

Dr. Justin Arne...: Welcome everyone. I'm Dr. Justin Arner from the University of Pittsburgh Medical Center in Pittsburgh, Pennsylvania. Today I have the pleasure of speaking with Dr. Anika Chhabra, Chair of Sports Medicine and professor of orthopedics at the Mayo Clinic in Arizona. Dr. Chhabra was a senior author of the paper titled, "There Is Substantial Variation in Rehabilitation Protocols Following Anterior Cruciate Ligament Reconstruction: A Survey of 46 American Orthopaedic Surgeons," which is in press in the Arthroscopy Journal. Welcome Dr. Chhabra, and thanks so much for joining me.

Dr. Anika Chhab...: It's great to be here. Thanks for having me.

Dr. Justin Arne...: Yeah, this is great. I think first of all, I want to congratulate you on a really great study that has such an important clinical part of our episode of care, and I think it's really under assessed, which I know you agree with as well since you're the one that undertook this topic. So I think it's a great topic and appreciate your time. So to dive right into it, I wanted to basically ask you that: how did you come up with this idea of evaluating the variability of perioperative treatment of ACL reconstructions, and tell me a little bit about your interest in that topic.

Dr. Anika Chhab...: Yeah, so this I think is, as you mentioned, a really under discussed topic in ACL surgery. We talk a lot about, as surgeons, the technical side going medial portal, what type of grafts should you use, what type of fixation should you use? We talk about that over and over and over again at all the meetings. But this is something that I think is just as important if not more important than the surgical side.

And I started, did my fellowship at Pittsburgh as you know, seemed to be back then in the mid 2000s, 2005-6, it seemed to be more of a time based approach where at six months the graft was healed. We know that from basic science studies, so let's get them back then. As I've practiced over the last 18 years and done more and more ACLs, this trend has changed to more of a function and strength based approach.

What that's caused is a lot of confusion. So there's still people who base on time, there's some people who base it on function and strength in terms of returning patients back to play after an ACL. So we don't have a consensus.

So this topic came to light at a PAC 12 medical meeting. I was having dinner with a few of the other ortho colleagues of mine throughout the PAC 12, and we started talking about when do we get these patients back? The bottom line was nobody had a consensus. Everybody did something different. So that's what sparked my interest in saying, hey, for such an important topic, with so much press and so much media coverage, why are we not able to come to a consensus about how to return an athlete back to play after an ACL?

And so that's really what sparked the interest. And really what we've learned, doing the study, is it's opened up a more questions and more discussion, which

was really the goal of doing this study is to have people discuss, "Hey, why are we doing this?" It's not really based on time or strength or function. There's so many other variables that we haven't even thought about. And hopefully it'll allow our readers and other surgeons around the country to start thinking in that way of individualizing care for these ACL patients.

Dr. Justin Arne...: Right. Certainly like we were talking about earlier, Dr. Fu talked about individualized surgical treatment, but individualized rehab and preoperative care is so important too. So I think that's a great point and so important. Tell us a little bit about how you determine the variability and a little bit about your methods, how you set it up, how you recruited surgeons, all of that. It's pretty involved and really complete, you guys did a great job.

Dr. Anika Chhab...: Yeah, no, this was hard because as we talked about, there's so many different variables when it comes to ACL recovery. It starts with first picking the right patient. How are you evaluating that patient? Because my processes are different than yours and another surgeon out there, which patient needs surgery? What type of surgery? So evaluating those demographics of those patients.

Then you got to take into account the surgeon. How many ACLs are you doing a year? Where are you from? Where were you trained? Everybody does things a little bit different. But those things do affect the outcome of an ACL surgery.

On top of that, you have the prehab, how many people are doing prehab and what type of prehab, what are you focusing on? Then you have the post-op protocols and how do you progress them? How do you do it early? Do you wear a brace? Do you not wear a brace? When do you let them start get off crutches? When do you let them start jogging? When do you let them progress to non-contact sports? And contact sports? And what criteria?

So there's so many variables that it was very hard to undertake a project of this magnitude to figure out how to make it into a survey. So our thought process was first do a literature review, which we did. And what we found was everybody uses different variables, different metrics to decide these processes of the pre and postoperative protocol. So we took the most common ones and put them into a survey to find out really what people around the country were doing. And that's where we came up with this and it ended up being a pretty tedious undertaking with anywhere from 45 to 65 questions for each person who filled out this survey. But I think it's very comprehensive, as you said, and it hits a lot of key points all along the whole rehab process.

Dr. Justin Arne...: Right, for sure. The cutoff I thought was interesting too. How did you determine 20 ACLs per year out of the surgeon to include here? And like you said, and I think we've learned from Moon and Mars that it's important to get thoughts from people in all different types of positions and locations, rural, urban, suburban. Tell us a little bit about how you did that and chose that. And then a

little bit about it. I saw that AOSSM and AANA members were part of how you gathered this data.

Dr. Anika Chhab...: Right. So we went back and forth about how many ACLs should you be doing a year to be considered, quote unquote, a ACL specialist or an expert. And 20 was sort of the number that kept popping up in the literature. 20 yearly. That means you're doing probably about close to two a month, one every other week. I think that gives you enough of an experience where you, as a surgeon, should be thinking and optimizing your rehab protocols. It's a little hard if you're doing one or two a year to say, "Okay, we need to change this or that and modify our protocols." So 20 seems to be that accepted point where you're a moderate to high volume ACL surgeon where you're doing enough.

Now, obviously the way we got to that point is calling out to all the AOSSM and AANA members because the majority of those are sports certified and sports based orthopedic surgeons who are doing that number a year. We thought that was going to be our highest yield to get as many surveys as possible.

The problem with, as you mentioned, you want to hit everybody from every demographics, every demographic, academics, private practice, urban versus suburban type surgeons. Everything's a little bit different in terms of access, in terms of what you have available to you in terms of postoperative rehab protocols and techniques and technology and things like that. So we wanted to try to hit as many of those as possible to give us the wide array. And we thought that hitting both AANA and AOSSM members would be the best way to do it.

And as we know, surveys are hard to do. We're all very busy and nobody wants to fill a survey. We get a lot of them, but fortunately we had enough to make some significant statements with our study and were able to get enough data. But it was a difficult task to do it the right way.

Dr. Justin Arne...: Yeah, I thought something I wasn't familiar with that you mentioned in your methods the checklist for reporting results of internet surveys or short for CHERRIES. You went through that, you guys were so complete to make sure you didn't just throw together random questions. I mean there had to be so much planning. Tell us a little bit about the basics, at least about these online surveys and how to make them so legit like you guys did.

Dr. Anika Chhab...: So online surveys historically have not been considered accurate and have been considered basically expert opinion, level five type studies. CHERRIES is a checklist for reporting results of internet e surveys that came out in the early two thousands. And basically it was a way to try to minimize bias in these surveys.

We know that inherently web-based surveys are biased based on people who have computers and good internet access and academic centers maybe have more time than a private practitioner. And so these web-based surveys

historically because of self selection rules are biased. And so this is a checklist and it's about 20, 25 items, I can't tell you exactly, but it goes through how to try to minimize those biases. And so we went through each point and said, okay, we're going to do an IRB through our institution. We're going to set up the survey with each question being reviewed over and over and over again by multiple different people to try to minimize the biases in the questions, and then sending it out to those different members multiple times, putting on their websites, try to minimize our selection bias.

And so it's a great checklist for anybody interested in doing web surveys. I learned a lot when doing this in how to try to minimize the biases that are inherent in this type of study. But it's a powerful tool that was started in the early 2000s that really helped validate a lot of these studies that we're doing.

Dr. Justin Arne...: Yeah, that's great. I think it's just such good science, far we've come over the last few years with these types of surveys I think are really important. So getting into the nitty gritty, tell us a little bit about your results and what you found and tell us a little bit about what you kind of personally took from the findings of your study as well.

Dr. Anika Chhab...: Yeah, so when you read this paper, you'll see that we separated into eight basic categories of questions that we wanted to ask, starting out with patient selection and background information, demographics, basically. Technology use, how many people are using technology to help with ACL recovery rehab. Meaning motion sensors, force plates, things like that that are a little bit more technologically advanced.

And then preoperative phase, what do you do? Do you do prehab? Do you formally do prehab? Do let them do it on their own? Are there criteria used before you go to surgery? Then we looked at postop rehab. Do you wear a brace afterwards? What kind of exercises do you do immediately after surgery? What do you limit? And then also we looked at the return to jogging as one major milestone. That includes light lateral movements and then contact unrestricted athlete, unrestricted return to sports, the next major milestone and then finally return to all contact and all unlimited activities.

So we took the that and broke it down into those categories. Ultimately what we came up with is there's a lot of variability and there's a lot of discrepancies in how people care for their athletes in all of these modalities. I think it's pretty well accepted that 80 some percent put people into a brace after surgery. The duration is variable. A good number of people, over 70%, do prehab in some capacity.

But when it comes to progression back to sports and those milestones, the jogging, the non-contact and the contact activities, we found that the variabilities is a lot greater and there's no real consensus. And so for me, that tells us what we kind of knew that we're just trying to figure this out along the way as we go and there's no right answer, no wrong answer. And I think this

makes it hard for surgeons, especially for us who are dealing with high level athletes to say exactly when you're going to get back what you're going to be doing along the way because we have to individualize that for each patient. So the variability in protocols is really the main take home point from this. And it tells us that we still have a lot of work to do to figure out exactly what the right answer is.

Dr. Justin Arne...: I mean, I still have patients that say, "Well there's this kid in my school that had a hamstring ACL and he's allowed to play sports at five months. Why do I have to wait for nine months?" It's hard for patients and it's hard to really explain that things to patients as well. And I know you would know better than me, but I believe internationally and in Japan, they keep them out even longer a lot times than we do.

Dr. Anika Chhab...: That's a great point. It's a really great point because we look at it as surgeons and say... It's not as prevalent in an academic world, but in saying community practice, and I was in private practice for 12, 13 years before I moved over to Mayo, and you don't want to lose patients. And I have used to have patients come to me all the time, "I'm here for a second opinion. My doctor last week told me that they're going to get me back at seven months. If you can get me back less than that, you're going to be my surgeon." And so it drives and influences, unfortunately care sometimes because no doctor wants to lose a patient, especially when they feel like they can do a good job, but then you're not being honest with the patient. So that's where we get into, hey, this is the conversation that we have to have before surgery. The education side of it.

I personally never give dates to my patients of when they're going to be back to play. I go through the protocol and educate them before surgery and tell them, these are the criteria you have to meet based on my protocols that will get you back to sport. And when that is. The minimum time is six months, but more realistically it might be later because not only does the graft have to heal into the bone, you have to meet the strength criteria, the function criteria, and then psychologically you have to be ready to return to sport. So I think that's a big take home point is if you're telling your patient you're going to be back in six months or seven months or eight months, I think you're not being honest with yourself and your patient because we don't know that it's too early to tell. There are too many factors that you have to take into account before clearing them to play.

Dr. Justin Arne...: The psychological aspect I think is so big too. But as surgeons it's something we're not as experienced with and certainly it seems like it's difficult to the sheer volume of psychiatric and psychological care that's required, we're just, I think, understaffed and we need to do a better job at that for sure.

Dr. Anika Chhab...: Yeah, I think that's becoming a bigger and more well known area of study in ACL reconstruction. And we see this all the time where technically the surgery goes great, the rehab is gone great, but then the patient at eight months, nine months, whenever that criteria is met, they say, "Doc, I just don't feel ready."

And me personally, I've had my ACL done and even though I was cleared to go back to play at seven months, I didn't feel right until about a year. And that was the psychological readiness. I was so afraid of re-injuring myself. And I think that's the thing that gets overlooked with patients and that's something that's hard to quantify. We're starting to do these psychological scales before surgery and there is correlation between getting back to play, return to sport with some pre-op testing. So that's something I would encourage. We're starting to do that and the data starting to come out about being able to have a better sense of when a patient's going to be ready to go back.

Obviously it's not the only factor. You have to deal with the things with the objective measures, the strength testing, the functional testing in addition to that. But I think it is one piece of the puzzle that we're going to be hearing more and more about in terms of getting people back to their preexisting levels.

Dr. Justin Arne...:

Right? Yeah, they definitely want to have some idea even if it's impossible to really tell them. And I would echo what you said for the listeners, Dr. Chhabra was the fellow with Dr. Bradley whenever I had my shoulder done when he was a fellow and I had the same experience at six months I was back to sport, but really was a year I think until I had that confidence and something that a lot of times gets lost. So I think that's really important. Like you mentioned.

One thing you mentioned in the limitations, and we discussed a little bit just briefly, was academic and experienced surgeons were really a lot of the people that responded to the survey. Since you have that really unique background, as you mentioned with private practice and now academics, tell us a little bit about that transition and the different resources you think or tell us a little bit more about the patient selection. Where I grew up, 5,000 people or less in my town, the physical therapists, you have to take care of everyone. They don't probably have the time or resources to do return to play testing. So that a lot of those challenges I think are out there for sure.

Dr. Anika Chhab...:

When I was in private practice in Phoenix here, the patients will go to lots of different therapists and we didn't have a say. Patients will drive to see their physician, drive to have their surgery, but they're not going to drive to do therapy two to three times a week for many months. That's not realistic and that's not time efficient for patients. And so I've built a pretty strong relationship with I think 25 to 30 physical therapists all around metropolitan Phoenix, which is hard to do, but it really was important I think, because what I realized is everybody does different functional testing, everybody does different types of strengthening. Everybody does different modalities because their resources are limited.

And changing over to academic medicine. A lot of my patients like to come to our therapy here at Mayo Clinic and so it has consolidated a little bit more. I'm able to control therapy a little bit more than what I could in private practice.

Having said that though, I think we all have to know our therapists and know what techniques they're using, what technologies and what... A big example is blood flow restriction. That's become a big therapeutic modality now that people are doing in prehab and posthab, but there's still a lot of therapists who don't have access to a cuff and the training to do that. And I think the surgeon needs to know that so they can help guide their therapy based on the resources that people have.

So outside of private practice versus academics, I think that's the take home point is understand your therapist, have a therapist that you trust and you know has some experience with sports related progression back to activities and know what modalities they have so you can use another different modality if you're not going to have access to other certain ones.

And so it's confusing because the world's, it's different than Pittsburgh where most people come to UPMC and get their therapy there at the sports center that Dr. Fu built. The real world doesn't work like that. So it takes a lot more work and understanding and patience from the surgeon and the therapist and ultimately communication to make sure the patients are taking steps at a time.

I found myself in private practice seeing patients a lot more frequently to make sure I can correct any deficiencies early than I am when I know that they're going to our therapist down the hall and our therapist is going to come talk to me if there's a deficiency. So I think that's a big thing that a surgeon has to be aware of.

Dr. Justin Arne...: Those are great points and I think something that we don't really learn a lot in training, you go to an academic or whatever kind of center, it's all been already set up and then you go out to your own practice and have to start all over it. I think those are great learning points. One thing that you mentioned a little bit, and I think the meat of this that people really want to know is with your experience in taking care of all different levels of teams, can you tell us a little bit about what you do and run through some of the basic questions that you asked about prehab, and bracing, and return to sport and any other things that maybe even you could have changed based on this results of your study?

Dr. Anika Chhab...: Yeah, sure. So now I'll go through my protocol. So I'm lucky and I have a pretty tertiary care type practice. I get referred a lot of ACLs from all different levels, from kids, to club sports, to college athletes, professional athletes. And so I tell all my patients, I treat everybody the same. Everybody goes through the same protocol. And that's a great thing for a high school athlete to hear if they know they're getting the same care and same protocols that a professional athlete is getting or a Division I football or basketball player is getting. I think that's comforting to them to know that it might not be what I want to hear, but I'm getting the same care and the same process that high level athletes are getting. That's very reassuring to patients.

So starting with prehab, I think prehab is critical. I think in terms of timing of surgery, I'm of the belief that anywhere from two to four weeks after surgery is after the acute injury, I'm sorry, is reasonable for surgery, but it's not based on time, it's based on range of motion. I like to use a magic number of 120 degrees. Again, that's not always accessible, but to me that says that the effusions down, the inflammation's down, the pain is down and patients have enough motion to proceed. That's to me usually within two to four weeks.

Now I do like people to work their quad muscle prior. I don't like to get that quad atrophy. In my practice if it's available, I love people to do blood flow restriction early. I think that does seem to help. We ran a study last year where we're collecting data to see if prehab blood flow restriction can help with post-op recoveries in terms of pain, range of motion, and ease to get to some of those milestones after surgery.

Now again, that's not always accessible. So if it's not accessible to get to a therapist to do some of the prehab exercises, then I give them a home exercise program to do on their own. Riding a stationary bike with low resistance, doing straight leg raises, things like that are very helpful to get your motion and get the quad strength back. So I think that's a critical piece of it.

Additionally, with prehab it does help build a relationship with your therapist, which I think is critical that people overlook if you've seen them before surgery, it's very reassuring to know that this person's going to be there to help you after surgery. And so I think the psychological readiness starts in that prehab phase.

So in terms of post-surgical, I do wear a brace. I think a critical thing to do after surgery, the three to four most important things is one, obviously you want to get the wounds healed. Two, you want the swelling to go down three, you want to get terminal extension. So for those reasons I take it out of the patient's hands and put it in my hands and put and lock them in extension in a T Scope brace immediately after surgery. I use Polar Care machine, which is put on in surgery.

So the first anywhere from six to ten days for a patient, for me, they're kept lock straight in a brace. It helps accomplish those criteria I want to do. I think it minimizes wound infections. If you have somebody going to therapy immediately taking their dressings off, they have a big large effusion, they're starting to move their knee, they're exposed to maybe not the cleanest environment in a therapy place. To me, I take those things out of the equation by locking them in extension. I don't have a problem getting their flexion after that, as long as you get them to therapy and get them on the right exercises.

So for me, when they come back for their first post-op visit, I keep them in their long brace, I unlock that brace, I change their dressings, I keep the wounds dry for usually three to four weeks until they're all healed with ACL surgery. That's just my protocol for protecting the wounds. But they can shower after that first post-op visit.

The goals the first three to four weeks are to get your motion back, wean you off crutches as your quad strength improve and your gait pattern improves. So I tell patients by three to four weeks you should be walking normally your gait pattern should be improved, your swelling should be minimal and your motion should be progressing past 120, 125 degrees At that point in time.

I let people ride a stationary bike when they have enough motion to do so with minimal resistance usually starts by two to three weeks. I let people get on the elliptical by ten weeks as to not prevent stretching of their graft. And then at three months we start looking about the progression, those other milestones. And usually when you have enough quad strength, which is above 80, 85%, you can start doing light straight ahead jogging with no sudden starts or stops and start instituting light lateral controlled movements at that point.

Usually at that point, I do not functionally test my patients because they haven't done the functional testing. As we know, those functional testing things have to be learned. The hop testing, things like that, patients aren't ready to do that at three months. I always get a little bit scared when therapists call me and say, "Hey, you want me to functionally test them at three months?" No, because you're putting them through hop testing, single leg stuff that they're one, they're not ready to do, two, the graft's not prepared to do that, three, the muscles definitely aren't there to do that. So I don't functionally test them until they get their strength high enough, which is usually at the 90% range with strength testing. So that's usually at about four and a half to five months we start their functional testing sometimes longer based on when their strength is above 90%.

Then I use this functional testing, whatever modality your therapist has available, there are lots of different types of functional testing out there and they're all good and they all have merits and they're all very sports specific. Some believe in one type other believe in another. But the bottom line, whatever testing you have, you have to understand that testing.

And then for me it's when you're above 90% of a limb symmetry index based on that testing, and that's anywhere from six months to eight, nine, ten months depending upon the patient is when I let them get back into the non-contact, more aggressive sporting activities.

And then for full contact sports, I do a four to six week sports specific progression after they're doing their non-contact activities and sporting activities.

So to me, again, as you can tell, I don't put a time on it. I base it on strength and then function and then their readiness to go. And that's that four to six week progression before getting back into contact sport.

So I know that's a long winded answer, but that's because there's not a quick short answer. But those are the basic tenets of my ideas of how I approach each patient. And I think every patient has to be individualized because even though somebody feels great and has passed all their functional testing, if they're not me mentally ready, then you shouldn't put them back out there. And so a lot of it comes with communication with the patient and the therapist in addition to having these guidelines. And the bottom line is it's not black and white, it's all gray and when it comes to each patient. So it's exciting because there's so many of variability. To me, you'll never get bored getting a patient back to sports. It's not a cookbook answer, it is something that has to be individualized. And so that's what makes this field very exciting.

Dr. Justin Arne...: Yeah, no question in so many unanswered questions as well. One person I was just curious about, say you have a young, say 15 year old soccer player, female that's hyperlax. If they're appearing to follow all those milestones, will you let these riskier people go back say six, seven months? Or do you kind of treat them all the same that way? It's all based on hard data?

Dr. Anika Chhab...: Yeah, that's a great question. So for me, that's part of the factors that we can't control. The sport they play the position they play, the ligament laxity, and obviously with in today's world, in the surgical side with some of these high risk patients, we're adding a lateral extra-articular tenodesis to these patients. And I think those results are coming out and very promising for those types of patients.

So when you throw in a different surgery, does that change your rehab protocols and your return to play? We don't have those answers. For me. I think the soccer players, I'm taking them out a little bit longer because usually they're not ready to go back from a psychological standpoint anyway, knowing the high risk of reinjury.

But yes, to answer your question, the trends that I follow, they seem to be staying out longer than the patients, the football lineman who aren't as high risk from a non-contact type injury. So to answer your question, yes, as I am maturing in my practice, I do think those risk factors are making me slow them down a little bit. But there's no hard data to show that.

Dr. Justin Arne...: Yeah, I love that. After 17 or 18 years you're still changing practice and learning, that's the way it should be. That's great.

Dr. Anika Chhab...: That's the great thing. Even though I think technically we feel more and more comfortable at this point as we practice, I think those other things are things that we modify and change. But again, I think we also become more realistic that there are non modifiable factors, meaning she's playing high level soccer, meaning she's ligamentous lax, those things we can't modify.

And I think we're more cognizant of those non modifying factors because we realize with experience that hey, your risk of re-tear if you have an ACL as a high school soccer player, go play college soccer. That can be up to 20 to 30% depending upon what you read. And more importantly, the risk of tearing the contralateral side is significantly higher up to 30%. And so those are very humbling numbers. And I think what we learn in our field is our job is very humbling. No matter how great of a surgery you do, you can still have failures and those are sometimes you can't control those things.

And so as we become more experienced, we also become more humbled, I think, and really more critical of our successes and our failures and how to make those better. And this rehab process is all part of that in getting better as a surgeon.

Dr. Justin Arne...: Yeah, all very great points. You mentioned the psychological readiness, and we talked about that briefly before. You mentioned about talking with a therapist and the patient. Can you give us kind of your gestalt or what you do if you find someone that you can tell is not quite right? Is it something just with experience you've been able to gather or give us some insights on how you determine who's not ready psychologically?

Dr. Anika Chhab...: Yeah, so I think one thing we haven't really touched on too much in this talk that's very important is the patient reported outcome measures, the PROMs that we call them, or the PROs, or whatever mnemonic you use. But those become really important. And what we did here at Mayo is we've instituted our PROs within our EPIC system. And so we have recently started to try to collect more PRO data, and that's very challenging to do. It's been very challenging. Fortunately we have Dr. JT Tokish, one of my partners who's a big researcher and excellent in that world, in that realm, help put those together. And we're trying to unify Mayos in all three sites to have a larger database of PROs.

But I think that's where this comes into play is you have to look at these PROs. That's what I do to help with patient readiness. Because they'll tell you in reading those surveys and what you're asking them, they'll tell you if they're ready to go back or not ready to go back. And so using those to help guide those.

Now in terms of once you realize if they don't feel like they're ready or you sense that they're not ready, then what I do is I get them involved more with their athletic trainers, their strength and conditioning coaches, their therapists, and I give them guidelines of things and activities that are going to help them gain that confidence. And it does take time. Everybody's different. But also having that outside support from the people you trust and have been working with really seems to help.

And so I think every person is different, so it's hard to say what's going to be the one trigger that's going to make you be ready to play, because I think there are a whole bunch of factors and a whole lot of different factors.

So I do offer them. I also, I've started to offer my patients sports psychologists. I think sports specific psychologists for return to play can help. And I get spoiled because I have access to that here at Mayo and here at ASU where we have those people who can help people through life after an ACL, not just sports. And I think that makes a big difference. So I'm fortunate to have the resources that not a lot of people do have, but I think it's something that's going to be coming a bigger and bigger part of people's practices as we get more literature on, as more literature starts to come out. So be cognizant of that in terms of your patients and have a real conversation with a patient to tell them, "Hey, you might not be, you're physically ready, but mentally you're not there. And if you're not there mentally, you're going to be hesitant, which is going to increase your risk of repeat injury and other types of injuries."

So it's an exciting topic and I think we need to do a lot more research before we're going to have really concrete answers of what the right answer and how to approach it is.

Dr. Justin Arne...: Right, yeah. Since you've gone through getting the patient reported outcome measures really linked into your practice, do you have any advice for other places or specialty groups or more rural listeners or people starting their practice, how to incorporate that into your practice and make it least disruptive as possible? Because it's always more work for everyone. It's a lot to go through.

Dr. Anika Chhab...: Yeah, no, I think you're exactly right. I think it's very cumbersome and it's very time consuming. So fortunately, when we have a robust web-based system that we have, we are able to get iPads and able to give them iPads in the waiting room. That way it doesn't slow you down in clinic. We're all very busy seeing lots of patients and always got one or two patients come in that take a lot more time. And so we've tried to have our check-in staff, our nursing staff do that.

And then for surgical outcomes, we have our surgery schedulers do that, and we send them emails prior to surgery. And for the ones that slip through or don't do it, we have them do it in pre-op since they're getting to surgery two and a half hours in advance to get ready. And so we have generated iPads and things like that.

Now compliance is still a problem. So you have to have people really bugging patients to do it. And really it takes time, but once you get it set up and it becomes part of your practice, it becomes a lot easier. It becomes part of the checklist of things to do rather than the extra thing to do.

Dr. Justin Arne...: I think it's probably, it's very powerful to pull up a graph on your computer and show them their improvements to give them the confidence or also their psychological readiness. You can show that in a data form, I think is powerful to show the patient and really have them buy in, which to me is excellent.

Dr. Anika Chhab...: More importantly in what, and the thing, I started this early in practice and I actually printed out on graphs all my PROs when I went to take step two of my boards. And so for young surgeons out there who are starting practice, I think it was a very powerful tool for me to show the board examiners, "Hey, look, I actually care about my patients. I'm actually trying to make changes based on how they're doing." And I think it's a very powerful tool for you as a surgeon to look at yourself and say, "Okay, these patients, my patients, when I do these MPFL reconstructions or this type of ACL, they're not doing as well." It makes you really be self-critical of yourself. And so I think that's the power in these PROs, in addition to using them to help patients progress and use them as subjective data points to get them to the next level, I think it's very important for yourself as a surgeon to have.

So I think it's good. I laughed a little bit when we got this final data from these surveys in terms of returning back to play, only one person said other factors meaning a sense of how they feel. And I think that one person probably is talking more about the psychological return to plan readiness than any of the other people who surveyed this and looked at only objective findings. So I think that one person might be onto something and seeing the bigger individualized care than everybody else who just answered, "Yeah, I use strength or I use function." So I think it's important to take all these factors that we've talked about and put them into this special machine and come out and then you let them go back when you feel they're ready as a surgeon. So it's a very interesting topic to discuss because you're going to get a lot of varied opinions across the country.

Dr. Justin Arne...: Right? Yeah. It's the art of medicine that we have to use all these data points and the best technologies and things that we have to make those important decisions. So to wrap this up, do you have any closing thoughts or discussion about the future of ACL perioperative treatment? You know, you mentioned the technologies and wearable technologies, and tell us what you think the future holds for this and how we can continue to improve.

Dr. Anika Chhab...: Yeah, I think, again, that's a loaded question with a lot of answers, but I do think we are going to continue to evolve and change as surgeons, as therapists, as rehab progresses. I think we are going to use more technology. I think the wearable motion sensors are becoming easier to use and we're developing that sort of technology without having to wear sensors now. We can do motion analytics based on pictures and movement and kinematic studies and gait studies and landing studies more based on just visualizing pictures with computer algorithms and AI. So I think that is going to change and become technologically more prevalent. I think it's going to be easier to use technology and it's going to become more readily available and the cost isn't going to be as prohibitive in the future. So I do think that form is going to help us guide some decisions and have more objective data.

The one thing that's crazy, and I'll mention this at the end, is I had a single patient who is a therapist and I sent them to four different therapists to get

functionally tested. And this was at nine months, eight months, eight and a half months. And I said, "Hey, let's go see how variable these functional testing are." The functional testing limb symmetry index ranged from 60% to 94% in the same patient at the same point in time. And so that functional testing is not an end all sale. We look at as objective data and say you're 90% go, but that might not be the right answer. And I think the accuracy of these across the board is not that accurate. And I think that's something we have to be cognizant of. So even if I see a patient who's got 93% limb symmetry index and they meet all their strength and function criteria, I still might not let them go back to play.

So I think the bottom lines, we have to individualize care. We have to use our basic common knowledge and common sense and take every piece of data that we can before we release somebody at back to play. But also you have to educate the patient about their risks of re-injury. And that education starts in the pre-op, prehab stage. And so I think we're going to see a lot of changes in the future, and it's hard to basically say, okay, one little thing is going to make a big difference because it's multifaceted and that's what makes us so exciting and that's why this topic is not going to go away. So the more you learn about it and have reason for things that you do, the sounder you're going to be as a surgeon and the better you're going to be with your patients to be able to explain it to them.

Dr. Justin Arne...: Right, and continue to evolve, I think is one thing we can all learn from discussion with you today. So we appreciate your time and thanks so much for sharing all your knowledge with us today, Dr. Chhabra.

Dr. Anika Chhab...: No, this has been a lot of fun and great, and I'm happy to answer any more questions if they come out. I think most people know how to reach me here at Mayo, but I love the questions and love the forum to be able to get this paper out there, so I appreciate the opportunity.

Dr. Justin Arne...: Absolutely. Thanks again. Dr. Chhabra's article titled There Is Substantial Variation in Rehabilitation Protocols Following Anterior Cruciate Ligament Reconstruction: A Survey of 46 American Orthopaedic Surgeons is in press in the Arthroscopy Journal and is available online at arthroscopyjournal.org. Thanks so much for joining us.

Speaker 3: The views expressed in this podcast do not necessarily represent the views of the Arthroscopy Association or the Arthroscopy Journal.

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