

## Knee Pain and the Weekend Warriors

Mercy Hospital  
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Hello, and welcome to Mercy Hospital. We're in the emergency room -- in the operating room live at Mercy Hospital live. Thank you for joining us. We will be witnessing two surgeries today. We have Dr. Carlos Lavernia, who will be doing a total knee replacement, and Dr. Peter Hommen, who will be doing a knee arthroscopy. Let me introduce first, Dr. Lavernia.

Hello there.

Dr. Lavernia is the chief of the Orthopedic Institute at Mercy Hospital.

Welcome to our operating suites. This is our third visit with you, and we want to welcome you again. And I think today you're going to find our operations quite fascinating.

Thank you, Dr. Lavernia. And now we will switch to Dr. Peter Hommen. Dr. Hommen was the team physician for the professional soccer team here in Miami, Florida, and is a sports fellowship trained orthopedic surgeon who will be doing the arthroscopy for us today. Hello, Dr. Hommen.

Hello, everyone. Welcome to Sunny Miami. I'd like to welcome you to our operating theater here at Mercy Hospital. This is going to be a knee arthroscopic surgery, which is a camera-insertion-type procedure in the knee joint. Can everybody see the knee joint down here? So what I have outlined here is a couple things on the knee. I can show this to you. This is the kneecap right here, and then I've marked that out. As you can see, this is the kneecap as it slides back and forth here. This is the joint line. This is where the actual joint is. You can see where I put my actual finger here as it slides back and forth. That's where the inner side of the knee is. This is the outer side of the knee is. This is where the medial meniscus structures will be. This is where the lateral structures would be. This is the kneecap tendon right here, or the patella tendon, and this is quad tendon up on top here.

So what I've done is I've actually exsanguinated, meaning I've used a little S mark to push the blood up, put a little tourniquet up on the thigh here, and we're going to start a little incision right now on the knee. What we're going to do is I'm going to mark out a small incision. I'm going to mark out how small these would be. So the incisions I make are at the joint line, okay, next to the tendon. The smallest incision about that big. On this side, somewhere between here and here a small incision, okay, that will make to get our camera and our instruments inside the joint.

So what we'll do now is we're going to start to make a little skin incision here, take a little cannula and put that in the joint. Okay. And that's a camera being put into the knee joint through a small skin incision just big enough for that cannula. Okay. So now what I do is I bring the knee straight and I put this cannula right inside the knee joint, right up in here. I turn my water on and I can put my camera right in there. Okay.

And the way we do that -- we don't like to have too much water under our feet. It causes a big lake effect, so we have a little pouch that collects our water for us. And now we're hooked up inside the knee. So welcome to you inside our patient's knee. And this is a 26-year-old gentlemen who has a meniscus tear, we think, based on an MRI scan, as well as clinically on his examination. So we're going to be looking for a tear of the inner meniscus.

Now he did this playing golf a few weeks ago. He had a twisting injury to his knee and felt immediate pain, was not getting better, and pain and locking-type sensation, okay. So what I'm going to do now is I'm going to show you the inside of his knee. So what this is this is the backside of the kneecap surface, so if I push on it, you see that kneecap bounce, that's the undersurface of the knee. That's a cartilage layer back there. This is the cartilage layer where the kneecap glides back and forth, and you can see that kneecap gliding like this as I bend the knee up and down. Okay.

So we're going to down the inner side of the knee here. You see there's nothing loose or nothing floating on the knee. I'm going to look on the outer side of the knee here. This is called a "diagnostic arthroscopy of the knee," and we do this on everybody's knee to see what's going on, to see if there's any cartilage injuries that we may be missing. Okay. We go back in the way back side, the outside of the knee, and there it is, the popliteus tendon and the outer meniscus. That's looks pretty good.

Now we're going to go back up here and here and we're go to go down in the inside of the knee. And my second port I'm going to use a little spinal needle technique, and that's the inner meniscus right there, and that's where we think there might be a small tear, and hopefully in his case he won't have one, but on examination and by MRI scan he looked like he did, so I'm going to put this little spinal needle up inside here. You can see where I'm coming in with a little needle. You can see where my location is here where I put my needle in. I can kind of probe at that meniscus right here. We think the tear might be kind of under the undersurface right underneath there somewhere. So let me have a little knife. Take that.

I'll make my second skin incision right about here and use a little clamp next. And I use a little cannula after that and I can dilate out, let the water run through. I kind of dilate just to make this big enough to put a cannula inside and irrigate my knee out. There's my cannula going in. I like that position, so I can take this out. Take out the sheet there for me, Phil. Then we can get a little irrigation through this knee and we can see what's going on here. We have a little probe next, and we'll go inside and look further.

Dr. Hommen, can you hear me?

I can hear you loud and clear.

Let me ask a quick question. You mentioned that the patient had been playing golf and sustained the injury. Can you tell us anything about preventing this.

Well, preventing meniscal tears in the young and athletic-type population like this gentleman, you know, very active, obviously somebody who's going to be probably going back to sport even after this, these things are hard to prevent because they can cause -- they can come up by any kind of twisting injury or any kind of pivot injury to the knee.

Is that something related to exercise, lack of exercise? Is there anything that that an individual could do that would diminish the probability of sustaining this kind of injury while participating in weekend activities or sports?

Well exercise is always good, but a meniscus tear itself is really a tear that can happen from, like I said before, any kind of a twisting injury or pivot or rotation injury to the knee, or if you have torn your anterior cruciate ligament at the same time, that can cause this as well. But preventing cartilage and wear of this part of the knee here, this is called the "cartilage that lines the bone." This is the condyle surface of the femur, and this is condyle surface of the tibia. And you can see as I bend the knee back and forth, this is how the femur moves. Okay.

This you can prevent arthritis in if you have good quadricep control and good hamstring power and you're not overweight and you're not doing activities that can cause this to wear out like repetitive overuse-type activities in the knee. But you can see here what I'm showing here as I push my probe on the top of his meniscus; you see how it kind of falls in there; that's a little tear of the meniscus. You see when I pull on that, that's unstable. That's right at the peripheral capsule of the knee. And luckily for him, this is something that can be repaired with a little insertion device that we can put in there to fix that. We're going to have one of those open up right about now. All right.

And this is the root -- the posterior horn of the tear -- I'm sorry -- the posterior horn of the meniscus, and that looks like it's normal. And the front here of the meniscus looks fine. This is the anterior horn of the meniscus. This is all the medial meniscus, and you can see, again, this is where the tear was, a little too much give, a little too much slack, and this is exactly where he is having his pain. All right. Now let's look at the rest of the knee. Let's have the table up a little bit.

Dr. Hommen, is that pain the patient is feeling, is that specifically from the tear in the meniscus itself?

Very likely. There are pain receptors in the meniscus along the capsular edge, along the outer. This is the outer edge here of the meniscus. This is the inner edge here of the meniscus. That's the inner edge. That out here is the outer edge. This is where the blood supply comes in. This part really does not have any nerves and really does not have any blood supply at all. However out here you can actually see this is the blood supply coming in. You can sometimes see a little redness here as it comes in and feeds the meniscus to about right here. The rest of this meniscus really does not have any good blood supply at all.

So when folks are engaged in these kinds of sports and feel that sudden pain that you were talking about, is there something that alerts them that this may be meniscus specifically, anything about the pain?

Yeah. They can have pain with, like, a pivoting-type sport, like if they were to turn on their knee with their foot planted, this could cause this meniscus to kind of bunch into the knee here and cause pain or a tugging sensation on the meniscus, or a knee that is bent in high flexion can be pain right there. It can be painful right here on this part of the knee where it's kind of lit up with my camera. That's kind of where you would have pain, right along in this area of the knee. And also the same thing can happen on the outside of the knee here.

Does this pain persist after the twisting motion, or does it only recur with the same kind of motion.

It can happen with any kind of motion. Once it's torn, it either will start to heal up, okay, in certain tears that are close to the blood supply, okay, that can heal because they still have a blood supply, versus those that are in the inner edge here, those generally do not heal. Now if the injury happens and it is torn and it's not healing, any twisting motion, any pivoting motion can illicit this pain again.

Okay.

Right here, this is the anterior cruciate ligament of his knee right here. You see that nice sturdy ligament right there? That is the "ACL" we call that, the anterior cruciate ligament, and this right here is the posterior cruciate ligament, and both of those are really nice and stable. Okay. I'm probing those. I'm putting my probe around that ACL, and you can see the normal two-bundle attachment, one is up here and one is further back behind the knee here. Those are stable. It is not an ACL tear. So he's lucky he does not have an ACL. We knew that from his exam as well. So we're going to go into what's called the "figure-four position" at this time. We're going to have the knee brought into a flexed position. We're going to go to the outer meniscus now.

Let me ask you a question about what our folks are seeing on the video. There's some loose wispy filaments that one can see in the background as you're showing us the cartilage and the ligaments.

Yeah. That is the synovium of the knee, and we'll go back to that. That's normal structures in the knee. That helps bathe the knee in normal joint fluid. Okay. And we'll show you that again in a little bit. Now this is the outer side of the knee, this is the lateral meniscus of the knee, and that's nice and stable. You see that normal bounce, that little bit of -- we call that a "flounce." And that's looks normal. If we bend that knee up nice and high into flexion, you can see the position we're in right now with this knee, this is a nice cartilage surface of this outer femoral condyle. This is the tibial plateau, a little soft. Okay. A little bit bouncy, kind of like a trampoline, maybe a little cracked right there, but we'll watch that. That's not something we're going to take care of here today.

So that is the popliteal tendon back here. That's a normal structure found in the knee. Okay? One of the few you can actually see right in the knee joint. So in this meniscus, if I pull on it and probe it, okay, that looks good. Okay. That's a normal little bit of give right there. The lateral meniscus has a little bit more give than the medial meniscus. Okay. But the posterior horn here looks attached. All right. Let's probe that again just to be sure of that that there's no meniscal separation from the capsule. That looks stable right there.

Dr. Hommen, as you're going through this and explaining the anatomy that you're showing us, I do want to make reference to the patients that have allowed us to demonstrate their surgeries today. These are two individuals who were very committed to the educational opportunities that we could offer through this live webcast. And again, this is a live Internet webcast from the Mercy Hospital operating room. And again, I just want to acknowledge the participation of the patients who were dedicated to this effort and to the education it could provide our community, so I just wanted to mention that as you're showing us the first knee.

That's right. That's right. It's a wonderful chance to really see the inside of a knee. Really at this point, a normal knee on the outside and really there's a small meniscal tear on the inside. Now he also has a little cyst we'll show you that in a second, how we take care of that. But, really, that's kind of what we do with a diagnostic arthroscopy. We look around. We make sure there's nothing else we need to take care of at the same time.

Dr. Hommen, before we cut away to the other surgery with Dr. Lavernia for a couple minutes, I wanted to ask you, when is it that you identify that a patient might require an arthroscopy?

Well, a patient that comes in with knee pain, you got to do a very thorough examination. It's not just run to the MRI scanner and see what's going on with the knee on an MRI. Really, you have to do a thorough exam. The MRI scan really validates your examination. So, you know, what I do is every patient that comes in gets a very thorough examination of whatever joint or wherever they're having pain, and at that point we proceed, we may need an MRI scan or further scans.

A patient that has a meniscus tear on an MRI scan, a young patient that may or may not have further ligament injuries look an ACL or PCL or other injuries, you have to be very careful, because a small tear like this can progress. And he's been having pain and it has been getting worse. These are the kind of meniscus tears that can get bigger over time, and the last thing you want to do is have a young patient like this have a small tear propagate into a large tear, and that kind of tear can really cause this surface of the bone to become arthritic. And that could be a shame, because you play end up on the table next door getting a knee replacement in 25 years. So that's the kind of thing we're trying to avoid by perhaps trying to fix this meniscus tear right here.

So what you're saying is that the early intervention can help prevent further problems.

Exactly. In certain cases, yes. Now there is definitely a need for conservative management as well where you do not go right into knee with a camera. You know, certain things will heal like the medial collateral ligament or some cartilage on the bone here can heal with non-operative or non-surgical management a well.

Very good.

So you have to be very careful. Not everybody is an immediate surgical candidate.

Thank you, Dr. Hommen. For a couple minutes now, we're going to switch operating rooms and come back to the operating room with Dr. Carlos Lavernia where we're going to be witnessing a total knee replacement. Hello, Dr. Lavernia.

Hi, Dr. Anton. On this side of the operating room you're going to see the end-stage or what happens to the knees that end up needing a knee replacement. All that beautiful cartilage and ligaments that you saw on that other knee are destroyed on this knee. It's a different type of problem on a different type of process, but a lot of people that are out there doing the weekend wars are going to end up needing knee replacements. We're currently doing around 700,000 of these operations a year, and they project that we'll be doing approximately 3 to 5 million in about six years.

That's nationwide in the United States; right?

That's only in the United States. What you see here on the operating table right now is the same process that Dr. Hommen underwent in the other room. If we can look at the leg now, this is a tourniquet starter. It's called and "S mar", and what we do is exsanguinate the leg. We take all the blood out of the extremity so we can operate and see exactly what we're doing. That's why these knee surgeries are what we call "clean operations," because you barely see any blood. Knee replacement, we've been doing for approximately 45 years throughout the world, and in the last five years, major advances in the procedure and in the way we do it have taken place.

If you can look at the leg right here, we can see the way that they used to be done in the past, and the incisions used to be almost half the leg. These days we're doing the incisions much smaller thanks to instrumentation, so we can do the operation through a much smaller hole, and we can actually get to the knee and replace the knee with minimal interference in the patient's life.

What I'm doing right now is I'm injecting the skin, which is one of the major advances that we have done in knee surgery, which is the pain management. In spite of this patient having a spinal anesthetic, I'm actually anesthetizing the skin, and what that does is it works on different receptors of the patient's sensory and allows the operation and the rehabilitation to be faster and allows for the patient to have a lot less pain.

So pretty soon I'm going to have the knee exposed, and you will be able to see in a second some of the same structures that Dr. Hommen was looking at through the camera, but you will be able to see them directly. This surgery is much more invasive than an arthroscopy, and you can see here, this is the kneecap right there, and this is the quadriceps muscles right there, and what we do in order to get into the knee to actually replace the structures that are damaged is we cut around the bones and we lift the ligaments gently from the area of insertion without cutting them. And once we have -- you can see inside the knee. This knee has a lot of damage as opposed to the other knee that had nice and shiny cartilage. On this particular type of patient the knee is destroyed.

Some of the same ligaments that Dr. Hommen was actually showing on the other operation are still here. The ligaments, as you probably know, are ropes that tie the bones together, and one of the most famous ligaments in the whole body is the anterior cruciate ligament. You can see it right in here. So this patient's problem did not result from an anterior cruciate ligament disruption or injury, which happens in some of the patients, because the ligament is right there and it's intact. So in his case the problem was different.

I'm going to straighten out the leg so I can actually show you a little better. That liquid that you see is sort of the oil that God puts in these knees to allow these knees to do their job. These knees carry sometimes ten times body weight, and on an active person this particular patient was extremely active throughout his life, he probably puts into his knee around five to six-million cycles a year. So now you see a little blood,

which is not unusual in these operations, and even that we're under tourniquet there are some venules that will get in our way here, and we'll just cauterize them as we go along.

Dr. Lavernia, Let me ask you a quick question about the patient. What kind of symptoms was the patient having prior to surgery?

This patient was having significant problems doing all of his activities of daily living, including going for long walks, which he enjoyed very much. And it gradually gets to the point where the patient is almost unable to go and do his normal bathroom things because it hurts so much.

Was the patient having constant pain or pain on walking on standing?

This particular patient was having pain on walking only. In some cases, the pain and the disturbance is so severe that they can't even sleep due to the pain. Now if we look over here, you can see a very beautiful example of the process of arthritis. This medial condyle or the inside part of the femur bone, this is the femur bone right here that I'm pointing to, and it looks shiny, almost like a billiard ball because it has lost all its cushion. So this area right here is completely bare. There is absolutely nothing but bone right where my knife is. On the other side there's still a little bit of that cartilage that you can see here right, which is the normal cushion that we have between the bones that allow the bones to move on each other without hurting.

I am now taking the anterior cruciate ligament, because on the knee reconstructions, we don't preserve it. We take it. We do preserve the posterior cruciate ligament, which I'll show you in a little bit, which is another rope that sort of lives in the back of the knee, and holds the bones together. The knee replacement design that I utilize replaces and takes care of the kinematic or the mechanics of the knee without the anterior cruciate ligament. In order to be able to make the proper cuts, I'm now drilling a hole on the inside portion of the femur bone, and my assistant is taking the fat out of the bone so that we avoid one of the problems that on occasion we will see in knee replacement, which is what we call "fat emboli."

Dr. Lavernia, Obviously the audience will be seeing some of the mechanics of the total knee replacement, and obviously some of this is pretty dramatic for folks that haven't witnessed or experienced surgery before. The concern that a lot of folks would have is what kind of pain would I have immediately post operatively and how long would it take for that pain to resolve? Can you talk a little bit about the pain management.

Absolutely. Behind the curtain here we have Dr. Rudy, who is our expert in pain management, and he has, before we started this operation, given the patient what's called a "femoral block," and the femoral block is basically a puncture in the groin area that's done after the patient is sedated and drips a little bit of Lidocaine, the same things that dentists use to anesthetize the teeth when they work on them. And it makes the post-op course very, very comfortable. This particular procedure used to be so painful that patients would avoid it for years because they were so afraid of the post-operative course. These days, now we have the techniques that allow us to keep the patient relatively comfortable.

Dr. Lavernia, do you want to explain what it is that you're doing with the saws at this time?

I'm sorry. Can you repeat the question?

Yes. I was asking we're seeing you saw, just explain a little bit about what you're doing at this point.

Absolutely. I'm cutting the diseased portions of the bone off right now. Those arthritic surfaces that I showed before have been removed, and now I'm preparing this for the metal portion or the femoral component, and I'm now with this, it's called a "Goniometer," an angle measurement device, double checking that I have done the proper angle cut. The precision on this surgery has to be monitored throughout the procedure, and it's most important in order for us to be able to give this patient a pain-free knee that will last for many years.

Dr. Lavernia, is this a good time for us to cut away to the arthroscopy with Dr. Hommen?

Absolutely.

Okay. Why don't we try to pan over to the other operating room. Dr. Hommen, I have you in my sights now.

Okay. Here we are, we're back in the knee. We're actually ready to put in a meniscal suture across here. Now what this little device is, it's a little pick that I can put into the meniscal area wherever I want and put a thread across using arthroscopic technique without having to open up the knee joint. Now certain cases, this is not the best technique, and other cases it is. It all depends on the type of tear and how the big tear is and what we see in here. So you have a little clamp for me, please.

So what I'm going to do is I'm going to put this meniscus repair stitch right in here. Okay? I've marked it. I'm going to put it right up in the side. Okay. Now it's going to stabilize this little tear right here. Okay? And you can see that little thread that comes out. I'm going to use my meniscal pusher or my little knot pusher, and it also has a little cutter device on it. You can see that thread, Phil is showing it right now. He's holding the camera for you. You can see what it looks like inside there.

Dr. Hommen, what's the function of the thread as it passes through the meniscus?

The function of the thread is, you'll see in a second. What that does is this is going to tie a stitch across the tear of the meniscus, and we'll put a few of these in to repair this meniscus back down, because there is a tear here, and we're trying to put a stitch across it. It's like a suture repair. Okay. What you can see now as we look inside here, as I push, okay, it's going to kind of bunch this meniscus together, okay, right there. That looks real nice. Okay. I'm going to cut that thread right there. That looks really nice.

Now as you accomplish that, does that increase the stability of the meniscus?

That's going to increase the stability of this meniscus, and actually hopefully allow it to heal with the blood supply in that backside of the meniscus there. This is a meniscus tear that's right on the capsular edge where we talked about. So this is definitely one of those tears that I would think is amenable to surgical repair and not to remove it. Given his age, I think we're doing the right thing here. I would definitely being a little bit more aggressive or an 24-year-old who's active, because taking out a meniscus, in probably a decade or so does cause arthritic changes in the knee joint. Radiographically if I get an X-ray who I have taken a piece of meniscus out for a tear, I know that over time I'm going to get degenerative changes, arthritic changes within that knee within seven years, and that has been shown in studies. Whether or not that patient has pain from the arthritis is different, but the whole goal here is to save this guy's meniscus and not have further progression.

Now with the kind of intervention that we're seeing here, what kind of success rate do we see in prevention of deterioration?

Well that's the thing, you know if you look at meniscal repairs in general, there's some mixed data out showing whether we can actually prevent arthritis, especially with surgical repairs -- suture cutter -- of this type of repair pattern. These do work and they do cause the meniscus to heal in about 60 to 80 percent of cases depending on where the tear is and how long it's been there and so on. But I think in this guy we're going to have a good repair, and he's going to have a successful outcome if we do a post-op rehab protocol correctly, he's not jumping or bouncing on his knee too quickly, I think we'll have successful repair here.

What is the improvement, the expected improvement related to the pain that the patient was having in relationship to the intervention?

Oh, she should have significant improvements of pain relief with this type of repair if the meniscus heals up.

And what kind of time window would you expect as far as being able to get back to the regular activities?

Well I'd say to get back to regular activities is going to cause him probably, you know, I'd say about four months before he's back to running-type activities. That's usually the protocol for meniscal repairs.

And how quickly after the surgery can the patient actually stand and weight bear and walk?

He's able to weight bear minimally after this procedure for the first usually about four to six weeks depending on what we see and how big a tear it is, and then we slowly progress more and more weight bearing on the knee joint, and we allow motion of the knee, but really only with a bending machine and with the therapist. Okay. Because motion is good to the knee. We don't want to lock him up in the cast, because they would cause more problems down the road.

Very good.

Like a stiff knee and things like that.

Let me do a quick welcome again for those who have joined us recently. We have a lot of folks joining the webcast. We're live in the operating room at Mercy Hospital. I'm Dr. Manuel Anton, the medical director at Mercy Hospital. We are witnessing two surgeries today. One is a knee arthroscopy being done by Dr. Peter Hommen, and the other is a total knee replacement being done by Dr. Carlos Lavernia. We're going back and forth between the operating rooms, talking a little bit about the kind of knee injuries that weekend warriors tend to have, and the kinds of interventions that might be required in order to be able to improve both their symptomatology and their long-term outcome in trying to improve the conditions of their arthritis.

We've spent some time with Dr. Hommen, witnessing the arthroscopy. We just panned off that. And we're going into the operating room now with Dr. Carlos Lavernia to check on the status of the total knee replacement. Dr. Lavernia, can you tell us a little bit about where you are in the process of the knee replacement.

Absolutely. If you can look up here, I have already prepared one of the two bones. Okay. This is the femur bone. It's already prepared to receive an implant. This is what we call a "trial implant" that we use, okay, in order to see which size do we have. This is what they look like. The actual real one looks much like this. We have approximately 11 sizes to try out until we select the one that we want. You can see very nicely that I am delighted with what I've ended up here in, and now I'm preparing the other bone, the tibia bone right here, which you saw in on arthroscopy earlier. This is the meniscus right here, which in patients with arthritis like this, see on this side over here there is no cartilage. This is like a billiard ball, as well as the femoral side, this was also very damaged.

So now I'm going to cut this bone and I'll remove the meniscus to be able to size the proper cut. I'm removing this, what we call "lateral meniscus," or the meniscus on the side of that bone in order to be able to really truly measure my -- what's called a "bony resection" or the amount of bone I have to take off in order to fit this patient with an artificial knee.

Dr. Lavernia, the most common, I think, symptom for those having either knee arthritis or knee injuries is obviously pain, and that's obviously what drives a lot of folks to visit their physicians and orthopedists. Is the pain and the condition you're talking about here due to the bone-on-bone opposition or the fact that they have lost the cartilage and they actually have bone-on-bone when they move?

That's correct. It's the equivalent of putting some sand inside your bathing suit on the beach and running on that bathing suit. It's a raw surface rubbing against another surface. It's extremely painful and disabling, and it doesn't allow you to perform very many activities without a lot of suffering. One of the things that people want to know always after these operations, can I be a weekend warrior again, and the answers are, absolutely, yes. If you take care of these knee replacement and you do the proper sports

activities, you actually lengthen the life of these knee replacements by exercising on them, but the exercise that you must do is low-impact exercise. For example, you cannot jog on these knee replacements, but you can play tennis. You can actually ride bikes. You can play golf. You can swim. So you can pretty much go back to a lot of the activities that most of these folks were doing before surgery. There are some that they cannot do and they have to give up, which include jogging, impact-type sports like football or racquetball. They're not something that's very a very good thing to do for these knee replacements. Now I'm getting ready to cut the tibia bone, which is my last step here.

As we see Dr. Lavernia cutting away the tibia, I'd like to remind everyone that we are live in the operating room at Mercy Hospital. If you are watching the webcast on your computer, you can see that there's a way to communicate with us, and we are welcoming any questions that you may have. We'll be trying to answer some of those questions as we go through the surgeries today.

As we see this, I think I'm going to ask that we take a look at some of the slides that we have related to the knee and the structure of the knee so that we can ask a couple of questions of our doctors here related to the anatomy. You see here in the beginning we have the muscles in the upper leg that connects to the patella. We're going to ask that we go to the next slide.

Here you can see a little bit about the areas that Dr. Lavernia was speaking to earlier. The femoral condyles are the two parts that he worked on previously. We'll go to the next slide. And then the articular cartilages that are the cushions that Dr. Lavernia was referring to. These are the cushions that we try to protect and which in this patient had been worn away.

We'll go to the next slide. And you can see here depiction of the meniscus, which are structures that were damaged in the case that Dr. Hommen was working on. With that, let me ask that we switch over to Dr. Hommen and see how the surgery is going with him. Dr. Hommen, we're back to you.

Okay. We're back on. Again, we're working on the knee here. We have repaired our meniscus. I'm going to show you that in a min second. This, again, is our anterior cruciate ligament right here. You can see that nice bundle of collagen right there. That is the outside of the knee right there, the femoral condyle of the lateral side of the knee. Again, that's the posterior cruciate ligament. Let's go in there and look at that meniscus.

So we put a suture in there. It looks real nice. It's going to hold up real nice. Probe please. I'm going to probe that for you and show you what that looks like as soon as I get this little probe in here. You could see here, this is all repaired. I'm going to pull on that and see if it comes back in. And I'm pulling pretty hard there, and that's not going anywhere. So and same thing, that's not going anywhere. So that looks pretty good. I like the way it looks. The top side looks good. I'm not falling into any depressions here where there might be further tears. And, again, here, you can see this is where the capsule and meniscus join, and if we had a tourniquet on you could actually see the individual blood cells sometimes kind of tracking through here through little blood vessels.

But what's really important to know is that not all meniscus tears can be repaired like this. Certain ages heal better and certain tear patterns heal better. And this is a great tear to heal up with surgery. The only thing I want to do with this -- micro fracture set -- what I want to do with this is do what's called a "little micro fracture," because I want this bone to heal up. I want the blood from the micro fracture sites to actually trickle into the knee joint so that we get extra blood flow into the knee. I want a little clot to form in that area, and I'll show you what that is in two seconds. You can pan back into Dr. Lavernia. As soon as we get our little micro factor set up here. We'll do that and keep going.

Okay.

Actually, we're ready.

Dr. Hommen, as we pan away, there are actually a couple of questions we'd like to ask. We're starting to get questions from our viewers. And the first question I have for you from our viewers is, "How would an

individual know whether they required knee arthroscopy or a total knee replacement?" Is that something the patient themselves would be able to understand, you know, understand which one they might need?

Yeah. If you're a candidate for a joint replacement or an arthroscopy. That's a really good question. It's often very much debated, even today among some orthopedic surgeons whether or not, you know, putting a camera into a joint that has arthritis is the right thing to do. You know, if you have arthritis but you have a tear of your meniscus and really the tear of the meniscus is something that may be causing the majority of your pain, you may be a candidate for knee arthroscopy, where you put a camera in, you get rid of that tear of the meniscus. It's not going to make your arthritis go away though. That's an important thing to know with this type of procedure. This is not an arthritis salvaging type procedure or of the knee or shoulder or any joint for that matter. But it is good for if you have a tear or a piece of cartilage that's loose that's floating on your knee joint, that's a fairly good indication.

Okay. So would it be fair to say that arthritis would tend to lean one more towards the knee replacement if it was severe enough, where as if it were another type of injury of the soft tissues of the knee that arthroscopy might be the proper way to go?

Right. And only your doctor is going to be able to tell you that for sure whether or not you are a good candidate for knee arthroscopy or if you are a candidate for replacement surgery. But, again, you know, most cases where it's really bone-on-bone arthritis like Dr. Lavernia is doing next door, where you've got a completely collapsed joint space, the cartilage is worn out, that is a perfect indication for a knee replacement. It's one of the best procedures done in orthopedics and really gives patients wonderful pain relief; whereas an arthroscopy in that setting alone is probably not your best answer and is not going to give that patient long-term relief; however there are certain indications where it may be indicated.

Dr. Hommen, another question that we had have your viewers that ties into this issue is whether or not most people who end up with a total knee replacement have to have had an arthroscopy prior to that?

No. It depends. No, that's not the case. Most patients that come in that get joint replacements will not have a prior surgery, although many of them will. You know, if you've had a meniscectomy done, if I had taken this gentleman's meniscus out, there would have been, maybe ten years from now, a case for me to -- or 25 years from now, 30 years from now, to do a knee replacement surgery. Let me see that.

Okay. So we can say that the majority of the patients that are undergoing total knee replacements today in the United States have not had an arthroscopy but some number have because they have had prior injuries.

Exactly. Some of them may have had an injection to the knee or some of them may have had, you know, therapy to the knee or other things, but, no, it's not -- I don't think the majority have had an arthroscopic procedure of the knee before they go for knee replacement surgery.

Okay. Thank you, Dr. Hommen. I'm going to switch to Dr. Lavernia for a minute. And, Dr. Lavernia, I have a couple of questions for you.

Absolutely.

Can you tell us what the recovery time of the total knee replacements tends to be. I know there are variations in patients, but our audience is asking what kind of recovery time can be expected with total knee replacement?

I try to tell my patients that they need to count with between 8 to 12 weeks of time after these surgeries. Now after having said that, I have operated on some physicians that have been back in the operating room in two weeks. That's not advised. I recommend that you at least rest for three to five weeks before you go back to any prolonged standing or any type of activity in which you're using your knee quite a bit. But most of these patients walk the next day or the following day, thanks to our master back here, Dr.

Gomez, who has that block in, and he does a great job with these blocks, we work together, at least about 300 days a year. Go up one side.

Now I'm trying to figure out what size to use on this side, and I tried a number six, and it's too small. On the tibia side we have approximately ten different sizes that we can use, so a lot of the measurements that we take before surgery is not as good as the measurements that we take in surgery. That's why it's most important that the surgeon have a complete spectrum of implants during the surgical procedure. And that's one of the nice things that we have here at Mercy Hospital -- let's go with a six -- which is that we have here a tremendous inventory of parts in back in case we need them. Pin on a stick.

So what you're observing here is the last stage of preparation in the knee replacement in which I'm preparing the tibia bone to receive these tibial component that will allow the patient to walk on this knee. Now all of these knee replacements are done with bone cement, which is a grouting agent that we use in order to keep the knee from moving in the early stages of the recuperation and allow the patient to full weight bear on these things right away.

As I wait for a part here, I'm trimming back some of the excess bones that are called "osteophytes" that form in arthritis. And a common question that I get from my patients, does running cause arthritis, and the answer to that is, no. If you run on the correct surfaces and you actually use the correct shoes you prevent arthritis when you run. And we have longitudinal studies from a great number of different cities across the United States and Europe that have shown clearly that when you run on the correct surfaces and you don't have an underlying anatomic problem, you actually protect your joint from arthritis. Now if you are, for example, 40, 50 pounds overweight and you run on some bad shoes and on a bad surface, you will get arthritis a lot earlier than if you did not run.

I need the saw please. Yeah. And go ahead and mix. Yeah. So now on the back table, you have Stephanie Rivera, who is one of our physician's assistants preparing the bone cement like I said before is a grouting agent that we have been using in orthopedics for 50 years, so we have quite a good track record. The other very common question that patients like to ask me is how long do they last? And the answer to that, although complicated, in a nutshell is if you take care of a knee replacement done in 2009 by an expert knee surgeon using good implants, it should last you a good 30 years. You can play golf. You can ride bikes. You can swim. But you cannot jog. You cannot play tennis on them or you'll destroy them earlier. So for the most part, people that take care of these knees should have between 25 and 35 years of good life on these implants.

Dr. Lavernia, there's a question from our viewers related to the success of the surgeries or any variances that there might be in the success of the surgeries related to women as opposed to men. Are there any factors that affect how females do in recovering from the surgery and in the outcomes of the surgery?

That's a fantastic question and one of my research interests. We have recently presented data at the major orthopedic meetings to show that females don't do as well as males for the first three years after knee surgery, and the reason is that they wait quite a bit of time to get the surgery. And the exact reasons why that occurs we're not sure. Right now for every man that gets a knee, three females get a knee replacement. So we're seeing a very large epidemic, if you would, of knee arthritis in the female population.

So, Dr. Lavernia, you're saying that there's a lot more knee replacement surgeries being done in the female population but that they're waiting longer to have the surgery done, and that complicates their outcome?

That's correct. Now at five years, the difference seems to disappear. Okay. At five years after the surgery, that difference seems to disappear, and men and women do the same. We don't have complete data on that, but it seems like they do. It's the same thing for African Americans as well as Latin patients. So we have found a gender and an ethnicity disparity in the results of this operation that's fascinating. And right now we're researching exactly why this happens and most importantly, how do we avoid it or prevent it and how do we equalized the outcomes between men and women.

The implant that you're seeing was designed specifically with the majority of the patients' anatomy in mind. But we have also created a female side to this implant, and it's the first gender-specific knee replacement system that was designed in this country. It's called a "gender knee replacement system," and we've probably already done around 350 of those here.

Dr. Lavernia, let me ask you, speaking of factors that affect recovering, it sounds like perhaps in the female population one of the factors that you're mentioning that affects recovery is how long they wait to have the surgery when they have symptoms. Are there any other factors that affect recovery?

The obvious is the medical condition of the patient before surgery. If you have a very, very athletic person like this patient that we have here who had a life time of exercise, they will bounce back much faster than if you have a patient that has been sedentary all their lives, that's a diabetic, that has medical conditions, which we call comorbid conditions, which add to the, you know, to the delays and the percent of problems that can occur with this operation.

What I'm doing right now is putting the grouting agent in in order to prepare the surface to receive the implant. And as you can see, this grouting agent is polymethyl methacrylate. It's a substance that we have had a tremendous experience with it. And some of the knee replacements done with this substance 25 years ago are still working. I follow them in my practice. And something most important that I like to remind my viewers any time that I do an educational program is that if you have a knee replacement or a hip replacement in you, you've got to be seen once a year by your orthopedic surgeon. That is most important, because there are problems that occur and that problems can be taken care of with lesser of a surgery if you catch them early than if you just sit on these things.

Some people think if I have no pain, I'm okay. I don't need to go see any doctor. That's not the case. When you have an artificial knee or hip in you, you have to see your doctor, preferably every year but after 10, 15 years of not having problems, you actually can see them every three to five years.

This is the actual implant. It is made of our titanium, aluminum, vanadium. It's a super alloy. In my 20 years of practice, I have not seen one of these break. So the technology to withstand the forces of these implants see on a regular basis is terrific. We have patients that use these knees, artificial knees, five to six million times a year, and like I said, as long as you don't impact load them, they should last you a good between 25 and 30 years.

Dr. Lavernia, our viewers are asking regarding the stiffness whether there's stiffness after the procedure and how long it takes for that stiffness to resolve if there is stiffness after the total knee replacement.

In a certain percent of the patients stiffness can be very bad. That's one of the possible complications that you can get after knee replacement. It's called "arthrofibrosis" where the knee freezes up on you, and you are not able to bend it. But the generalized stiffness that you see while your body gets used to these artificial parts lasts anywhere from three months to six months. But what I mean by "stiffness" is the sensation of that knee not being completely and totally flexible. But the knees bend right away. The next day, these patients in recovery room are bending their knees 70/80 degrees, and over the next week in the hospital these patients will actually on their own bend 85 to 100 degrees, and they will walk with a walker.

So it sounds like movement and the ability to flex the knee occurs very quickly after the surgery. The sensation that there may be some stiffness can last a couple of months; is that correct?

That's correct.

Okay. We have a question that I'd like to throw back to Dr. Hommen, if we could go back into the OR with Dr. Hommen who is doing knee arthroscopy there.

Well, we were doing the arthroscopy, but our patient has a little perimeniscal cyst, meaning a cyst that sits next to the meniscus tear. It's not a very common finding, but you have to look for it carefully on an MRI scan. It's a cyst that's actually created by the tear itself. And for some reason there's a little fluid that builds up as a result of the tear, and it can kind of get caught into the capsule of the knee, and they can be painful, just as painful as the tear itself. So I like to take those cysts and actually get them out of there so that he does not have continued pain from any kind of a cyst.

Dr. Hommen, a question that we have from one of our viewers is whether or not the kind of knee pain that we've been talking about that either of these patients may have, either the one undergoing the knee arthroscopy or the one undergoing the total knee replacement, whether that can have any impact on hips or on backs and cause either discomfort or anatomical problems in the hips or backs?

That's a really good question. We get asked that quite a bit. Let's say you have knee pain and it requires you to walk with a walker, requires you to -- or if you're walking with a limp, that can cause more stress on your back. It can cause more stress on your hips. If you have a knee problem and it causes let's say some arthritis in your lower back over many, many years, you can get arthritis in your back as well, and that can cause further problems. And, you know, walking, everything is related. So, you know, the hip bone is connected to the knee bone is, you know, it sounds funny but it's true. And if you have a problem in your lower back, it can cause problems in your hips. It can cause problems in your knees and your ankles down the road. So absolutely true.

Dr. Hommen, in addition to pain, some of the patients, particularly those that reach the point where they have to have to total knee replacement, also have alignment issues of the leg. Can those alignment issues also contribute to the hip and back problems even if there's no pain?

Absolutely. You know, alignment issues, you know, overall joint alignment issues, if you're talking about a knee alignment, can absolutely cause problems in the knee joint. If your knee is bowlegged or knock-kneed, that can cause undue stress on a very specific part of your knee joint. It's like your tires, if the your tires aren't aligned correctly, you're going to get wear of a certain aspect of the tire, either the outer side or the inner side of the tire, and if you get your tires rotated that's fine, but in the knee you really can't do that.

There are procedures you can do to fix alignment issues if you catch them early. Certain patients can actually undergo a realignment procedure where we cut the bone, kind of like Dr. Lavernia is doing, but we don't replace the joint, we actually allow the realigned bone to re-heal itself in a different overall alignment. So kind of like changing the alignment of your tires in a way, but that's called an "osteotomy procedure."

Another question along those lines. One of our viewers is indicating that they have had surgery, arthroscopic surgery a number of times and they're asking is there a point at women it would be recommendable to go ahead and have a knee replacement rather than undergoing arthroscopy for a fifth or sixth time.

Well that's a really good question, and only your orthopedic surgeon is going to be able to tell you what exactly your problem might be. You know, if it's over all arthritis and you have had, you know, a couple knee surgeries done, you may be a candidate. But if you're very young, and let's say you're, you know, in your 20s or 30s and even if you're had a couple knee scopes, make sure that whatever was done before was the right procedure. Maybe the ACL is still torn, or maybe a meniscus is still torn. You know, make sure we address everything, you know, before you undergo knee replacement surgery.

But if you have had a lot of procedures done and it's arthritis, that's the main cause, absolutely, you may be a good candidate for joint replacement. Dr. Lavernia can tell you about the patients he's done and the ages of his patients he's done, ranging, from you know, in their teens to, you know, well into their 90s and I think 100 years is his oldest. So, you know, everybody is a candidate at some point if you have the right indication for it.

Let me switch back to Dr. Lavernia for a second on this other question. Dr. Lavernia, one of our viewers is indicating that a family member is in their early 90, relatively active, did have a stroke some years ago, and suffers from high blood pressure. Is an individual in their early 90s who is still relatively active still a candidate for a total knee replacement?

Absolutely. If the medical doctor, the pulmonologist, cardiologist -- I'm not that much afraid of the calendar but of the physiology of the patient. I have had 95-year-olds that come to me because they can't play 18 holes of golf three times a week anymore, and they have a very bowed legs, and I have done them successfully and I have gotten them back in life. The fast growing age group today in this country is the 100-year-old plus. So if the physiology of the patient is healthy, meaning that they can tolerate the procedure and the rehabilitation, I would definitely operate on that person if they needed it.

Now as you age, your activity decreases in most cases, and people are very tolerant of not being able to do the things that they did in the past, but in other cases, they have led such active lives and they're so full of life that they want to continue living like that. And having the ability to exercise gives them an even higher and longer quality of life, and I think that, again, the most important thing -- I'm more afraid of a 50-year-old with significant heart disease and cardiomyopathy, meaning that their heart is very dilated and the heart doesn't work that well, I'm more afraid of that patient than a 90-year-old that had an active life that wants to go back and play some golf or ride a bike.

Dr. Lavernia, another question for you related to the minimally invasive approach or to the smaller surgery. Is this something that is used in partial knee replacement in addition to total knee replacement? Can you talk about the difference between those two?

Yes, it is. Partial knee replacement is a procedure that involves only doing one side of the articulation. Today you saw a patient that had damage on all three sides. The knee, as you saw on the little anatomy slides, has three basic sides; the inside part, the outside part, and the kneecap side. And if one of those compartments is bad and the rest of them are in good shape, you can consider doing only a partial knee replacement.

Having said that, in one year of practice, I see maybe only five or six patients that are candidates for a partial knee replacement. Most patients have significant damage on all three parts of the knee, and the recuperation is so much faster these days with the pain management protocol and the smaller incisions that it's almost indistinguishable in terms of the total time that it takes the patient to get back in their lives whether you have a partial or a full knee replacement.

You can see, if we can have the top camera here for a second. The way that we did the incision before where my fingers are, can we get a little bigger picture of that. Can we go away from the knee a little bit so that the audience can see the difference between the way -- the way we used to do it was between my two fingers, okay, and today we do it from here to here. So the damage is much less. As you saw during the procedure, a lot of the instruments that I use have been redesigned and reengineered to allow me to really truly put things in in the correct alignment through a much smaller incision. In the past, there was no way that we could actually do this with the precision and accuracy that we're able to do it today.

Now having said that, the whole concept of minimally invasive knee surgery for replacement is something that I truly do not believe in, because you have to be able to see what you're doing much like you guys saw today, and the MIS revolution, if you would, which started in 2002/2003 years, actually everybody went to a very tiny incision, and because they were trying to do this knee replacement without seeing what they were doing properly, the operation ended up bad, with a lot of crooked knees, and a lot of them went bad. So the field of surgery went back to a middle ground. Not the old incisions like I showed you here, but a lesser incision, or what we call a "small incision total knee replacement," which is what you've witnessed today.

Now I am done with the surgery. I'm going to show you the knee moving up and down. This is a complete knee replacement, and you can see how that knee bends and extends. We have to remove some of that excess glue that you see right on that femoral component right now. The femoral

component is made out of cobalt chrome molybdenum, which is a super alloy that has been in use in orthopedics for approximately 35, 40 years. So these materials that we're using in knee surgery today have just an outstanding track record.

One of the things that people ask me, what's the chance that I'll reject this knee replacement? And the answer to that is almost nil. Unless you've had allergies to metals, and some patients do. Today, this morning I did a patient that needed a hip replacement that was allergic to metals. And people that are allergic to metals they know it because they basically whenever they wear jewelry, they have rashes around the jewelry, they have rashes around their glasses. So it's a very rare thing. I probably -- I do 400 or 500 operations a year, and I can tell you that I see maybe two people with metal allergies a year, so it's a very rare occurrence. And true rejection of these implants is almost a non-issue.

Dr. Lavernia, Dr. Hommen, and viewers, I'll remind everyone that we're about two or three minutes from concluding this live webcast from the Mercy Hospital, Miami, operating room with Dr. Peter Hommen and Dr. Carlos Lavernia. We've been seeing a live knee arthroscopy performed by Dr. Hommen, and a total knee replacement performed by Dr. Lavernia, answering some of the questions from our viewers as they have come in. Dr. Hommen, we'll pan to you for a minute. As we get close to the conclusion, can you tell us a little bit about how the conclusion of your surgery is.

Okay. We're back here. I wanted to show you real quick the incisions on this knee. I don't know if you can see them. One is right here. Okay. The other one is right over here, and the third one I made back here to get that cyst out is down here. So you can see the size of these incisions -- or maybe you can't, but it's about three millimeters that way, maybe four millimeters here, and maybe a centimeter on that inner side here. I don't really generally make this one unless there is a large cyst like he had. So we're going to put some stickies across here, and these are little band-aids that really just kind of close the knee up. And this patient will go to the recovery room. When he wakes up, he will be walking with crutches today, putting a little bit of weight down, and we'll wait for this meniscus to heal up completely.

So, Dr. Hommen, are we to understand that the patient will actually be walking with crutches today?

He will be walking today when he wakes up. He will be walking today with crutches, putting a little bit of weight down, and a special knee brace we put on his knee to keep the meniscus tear from being pulled apart in the early stages of healing.

And Dr. Hommen, probably the last question we'll have for you is how long would it take for you to determine whether or not the surgery has been successful and the patient would or would not require other treatment?

Well, the meniscus is going to take several weeks to heal. It could take up to six to eight weeks for full healing of the meniscus tear with this type of suture. So what we look for is, you know, about two or three months from now if the patient has in pain and he's coming back to full activity, we know we had a successful repair.

Very good.

You know, and sometimes, you know, it can happen where in 20 percent of cases where you don't get a full healing of meniscus tear. But what we did is we enhanced our success of repair by putting little holes in the bone called "micro fracture" to put more blood in the knee joint to allow for like a clot formation in the meniscus tear.

Very good. Thank you, Dr. Hommen. Again, as we prepare for departure from the operating rooms at Mercy Hospital in Miami, Florida, I want to give a special thanks to the two patients who made themselves available for this educational presentation and were so committed, again, to presenting this information so that others could learn from their experience, both in the prevention, in the management, and the care they're after of the weekend warrior. Those who, through exercise or through other activities, might find

themselves either injured or needing orthopedic care. Dr. Peter Hommen has done the arthroscopy. Dr. Lavernia we'll pan back to you in our closing segment and see how the total knee replacement is doing.

Well we're now closing the wound, and now this patient will not get back the life as quick as Dr. Hommen's patient. He will have a new life. I have seen a great many cases in which after just about a month after surgery, their whole face changes because they had so much pain for so long, and this operation is truly a pain-relieving operation that gets them back on their feet relatively quick.

Very good. Is there anything in the post-operative period that is particularly important as far as the patient doing well?

The therapy on these operations is critical. We have a team of therapists here that are highly specialized and superb, and in the first week after surgery, if you don't bend the knee properly, you're going to get in trouble. So it's most important that these patients have professional and intense therapy. At Mercy we give our patients therapy twice a day while they're recuperating from these surgeries, which I think makes them get back into life much quicker.

Is there a rehabilitation period that's done with physical therapy after one leaves the hospital?

These things are much like cars, man, you have to take care of them. It's like changing the oil, if you don't keep your quadriceps and your hamstrings in good tone and strength, they will not glide properly, and they will wear out early. So the knee replacement mandates a lifetime of physical therapy on your own. Patients are instructed how to do these exercises. They're far and few of them, but if they are done properly and on a daily basis, they will keep these knees working nicely for a life time in most cases.

Very good. Very good. Dr. Hommen, is there anything else that you can add here?

You know, the benefits of an arthroscopic surgery are fairly obvious. It's kind of a minimally invasive-type procedure with, you know, smaller incisions and really beneficial for patients who have loose cartilage flaps in the knee or meniscal tears or ligament injuries to the knee. So I hope you had a interesting and you learned a little bit from our website and our webinar today, and hopefully we can do this again sometime soon.

For our viewers, I'll remind everyone that we will have what was today's live webcast posted and available through the Mercy, Miami, website so that you can come back and see the presentation again. We welcome any questions that you might have, and you can contact us, again, through the website. Either make contact with Dr. Peter Hommen, Dr. Carlos Lavernia, or the Orthopedic Institute at Mercy Hospital.

I want to thank, at this time, the viewing audience. We know that these procedures are sometimes exciting, but sometimes a little scary as well. I think one of the things that we've determined at Mercy Hospital is that it's important for patients to know what kind of surgery they're going to have, what the effects are, what the surgery looks like. It can be a little bit intimidating sometimes, but as you've heard from Doctors Hommen and Lavernia, the important thing here is the proper preparation for the surgery, the proper pain control, so that once the surgery is concluded the patient doesn't have significant pain, can recover quickly, and as you heard today, with today's technology and the intervention from the skilled surgeons, the recovery time is very quick. Dr. Lavernia, would you like to give us any closing words?

Absolutely. I would like to thank my team. I would like to thank Enrique, Roy, and Jose and Camillo and Melvis and Stephanie. They were all part of making this operation a success. These things are never done by one person, so I want to thank them for a great job.

Dr. Hommen, any parting comments from your room?

Same thing here, like to thank Maemae. Like to thank Phil, the whole team, Dr. Bresnick. We have a specialized team here day in and day out doing knee arthroscopies and joint replacement surgeries, and

these specialized teams help to make things go faster and smoother, and without them, we couldn't do this, so thank you.

All right. Well, with that, we'll be concluding the live webcast from Mercy Hospital, where you had the opportunity to witness a knee arthroscopy and a total knee replacement. Two different patients with two different conditions, two different kinds of orthopedic interventions that can help individuals who are suffering with knee pain and conditions that occur to us sometimes for those of us who are weekend warriors and who want to be able to get back to the activities that make our life so fulfilling and find ourselves hampered by the kinds of conditions that might cause us pain and stiffness and other problems in our joints. So with that, I thank very much for joining us today at Mercy Hospital live in Miami. Thank you.

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