The Lead in Peds

Transcript: Season 1, Episode 8 – Moving Parts: Collaboration and Engineering in Pediatric Orthopaedics

Host: Nathan Kuppermann, MD, MPH

Guests: Matthew Evan Oetgen, MD & Kevin Cleary, PhD

Dr. Nathan Kuppermann (00:00):
At Children's National Hospital - Innovation is moving fast, from the operating room to the motion capture lab. New technology is driving how we diagnose, assess, and treat kids with orthopedic conditions, including trauma. Technology is really becoming part of the care team, giving doctors new ways to see, measure and treat. Welcome to the Lead in Peds, the podcast where we highlight the breakthroughs driving pediatric research and clinical care and how each is critical to the other. I'm your host, Dr. Nathan Kuppermann, chief Academic Officer and chair of Pediatrics at Children's National Hospital. Today we are focusing on the intersection of technology and pediatric orthopedics. Joining me are two leaders in orthopedic surgery and medical robotics. Dr. Matt Oetgen is the division chief of Orthopedic Surgery and Sports Medicine at Children's National and Joseph E. Robert Jr. Professor of Orthopedic Surgery and Sports Medicine. Dr. Kevin Cleary is the associate director of engineering within the Sheikh Zayed Institute for Pediatric Innovation and the Sheikh Zayed Professor of Bioengineering. Together we will explore how robotics, ultrasound imaging, motion capture, and device innovation are changing the landscape of pediatric orthopedics and what this means for children and their families. Welcome to the show.

Dr. Matthew Oetgen (01:20):
Thank you very much.

Dr. Kevin Cleary (01:21):
Thanks for having me.

Dr. Nathan Kuppermann (01:22):
It is great to have you here. Before we start, if you have watched any of these episodes that we have done, I would like to just engage in a little bit of outside conversation. First of all, since this is a discussion around orthopedics, I would love to know what your involvement has been in pediatric sports. Do you have kids that participate in sports? Have you been physicians in sports activities? What has been your history? Lemme start with you, Matt.

Dr. Matthew Oetgen (01:46):
Well, yeah, I have two girls who are now in college, but throughout their whole junior and high school years they played ice hockey. I was fortunate enough to coach both of them. They are

about two years apart, so I would flip flop each year who I coached. They probably liked it when I was the off year, not coaching them, but I was able to do that and then as it intersects, anytime there was a player down on the ice, I would have to go down even if I wasn't coaching. So, you probably know that too. Whenever you are watching your kids play, you're also the de facto physician on call, so I got to do a little both, some coaching, and some physician work.

Dr. Nathan Kuppermann (02:23):
And by the way, since we're talking about orthopedics, your daughters have serious injuries plan.

Dr. Matthew Oetgen (02:29):
They both were able to avoid it. I like to say because I taught 'em how to get hit, but they both were able to avoid it.

Dr. Nathan Kuppermann (02:36):
Awesome. How about you Kevin? What's your story?

Dr. Kevin Cleary (02:38):
I also have two children, so my son is 31 and my daughter's 29. Hard for me to believe now, but they did play a lot of sports growing up and I also did some coaching and I'd like to also relate that Matt actually treated my daughter once when she was the high school softball pitcher, the fast pitch, and I was agile enough to be able to bend down to catch then as well too. But she came out of it fine and she's actually going to defend her PhD at Florida next month, so I'm very happy about that.

Dr. Nathan Kuppermann (03:04):
In robotics or no?

Dr. Kevin Cleary (03:05):
No, she's in epidemiology.

Dr. Nathan Kuppermann (03:06):
Oh, okay. Excellent. Of course, I have a story around this as well. I have three daughters and my youngest was a very competitive soccer player, but as Matt knows very well, she was one of those young athletes who had a major knee injury. She tore her ACL, both menisci, major reconstruction, had to go back to the OR so basically ended her soccer career. Fortunately she discovered robotics and she now does underwater robotics and she's a freshman in college. I have to say partly being the son of Brazilians. But it is really fun to watch soccer, watching underwater robotics. I don't know, you have to show up as the parent and there's just a bunch of robots in the water. You do not know what's going on and you have to be there looking like

you're enthusiastic, but you have no idea what's going on. It is much more fun to watch soccer. I hope my daughter is not listening to this podcast.

Dr. Matthew Oetgen (04:03):
Well, maybe if they had better commentators, you got to get the soccer commentators to do. I bet that would spice it up some.

Dr. Nathan Kuppermann (04:09):
So let's just kind of take this from the start. When a pediatric patient and their family comes into you with a complaint, whether about their knee, their shoulder, whatever, just walk us through your approach from the history physical and then when do you bring in technology to assist?

Dr. Matthew Oetgen (04:25):
I actually had a conversation with our residents the other day. It still starts from the basics from our training of history and physical listening to the patient. As technology evolves, that is still key and sometimes now we actually have to remind the residents that that's the key to everything. So I think it still starts with hands-on listening to patients and seeing what their complaints are and then getting a look, watching them walk, seeing them move around and some special testing that we can do in orthopedics to isolate some injuries or some areas of the body. Really what the technology has come into is the imaging and then the modalities that we can use to actually look at how kids move. And that has really sort of taken off over the past few years, even from when I was a trainee to now the type of imaging, the type of modalities that we use are just increasing and really very impressive these days.

Dr. Nathan Kuppermann (05:18):
So tell me a little bit about how do you go from imaging to the gait lab and looking at motion whatnot? What is the sequence and how do you work through that?

Dr. Matthew Oetgen (05:28):
The gate lab is one of the modalities that's used for certain type of patients, but I would say that the basic x-ray is probably the bread and butter of what we do in orthopedics. And even that the technology that's increased in that field has been amazing. For instance, we now have a x-ray machine that is a hundred times less radiation used to x-ray kids and it can reproduce in three dimensions, the skeleton. So when I take an x-ray of a spine, I don't only get a two dimensional x-ray, now I can reproduce it and see what the spinal deformity is in three dimensions, not having to use extra radiation to look at CT scans and things like that. It's amazing. It's remarkable what we can do and what we can see.

Dr. Nathan Kuppermann (06:13):

For our listeners, why don't you give us an example of a piece of technology or a clinical situation where the technology picked up something that you would never have imagined based on your history and physical examination?

Dr. Matthew Oetgen (06:28):
When kids have deformities of the spine, it's a three-dimensional deformity. When you look at an x-ray, you can see what the curvature is, but nowadays when we do the reconstruction and we see the three dimension, I can see if the kids have too much round back or too much flattening of the back, which I couldn't before. And so it really allows us to make braces or plan surgeries to correct that three dimensional deformity where that was not something we thought about six to eight years ago. So it's really changed the way we approach these kids with curvatures in their spine because we can see what the deformity is a lot better.

Dr. Nathan Kuppermann (07:04):
We're going to stick with the theme of scoliosis, and this is really for both of you and I'll start with Kevin. So at the Sheikh Zayed Institute, you guys are doing a lot of device innovation in general, but also a lot in orthopedics. So you want to talk a little bit about some of the sort of novel devices that you've worked with specific to the diagnosis and management of scoliosis?

Dr. Kevin Cleary (07:27):
Yes, I think so. We really at Sheikh Zayed Institute really are looking at how technology can help augment what the physician does. So Matt just gave an excellent example of how technology and x-ray dose is also lower nowadays too, but what we want to do is really make medicine more quantitative. So I think in the past, physician's judgment was really the primary factor and will continue to be so, but I think if we can make things more quantitative and consistent, one project that we started over several summers now here is also looking at how we can use ultrasound imaging for getting a three-dimensional picture of the spine and scoliosis. And I think the one advantage there is, although the dose is quite low from x-ray, as Matt said, our ultimate goal would be to eliminate x-ray when we can and use modalities such as ultrasound or even MRI to give the doctor more quantitative imaging so they can devise a better treatment plan.

Dr. Nathan Kuppermann (08:18):
What are the limitations that is ultrasound imaging compared to x-rays, particularly around the spine? What are the limitations? Do you use it in a repeated fashion?

Dr. Kevin Cleary (08:27):
I mean, ultrasound has really advanced. We're used to seeing ultrasounds for baby images, but ultrasound is used for so much more now. And now with our ability to track an ultrasound probe and kind of take the fan shaped picture that you get from ultrasound and reconstruct it in three

dimensions; I think we really can give a three three-dimensional view. But there are pros and cons of ultrasound versus x-ray.

Dr. Matthew Oetgen (08:47):
Yeah, I mean you don't see the bone as well, but you can reconstruct it and get a good idea of what the shape of the spine is, where this is going to be. A game-changing thing is a few years ago, the American Academy of Pediatrics and a few other societies came out and said screening for scoliosis is probably still worthwhile. So we remember when we were kids doing that in school. The downside is that it leads to some kids having to come see me that don't have scoliosis, what we call false positives, where they think they have scoliosis and they don't and they get an x-ray, and we find out they don't have scoliosis. If we can eliminate that x-ray, not give them any radiation and tell them, no, you're fine and use ultrasound instead, that's going to be game changer. We're going to eliminate all that unnecessary radiation exposure and even one or a couple of doses of x-ray in very young kids is probably not what we want to see because very radiation sensitive. And so we want to eliminate that, and I think that's where ultrasound is really going to come into play with the screening technology.

Dr. Nathan Kuppermann (09:49):
I also study ways to diminish the amount of irradiation that we use in kids around CT use in the setting of trauma. There have been some recent articles in the New England Journal of Medicine that document, it is quite striking that particularly in young kids, of course radiation x-rays, cts are good when you need them, but we really want to minimize it when we don't. Are there challenges in introducing ultrasound into routine practice outside of the setting of the mecca, like Children's National out in the community? Are they using it as we are using it at Children's National?

Dr. Matthew Oetgen (10:22):
Certainly not. I mean, I would say Kevin's team working with us, we're still working through a lot of the kinks and so I think that that's what a place like Children's can do. We can see kids, we have a high volume, we can sort of quantitate things and then the next step in this whole process is, alright, how do you make it useful to the rest of the world? How do you make it handheld? How do you make it a cheap alternative so we can decrease that stuff? And that's sort of the next step. And when you do research like this, you're always looking at the next step and excited about the next step. Maybe not so much what you're doing now, but it's a means to an end.

Dr. Kevin Cleary (10:59):
I would certainly agree there, Matt. I mean one of our goals is to take things we do at an academic medical center like ours and make it more available to the community and we certainly have heard about the topic called artificial intelligence or AI that you also did a podcast on with our colleague Marius. So, I do think that once you have a sufficient number of ultrasound

images, at some point it will be possible to train an AI algorithm to help the physician interpret that. I think the patient still wants to hear from the doctor and not the AI algorithm, but I think that will play a major role in spreading this technology in the future.

Dr. Nathan Kuppermann (11:30):
Walk through for our listeners and viewers how you both interact. That is Kevin, you're the professor of engineering and doing devices, and Matt, you're the orthopedic surgeon. Really, one of the great purposes of this podcast is to talk about the interplay of science and clinical medicine and how it works hand in hand to raise the bar of care that we deliver. So, when you're approaching an orthopedic issue, for example, how do you guys work together to address the particular problem?

Dr. Matthew Oetgen (12:01):
Years ago, when this idea of the Sheikh Zayed Institute was founded, the people that really put it together made the absolutely crucial decision to say this needs to be housed in the hospital. So, engineers and surgeons and everyone can work together hand in hand, and we can go back and forth. I think that's the number one thing that they made such a good decision that it's back and forth. Now Kevin knows where my office is a little too well sometimes, but we communicate quite a bit, and I think that just being in the same location has been unbelievably facilitating to what we do.

Dr. Kevin Cleary (12:38):
No, it’s absolutely essential. I mean, I have plenty of colleagues at engineering places at small universities like Johns Hopkins in Georgia Tech who have unbelievable engineering house horsepower, but even at Hopkins, they're not co-located with the medical center. And I think that's essential. And I usually tell my engineers, if you come in early and you find the doctor in the cafeteria for breakfast, see if they'll buy you breakfast, then you can talk with them too as well. So that's one other way we try to get together. We see them during the day; we can go into the or everyone at the hospital is medical clearance and it really has facilitated communication immensely.

Dr. Nathan Kuppermann (13:10):
Kevin, you hosted this past week and when I attended it was a symposium on the future of surgical innovation and a couple of things that you just said now just kind of sparked my interest. There's so much technology coming into medicine. My field, as you both know, it's pediatric emergency medicine, same thing, a lot of new technology and you've mentioned AI and robotics. How do we reassure surgeons and physicians that this technology is not going to replace them, or can we reassure physicians and surgeons that that will happen?

Dr. Kevin Cleary (13:42):

Yeah, I think that's at the heart of the matter. I have had people say we will not replace surgeons, physicians, but surgeons, physicians who do not learn to use the technology may become obsolete right here. And my feeling is, and we did just have a very nice meeting on the future of surgery hosted by the Society for Medical Innovation and Technology is that the clinicians always need to be in charge. And I say that just because medicine is a human endeavor right here, and I think there still is the art of medicine despite all the science involved. So we say that the clinicians need to run things, but the technology, if it could make your life easier, if it could help with scheduling, if it could help with patient follow, could help with clinic notes and all the things that take up time that maybe don't contribute to patient cares directly and then where it will land in terms of diagnosis and things like that, I think remains to be seen. But I would certainly say that Children's and Sheed Institute is well positioned to explore that.

Dr. Nathan Kuppermann (14:34):
Matt, do you have thoughts about that technology physician interplay?

Dr. Matthew Oetgen (14:38):
My general feeling is it's going to allow everyone's floor to move up. So, there are some things that you're not going to have to do because it's going to be automated or there's going to be technology to take care of it, but that means that we're just going to be operating at a higher level. We don't have to do some of the more mundane things. I think medicine, there's no a hundred percent in medicine, there's always going to be one-offs or two offs. And pediatrics in particular because it's a smaller population, more diverse, there's much less similar sort of things like heart disease and things that you're still going to need people that look over the data and say, ah, I know this, so I don't think it will be replaced. I just think there'll be more mundane things that we're not going to have to do in the future.

Dr. Nathan Kuppermann (15:22):
As a clinical epidemiologist where I use big data to create prediction algorithms to really reassure physicians and these create algorithms for care of emergently injured and ill children, it's not there to replace your judgment. It's there to empower your judgment. So you can go into the room already with this data knowing what the likelihood of X or Y is, but that goes on top of then your clinical judgment and you are there with the patient and you have intuition, but it's intuition powered by evidence that we did not have historically. And what you guys are describing is somewhat similar to that.

Dr. Matthew Oetgen (15:59):
Very much so, yeah.

Dr. Kevin Cleary (16:00):

Yeah, I think in that sense, medicine to me is the ultimate frontier, if you can say that. I actually worked for NASA, I worked for Department of Defense and we had hard problems, but that environment was very well characterized and in pediatrics and in medicine you have an enormous variability in anatomy, how people train right here, the age range, the size of patients we treat, and I think that's a little bit harder to quantify. I think ultimately though, our goal as a pediatric academic hospital is to be able to do those things so you can have consistent outcomes regardless of the patient that comes in.

Dr. Matthew Oetgen (16:32):
I'm actually quite excited because we have populations of patients that have similar issues, but they're very small populations and as you know, bigger populations give you more consistent data. But I think what AI and the technology like that is going to allow us to do is pull from different populations and see what the similarities are and maybe allow us to pull some different populations and still get data out of them. And I think that that's where we see these hidden connections that we don't see, but maybe the AI algorithms will be able to show us that and it'll make it more powerful, these little populations we can study.

Dr. Nathan Kuppermann (17:08):
Now I want to move to another sort of clinical realm and that's motion capture and the gait lab. As we just mentioned a little bit earlier, we were talking a little bit about the gait lab, and I know in the fight for Children's Sports Medicine Center, you guys are using it. Matt, when do you use the motion capture and how does it benefit the treatment of children with different gait conditions?

Dr. Matthew Oetgen (17:29):
Motion capture, it's been around for quite some time since the seventies. It started in California and its sort of spread out from there. It's been very helpful. Originally it was used for kids with cerebral palsy and motion disorders to try to identify areas that we can address to make them walk better or make them function better. But now as the motion capture systems have become better, as we've put in backends of AI, it's been expanded now to look at sports, throwing athletes, hitting athletes and things like that. So we use it in the traditional sense to look at kids with disabilities and their motion and gait, but we also are using it to look at sports. We're looking at the way that kids move after injuries to determine if we can say you're ready to go back to playing again. Your motion is good, your strength is good. And we look at that before surgery to say, you've got enough motion now before surgery that we think we can do surgery safely and allow you to get back in the shortest amount of time. So we've really expanded the utility of it, not only just kids with disabilities, but really helping with kids get back to play as well.

Dr. Nathan Kuppermann (18:39):

How does the motion capture, how does it help you direct care if you see X, you do Y or how does that work?

Dr. Matthew Oetgen (18:50):
There's such a long history now that there's a database with it. We can actually look at the kids beforehand, watch the way they walk, and based on the way that their knees move and the amount of range of motion we can say they should have this type of surgery to help them walk better. And so that's just from the long history of it. And we do that now with almost every child with cerebral palsy that goes through to have surgery because we know that that will help us make decisions so much better than just the eyeball test watching someone and saying, I think we should do this.

Dr. Nathan Kuppermann (19:21):
Kevin, what's been Sheikh Zayed Institute's role in motion detection? Gait lab

Dr. Kevin Cleary (19:27):
We're very involved, particularly from the beginning when we were looking at which systems to use. And we did also a project with an ankle rehab robot for patients with cerebral palsy where actually the children became a pilot for an airplane video game using their ankle, and that was quite motivating to see them recover as well. But I think it's also about quantitative data. We also have a project on cervical range of motion that we may talk about later as well, but it's again, giving you more data to make more informed decisions right here so you can hopefully have better outcomes. Do you want to talk about the

Dr. Nathan Kuppermann (19:56):
Current state of robotics in the treatment of orthopedic conditions and what does the future state look like? Lemme start with you, Matt, on that.

Dr. Matthew Oetgen (20:04):
I'm going to defer to Kevin, but we're going to have to put a stopwatch on this so you have 30 seconds because this is Kevin's field. He can go on forever and then I'll clean it up after you.

Dr. Kevin Cleary (20:14):
It sounds good. Well, I would say in medical robotics in general, there has been an explosion. We certainly all know about the DaVinci robot in that too, in prostatectomy and other fields. I think in orthopedics it's been a little slower and more in the adult population. There are systems that assist the robot, for example, in the cutting plane during a knee osteotomy and things like that. But I think in pediatrics it's been a little slower to evolve.

Dr. Matthew Oetgen (20:36):

Yeah, I think in orthopedics, there've been two ways that the robots have come in. The first is with total joint replacements in older people that need a new hip or a new knee, and they've helped do the accurate cuts of the bone so the implants can go in and it's shown that it's more accurate for that. The other place that does cross over to pediatrics is with spine surgery and in spine surgery, you're putting instruments into very sort of small channels and delicate things around that. And so it's been able to guide us and be more accurate to put in the channel around nerves and spinal cords and those sort of things. Those two have been very well established and they're continuing to move forward. How it relates to pediatrics and how we can do that, I think that it's still a burgeoning field and that's where Kevin and our collaboration has really tried to move it forward.

Dr. Nathan Kuppermann (21:27):
The Da Vinci robot is obviously famous from early prototypes to current. Is there the equivalent for pediatric orthopedics? Is there a prototype robot that people turn to or

Dr. Kevin Cleary (21:40):
I think not yet in the market. Unfortunately, as we all know, being in pediatrics, the market can be small. We actually tried several years ago when we founded the institute to convince Intuitive Surgical that makes the Da Vinci to make a pediatric robot. And the truth is, the volumes and market size were not quite enough for them. But I do think nowadays there is an explosion of companies in the space too, and I think as you get more and more companies in that space that perhaps we can adapt to design for pediatrics. We also have to remember in pediatrics, we have a wide variability in the age and size of kids we treat, which may make it more difficult to make the one size fits all robot.

Dr. Nathan Kuppermann (22:15):
This is one of the challenges around pediatric innovation. The population is children are about 20% of our population, and they're not as medically needy as aging adults. So how to kind of scale up our inventions maybe to make them also useful for adults to make a market for it. It is a bit of a challenge. Again, back to the issues around innovation at the Sheikh Zayed, we were starting to talk about cervical motion. So you want to talk a little bit about at the Sheikh Zayed Institute, what devices or technologies you've been working on to assess cervical motion and maybe speak to that to our listeners, why that's important. Obviously, you, Matt, you'll chime in as well.

Dr. Kevin Cleary (22:54):
Yeah, I will definitely also defer to Matt on this one as well. But from the technology side, again, the advances in computer vision, computer tracking, computing power, we already know what computing power we have in the palm of our hands right now have made it fairly easy to create low cost systems that can be used to track a head range of motion. And we have been working

with Dr. Achin to bring a prototype to clinic that again, can help provide you more quantitative data.

Dr. Matthew Oetgen (23:20):
You know, we have a lot of cross-communication and we get together and talk about what other people are doing. And Marius who you had on a few weeks ago, he developed a program where they looked at facial recognition and that got me thinking. And one day we were in the clinic trying to assess the range of motion on someone that I had done surgery on their cervical spine. And it got me thinking, if Marius can track the eyes and do that, can he look at the motion and see if we can quantitate, if he can identify the eyes, how far they move up and down. So I called Kevin, Kevin came down, I told him the idea and Kevin said, yeah, let me think about that. Let me talk to the engineers. He called me back a week or so later and said, yeah, we got it.

(24:01):
And I said, oh, you got a meeting with the engineers? He said, no, no, they got a way to do it. So right away. So I said, oh, perfect. So they got to work and they came down to clinic. We got a little trial set up and they've developed a sort of facial mapping recognition where they can actually quantitate the range of motion in all three planes. We got a small grant and we're moving forward with it, and I think it'll really be helpful in the clinic to be able to track as kids are growing, what sort of changes. We just don't know that right now.

Dr. Nathan Kuppermann (24:32):
Would you design specific, again, interventions around?

Dr. Matthew Oetgen (24:35):
Well, I think it goes a number ways. Number one, when we do cervical spine surgery in young kids and we have to fuse their spine, how much does that affect them later on? Is there other disease processes that come up we limit that we don't know? And so tracking it going forward. There's also a large population that have congenital abnormalities in their cervical spine that limit motion. And how much does that change over time? Again, we don't know. And so if we can track their motion of things that we do or if they're born with abnormal anatomy, I think we can design treatments to maximize their motion. Maybe there are times we need to intervene or not intervene, and we just don't really have that data right now. And we're not talking apples to apples when we talk about someone somewhere else because everyone sort of assesses it differently. So if we had a standard platform that everyone used on their phone that we could talk the same language, I think it would be much better.

Dr. Nathan Kuppermann (25:30):
Kevin, you want to talk about the sort of engineering aspects around assessing cervical motion?

Dr. Kevin Cleary (25:35):
Yes. I think really what's enabled this again, are all these advances in technology that we have and the things that we can do in our prototyping lab are things that when I was in engineering school, you would've required Lockheed Martin or one of the big defense contractors to do so, the rapid prototyping. So every device we have now has a mechanical piece as an electronics piece, has a software piece, and we'll soon have an AI piece. So it really is about putting those all together. And as Dr. Oetgen said, or Matt as we say here, yes, the ability to have rapid prototyping cycles and then have the physicians in house where we can say, Hey, we put this together, we're not sure if it's the right direction. Can you pop up or can we pop down? Or sometimes they say, can I put my scrubs on and catch you in the operating room between cases? And so I think that an environment and the close collaboration and the ability of rapid prototyping, the technologies that have advanced have really set us on the right course here.

Dr. Matthew Oetgen (26:27):
For this one, we started with the engineers using a sort of gaming console that looked at the old we that they set up, and it was great, but you can't move that around from clinic to clinic. And so I said, this is awesome. We're getting there. Let's do it on phone. And they said, oh yeah, we can use the phone. So it's just that iterative process where we're back and forth that's really allowed us to build this prototype.

Dr. Nathan Kuppermann (26:51):
In medicine, we're always concerned about doing the right thing for patients, making sure that we're using technologies to its utmost. Other particular approaches around robotics and these devices specific to children that are different than adults or is the approach the same?

Dr. Kevin Cleary (27:07):
I mean, we certainly look at safety in everything we build. And when I was at Georgetown in the adult hospital, I used to say for a trial, if I'm not ready to use it on me, it's not ready now at a children's hospital. If I'm not ready to use it on my kids, it's not ready. So certainly we have the various regulatory approvals we need to go to try things as well, but we do consider safety anything from electrical shocks to proper software design to mechanical hard stops on equipment, and that certainly at the forefront of our mind when we design things for children.

Dr. Matthew Oetgen (27:36):
I think this is where Kevin probably is sick of hearing me say, but this is where I push his team because the default, especially when you're looking at the anatomy and then sort of using the robot against the anatomy is to use some sort of 3D imaging, CT scan for bones. We get a great CT scan where everything is, you can sort of orient the robot and then it goes from there. But like we talked about, that introduces radiation. So as we try to get safer and safer, I hound his team, let's get away from that. How do we use ultrasound? How do we use low dose x-ray or

imaging to get the same quality? They roll their eyes and then they tackle that problem. That's I think the big safety piece is if we can continue to lower the radiation, we will get safer and safer with these things.

Dr. Nathan Kuppermann (28:23):
I can imagine that parents come in and they're preparing for surgery and they're probably a mixture of excited about having robotics and another thing and also scared. How do you address patients and their families around this tremendous use of technology that you use?

Dr. Matthew Oetgen (28:40):
The good thing about how these robots and this navigation sort of technology has rolled out, it's still the surgeon that's controlling things. It's not fully automated or autonomous. It's not just the robot and I'm having a cup of coffee checking at the end. We may get there at some point, but we're not there right yet. And so we still are the ones that are doing the surgery and we're using these technologies to make us more precise, hopefully to speed up the surgery, decrease time in the operating room. And I think once you tell that to people and they understand, oh, it's not just a robot in there doing what you're supposed to be doing, they're just helping you be more precise, it resonates and then they understand. Yeah,

Dr. Nathan Kuppermann (29:19):
It's sort of amazing where we are now with technology. It's hard. We're doing things that we couldn't have imagined 10 years ago, 20 years that we were doing, projecting five to 10 years from now between imaging devices, robots, motion capture, where do you think we'll be in five to 10 years from now, specifically with regard to orthopedics and what barriers and challenges will we need to overcome to get there?

Dr. Kevin Cleary (29:43):
Well, for one, I think we'll still need both of you so you can rest assured that I don't think, again, the AI or the robot is going to take your job or you're going to say to the patient, the robot will see you now.

(29:55):
But even for me, I must say as a technology person, the explosion of technology certainly in the last couple years seems so fast that it seems hard to keep up. But I think that's really where we're well positioned as an institute where one, we have a number of different engineering disciplines, so we have computer scientists, we have mathematicians, we have mechanical engineers, electrical engineers. It takes that interdisciplinary approach. And then I think the same thing being in the hospital, as we've said many times now, being there and our engineers get to see surgery, they realize that the doctors get to see our technology, and so I think it's only going to be by working together and doing demonstration projects that we can figure out the appropriate use

of this hopefully to better patient care and then hopefully not to be overwhelmed by the new technology as well.

Dr. Matthew Oetgen (30:37):
I just have high hopes for this as we go. I'm not nervous about it. What I think is this is going to help us be more precise. It's going to help us get to the end where we want to be. We have a lot of data that says, if you put this fracture together correctly, they'll do much better. Now, a lot of that outcome is technique and skill dependent, and my hope is that everyone's floor to be raised and it'll make people better surgeons because the little things will be easier to do. And so the very, very complex things, it may allow other people to sort of be just as good as the most talented surgeon there is, and then there's still going to be very, very complex things that you just need that talent to do. But I think it'll raise everyone's floor to let them do things a little bit better. I think the challenge is there's so much technology and there's so much interest in it As we go from now to 10 years from now, how do we pick the right thing and invest in that or say that's what we need to grow with? And I think that that's where the collaboration is really helpful.

Dr. Nathan Kuppermann (31:38):
All this great clinical care that we deliver, whether it's orthopedics, pediatric emergency, or other specialties. What I think a lot of viewers and listeners don't know behind it is a lot of research, just to your point that you raise, Matt, how do we decide on doing X or Y, which technology? That of course is research that helps get us to this great clinical care. And I want to mention that you both are endowed professors, Kevin of engineering and Matt of orthopedic surgery. And for our listeners, what that means is that somebody has basically given you, that has endowed you with a certain amount of money that the spinoff of that money allows you to do interesting and important work to raise the bar of care for children. If you could each talk about what your endowed professorships have allowed you to do and be in your professional lives, and let me start with you again, Kevin.

Dr. Kevin Cleary (32:32):
Well, I don't think you can underestimate the value of endowed chairs because basically being a researcher, we spend a lot of time looking for funding, writing proposals, things like that, and we understand that. But if I get more of my time free to actually work on solving the problems that clinicians like you bring, and I also know that I have that steady stream of at least income throughout the work that we do, it really enables us to do new things. So I think the endowed chairs are really critical to advancing medicine and what we do, and I really appreciate the grateful support that we get from such people.

Dr. Matthew Oetgen (33:05):
I think in the 16 years I've been here, given that endowed chair by the Josephine Roberts Foundation, it's the single most important thing that's happened to me in terms of building our

department. What it does is it allows people to take a risk or follow an idea to a point where then they can say, okay, this is good or this is not. It allows us to do more things to sort of take some chances. It allows us to collaborate with people setting up meetings and having symposiums. And as you know, the basis of what we do is talking to other people. What are you doing? What are we doing? How do we do that together? And it allows us to set up those interactions to do that. It's allowed our faculty to come to me with ideas, and as you know, the power to say yes, go for it. It just makes people happy and motivated, and it just has allowed us to do more things, which is what we want to do. There's no amount that's too small. It just allows you to sort of explore out there and move the bar.

Dr. Nathan Kuppermann (33:59):
With that, Dr. Matt Oetgen, Dr. Kevin Cleary, really, it's been a pleasure chatting with you guys. It's always fun to hear about what you're doing and super enlightening to see how you are raising the bar together with research, with clinical care to improve the lives of children with orthopedic conditions. So thanks a lot for being with us.

Dr. Kevin Cleary (34:18):
Perfect. Thank you. Thank you for having me.

Dr. Nathan Kuppermann (34:20):
I'd like to thank Dr. Matt Oetgen and Dr. Kevin Cleary for joining us and sharing their expertise. In this episode of The Lead in Peds, we explored how robotics imaging and motion capture are changing pediatric orthopedics. What we've heard shows how technology and teamwork from the lab to the clinic are opening new doors for children who need specialized care. Be sure to subscribe and share this episode with anyone who wants to learn how pediatric research and innovation are transforming care at Children's National and beyond.