

BroadcastMed | High Intensity Exercise: is It Good For Heart Patients?

**THERESA
ADDISON:**

So today I'm gonna talk to you guys about exercise and the intensity of exercise that we recommend to our heart patients, OK. So most of you should know by now that back in the '50s, we really did not recommend exercise for folks after they had a heart event, all right. What we were looking at was you come in the hospital. You have a heart attack. You're in bed, OK.

You're not getting up. We don't even want you to barely move at all. It really took awhile for us to realize into the '60s and '70s that we need to start moving folks. And it really started very gradually. It was like a let's get you to sit up versus laying down kind of thing. So I'm gonna talk to you about a whole different concept today of possibly having our heart patients do high intensity interval training.

So things have changed a lot in the past here as far as going from doing nothing to is it possible that we can have our cardiac patients-- post MI, congestive heart failure, low EFs-- do high intensity exercise? So as most of you know, cardiac rehab exercise is really the cornerstone of non-pharmacological treatment for coronary heart patients.

Our cardiac rehab here at Wake Forest Baptist was the second in the country and the first in the state. So we've been working with patients with exercise since about the mid 1970s. And a lot of these thoughts, the forefathers of our exercise, really started here locally, which is really kind of a cool concept.

What cardiac rehab is is an exercise program. But we're really looking to help patients make lifestyle changes. So they come to us, and they spend most of their time exercising with us. But while they're doing that, we're talking to them about how to change their diet. We're talking to them about psychosocial concepts. You know, how are you going to deal with stress?

And it's amazing some of the things we deal with. We will deal with everything from what did you have last night for dinner, and how hard was it for you to not open that bag of chips after dinner to, OK, how are things at home? How are you doing with your husband supporting you to stop smoking? So it's a very well-rounded program.

So we deal with exercise, diet, and risk modification. Our patients come insurance covered for 36 sessions. We, ideally, see them three times a week. And we work with patients.

Sometimes we have folks that are coming from way up north. There's a lot of areas around here that do not have rehabs, like Wilkesboro. There's nothing out that way. It's tough for somebody to come from Wilkesboro to Winston. So we may talk to them about coming to us once a week. And then, we adapt it, and tell them what to do at home on the days they're not with us.

So if you're ever speaking to a patient and they need help, we can work with them. Traditionally, cardiac rehab is covered for patients that have had MI's, CABG, stents, valve surgeries, and transplants. Congestive heart failure just started to be covered by Medicare just two years ago.

And it's still very strict what they will cover. So insurance wise, we have to be careful as to who we're bringing in. But we have ways to help everybody. We have what we call a maintenance program. We will bring in folks that don't have insurance coverage or are not covered because of their diagnosis. And we, basically, charge them a low monthly fee almost if you were going to the Y.

But we are monitoring them a lot closer than if you were to do something like join the Y. So my point of telling you that is we will work with anybody. We work with all ability levels. And as I talk to you about some of this stuff today, the exercise physiologist in me, the person who helps with behavior change wants you to think about.

I want you to think about what are you doing for exercise because even though I'm going to be talking about heart issues, and heart patients, this fits for all of us. So this is one of our patients. He's been coming to us for a while. Once the patients start with us, they tend to stay. We tend to not be able to get rid of them.

After insurance is done for three months, they have the option to pay out of their pocket. And it really is hard for us to get to some of them to go, not that we want them to. But they become our family. So some of the benefits of cardiac rehab and it's the same for exercise is that there is a huge psychological benefit, improved quality of life, less stress with exercise, and a big part of it is because, in our situation, we have a big social club.

So this guy, his name is John. He's one of our patients. His wife made him that t-shirt. It says Wake Forest Baptist Health Cardiac Rehab and Social Club. It's amazing. That group of folks, they all have friended each other on Facebook. They go out. They have a good time. It's amazing the friendships that happen. So we know exercise is good for the heart, but it's good for the psychological side of things too.

The physiological benefits that we get from cardiac rehab-- and again, it's exercise across the board-- is that exercise will reduce your morbidity and mortality. Exercise increases your VO₂. VO₂ is the gold standard of physical fitness. And I'm gonna get into that a little bit more here because that's going to be the main outcome that I'm gonna be looking at with you guys in talking about different levels of exercise.

Exercise increases stroke volume and decreases your resting heart rate. Exercise will also decrease your heart rate at certain workloads. So once you start exercising, let's say you get on the treadmill at three miles an hour and your heart rate gets to 150.

After about two or three weeks, it will not reach 150 anymore. It may be 130 because your body gets used to that work level. Therefore, you need more work. So exercise also decreases systolic blood pressure, helps with glucose uptake, decreases triglycerides, increases HDL, of course, helps with skeletal muscle function, and decreases inflammation.

I want to focus mostly on VO₂. VO₂ max. Peak VO₂. VO₂ is the volume of oxygen consumption during an activity. So as an exercise physiologist, we put somebody on the treadmill, and we measure their oxygen uptake during a stress test to see what the highest level of oxygen consumption is when they're exercising at their peak.

If you haven't seen it before or haven't done it before, this apparatus that the guy has on his face is essentially how we do it. So it's basically measuring the gas exchange as you're exercising. It's tough to do. It's not easy to be breathing through that at your highest level. But it's the gold standard of us figuring out what somebody's fitness level is.

VO₂ is measured in milliliters per kilogram per minute. So that's milliliters of oxygen per kilogram of body weight per each minute. And I'm sure most of you have heard the term METs before, right. Have you heard that term before? VO₂ can be converted to METs. METs are metabolic equivalents.

One MET is equal to 3.5 milliliters per kilogram per minute. One met is essentially what you're doing right now, what energy you're using to sit here. You get up, and you do an activity that requires about twice as much energy. That would be two METs.

Three times as much energy. Three METs, OK. One increase in MET level for a patient for a person when they are exercising will increase their survival rate by 10% to 25%. One increase in MET level. So if we take somebody who's not exercising at all and we start them just into a nice, easy exercise program and are able to increase the amount of work they can handle by one MET, they are gonna increase their survival rate by 10 to 25%.

On the left here-- whoops. On the left, there was a study done with over 12,000 male cardiac rehab candidates over 30 years. On the left is the Kaplan Myre curve for cardiac death in patients over those 30 years. On the right hand side is broken out into VO₂.

The top level is a VO₂ 22 or higher. The bottom line is 15 or lower. So if you're not familiar with VO₂, most of us who are in this kind of healthy population are going to fall probably somewhere between 30 to 45, depending on age. Maybe even up to a VO₂ of 50.

Lance Armstrong, I think 85 was his highest level. 85, 86. Something like that. So I mean, that kind of puts it into perspective for you. Transplant patients, 14 or lower. So you can see that the higher your VO₂ is, the greater your chance of surviving over the next 30 years from cardiac death.

As an exercise physiologist, we focus on our exercise prescription in a few different points that we like to make when we're telling patients what to do. We look at frequency, intensity, time, and what type of exercise. We call this the fit principle.

So every time we tell somebody what we want them to do, we are gonna address these four different things in their prescription as to what to do going forward. The American College of Sports Medicine, most of the research that we've done on exercise has shown us that the majority of patients-- whether it be us, you, whoever-- we should be exercising most days of the week.

We need to be doing something almost every day. So that would be our frequency part of it. The intensity, I'm gonna-- in a few slides, get into a little more detail on this. But most of the time, we prescribe exercise off of heart rate or how a patient feels.

Time, ideally, should be between 30 minutes and an hour. Sometimes it's more, depending on the person. But the average patient, the average person, we're trying to shoot for 30 to 60 minutes of exercise most days of the week. And type, when it comes down to it, whenever we talk to patients, we try to find some type of exercise that they enjoy.

We know walking tends to be the best thing for us. When it comes to the specificity of training, your body is gonna be good at what you do. Walking is really what we all need to be able to do as we get older. So that's what we tend to prescribe for our patients who can walk.

There's always gonna be folks that we talk about, OK, you've got bad knee problems. So you're not doing well on the treadmill. It's better for you to do the bike. But when it comes down to it, for most of us, we fall into the walking running. And I'd even throw in elliptical kind of exercise into that range. Something upright.

But we want patients to be doing something that they enjoy. If somebody hates walking, and I say, all right, you have to walk every day for the rest of your life, they're not gonna do it. So we want to find something that they're likely to keep up with. So as I go forward and talk about interval training, it might not be for all of our patients.

But some of us actually like it better than just regular, continuous exercise. So it's kind of finding where these patients fall into what they enjoy and what they're gonna be more motivated to do. So let me give you a little bit of detail as to how we look at the exercise intensity, the kind of technical aspects, so that you'll understand as we go forward some of what I'm talking about.

So if I put a patient on a stress test and I am able to see what their highest VO₂ is, I'm gonna take note of that. And most of the time, we're gonna call it a peak VO₂ because a lot of us don't really truly hit that max level. It's really hard to get somebody to go, like, all max out. So it's usually a peak. We see that it's hit its highest level and it plateaus.

We can use the VO₂ amount. Or we can use heart rate to prescribe the exercise. Heart rate is easier to apply to the everyday world. If I say, OK, this patient needs to get his VO₂ to 25 on the treadmill, they don't know how to convert that. It's easier to take what their heart rate is and tell them what their heart rate should be when they exercise.

So just as a quick example, let's say that this patient on the treadmill stress test they got their heart rate to 130. Their resting heart rate was 70. We do equations where-- and this is called the heart rate reserve. It is where we take the highest heart rate, the peak heart rate.

We subtract out the resting heart rate. And then, we take a percentage of it. And we're going to actually add back in what the resting heart rate is. I'm sure most of you have seen the Karvonen formula for figuring out heart rate. 220 minus the age. And then, we take a percentage of that.

Truthfully, as an exercise professional, we don't like that. There's too much standard deviation on what somebody's true maximum heart rate is. And when the cardiac rehab population, you throw in a beta blocker, it's gone. Their max heart rate is not even going to be close to 220 minus their age.

So just, again, as an example. If this person was coming in and was going to exercise with me, which is kind of a regular, moderate exercise, I may set their target heart rate range to be between 106 and 141. I've used their max heart rate, I've used their resting heart rate, and I've taken a percentage of it.

And what I want you to pay attention to is those percentages because we'll talk as we go forward that interval training will use percentages a lot higher than that. With our patients, we find that it's a lot easier to teach them about intensity using how they feel and the level of how they can talk. And in the clinical world, it's a lot easier, especially if you're seeing patients in an office visit.

You can't tell them what their heart rates gonna be. I can't tell somebody what their heart rate is going to be during exercise unless I've worked with them a few times. I never feel really comfortable with it until I can see that over a few sessions I have seen that there's a trend. I want to see consistency. And usually after about three sessions of working with somebody I feel pretty good about it.

But when it comes down to trying to relate it to a patient in an everyday setting, we talk about how they feel. You know, if you're going to go out and you're going to exercise moderately for a continuous amount of exercise, we want them to be able to handle it and feel OK over that time.

You've heard of the talk test before? If you can carry on a conversation as you exercise, that tends to be a pretty good level. Now you shouldn't be able to carry on this kind of a conversation. You should be huffing and puffing a little bit.

But if you were to go climb the stairs out there-- we're all gonna start at the bottom, and we're going to go up to the top-- how are you going to be breathing by the time you get to the top of the stairs? You're not gonna be able to breathe. You're not gonna be able to talk.

So we instruct the patients with just their normal everyday exercise, you want to be able to carry on a light conversation. But you shouldn't be huffing and puffing where you can't catch your breath. OK, so the normal prescription for exercise-- what we tend to do, the gold standard-- is moderate Intensity continuous exercise.

So this is where we tell our patients go warm up for five minutes. Go take a walk for 45 minutes. And then, cool down for five minutes. It's kind of that gold standard. You should feel like you're doing something, but you're not killing yourself. At the end of the 45 minutes, you feel like, OK, I'm done. But I can continue on with my normal activities.

It's safe. It's easy to do. What do our patients need? Some shoes and a place to walk. There's relatively not many contraindications. Most of the time, even if we have these patients that are somewhat symptomatic or has some stable angina, we can still figure out a way to get them to do moderate exercise that's safe for them.

Moderate exercise should be done most days of the week, just like I said before. And most of the time, we prescribe it in a range that is between 50% to 85%, essentially, of what they did on their stress test. And like I said, with that talk test, they should be able to carry on a light conversation and not be dying.

High intensity interval training. So this is where I want to spend most of the time focusing. It's become kind of a hot topic nowadays. I should have put a slide in here of this. You see those ads. It's like burpies, sit-ups, push-ups, squats. And that's what we think of when we think of interval training.

There's some patients that can do that. But most of us are going to be talking about doing things like go out for a walk, and for a few minutes speed up. And then, for a few minutes, slowdown. Or even maybe we take them to a jog for a short period. And then, slow them down.

So when it comes to our cardiac rehab patients, that's what we tend to do. I do have some that will do the kind of extreme insanity p90x kind of stuff where you're doing sit-ups, and burpies, and push-ups, and mountain climbers until they're done. But that tends to be our higher function patients.

Most of the time when we prescribe high intensity training, we're looking at taking somebody at 85% of what they did on their treadmill test or higher. Maybe even upwards of 120% of what they did. So we're talking about really high intensity, but usually it's short bouts.

Most of the time when we do it in the cardiac rehab setting, we're usually looking at about a two to three minute bout. But it could be anywhere from 15 seconds to five minutes of pushing hard, and then again taking a short rest period. With the talk test with the interval training, at the end of the interval, you should feel like you need a break.

You should feel like, all right, this is really hard. I need a minute or two to catch my breath. So a lot of times when we teach our cardiac patients about what to do with interval training, that's what I teach them. We'll try one interval. And at the end of that interval if I can hear that they're not breathing that hard and they can talk to me, I instruct them on that. And then, we say, OK, next interval we're going a little bit harder. I want to try to push you a little more.

But it shouldn't be so hard that they can't recover. Most of the time, we want them to recover within a few minutes. So if we can get them to recover during that time, we've set a good level there. And then, again, most of the time just like the continuous exercise, we're shooting for somewhere between 20 to 60 minutes. There is an idea out there. And some of the studies have shown this.

You may be able to do less time with interval training. So if you've got somebody that's kind of short on time, we may be able to get away with doing 30 minutes of exercise instead of doing an hour of exercise. So that's beneficial, too.

We don't like to do intervals more than one to three times a week. It's kind of the same ideas with strength training. You don't do it back to back days. Don't do the interval training back to back days. So whenever we teach our cardiac patients about interval training, we have them do it somewhere between one to three days a week. But not two days in a row.

It takes a little longer to replenish those energy sources when you go into that anaerobic phase. And you really need that time to recover. If they're doing intervals every day, eventually they're going to increase their chance of injury. They're just going to get worn out from it. And they're not gonna be able to keep up with it. So it really is the safest thing to do.

So this is an example of moderate exercise, the dotted line there. And then, the solid line would be interval training. And you'll see as we go forward that those intervals can be of different time lengths. But this is just kind of a basic overview. Moderate exercise is going to keep the heart rate lower.

And it's more continuous. And we know it's not an exact straight line. But it is what most of us do. And you can see that the interval training takes their heart rate a lot higher.

With high intensity interval training, we can vary these intervals quite a bit. We could do long intervals, which would be between three minutes and five minutes. And usually with a longer interval, we have somebody work a little bit less. Usually, that's going to be about 85% to 90% of what they could handle on a stress test.

A medium interval will be somewhere between one to three minutes. And usually, that's more like 95% to 100%. Now short intervals are more like sprint training. Sprint training would be as fast as you could go for a really short period of time.

So most of the time with the short intervals, we're looking at 10 seconds to a minute at 100% to 120%. That's pretty high. But believe it or not, it's safe.

Recovery has some variability in it too. The recovery periods can be passive in that you basically are not exercising during that recovery time. So you push for two minutes. And then, you basically stand still or barely move.

We don't usually advise that for our cardiac patients. A lot of our events, cardiac wise, or our problems happen post-exercise with hypotension. OK, somebody's working, and they don't cool down enough, and they have this post-exercise blood pressure drop. It starts to make them lightheaded and dizzy.

And of course, you throw in there a beta blocker, and it's even worse than what it is for you or. So most of the time when we're exercising our cardiac patients doing intervals, we don't do passive recovery. And a lot of the studies did not do passive recovery.

But it is an option. Personally, I don't like that idea. You know, I need to keep moving at least a little bit. So most of the time, we will do active recovery, which is usually gonna be that you are dropping your exercise levels way down.

So remember moderate exercise is about 60 to 85%. With active recovery, we're taking somebody down to like 40% or 50%. So it's usually a pretty good low level to recover. And by the time they're done recovering, we want to see that they have the energy to go back and do the next bout of their intensity.

And with the active recovery, we've seen too that there is greater caloric burn because you're moving, obviously, instead of standing still. These are two different ways, essentially, that you can do interval training. One of the things about proving that interval training is good is there's no standard protocol.

I can make up a gajillion different ways to do interval training. But these are just two basic examples. The top one, the blue, is representative of moderate exercise. The red is representative of interval training.

On this top protocol, what they did was they had the patients push really hard. This was a high level, short duration interval for about 30 seconds. And then, they bring it way down. And they were barely moving for their recovery period.

And then, here's another example with a longer intensity interval with a higher level recovery. These graphs are the same patient. This patient was exercising continuously. And then, they were exercising doing intervals.

The top is their VO₂. And the bottom is their heart rate response. So on the left hand side with the continuous exercise, you can see that their VO₂ and their heart rate gradually increase as they warm up. Stays about the same. You know, there's a little bit of variability, as there should be, but stays about the same until they start cooling down.

The patient on the right here, they did their intervals, which was actually about 30 seconds on and 30 seconds off. And then, they took a four minute period where they really recovered. So that's where you see that dip there. But you can see just overall, the dotted line is what they would have achieved on their stress test.

So you can see with the moderate exercise how close you get to your highest VO₂. And you can see with the interval training how close you get. So you're able to train, obviously, at much higher levels.

Intervals were actually first studied back in the 1970s. That's kind of a hard concept thinking back to the fact that we were still trying to decide if we should get people up and moving. There were some studies done at that point where they looked at cardiac rehab and patients riding a bike.

And they would basically have them ride hard for 60 seconds and rest for 30 seconds. Pretty high work levels. And what they showed at that point is that people who did the interval training were able to exercise twice as long as those who trained with continuous exercise. So nothing earth shattering, but it's a very early study because interval training has become hot now.

So we had these ideas. We just never moved forward with it. There was actually some research in the 80s and early 90s that at first was starting to tell us maybe it's not so good to do it. But then, more and more, we've seen studies that are showing us that it is OK.

So this is one study done by Warburton in 2005. They had 14 men who had recent bypass surgery, or angioplasty, your stints. They had negative stress tests. They were pretty high function. They were able to do over nine METs on their stress test.

The study lasted about 16 weeks. It was two days a week of supervised exercise, and three days a week of unsupervised exercise. So basically, they would watch them for two days a week. And then, they'd send them home, and they'd say, OK, this is what you need to do at home.

These patients exercised on treadmills, on stair climbers, and airdynes. And they all had the same amount of time on each piece of equipment. There were no cardiovascular events with the study.

This is what their protocol was for the continuous exercise versus the interval training. The continuous exercise was 30 minutes at 65% of their heart rate reserve. Their interval training was two minutes at 90%, and then a two minute recovery at 40%.

Both groups worked for a total of 30 minutes, OK. The continuous group did have the warm up and the cool down added into that. The home exercise was the same. So they told everybody in the study to go home and to exercise at 55% of their heart rate. And they would monitor their own heart rate. And they would do that for 30 minutes.

So the results showed-- the interval group is on the left side here-- this is the time to fatigue on their pre and post study treadmill test. There was a significant difference in the interval group versus the moderate exercise group to see that that time to exhaustion on that stress test.

And then, the VO₂ increase pre and post was significantly different in the interval group. Remember, we're talking about VO₂ being important because it helps us reduce the mortality and morbidity of these patients as we go along. This is a meta analysis of 10 studies. These were mostly patients that were walking or running on the treadmill.

Their moderate exercise time on average was 46 minutes. Their interval training on average was 36 minutes. So it was about 10 minutes less of interval training. And the majority of the studies favored an increase in VO₂.

So everything that falls on this right hand side is in favor of the higher intensity interval training increasing VO₂ more so than the moderate exercise. The average increase in VO₂ for moderate exercise with 10%, and the average VO₂ increase for interval training was 19%. That's a pretty big difference.

This study that was published in 2007 had 27 posts in for our congestive heart failure patients. They were stable. And these tend to be the patients that we don't always look at as being able to do interval training. We look at somebody with a low EF and we're like no. Mm mm, you can't do that.

We have actually with our cardio rehab have had patients with low EFs be some of our strongest patients and most able to do intervals. And we've had some guys with a EF of 15, 20% that were able to do more work than some of our other folks. It's pretty amazing how our body can compensate for it.

But basically, with this study, the patients were a year out. So it was a little bit longer out. They were on the standard treatment of beta blocker an ACE inhibitor for more than 12 months. They did a 12 week training program on the treadmill. All of their EFs average were below 40%.

There were no cardiovascular events with the training. Their protocol was that the moderate exercise would essentially be from 70% to 75% of their peak for 47 minutes. The interval training was four minute intervals at 90% to 95%. And then, three minute rest at 50% to 70%.

And their total amount of exercise time was only 38 minutes. And then, there was a third group in this study that was usual care. You have congestive heart failure. I want you to just listen to what your doctor tells you for exercise.

So we had interval training, moderate exercise, and kind of that normal just go and do what your doctor told you to do. And they would get a little bit of information from the study, but not much. So this graph shows you the VO₂ increase with these patients. The top is, of course, the control group. And there wasn't much change.

The moderate exercise is the middle. And the interval training is down at the bottom. And what we saw with these folks is that there was a significant increase in the VO₂. The moderate exercise increased their VO₂ by 14%. And the interval training was able to increase their VO₂ by an average of 46%.

And that was significantly different. Of course, that's a huge improvement. These patients, they also looked at some other factors like their LDL. There was a significant change more so in LDL and triglycerides, in fasting blood sugar, in HDL, and in the interval training versus the moderate intensity exercise.

And of course, the control group did not see much change at all. The top graph is the PGC 1 alpha, which, of course, is a huge increase on the interval training. And then, in the middle, the BNP drop on the anaerobic threshold or the interval training was a significant difference.

The BNP dropped by about 40% with a interval exercise versus continuous exercise. The bottom here is the EF for the three groups. So pre and post exercise training. Essentially, the control group stayed about the same. They were about 26%.

The moderate exercise group was about 32.8% to began. And they increased on average to about 33%. The interval training group was significantly higher. They went from an average EF of 28 to 38%. That's pretty big, especially for our patients that have congestive heart failure. And we're trying to keep them from having to get a defibrillator.

We have had quite a few patients that that's their main goal. You know, they're like, listen, I'm alive. This is good that I'm here. But I really want to get my heart function up so that I don't have to get a defibrillator put in so I don't have to deal with it. You know, I can get rid of this life vest. That is huge.

Have you thought about walking around for months with this vest attached to you that inevitably beeps every time you make a false move? I mean, we've had a lot of patients that it's such a headache for them to have to deal with that and to have to exercise with a life vest on. That is a huge improvement to be able to increase somebody's EF that much.

So we have done interval training with a lot of our patients. What we tend to do is we bring them in, let them exercise for a few weeks moderately, and just make sure everything's working OK. So I may have them come in for two or three weeks, maybe even longer.

But I throw it out there to almost everybody. You know, we do group education sessions. And I let them know it's an option. And actually, I gave this talk to them yesterday. We do a once a week education for them. And they were my Guinea pigs.

I changed it a little bit and put it in their terms. But I said, listen, I want to work through this. I want you to listen. So we talked about interval training yesterday. Did it for two different groups. I think we had, maybe-- we leave the talk, and they're always talking amongst themselves.

I think I had, at least, 10 out of 50 patients come up to me and say, you know, that's what I want to do. So next Tuesday, we're on it. We started a few of them right then and there was like, OK, you want to do it today? Let's go.

But we have had many patients. And we work with them just, kind of, one on one. It's like, all right, how do you want to do this? Do you like doing it shorter and harder? Or do you like doing a few minutes and, maybe, not pushing quite as hard?

But I still take them to that point where at the end of the interval they feel like, OK, I'm done. I need a break. We recover, and then we start back up again. Most of these studies are very strict about how they do it. You know, the heart rate response. I want to get you to 140 to 150.

We tend to use it more so with RPE. We watch their heart rate, of course, because they're hooked up to monitors. But we tend to go more so with how do you feel. Can you talk, can you not talk, so that they can take this, and do it on their own.

My goal with cardiac rehab is, even if you're not going to stay with me, I want you to learn how to keep up with this on your own so you know what to do in the future. So one of our guys, he came last year. He's actually a physician at Wake Forest Baptist. 47 years old.

He ran Mistletoe 5K last December. And then, all of a sudden, he felt horrible. He said he had no significant cardiac history. He got short of breath, and could not do his regular exercise. About two months of feeling short of breath, and he finally ends up in the emergency room.

So at baseline, he was able to walk, jog long distances. When he got admitted, he couldn't walk two blocks without being short of breath. He was admitted February 4th of this year. His BNP was 985. His EF was 15 to 20.

And there was no reason for it. Like, it was just one of these, where did this come from? So of course, when he was inpatient, he had runs of V-tach. So he ends up on the life vest. So he comes to us frustrated as can be.

I'm a medical professional. I'm fit. His body weight is good. Why did this happen? My heart function stinks. I have to wear this horrible vest, and I don't like it. I'm not happy.

So we brought him in. We started exercising just at a nice, even level. We helped him with his diet. He became very strict on his sodium intake and very strict on his fluid intake, even to the point that we had to help him increase his fluid a little bit. We actually spent the first few weeks with him working on just trying to get used to being on the beta blocker and having to get used to low blood pressures.

He would exercise moderately. And then, at the end, he would have the post-exercise hypotension. I think we spent, probably, the first three or four sessions where he was in a chair, and we're checking his blood pressure every few minutes to make sure that he's not dropping too low. But he was hovering around, like, 80 over 50. And so it was tough on him.

You know, this is somebody that's really active and working in our medical community. And all of a sudden, he's taken a hit. So like I said, he had a low sodium diet, ACE inhibitor, beta blocker. While he was with us, he lost nine pounds. And a lot of that was the fluid that he was holding onto.

So on February 4th, his EF was 15 to 20. On May 18th, his EF was 35, and he was able to get rid of that life vest. We did a lot of interval training with him once he got done with feeling not so great for those first two weeks. He didn't have any arrhythmia's. And like I said, he didn't need that defibrillator.

And that was huge for him. We've had quite a few folks. And like I said, that is just important. They just don't want to have to end up with the ICD. He started rehab on February 16th, which if you remember, he came into the hospital February 4th. So we started him within 12 days of his admission.

We try as hard as we can to get people in as quick as possible. We found just looking at some of our patients and the results, if we can start a patient within 15 days of their admission, no matter what that admission was, they have a better met capacity leaving cardiac rehab than if we wait.

Traditionally, we used to take six weeks to start patients. And truthfully, there's still some programs out there that do that. We tend to be a little bit more proactive. If somebody is able to get up, and get themselves dressed, and walk around a store, they're able to come to cardiac rehab because we'll work with them at whatever level they're at.

And on the other side of that, we also work with people that are really high intensity. We've had marathon runners come through the program. So he was very anxious. We did the continuous training. After he had been to us-- about 10 sessions is when we started doing the intervals-- he basically went over 15 sessions.

He went from only being able to do 4 1/2 miles an hour to being able to run at seven miles an hour. 15 sessions. That's about a month. That was a huge improvement for him. Number one because that's a huge exercise improvement. But number two because it helped him psychologically.

He was able to get back to work. He's back to all of his normal activities. So when he first started jogging with us, he was at four miles an hour. For 30 minutes, he could do it continuously. Upon completing cardiac rehab, he could do seven miles an hour for 45 minutes.

So that's just one example of what we do with our cardiac patients. And everybody is a little bit different. I'm not going to do intervals with everybody. One of the guys yesterday that walked out of the talk with me that wanted to do intervals, is one that we're still trying to figure out is he having some musculoskeletal pain from his bypass surgery, or is he having some angina?

He wanted to do intervals. I had to talk to him about how it's probably not time yet. We need to wait a little bit. There are some contraindications to doing intervals. Most of them tend to be pretty obvious. You know, your heart function isn't great. Class four symptoms.

A recent transplant. An LVAD, or any kind of arrhythmia, especially if it's something that's causing symptoms. So it's not always good to do interval training. But if somebody is pretty stable, it's OK. So interval training shown to be safe. There's really not much significant problems in any of these studies.

So even if we push somebody to 100%, even if we push somebody beyond that, it's OK. It tends to be better if they're with us in a setting like cardiac rehab so that we can watch, and we can see. If we start to see that maybe, they're, getting an increase in PVCs, or maybe their blood pressure went too high, or maybe they're a little bit too short of breath and they're not recovering, that would be ideal for somebody to come to cardiac rehab, and let us teach them. And they do it out on their own.

So in a meta analysis of 631 patients studied with coronary disease, there were no major cardiovascular events during training. Out of those 631 patients, there was no increase in arrhythmia's. There was actually only one cerebral hemorrhage with interval training. But it had to do with some other factors. And there were two MIs with the continuous training.

So it's relatively safe in our cardiac patients. High intensity training burns more calories. Lots of our patients need to lose weight, even if it's only five pounds. A lot of our patients need to lose weight.

Post exercise calorie burn is higher-- EPOC-- is higher in interval training than with continuous exercise. So when somebody gets done exercising for a period after the time they're done exercising, their caloric burn is higher versus if they had not exercised or if they had done moderate exercise.

The higher intensity training actually has greater adherence. And patients tend to like it more. I like it more. It's the way I like to exercise. I am one of those people that when I exercise, if I'm doing 45 minutes, I got to have the towel over the treadmill so I can't see the time on it. It drives me insane. It's like watching the clock tick.

It's like is it done yet? Am I done? But if I do interval training, the time flies by. A minute of working hard. Let me recover a little bit. A minute of working hard. Let me recover a little bit. It tends to go by a lot faster. So it might be a mental thing.

But the patients who did the interval training actually rated that they enjoy the exercise more. And it passed the time more. And they were more likely to keep it up. Higher intensity training accumulates more time at a higher intensity, maybe even at a less amount of time.

So a lot of these studies we saw benefit where somebody possibly was only doing 30 minutes of exercise with interval training versus 45 minutes of continuous exercise. And of course, interval training leads to a greater improvement in VO₂. And that's what we want to see in these patients with coronary disease. And that's what we want to see in all of us.

We know that one MET increase, that increase in VO₂, will help with survival by 10% to 25%. So in summary, high intensity interval training is safe for most cardiac patients. We advise them to usually do it one to three times a week. And on the other days because there needs to be other days, you do your moderate intensity exercise for a total of five to six days a week of exercise. Maybe even seven.

We all know that sitting is the new smoking. We know that sitting-- I always say that, and I sit here, and look around the room. And everybody's sitting. And it's like, OK, we need to get up. We know that sitting down is not good for us. For every eight hours we sit, we need an hour of exercise a day. OK? Get up,

So our patients need this too. Our patients are coming, and going home and sitting. So it is important to get them exercising every day. And it is important to make sure they're doing stuff outside of the program, too. Not only do we talk to them about making sure they're exercising everyday, but we talk to them about getting up and just moving around.

Supervision to start out interval training is recommended, especially for our folks that have heart problems. So that's where we like to have them come to us. And again, even if insurance doesn't cover it, we've got ways that we help people. We've got ways to bring them in, and do what they need, and then get them out the door.

There are a lot of future studies that need to be done in interval training. There's a lot of variability in the protocols for interval training. So you can imagine with how I showed you there's variability in the interval length. There's variability in the rest periods. There's no standard protocol on how to study the interval training.

So we need to look at different protocols and what's more beneficial for patients. We need to look at the dose response. Is one day a week enough? Is two days a week enough? Or is three days a week really where the difference becomes? We also need to look at how to progress that.

One of the most important concepts that we try to get through to our patients is do not keep doing the same amount of exercise every day for the rest of your life. You need to change it up. And I couldn't tell you how many people have come to us, and they have done the-- you know, it's great. You've been exercising for 50 years, but you've been doing the same thing.

You've been going out your front door. You turn left. You go through the neighborhood. You come back, and you're back home within 30 seconds each time. I mean, I'm glad you're up and you're moving, but it's not enough.

So how do we progress the intervals? How do we progress their exercise to get the most out of it? And then, also trying to take these intervals and put it more into a home program or a community program. So there's a lot of stuff that needs to be looked at. But we know, initially, that it can be more beneficial to do interval training versus continuous exercise, of course, in combination and that it's safe for our patients.

So this is our patient, again, John. This was the first t-shirt his wife made him. Gave it to him as a Christmas present last year. I love my Cardiac Rehab team. And it really becomes a big family with our patients. And when we see them three days a week forever, they become part of us. So we appreciate having them and being able to do this work with them.