relationship with these companies, no stocks. I'm not selling anything here. But one of the issues that has come up with AEDs of late over the last decade is they haven't taken full use of technologies like GPS or wifi or cell service to connect and be useful in that way.

And here's what I mean. A fire extinguisher is a device with no connectivity. If your house has a fire, do you know where your fire extinguisher is? Well, you

may or you may not. On the other hand, you also don't know when's the last time you checked it? Is it charged? Is it dead? But now, imagine a connected device that goes to your phone that can warn you if the battery's gonna go low. It can tell you where it is. It can call 911 through the AED and receive messages from 911 through the AED. and there's been a newer, now FDA approved defibrillator that does just that.

And we're excited about this generation of technologies because imagine a world in which an AED is in the lobby of a building and someone has a cardiac arrest, a block away, you wouldn't know. But with a connected AED, it can actually wake up alarm and show a map of how to get to the victim. So it basically can create this radius of care because there have been many, many instances where people didn't even know a defibrillator was in the vicinity, and they were never applied. So, I think we're gonna see more and more AEDs with connectivity abilities, which will really enhance saving lives.

Dr. Kendall Williams: Yeah, it's gonna tie into Apple watches and other devices I'm sure. So that you can.

Dr. Ben Abella: Exactly.

Dr. Kendall Williams: Yeah. DeMar Hamlin, as all cases would have been put in the ambulance he was intubated in the field. That's part of standard protocol. I got a lot of questions on Twitter about that, which I said, it doesn't really mean anything that he was intubated that standard protocol and then he gets to the hospital and, starts a cardiac arrest protocol. Can you tell us in broad outlines what that is?

Dr. Ben Abella: Right. So when people get their pulse back from cardiac arrest a lot of work remains to be done, and this falls under this rubric of post cardiac rest care. After you don't have a pulse for a period of. And then your pulses are restored. This triggers a sequence of events known as ischemia, reperfusion injury, and it can be quite devastating. You can have brain swelling, inflammatory cascades. It can look like sepsis. You have endothelial dysfunction. You can develop ATN, all sorts of problems in the critical care unit can. en Sue, and there are some ways to address this. And so one of the major therapies that we employ in postcardiac risk care that Mr. Hamlin certainly got is known as targeted temperature management or TTM.

And the idea here is the precise control of body temperature. Now, why does that matter? Well, many patients after cardiac risk develop fevers from brain dysfunction. They're neurogenic fevers and they've been shown to be very bad

for recovery and worsen brain injuries. So they're not, they're pathologic fevers, they're not useful in any way. And by controlling and, mitigating these fevers. And in some instances, and this is a topic of some debate, but at least it's fair to say in some instances, lowering of core body temperature. Traditionally we thought of this as lowering to 33 Celsius, although there is some debate about the appropriate goal temperature.

But by lowering temperature we can actually reduce his inflammation and brain swelling and improve outcomes. Another key aspect of post-arrest care is very aggressive blood pressure management. So many of these patients become hypotensive and it's been shown that this hypotension is very bad for the brain because it needs to remain perfused. And in many cases there's increased icp, increased brain swelling. And so, aggressive maintaining of mean air arterial pressure targets is another key piece of this. And a third thing is oxygenation. So too much oxygen is actually a bad thing and. Rapid weening of FI02 or oxygen inhaled oxygen through the ventilation circuit is also known to be very protective.

And there's four or five other things that I could go on about as far as critical care maneuvers. But suffice it to say that many hospitals have this posters care bundle where they have a set of. Eight to 10 things they do in the first 24 to 48 hours. And they've been shown to greatly improve survival through implementing a post-arrest care bundle up pen. We published on this in 2009, we were able to double survival for patients with their pulse back who showed up at our emergency department.

Dr. Kendall Williams: So once they get the pulse back, as you note, you're not out of the woods because there's inflammatory damage that's being done. Multiple organs that you're trying to support and get people through. Once the heart and lungs are working and you're, managing renal failure or whatever. I would imagine most of it comes down to what's the situation with the brain, right? How much Anoxia was experienced? How do you assess that?

Dr. Ben Abella: Yeah. First off, that's exactly right. even though the word is cardiac arrest it's really a brain disease and a brain recovery disease. In fact, some hospitals have protocols where all the post-arrest patients go to the neuro ICU for that very reason. So it's really a brain problem. And how do we manage that and monitor that? Well, most patients fall on cardiac arrest at major centers are put on continuous EEG monitoring. And this is for a number of reasons. One, it's to look for prognostication signs how active is the brain, but also many patients post-arrest have seizures, and we aggressively manage those seizures and sometimes can improve outcomes.

So continuous EEG is important. Another thing we'll often do in many hospitals, get an MRI, these five to seven, to look for structural injuries that important information for prognostic purposes. And then as far as treating the brain, so certainly managing with anti-seizure medicines when appropriate, but maintaining, appropriate perfusion through arterial pressure goals and, lessening of ICP are important. But yeah, ultimately it is a brain disease. Now, if someone got aggressive, early CPR, they often have very little brain injury. And I suspect, I mean obviously I haven't treated or seen DeMar Hamlin.

I would not be surprised if he has no brain injury at all. Sometimes one doesn't know for weeks to months and there can still be subtle deficits. But certainly I can say with certainty, we've had a number of patients come through our hospital who've returned to their families, returned to work, and for all practical purposes feel back to normal. And their spouses have reported to us, their memory seems normal, their speech is normal. They go back to playing tennis, so their fine motor is pretty good. So, it is possible to return to life as before, which raises a whole other host of issues known as survivorship issues and co survivorship, which is even then the problems are not fully solved.

Many people after cardiac arrest have issues with the trauma they experience, and they sometimes have PTSD. Sometimes they're afraid to return to activities because what might happen sometimes their spouses are afraid for them to return to exercise or other activities for fear of what might happen. So there's a complex host of psychosocial issues and sometimes occupational therapy and physical therapy issues that need to be addressed after cardiac arrest and there's science behind some of these things. And so one of the things I think it's important to put to the primary care community is, there is help out there and I would imagine if someone goes to see a new internist or maybe a return visit and they say, oh, I had a cardiac arrest six months ago.

I seem to be fine. And the primary care doctor says, well, gosh, I'm glad you're okay. But this is not something I do very much. I don't know what sort of follow-up you need. It's important to know that these patients do have issues that need follow up and following up with a cardiologist isn't sufficient. Many of these patients need a psychiatry. Many of these patients need PT and OT evaluations. Because there are subtle effects for cardiac arrest that, that we can manage and actually improve the quality of life.

Dr. Kendall Williams: Does everyone, regardless of cause need an a ICD?

Dr. Ben Abella: That's a great question. No. Some people need an ICD, but many do not. it's a complicated area to do justice to it. But, I can say this briefly.

The most common indication for an ICD after cardiac. Is that someone had a shockable rhythm, so they had ventricular fibrillation of ventricular tachycardia, and on subsequent coronary angiography, they have no coronary disease. So a shockable, unexplained shockable arrest with no coronary disease in most cases gets an ICD.

Now in a sense, DeMar Hamlin, was that the difference there is he probably will never know for sure, but he probably had Kamodio Cordes. So there will be quite some discussion and debate, I suspect, among his cardiologists about whether he gets an ICD or not. But if he wasn't an elite athlete who would be afraid of returning to the field with such a thing in his chest, most people like him who have a shockable rhythm arrest with no coronary disease, as I'm sure he does not, would get an ICD.

Dr. Kendall Williams: Yeah. You mentioned Kamodio Cordes, and I remember this coming up when I was an early faculty member and there's a New England Journal article on it. Where Patients, usually young people, he was a little old for it. I believe get a blow to the chest. That just, the, pressure blow leads to an arrhythmia. And so it's completely reversible if he gets immediate care and everything else. But your life is in danger in those few moments. So he basically had V-fib due to that tackle. Right.

That's presumed.

Dr. Ben Abella: That's right. that's what we, think happened. it's sort of a diagnosis of exclusion. There's no sort of telltale findings afterwards, so it's hard to know. But yes. Anyone interested in this? one of the lead guys in developing science and Kamodio Cordes is the electrophysiologist at UT southwestern named Mark Lank, and he was one of the authors of some new England Journal paper that described this. But yeah, a sudden sharp blow to the chest timed exactly with a short segment. We believe it's about 20 milliseconds duration in the repolarization cycle can sometimes trigger vtac and or vfib and or Vtac that degenerates the vfib. So you have to be really unlucky. It has to be a blow in exactly the right place.

Generally, at the apex of the heart. It has to be enough energy. And in his study, where they had pig model of this, it had to be a baseball of at least 40. miles per hour of velocity. So you actually did velocity testing. So it's gotta be a hard hit with a lot of energy and it generally does not afflict people in their twenties. It's often a teenager thing. And the thinking there, and I've spoken to Dr. Lank about this, no one knows for sure, but the theory there is that young chess are more flexible and compliant. And so the energy is transmitted. As you get into

adulthood, twenties, thirties, ribs and sternum break and they absorb a tremendous amount of the energy.

And so less is transmitted to the heart than a more flexible system where it would. So, yeah, DeMar Hamlin, I think is 24, and that is old. The peak incidence for Kamodio cordes is definitely in the teens. if anyone is curious, the, the most common sports to have Kamodio Cordes courses cases are baseball and softball. And so those projectiles, a line drive hit that nails the shortstop or the pitcher in the chest, that's a high velocity, high impact thing. And every year there's a few little leaguers who have Kamodio cordes. it can also happen, by the way, in the lacrosse field, lacrosse balls are very hard and thrown fast. The difference there is, and most lacrosse players, if I'm not mistaken, have chest guards of some form, whereas baseball players, unless you're a catcher, do not.

So a pitcher and a shortstop and a second basement do not wear a chest protection, whether they should. That's a whole other conversation for another day. But thankfully there's not a lot of cases, but it does happen.

Dr. Kendall Williams: And it's important for anybody involved in youth sports to be aware of it and aware of at least what needs to be done immediately when you see somebody go down.

Dr. Ben Abella: That's right. And in fact, an important principle that is being, pushed to youth sports is at, little League baseball games, little league stadiums should have AEDs and many still do not. But this is something that is being actively promoted and advocated for that facilities that handle sports. Like baseball or softball should have AEDs. Oh, by the way, another sport where this happens is hockey. There was a well-known case of an NHL player who had kamo accords from a strong puck strike to the chest. He made a full recovery. So hockey as well is, a sport where having AEDs available is so important.

Dr. Kendall Williams: Well, Ben, this has been great. I wanted to have you on. It's timely, it's an opportunity for us all to educate ourselves so that we can educate our patients. It's an opportunity for us all to just remember what we're supposed to do, if we see something like this in front of us. And I would say that most people, I was thinking about this the other day, most people will see chest compressions being delivered in a public setting in their lifetime. I think I've seen it three or four times, where a baseball game or different places. So, we're gonna see these things happen and, to be able to at least get the process started, give good chest compressions very quickly and be able to get the proper professionals there is the key thing.

Dr. Ben Abella: Yes, I think that's right.

Dr. Kendall Williams: So Ben, we'll have you back when we want to delve into this topic. Again, I really appreciate your time and I appreciate the audience time to come and listen to the Penn Primary Care podcast. Please join us again next time.

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