

**DA VINCI ROBOT-ASSISTED HYSTERECTOMY AND LYMPH NODE DISSECTION
NORTHWESTERN MEMORIAL HOSPITAL
CHICAGO, IL
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ANNOUNCER: Welcome to the OR-Live webcast presentation live from Northwestern Memorial Hospital in Chicago, Illinois. During the program, it's easy for you to make referrals, make appointments, or request more information. Just click on the buttons on your screen and open the door to informed medical care. OR-Live, the vision of improving health.

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DILJEET K. SINGH, M.D.: Welcome to Northwestern Memorial Hospital. I'm Dr. Diljeet Singh, one of the gynecologic oncologists here and we appreciate your visiting us for this webcast of an endometrial cancer surgery case. I'd like to introduce Dr. Todd Tillmanns who is here with us from the University of Tennessee and is an expert in robotic surgery. Then I'd like to introduce the director of the robotics program here at Northwestern, Dr. Patrick Lowe, and then the surgical team working with him today.

00:01:00

M. PATRICK LOWE, M.D.: Good afternoon. I'd like to once again welcome everybody to Northwestern Memorial Hospital this afternoon. Let me take a minute to introduce the surgical team. Our fellow at the bedside operating with us today is Dr. Anna Hoekstra. We also have a resident, Dr. Margarita Aponte. Our scrub today is Jeff Madden and our circulator is Shannon [Ricard]. Today we have a patient with endometrial cancer that we're going to perform a hysterectomy as well as a lymph node dissection. If you guys have questions during the video cast, email those questions in. We have two excellent moderators with us today who can answer some of those questions for you. We also have some objectives that we would like to review for the viewers today. I'd like to turn back to the moderators and Dr. Tillmanns is going to give a brief overview of the robotic surgical system.

00:01:55

TODD D. TILLMANNNS, M.D.: Thank you Dr. Lowe. One of the benefits of robotic surgery is that you have [unclear] vision. Some of you can see here as Dr. Lowe is beginning his procedure, we can go back to the operating room, he has actually...

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DILJEET K. SINGH, M.D.: Perhaps even take a look at the surgery.

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TODD D. TILLMANNNS, M.D.: Yeah. You can see that he has -- essentially he's looking through a viewfinder that gives him three-dimensional view and he also is able to pick up the tissue very easily because he can see things in three-dimensions, instead of the typical two dimensions that you see in standard laparoscopy. Right there, as you can see, he's lifting up what is the round ligament. He'll generally incise that right at this point to begin the case and to begin the procedure.

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DILJEET K. SINGH, M.D.: I think one of the great things about the robotics compared to regular laparoscopy is if you watch, you can almost envision sort of hands making the movements that we're used to. That's one of the things that sort of allows us to do things more quickly, to do things I think more safely, in a way that we can't with regular laparoscopy.

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TODD D. TILLMANNNS, M.D.: Yeah, that last picture demonstrated very nicely the way that Dr. Lowe manipulates his instruments and as you said Dr. Singh, the devices allow us to have essentially seven degrees of freedom while we're operating, meaning that it's almost as if you're using your own wrists, which is a very nice attribute of this process. You can see the robot arms moving right there as Dr. Lowe controls them with the hand pieces. Essentially what happens is he fits his thumb and his forefinger into these ring-like devices and by opening them he can open the laparoscopic instruments and by closing his fingers he can do that as well. You can see him manipulating right now by just subtle movements of his arms and his hands. Those are transmitted to the robot to control the device. So he is controlling the robot at all times. Now he's opening up some spaces right there which we call the retroperitoneal space. You can see the blood vessel, which is the external iliac, pulsating right there alongside.

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DILJEET K. SINGH, M.D.: Don't forget, please feel free to email us if you have any questions while you're watching Dr. Lowe operate, or if we bring up issues that you'd like to have us discuss further.

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TODD D. TILLMANNNS, M.D.: That last instrument that he was just using are what are called the "hot shears". That device allows Dr. Lowe to coagulate blood vessels while he's dissecting the tissue. Right now it looks as if he's starting to move the intestines away just a little bit there and we're going to take a look at the ureter, which brings urine from the kidney down into the bladder. That's it right there.

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DILJEET K. SINGH, M.D.: I think the thing that sometimes people think of as almost space age about this is having the surgeon not actually be at the patient. But as you guys can see, you're in the same room and there's doctors who are literally operating at the level of the patient. It's just that the surgeon has the capability to have improved visualization, and unfortunately I don't think we can our webcast get the actual view that the surgeon has through the console. You know all the technical description. You've got to tell us that stuff.

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TODD D. TILLMANNNS, M.D.: Exactly. I think what Dr. Lowe is seeing is essentially in three dimensions and it's in high definition as well. It's very difficult to explain to people. What Dr. Lowe is seeing is different than what all the viewers are seeing right now. As we see things in two dimensions, he actually can see depth to everything he sees. Although the technology does not have the ability at this point for haptic sensation, meaning that you have feedback to your hands, you actually after about 30 or 40 cases develop a sense that you're actually touching the tissue even though you can't feel it. It's very unusual and it's difficult to explain, but that's the best way I think I can explain it.

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DILJEET K. SINGH, M.D.: Yeah, for the other surgeons on our webcast today, I do think that that's the most difficult thing, kind of learning to operate without the tactile sensation. But it really is true, the visualization is so excellent, you ability to see small vessels and eventually that sort of

switch-over of feeling how strong the robot is that it's a lot stronger than you are comes relatively quickly.

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TODD D. TILLMANNNS, M.D.: Yeah, I would agree completely, and I think the interesting part about the camera, when you look at the camera itself there's actually two lenses and that mimics your own eyes so it really enhances the view that you can see. Right now, Dr. Lowe is dissecting beneath the ovary there as he anticipates freeing up this tissue even further.

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DILJEET K. SINGH, M.D.: So for the people watching who don't know about endometrial cancer, so part of the surgery is removing the uterus, the cervix, the fallopian tubes and ovaries, and then the lymph nodes. All of those things help up understand what the stage of the cancer is, how far it spread, and then gives us the things we need to do to be able to treat the cancer if any more treatment is needed. Often times, though, this surgery itself sort of serves as all the treatment we need for endometrial cancer.

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TODD D. TILLMANNNS, M.D.: Right now, what he's doing is he's freeing up what's called the infundibular pelvic ligament, which is the blood supply to the ovaries and the fallopian tubes and the top of the uterus. This device right here is going to coagulate those blood vessels, sealing them, and then they'll be able to cut through them safely without losing really any blood and I think that's another large advantage, Dr. Singh. You can maybe elaborate on that, the blood loss compared to open procedures or standard procedures.

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DILJEET K. SINGH, M.D.: Yeah, I'll be honest. When Dr. Lowe first joined us and talked about this, I wasn't a believer. It's until you start operating and you sort of have the excellent visualization that you do, really every small capillary that, I'll be honest, we probably don't see very well when we're doing open surgery, but with the ten times magnification and the 3-D view that we get, we clearly see things that we can cauterize. Similarly, I think that one of the reasons the long-term complications of lymph node dissection is less when we do surgery robotically is for the same reason. We're able to coagulate small, small, they're called lymphatics, and so decreased chances of lymphoceles and lymphatic [unclear] in a way that we can't necessarily when we do the surgery open.

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TODD D. TILLMANNNS, M.D.: The procedure that Dr. Lowe is doing right now today, he is one of the authors on a recent study that was just presented at a national meeting and the average blood loss for this exact procedure, including the lymph node removal and everything, was about six tablespoons of blood, which is much less than we typically get with open procedures.

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DILJEET K. SINGH, M.D.: The average described in a standard hysterectomy with lymph nodes is about a Coke can of blood loss. The difference between that is substantial. In the long run and when we think about the other complications such as bowel, and how long it takes to wake up, other damage to the neighboring organs. All of those things are substantially decreased, probably because of a lack of exposure, not being touched, not being handled, and so recovering much more quickly.

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TODD D. TILLMANNNS, M.D.: Exactly.

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DILJEET K. SINGH, M.D.: I guess that's a topic we haven't really gotten to, surgical recovery after surgery like this.

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TODD D. TILLMANN, M.D.: Right. What are your, for instance, in a non-robotic approach, what would you say your average length of stay in the hospital would be after an open procedure, a standard hysterectomy and removal of lymph nodes and ovaries through a big vertical incision?

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DILJEET K. SINGH, M.D.: For us, and I think we're pretty aggressive about trying to get people back on their feet and eating and drinking, but people stay in-house at least two nights, with an average of three and I think that's pretty nationally accepted. For our patients who undergo robotic surgery, people go home the next day.

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TODD D. TILLMANN, M.D.: Which is nice. Then, for recovery time, what would you estimate as a recovery time for a standard open procedure compared to this robotic procedure?

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DILJEET K. SINGH, M.D.: You know, it's interesting, as we talk to patients we sort of talk about, "Oh, in four to six weeks you'll be feeling better," but I think honestly it takes eight weeks before people aren't uncomfortable and are definitely not using pain medicine. For me, I think about two weeks after a robotic procedure. It takes us that long roughly to have people kind of back at their working level. Would you agree with that?

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TODD D. TILLMANN, M.D.: I would. It was interesting, and this is anecdotal information, but I think it's kind of the fun part about doing the procedure is you will have patients come up and tell you about their own personal experience, and one of my patients who is a 70-year old woman, she said, "You know, I've never had to work in my life, but if I was a working mother, I wouldn't want any other procedure than this," and the reason why is she said, "I really felt like after having surgery on a Wednesday, I could go back to work on Monday morning," which surprised me.

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DILJEET K. SINGH, M.D.: I had a patient who taught from 9 am to 1 pm against my advice actually, four days after her hysterectomy lymph node removal and she's 67 and in reasonable good shape and she said this was a class she had to teach and something she needed to communicate. It was at the end of the school year and it was really important to her. She said she was fine. She though I was sort of silly and overprotective. So I don't know if Dr. Lowe would like to take a few minutes to talk with us.

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M. PATRICK LOWE, M.D.: Yeah, let me get you guys caught up to where we're at and so what I normally do for all these procedures, specifically for patients with endometrial cancer, I think Dr. Tillmanns and Dr. Singh kind of pointed out that we like to open up the retroperitoneal space and there's a portion of the broad ligament and there's actually an avascular space of Grave's that you saw me open and divide earlier. Here you can see the external iliac artery. Under that's going to be the external iliac vein. This here is going to be your superior vesicle artery. What this allows you to do, at least in robotic cases and also laparoscopic cases, is to open and develop the space. What that does is, when you come back later to do the lymph node dissection, when you have this space open and develop, I think it facilitates your lymph node dissection after you've completed the hysterectomy. In addition, we like to divide our ovarian vessels close to the pelvic brim which will allow us to later on in the case -- this is the common iliac artery here going up to the bifurcation of

the aorta. Here you can see the sigmoid colon. What that's going to allow us to do is mobilize the ovarian vessels up and away from our ureter, which is right here under this little area of tissue and under this little area of fat right there, which will then allow us to mobilize the ureter this way, laterally, and then to be able to remove these lymph nodes, and then as we extend up higher along the aorta as well as the vena cava. So, and I think Dr. Tillmanns and Dr. Singh both would attest to setting the spaces up, whether you're probably doing an open case or minimally invasive procedure, it really facilitates those dissections later on in the case. So to talk a little bit about setting up the patient set-up, going to sleep, putting in the trocars and dock time. We've had our robotic surgery program here at Northwestern for exactly 12 months and what we've seen over that point in time is pretty much a growth in the program to where we have dedicated surgical teams. We have two to three dedicated surgical teams where the scrubs and the circulators have been trained extensively in the robotic surgery and the robotic procedures. They are very interchangeable and they are all very good. So I think we're very fortunate in having them in our program. In addition, we have our fellows. We have a fellowship program that trains fellows in gynecologic oncology. Our fellows have participated in these cases since the beginning last summer and they've gained experience and maybe a little bit later on we can talk to Dr. Hoekstra who is our third year fellow, will be finishing next year and she has had a very good experience in my opinion in relation to robotic surgery, as well as other minimally invasive surgery. One of the things I think's really important when you talk about robotics in minimally invasive surgery is that a year ago we treated approximately five percent of our patients with endometrial, early stage endometrial, or early stage cervical cancer with conventional laparoscopy. What we've done is we've collected a perspective database over the last 12 months and we've recently reported some of our data at the interval of six months at the Western Association of Gynecologic Oncologists. So what we found is that we've been able to increase the utilization of a minimally invasive approach for endometrial cancer up to 50 percent from 5 to 10 percent and for cervical cancer up to 50 percent. So that's a really dramatic change in our program and also the way that we're treating patients with a minimally invasive approach. And we were doing laparoscopy before we instituted our robotic program last summer and so it has made a difference in our practice and it has made a difference in the way that we're caring for our patients and I think I heard Diljeet talking hospital stay for the patients since we've instituted this program and it's really been amazing when we look at the endometrial cancer patients specifically over six months. In the preceding six months before we started the robotics program, what we found was that the total number of hospital stays for all of the patients who had surgery for endometrial cancer was 206 days and that was between January and June the 30th of 2007. What we saw between July 1st and December of 2007 was the total number of hospital stays for the same number of patients having surgery for endometrial cancer was 96 days. So we basically cut the hospital stay in half for our patients. To sort of orient everyone where we are in the case right now, this is basically our uterine artery, uterine vein, okay. We sort of skeletonize the uterine vessels here. That's a fairly standard portion of a hysterectomy. We're going to divide these vessels on this side in just a minute and we'll also facilitate finishing mobilizing the bladder, which is here, as well as here, away from the anterior surface of the cervix and the upper vagina. Now Margarita, what I want you to do is just bring the uterus back just a little bit, little more retroversion, and what I'm going to do -- actually, nope. Come back a little bit. Come back towards me, Margarita.

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DILJEET K. SINGH, M.D.: Maybe we can take this little break in the action as a time to answer some of our email questions.

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M. PATRICK LOWE, M.D.: Hold on just a second, Margarita. Let me remove this instrument here.

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TODD D. TILLMANN, M.D.: I think some of the points that Dr. Lowe was just talking about with the laparoscopy versus the robotic procedure, and I think one of the things that some of the people, viewers may not know, one of the most beautiful uterine artery dissections that I've ever seen. It's just classic. The tortuous vessel that you see there and he's about to ligate that with one of the ligating devices. It's just beautiful. But one of the comments that was just sent in by email for us was, "For this specific case, do you think the surgery time will be significantly shorter than for a regular laparoscopic surgery?" I think Dr. Lowe and I have talked about this before. Essentially, yes. I think the answer is yes, it probably would be from incision to incision, once you have the robot set up it can just go so fluidly through it and you can see things so well. One of the other wonderful things is Dr. Lowe is actually controlling the camera entirely himself. He doesn't have to wait for his assistant to get to where he wants to be or to anticipate his movements. He does it all himself.

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DILJEET K. SINGH, M.D.: Asking the question, "Will it be shorter?", probably the time is similar and it sort of anticipates a question a lot of surgeons talk to us about, "What about the docking time?" The thing that Dr. Lowe was talking about early on, having a surgical team that's experienced, is something that's important in any kind of surgery, but especially in surgery here where we're talking about a new instrument where our team has gotten relatively efficient at setting things up, what we call docking the robot or bringing the robot over to the patient, setting those things up quickly and efficiently so that the time that that takes is often made up during the surgery because we can do the surgery itself more quickly. We also have a question here from Ruth that says, "I'm having the same surgery, not robotic, next month. Is this laparoscopic?" Absolutely. But again, sort of the differences between a laparoscopic and a robotic approach are about the instruments we can use and then sort of thinking about those wrist movement instruments where we have a lot better visualization and the ability to do things that we can't do with two-dimensional visualization and then instruments that essentially move along a fulcrum. The other instrument, and I'll try to remember to point it out when he brings it in again, that we're bringing in as a traditional laparoscopic assisting instrument, you can see how it's limited in its ability to work in the operating room.

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TODD D. TILLMANN, M.D.: Yeah, that's a good point.

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DILJEET K. SINGH, M.D.: The last question we have is sort of an interesting one and that is, "Does Dr. Lowe have a heads-up display of the vitals?" Now, when we do open laparotomies, when we do open surgeries, we don't see vitals. There is an anesthesiologist in the room that as surgeon -- when he described the surgical team, and we're going to have to get Dr. Lowe to do this, should introduce both the anesthesiologist and the CRNA. They are sort of in any surgery the people who are in charge of that and there's constant communication between the surgeons on a surgical table and the people above, or as we call at the patient's head, giving anesthesia. So they're the people who will constantly monitor vitals and constantly communicate issues of concern or other things to the surgeon in any kind of surgery, whether it's robotic or laparoscopic, or an open surgery.

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TODD D. TILLMANNNS, M.D.: We have another question here that was sent in. It asks who can have robotic surgery. Do you want to address that? Okay, well I think we don't generally put limits on patients that can have robotic surgery. I think they're pretty much the same as standard laparoscopy, but one of the things we actually have found is that we are able to push the limits in more obese patients, people that are a little bit heavier than others, because your visualization is so good, because you can see so well, and the instruments allow you to do things that you normally could not do even with standard laparoscopy I think. So you don't have to many limits.

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DILJEET K. SINGH, M.D.: Yeah, and I think even -- here's where comparing the robotic surgery to open surgery is the most interesting. So I guess we're getting a quick peek at the anesthetic team. That's for Johnny, who has that questions, I think. But getting back to this question of who's eligible. In a lot of ways, the things that limit us in terms of standard open surgeries, it's long been known that it's sometimes difficult to access lymph nodes in patients who are heavy enough that we can't reach them, so to speak, in an open surgery. We know that for endometrial cancer, the main risk factor is being overweight, so this is a common situation that gynecologic oncologists and our patients find ourselves in talking about. So robotics has, I think, really opened the door to providing people who are overweight and so at risk for this cancer with what we'd consider the best possible care where we can do things like check lymph nodes and make the best treatment decisions.

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TODD D. TILLMANNNS, M.D.: Yeah, I think it's very true. One of the things that we wanted to bring up as well is to look -- I'm not sure if we can do this in the other room, if we can look below it, at Dr. Lowe's feet while he's operating. I'm not sure that's even possible. There's a set of pedals that he's using -- there you can see them right there. At his right feet right there, he's using what's called a monopolar cautery and he's pushing down on that right now with a scissors, and then the bipolar cautery which is right next to that and that runs through the instruments that you see in his left hand, the one that's not moving, and he can use bipolar cautery just as he did just now. Just to the left of that bipolar cautery pedal is the focus where he can focus the camera in and out if he needs to.

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DILJEET K. SINGH, M.D.: I guess we can't get a view of it.

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TODD D. TILLMANNNS, M.D.: Yeah. And then just to the left of that there are two other pedals. Those pedals -- one of them allows him -- it's called a clutch pedal -- allows him to keep his inside the robot in the same place while he moves his hands outside where he's at the surgeon's console. So if he's in a place where he's moved his hands as far as he can move them, he pushes down on that pedal, you can see the clutch pedal on the farthest level right there. What he can do is actually he can -- it freezes the instruments inside the patient, he can move them wherever he wants. The pedal right next to that is the camera pedal, so he can move the camera around. As you can see, he can move it wherever he wants. There he just did it just there. So that's kind of how he controls a lot of the fine movements that you see.

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DILJEET K. SINGH, M.D.: You know, and I think looking at those pedals sort of reminds us again what are the things we really appreciate about robotics and how that allows us to treat patients. The ability to constantly focus and move the camera is something we don't even think

about when we do an open surgery, but sometimes in standard laparoscopy is something we struggle with because we aren't always able to see things just as we want, which is something that's completely removed from the picture when we're doing things with the robot.

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TODD D. TILLMANN, M.D.: Yeah and I think, like you brought up, I think the other thing is that sometimes the person that's assisting you has to almost anticipate where you want to look with the camera and the standard laparoscopy, whereas with the robot, you have to anticipate your own movements, which as we all know is very easy.

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DILJEET K. SINGH, M.D.: Right, we know what we want.

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TODD D. TILLMANN, M.D.: Exactly.

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DILJEET K. SINGH, M.D.: Just like everybody else out there. Again, don't forget, if you guys have any questions for us, please feel free to email us, we're happy to answer questions. It looks like Dr. Lowe is sort of now on the other side. Maybe we can take it back and look in the surgery.

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M. PATRICK LOWE, M.D.: Yeah, so what we're doing right now, we've completed the dissection on the right side of the patient's uterus, and so what you can see is, here is our Foley bulb inside the bladder. Here is the edge of the bladder peritoneum, we've dissected that away. One of the nice things when you compare it to conventional laparoscopy is when you're developing your bladder peritoneum and what you can do with the robotic system since the instruments are wristed. What I can do is just push that down as if I was doing an open surgery and so I kind of think that robotics mimics more open traditional surgery than laparoscopy because the instruments are wristed. And another advantage that I think is really wonderful is the camera is three-dimensional so I have depth of field, so I know precisely how far I am away with this grasping instrument from picking up that piece of tissue, as compared to a conventional laparoscopy which is two-dimensional. This is where we're going to make our incision when we've completed the hysterectomy. This is going to be the vaginal incision to remove the uterus. What you can see over here and I'll demonstrate this on the left side is you can see where we've divided the uterine arteries here and carried those all the way down to where we're going to be making our vaginal incision. What's really nice, this patient has a wonderful anatomy, not only for teaching but also for the purposes of this presentation. Here you can see the patient's ureter traveling into the pelvis, past the uterine artery, and into the bladder. So, we'll start working back on this side, on the left side a little bit more. This is that avascular space of Graves that I'm talking about. I'll show it to you in just a second. This is part of the bladder peritoneum right here on the left side. It's always important to mobilize the bladder away from the uterus. It involves the anterior surface of the uterus when you're doing hysterectomy. And making sure that you have nice adequate vaginal margins so that when you close the vaginal cuff together, your bladder's not close to that area and we have that down very nicely right there right now.

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TODD D. TILLMANN, M.D.: Patrick, can you hear me? I wanted to -- what you just did with that bladder where you flattened out your instrument and kind of pushed the bladder off of the top of the uterus, that's a really nice technique which you just showed a few minutes ago and I think that in a lot of proctored cases, showing that and teaching that technique to people learning it is just a wonderful way to teach them how to basically take down that bladder so nicely and so carefully.

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DILJEET K. SINGH, M.D.: And it sort of brings us back to the issue of what makes this different than standard laparoscopy. That's a move in that specific way that we actually can't do, that takes two tools to try to mimic that kind of procedure with instruments that don't have the same kind of mobility. We have a couple more emailed in questions that I think are good questions. One of the questions sounds like it might be coming from somebody pretty familiar with uterine cancer, asking about concerns about using the uterine manipulator with and obturator in a cancer case and concerns about sealing the fallopian tubes. That's something that even in open surgery has essentially gone out of practice and sort of out of our beliefs about endometrial cancer, the concept that we could spread endometrial cancer out through the uterus, out in the fallopian tubes during the procedure, I think is pretty much no longer believed. I assume you agree with that Dr.

Tillmann?

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TODD D. TILLMANN, M.D.: Yeah, I think there are people who still routinely practice and it's a simple thing to do if you want to just coagulate the fallopian tubes at the beginning of the case and if it does bother you, if it doesn't, like you suggested, for a lot of especially gynecologic oncologists and others, then you don't concern yourself too much with it, but if it was a bothersome part, you just cauterize the fallopian tubes and then place your uterine manipulator. I think that that's an easy way to address that, but a good question for sure.

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DILJEET K. SINGH, M.D.: Sounds like we have some questions about complications during robotics versus traditional laparoscopic surgery.

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TODD D. TILLMANN, M.D.: I think that's another good question. Some of this data was just presented at that meeting as well. For standard hysterectomy, for instance, in the collaborative group that Dr. Lowe is part of, they had 261 hysterectomies and intraoperative complications occurred in 2.7 percent of the patients, which is actually lower than a lot of other procedures that we find. The estimated blood loss was low, as we stated before. Most of those complications were generally urinary type complications if we had them. Interestingly enough, the conversion rates are actually quite low.

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DILJEET K. SINGH, M.D.: Sort of when we think about converting from having a laparoscopic procedure to an open procedure.

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TODD D. TILLMANN, M.D.: Exactly. Which is always a concern. If you start off laparoscopically, you'd like to be able to finish that way, and those rates are actually very low, in range of about two to three percent with the robot, which is much lower than was previously described. Let's see here. We have some other questions here. Let me just get those back again.

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DILJEET K. SINGH, M.D.: We're sort of still watching now. Dr. Lowe briefly mentioned the fact that he was mentioning the patient's anatomy. I think the other thing that we have to just take a moment to do is thank our patient who was interested in educating people and willing to have participated in this webcast. Looks like we had another question. There we go. I'm not sure if this is also coming from a surgeon, but asking about the transition from the operating room in person to operating on a robot remotely. Again, you're still in the operating room and so I think as a surgeon, because if you're literally sitting right next to the operative field, you set up the robot, you bring in

the console, you do all those things, you never really have to make and in-quote transition. It doesn't feel that differently in terms of intimacy with the procedure I think than standard laparoscopy where we're standing at the table. You're not actually in another room. There's nothing virtual about this. You're right there using a camera and you're controlling the camera that's in the patient in the same room.

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TODD D. TILLMANN, M.D.: I think that's a fascinating question and when I first -- my vision of what it would be like to do a robotic procedure was I would be behind some glass wall looking in at my patient and using a joystick type thing. So it's actually, once you've seen it, and today's a beautiful example of that, you're in the room with the patient and you're really -- it actually feels much easier than a standard laparoscopic procedure and most doctors who have operated laparoscopically with the robot say they'll never go back to standard laparoscopy because it's just so much easier and it honestly feels like your hands are inside of the patient just like an open procedure except it's a minimally invasive procedure, which is so much better for the patient.

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DILJEET K. SINGH, M.D.: So, we have some questions that I think are interesting. One of them is a great question and maybe we'll get Dr. Lowe's take if he has a minute but the question is, "Do you think that robotic surgery will replace laparoscopy in the future?" You just heard Dr. Tillmann's sort of addressing that. I think that for some things it will and for some things it won't. It's like anything else in medicine. We have to choose the right procedures and the right things for the right technology. Sometimes residents make fun of me because I say this but I say, "Everybody doesn't need an iPhone and everybody doesn't need a BlackBerry and everybody doesn't need a Palm," but there are situations in people's professions and other things that they need those things as opposed to the some things, you can pick up a phone and that's the right technology. So I don't know that it will actually replace laparoscopy because I think there will always be a role for laparoscopy. But for us for example, here endometrial and cervical cancer and gynecologic cancers, the robot clearly allows us to do things that we can't do with standard laparoscopy. So it allows people to have surgeries they wouldn't be able to have, get back to work, get back to their lives faster and I think have better surgeries because there is less blood loss.

00:33:48

TODD D. TILLMANN, M.D.: I would echo that same statement. He is actually -- one of the questions came from Jennifer and she asked, "Is this a zero-degree scope?" and indeed he is using a zero-degree scope today on this case. Occasionally when we're doing periaortic nodes, we may switch briefly to a 30-degree scope or if you're in a situation where you have to take more of a downward view to get a good angle. Sometimes we'll switch to a 30-degree scope. But this is a zero degree scope today and generally we're able to complete the pelvic and periaortic lymph node dissection and the entire hysterectomy would be as so with the zero degree scope. That's a great question.

00:34:24

DILJEET K. SINGH, M.D.: So, I'm wondering if we can go back to looking at the abdomen of the patient. We have a question here from somebody who's watching asking, "As they instruments travel through the body during surgery, how are we ensuring that the arms are not damaging sensitive parts of the body?" It would be great if we could take a look at the actual patient. That would be fabulous. The thing, it's an experience in that it's set up. At the beginning of surgery we were very careful and the robot has got a lot of protections built into it, so that if it's pushing on a patient or it's meeting resistance. So here you see those are standard trocars that are going through

the patient and one of the reasons we think that people have less pain with robotic surgery than they do with standard laparoscopy is the actual movement at the level of the skin and muscle is substantially less. They're all fulcrummed right as we enter the abdomen and so we think we get less pain for that reason. If you'll look at the rest of the instruments, they're truly sort of sitting off the patient so the arms aren't hitting the patient, the legs are positioned so they're out of the area, so the chances of hurting someone or damaging a sensitive part of the body is relatively limited and it's one of the good things about the robotic system that it's really well-set up to avoid that.

00:35:45

TODD D. TILLMANN, M.D.: One of the -- what's built in as one of the safety processes is that the robot takes its cues exactly where it is and where it's location is based upon preset references that you actually set as the surgeon based upon how deep the trocars are placed into the abdomen. There's actually something you can't see on the inside of the abdomen that are little marks that we set so that the robot knows exactly where it is. I thought that initial picture where you saw the abdomen almost looked like it was lit up from the inside and it's because it truly is because the intensity of this light is so great. That's what provides us such wonderful vision and wonderful view is a very nice optical viewing system because the intensity of the camera and the brightness is so nice as well.

00:36:35

DILJEET K. SINGH, M.D.: Maybe we can go back to the surgery now. I'm sure that's what our viewers are interested in.

00:36:39

TODD D. TILLMANN, M.D.: Yeah, and maybe Dr. Lowe, you can describe a little bit of what you're doing right now.

00:36:44

M. PATRICK LOWE, M.D.: A few little adhesions here between the fallopian tube and the medial leaf of the broad ligament. What you can see is we have now some adhesions right next to our friend the ureter right here and what we did we just mobilized that out of the way. We can clearly see it now. We just have a few more adhesions along this medial leaf. The broad ligament sort of mobilized to get the ureter away from the field of dissection. Then what we'll do on this side is divide the ovarian vessels and proceed with further dissection along the lateral aspect of the left side of the uterus. Okay? Then divide the uterine vessels on the left side, complete the hysterectomy, and then hopefully will get to a portion of the lymph node dissection before the conclusion of the program. Here you can see -- let me just point this anatomy out to you. Here's the fallopian tube, here's the ovary, here's the ovarian vessels. Once again on this side, this is the round ligament, external iliac artery, superior vesicle artery. Here's is our obturator space where we'll be later dissecting some lymph nodes out from around the obturator nerve. Also once again on this side you have your external iliac vein, which is right there, compressed a little bit from the pneumoperitoneum, but otherwise it's very visible, okay.

00:38:05

DILJEET K. SINGH, M.D.: Just some other really quick questions, we had a question about shoulder palsy and the incidence with this kind of surgery. I suspect you're asking about what we call brachial plexis injuries. Those do happen during surgeries and they have to do with how the arms are positioned. They don't happen in surgeries like because the arms are actually positioned by the patient's side. That kind of stretch injury that happens when your arm is out, so I'd say it's zero.

00:38:35

M. PATRICK LOWE, M.D.: Diljeet, we tuck the patients' arms during the case, so the patients' arms are not out at 90 degrees during the procedures.

00:38:40

DILJEET K. SINGH, M.D.: Yeah, you don't get to watch me, I'm watching you, but I'm showing them that whole tucked arm picture out here. So the other question people are asking, can they view this again. I think for a year, you know the answer to this Patrick.

00:38:50

M. PATRICK LOWE, M.D.: Yeah, this is going to be on OR-Live.com for approximately 12 months.

00:38:56

DILJEET K. SINGH, M.D.: Then, the other option if we don't actually get to all the rest and we won't get to, for example, the periaortic lymph nodes, is on YouTube.

00:39:03

M. PATRICK LOWE, M.D.: That's right.

00:39:05

DILJEET K. SINGH, M.D.: If you look under Dr. Lowe's name, it's M. Patrick Lowe, or if you look up periaortic lymph node dissection, you can get the videos of those procedures that are on different patients and might be interesting to people who are interested in those things.

00:39:22

TODD D. TILLMANN, M.D.: There's another question on "How many of these hospitals in the United States do robotic surgery for endometrial cancer?"

00:39:30

DILJEET K. SINGH, M.D.: I'll be honest that I don't know the answer in terms of the United States. I know here in Illinois, I'm pretty sure we're the only group doing endometrial or cervical cancer cases robotically. But I don't know. Patrick, do you have any idea about in the United States?

00:39:47

M. PATRICK LOWE, M.D.: Most of the programs with robotic surgery, they're sort of spread out all over the United States, and what I'm referring to is what you call a dedicated program in robotic surgery for women's cancer. Some of those are -- we're all familiar with the minimally invasive program that they have at MD Anderson, as well as Memorial Sloan-Kettering, and then also there's very robust robotic surgery programs at the University of North Carolina that's directed by Dr. John Boggess, and then also in Scottsdale, Arizona that is directed by Dr. Javier Magrina and Dr. Boggess and Dr. Magrina were two of the leaders and pioneers in this area. I've learned a lot from those guys certainly, listening to them give presentations, and they really sort of paved the way for a lot of the robotic surgery. At least at the time of FDA approval, that was received in 2005. So when we go to meetings, we hear more and more and we see more and more presentations of programs that are dedicating a portion of their gynecologic oncology practice to minimally invasive surgery and it seems that -- let's go ahead and divide these uterine vessels.

00:41:11

DILJEET K. SINGH, M.D.: I'm going to interrupt you for a second, Patrick.

00:41:12

M. PATRICK LOWE, M.D.: It seems that...

00:41:15

DILJEET K. SINGH, M.D.: Patrick, can I interrupt you for a sec?

00:41:16

M. PATRICK LOWE, M.D.: Sure.

00:41:17

DILJEET K. SINGH, M.D.: You know, we were just talking about the differences between the robotic instruments and what are standard laparoscopy instruments are, so that if we go back to surgery, that instrument that she's using right now is sort of a standard laparoscopic instrument. You can see how it's limited in its motion and essentially can only go straight in and out and then have the clamps move, which is dramatically different from the other instruments you've been watching Dr. Lowe use. Sorry about that, Patrick.

00:41:42

M. PATRICK LOWE, M.D.: No, that's okay.

00:41:45

TODD D. TILLMANN, M.D.: No, I think that's a really good point too and that particular device helps to seal the blood vessels and seems to do a nice job and it seems like Dr. Lowe favors that and you can see there's no bleeding, right there you just ligated right through a nice blood vessel there.

00:42:02

M. PATRICK LOWE, M.D.: You know, and Todd we actually use that device for a number of our open procedures, pelvic exenterations, dividing the mesentery of the bowel during bowel resections, and so it's a very interesting device in that what it does is it actually fuses the walls of the blood vessels together. So what it does is it remodels the collagen and the walls of the blood vessel and actually fuses them together and so we've just been really pleased with the experience that we've had using it, not only for open cases, laparoscopic cases, and robotic cases. If you haven't used it or you haven't used a vessel sealing type device, I would encourage surgeons to give them a try and as an example, I don't think I've put a suture on the ovarian vessels in about three years. Whether it was an open case, laparoscopic case, or robotic case, and I've never had re-bleeding at one of those ovarian vessels when I've used a vessel sealing device in the surgery. It can shorten the operative time, it can decrease the blood loss, and it can also almost even act as like an assistant in your case because it will actually clamp the vessels, seal the vessels, and divide the vessels. So it's really nice if the assistant that you have is not helping you, it can sort of replace your surgical assistant at times. Now Margarita, can you Antivert the uterus a little bit for me please?

00:43:36

TODD D. TILLMANN, M.D.: We just wanted to reiterate for those of you who are interested in watching this video at a later time, it can be seen on NMH.org and go back through and take a look at this whole video and the demonstration as we went through it today. I think that's an important point. We just got another email in and this is wonderful. It says -- we were just speaking about Dr. Magrina. Eric, who's a surgical tech that works with Dr. Magrina at Mayo Hospital in Phoenix said that he routinely uses the fourth arm, or asked if we routinely use the fourth arm during the cases and "What do you use in the vagina to provide visualization during the surgery to avoid injuring the bladder?"

00:44:24

M. PATRICK LOWE, M.D.: We use the uterine manipulator called the VCare Uterine Manipulator and we've tried sponge sticks, we've tried EEA sizers, we've tried the KOH Colpotomizer, and a number of different instruments and what I found advantageous about this particular instrument -- Annie, you want to come in here and seal the vessels right there where I have them skeleton zed? -- is that the handle of the instrument -- back up a little bit. So, what you

want to do, Anna, here is get inside that little peritoneal [unclear] that I have divided and just isolate the vessels only. Good, right there. Is that the handle is longer than a lot of the other uterine manipulators and so you do have a little bit of limited access to the peritoneum and to the vagina when you're using the robotic system. I don't know if we can flash over to the camera really quick to the patient and see where the robot is actually positioned between the patient's legs. Okay? Let's Antivert the uterus a little bit more, Margarita.

00:45:33

DILJEET K. SINGH, M.D.: You need to pan down to the foot of the patient actually just to show what Dr. Lowe is talking about.

00:45:37

M. PATRICK LOWE, M.D.: So, what happens is if you have a patient who's really obese, you may have an even less access to the vagina. So what this uterine manipulator does, it has a cup that's placed at the junction of the cervix to the vagina and when you elevate the uterus it will bulge out and I'll demonstrate this for you guys really quick. It will actually bulge out the anterior vaginal wall right here. So what it does is it really allows us to push that bladder down even further and it identifies the line of the incision that we're going to make for the completion of the hysterectomy.

00:46:16

TODD D. TILLMANN, M.D.: There is another question here. "Are there further applications for robotic techniques in gynecologic or obstetric interventions?" Probably not as many obstetric interventions, but certainly gynecologic. There are other physicians that do sacral [unclear] using the robotic procedure. They have some urogynecologists where we are that are doing that now. As well, you can do myomectomies. You can certainly do super-cervical hysterectomies as well. Pretty much anything that you can do laparoscopically, you can do with a robot in a similar fashion. So just about anything gynecologic that can be done with standard laparoscopy.

00:46:59

DILJEET K. SINGH, M.D.: We could actually, if we have a moment, we've got some slides on sort of the different oncologic applications that we've had. Maybe we can take a few minutes to go through those.

00:47:13

TODD D. TILLMANN, M.D.: What Dr. Lowe is doing right now is he's just kind of once again showing the great visualization of the robot. You can see his hands once again moving and manipulating the device. For those who have not turned in earlier, this is how he controls the instruments. You can see the hands moving back and forth underneath the surgeons console and they're transmitted directly to the robot.

00:47:50

DILJEET K. SINGH, M.D.: Great, and while we're kind of getting to those, we could even take a little time to go back into surgery and Dr. Lowe has used a couple different instruments to coagulate vessels, but I think watching him coagulate the vessels laparoscopically with the laparoscopic instruments, I think is very interesting. The instrument we used previously, he talked about, but I think this is another way to do it. I don't know how you do it.

00:48:15

TODD D. TILLMANN, M.D.: Yeah, I think one of the nice techniques that he's demonstrating here is activating the bipolar device before he actually touches the tissue. That's something that's a subtle little trick but it actually helps prevent collection of the charred tissue on the instruments and allows you to have better coagulation with further episodes of use. As you can see right now, he used the bipolar to seal the vessels and now he's using the monopolar hot shear scissors to kind of

come along that area right there. That's really nice as he's getting close and ready and prepared to come around the uterine manipulating device to enter through the vagina.

00:48:57

DILJEET K. SINGH, M.D.: Why don't we just take a couple minutes. People are asking questions for things that I think we had some slides that would be addressing those questions. I think Dr. Lowe has addressed this aspect. When the program was established here, we were pretty bare bones and that we're excited to have Dr. Lowe come join us. At that time we had goals that sort of were directed around both education and then increasing the amount of surgery that we were approaching from a minimally invasive procedure. I'll take the next slide. Right now, sort of a year later, a month from a year later, we have four surgeons, board-certified gynecologic oncologists who are using the robotic system. We've made numerous videos. We are continuing to proctor surgeons here in house and in other places. We have something called "N-CASE", which is essentially a lab where we teach residents and fellows and other doctors getting trained in laparoscopic surgery and now we're able to use the da Vinci there to further education. Our initial goal been that we do at least 50 cases in the first year. As you can see, we surpassed that. At this point in time, we're really approaching about 50 percent of our practice of endometrial and cervical cancer using minimally invasive methods. I'll take the next slide. So someone asked sort of what procedures can you do. So far, at least in our program, we've been doing simple and radical hysterectomies, pelvic and periaortic lymph nodes, doing what we call omentectomies, that be part of both uterine cancer and ovarian cancer. We've treated endometrial cancer, uterine sarcomas, cervical cancer, other tumors of the ovary, benign and malignant tumors of the ovary, and then we've taken care of a number of benign uterine diseases. I think one of our questions asked about that and Dr. Tillmann was addressing that. Things like fibroids, endometriosis, other diseases that can sometimes be challenging, that a robotic system offers us things that -- ways of visualizing, offers us mobility, offers us the ability to access things in a different way. I'll take the next slide. We can kind of get back to surgery quickly, so I'm just going to go through these pretty quickly. That's just looking at sort of the number of cervical cancer patients treated with robotics versus a traditional open procedure and I think our next slide will give us the opportunity to look at endometrial cancer. We see again a substantial shift from about ten cases to 53 cases. Over half of our cases. I think that's the last of that and I think that does address all the questions that we got sort of directed at this.

00:51:49

TODD D. TILLMANN, M.D.: Yeah, this is a really nice time because Dr. Lowe is now, as his assistant pushes up from below on this manipulator, he is actually outlining around the vagina and you'll see that manipulator come into view and you'll see a little flash of the green color of the manipulator show up in just a few moments and it's serving as almost like a cup that is against the vagina and the cervix would be almost inside of that cup and as he uses the monopolar device known as the hot shears to come around that cup, you'll see a flash in just a few moments. He's just about there now. This is really the fun part about the case as you're drawing near to removing the uterus and the tubes in the ovaries. There you saw -- what you can't see is he can see that little flash right there. That's a beautiful picture of that.

00:52:40

DILJEET K. SINGH, M.D.: And I have to say for people who are considering undergoing this procedure or patients who are watching, I think this is one of the things that I always find is hard to explain to people or hard to visualize, "What's going to be left at the top of my vagina?" and now you're going to essentially see that there's sort of a circle that attaches the cervix to the vagina and

then we remove that and then we close that. That's something that I know patients always find it funny that we call something a vaginal cuff, but that is essentially the vaginal cuff and you'll see where it's closed and you can see why this is probably the biggest incision that we have when we do our robotics case. It's an incision at the top of the vagina. All of the other incisions are a centimeter or less, the ones on the abdomen.

00:53:23

TODD D. TILLMANN, M.D.: This is the part of the case where after you've been doing robots for a while and my OR nurse, she and I joke at this point at the procedure, because I say, "Can you feel me touching you right there, because I can feel it," and even though I can't actually feel my instruments touching up against the top of that cup, it really does see -- your mind and your eyes play tricks on you that you can actually feel it. I saw Dr. Lowe do that just a minute ago and I know that was the same sensation that he had. Maybe we can get back to Dr. Lowe and tell us if he can give us some comments about what he's going through right now.

00:54:02

M. PATRICK LOWE, M.D.: Yeah, and so right now we're just sort of making the vaginal incision, sort of finishing up here on the left side with mobilizing our uterine artery laterally, away from where our cuff angle is going to be, our vaginal cuff angle, which we will suture together a little bit later in the case, and it's just like Dr. Tillmanns said, once you identified the cup from the uterine manipulator, it actually has a groove right there and you can follow that groove all the way around to complete the vaginal incision. The nice thing about this so far, we haven't taken the camera out, we haven't changed our instruments, our visualization has been fabulous, and the other nice thing is -- I don't know if we'll be able to show, but we actually have a smoke filter that we place through the camera port. Margarita, let's retrovert the uterus a little bit, please. That's good right there. -- that actually allows us to vent a lot of the plume from the smoke and that helps. If anyone has used a lot of electrocautery during their surgeries and their procedures, you'll quickly realize that if you don't have very good ventilation or very high flow from your insufflation system you'll generate a lot of smoke. Then what will happen is that smoke will obscure your vision and then it will actually create a mist or a fog on your camera and then you repetitively are taking your camera out of the patient's abdomen, wiping it off, exposing it to cold air, putting the camera back in, and then once you get your camera lens cold, you place it back inside a patient who's body temperature is 95, 96 degrees Fahrenheit, well, it continues to fog. So, one of the nice things is we've got good visualization. We're mobilizing our smoke out of the patient's abdomen, maintaining a good abdominal temperature. We don't have any fogging of the camera system and so far this case is going very well. We should have the uterus out here shortly. Margarita, if you could just hold still right there.

00:56:35

DILJEET K. SINGH, M.D.: The case has really gone beautifully. We are going to need to wrap up in a few minutes. If we have any other email questions, that would be wonderful. We'll probably have a couple seconds to take those and take a peak at those.

00:56:46

M. PATRICK LOWE, M.D.: How much time do we have, Dr. Singh?

00:56:48

DILJEET K. SINGH, M.D.: Dr. Lowe was talking a little bit about the systems. I think for surgeons who are sort of adjusting to the robotics as opposed to standard laparoscopy, I do think that's probably one of the biggest adjustments. I don't know if you agree Dr. Tillmanns, but sort of needing to control, needing to move things around, sort of having everything set up at the

beginning is a different way to do things.

00:57:11

TODD D. TILLMANN, M.D.: Yeah, I think that's the key is that you spend a little bit more time getting things in place and then once they're in place, the procedure goes much more rapidly than a standard laparoscopy would. It really becomes a -- the timing and the amount of time it takes is really dependent on your team and that's why having such a wonderful team like Dr. Lowe has, and that I actually have when I practice and you have here too Diljeet, that you can really get things down, the time, really down quite quickly and a lot of camaraderie and everyone actually plays and incredibly valuable role in the entire team. So that's nice.

00:57:51

DILJEET K. SINGH, M.D.: To take a second to talk about medicine in general, it really is so many of the things we do. When we talk about setting up a robotics program, often times we get focused on the surgeons, but setting up a robotic program is exactly what Dr. Lowe previously described. It's a place where the nurses who take care of you in the operating room and the recovery room in the post-op period, all have familiarity with the procedure. Now you guys are watching as Dr. Lowe is removing the uterus through the vagina from the body and this may actually be a time -- it seems like we are running out of time -- it may be a chance to wrap up. Again, if you all want to come back and watch this video again, go to NMH, Northwestern Memorial Hospital, .org. There's other information on the robotics program here at Northwestern if you go to Prentice, P-R-E-N-T-I-C-E, Prentice.NMH.org. Certainly any of those places and you can look into the cancer program here at Northwestern. We'd like to thank everybody who's tuned in at all today and who was good enough to send us questions. We really appreciate it. Thanks also for Dr. Tillmann for joining us, coming up from the University of Tennessee.

00:59:10

TODD D. TILLMANN, M.D.: My pleasure.

00:59:11

DILJEET K. SINGH, M.D.: And thanks, Dr. Lowe, for a beautiful procedure.

00:59:14

H: As the uterus tubes and ovaries exit, we will as well.

00:59:20

M. PATRICK LOWE, M.D.: I wanted to say one thing, I wanted to thank the operating room team again. They're invaluable, as well as everyone who helped put on this program today, Rebecca Stewart from NMH, as well as our anesthesia colleagues who helped us facilitate this case, let us start this case in the afternoon. If there's questions, please send in your emails and also if you want to see the technique that we used for the pelvic or aortic lymph node dissection, we didn't get to that today in this one hour, you can see those at YouTube. Thank you very much. Have a good day, guys.

00:59:59

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