# The Future of Surgery: Robotics, AI, and the Next Generation of Physicians With Dr. Sanjeev Kumar Transcript

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## Podcast Introduction and AI Preview

Welcome to the Doctors Making a Difference podcast, where we help physicians to be empowered with the tools they need to successful in medicine, in finance, and in life.

Join us as we highlight doctors and other professionals around the world who are making a difference. Hey everyone. So today we're going to hear an interesting interview with Dr.

Sanjeev Kumar. He introduced himself here in a minute on the podcast, but I wanted to give just a little bit of a preview. Dr Kumar is a really interesting surgeon.

oncologic surgery and has been on the leading edge of robotics surgery. There's so many things you can do with that technology. Very interesting to hear his passion and he talks about artificial intelligence and how that affects it.

I've got to say that I hear this question quite a bit from my kids and people of that generation, medical students. What's going to happen with AI? Am I going be replaced as a doctor?

Do I still have relevance in this field? I think there's a lot to be said by having physician to have the wisdom and the knowledge and judgment of someone that understands this field.

Large language models, what we call artificial intelligence, have access to tremendous sets of data. Every book in the world, every published study, everything that you can imagine on that.

And some of them are a little more discriminatory about getting good peer-supported data, and others just pull everything from Reddit to everything online.

So sometimes they pull out information that's not useful. But there is a place for AI. Think about if you have a decision-helping tool and it has every study in the world at your fingertips, or you something in a surgical field, a robotic surgery, and every surgery ever done, every complication ever documented is right there at you fingertips so that you can understand what comes next.

## Dr. Kumar's Background and Training Path

Instead of being fearful of AI, we can be hopeful and say, this is something that's a tool in our hands. by no means is it a replacement for having a physician, but it is certainly a helpful tool.

We need to help craft that. So I think you'll enjoy this interview with Dr. Kumar. One of the purposes of this podcast is try to leave medicine better than we found it.

And I you find him to be a delightful guest, very interesting, Okay, today I'm delighted to welcome Dr. Sanjeev Kumar. Dr Kumar is a Gainak surgeon, an accomplished surgeon who works a lot with robotics.

I am very excited to meet him and talk a little bit about what he is doing. Doctor Kumar, would you mind introducing yourself to our audience? Yes, hey there.

My name is Dr. Sanjeev Kumar. I'm a double board certified G1 oncologist, board-certified in OBG1 as well as gynecologic oncology. And I have a special interest in robotics.

After a lot of robotic surgery, very passionate about it, past, present, future, and I see great future in robotic

surgeries in helping the patients. And especially in the age of AI, the AI has been introduced into robotics.

And so where it is evolving is quite fascinating. Yeah, I'm really excited to get into this. Just as a little background, Briefly tell us your story. I know you mentioned you were born in India.

You did some work in the United Kingdom. you work In the united states now, but talk us through that. It's difficult to operate in and do something complex in a culture that was not where you grew up.

And then you chose surgery. How did you choose this path? Yeah, it's a great question. So I grew Up in our farming family back home in india. And right from the childhood, I had a dream that it'll be very, very nice to work with my hands.

I thought I was always good with hands and had good skill and always wanted to help people. And I taught that. It's a great idea to become a surgeon where your hand-eye coordination, your manual skills come into play.

So I thought that would be a great idea to become a physician and a surgeon and to develop a skill in kind of like a niche field. So, I was always a big fan.

When I growing up, actually, a close friend had an uncle who was an interventional cardiologist and was in practice in the UK. And he used to tell me stories how patients will fly from faraway places to seek care with him because of his skill.

Then I graduated from med school in India from a city called Chandigarh, which is in North India. And then I went to England and had an opportunity to actually work with a pediatric surgical urologist in England.

And the same concept is that he specialized in doing very, very niche procedures where pretty much he and three or four other guys were doing complex like developmental anomalies in kids, like hypospadias and things of that nature.

So kids will fly over. from all over the country and will do fairly complex operations. So that's where I saw that you would develop a niche practice, a skill that, you can push the field, push envelope and take the fields forward.

And then along the same thread, when I was doing fellowship at Mayo Clinic, Rochester, Minnesota, in G1 Oncology, my mentor, Dr. Bill Clivey, we were talking one day, And so I was like, fellowship is going well, this and that, but then how do you develop a career?

We were having breakfast one day in the hospital cafeteria and he's great at, you know, making it funny. And he teaches by stories. So it was, well listen, he said, try to find something that nobody else is doing.

and get good at it. And that's a great way to develop a career. That's awesome. So that is kind of how I always looked at things is that how can I focus in an area and then go real deep into it and develop it?

And so going back how i chose a surgical branch Basically, at least that's how I look at it, is that no illness is easy on people or the patient. But as they say in the Emperor of All Melodies, I don't know whether you've read that book or not, but if you haven't, it's highly recommended.

## Why Robotics Became His Focus

Written by Dr. Banerjee, Emperor Of All Mellodies basically says that cancer is the king of all illness. It's kind of like a form of life. it has its own life, it evolves.

But I thought that to treat cancer, is most challenging aspect of medicine. And then I was interested in surgery, so I kind-of mixed it. and hence, the areas that were fascinating to me were where I would get a chance to do cancer surgery.

And so there were two ways to get there with the exposure that I had. Either you become a surgical oncologist or you became an organic logic oncologists.

And when I calculated the number of years it takes, surgery residency is five years and OBGYN residency's four years. So that's how I ended up where I end up.

med school in India and then did fairly broad-based surgical training in the UK. And then I came to the US where I did OBGYN residency at Wayne State University and a G1 oncology fellowship at the Mayo Clinic, Rochester, Minnesota.

So that's kind of how my path came about. And so it sounds like you came into this and had this experience and then found that the robotic surgery was something you could really excel at.

And, so, you know, most of the listeners of this podcast are doctors. They're going to be familiar with robotic, surgery and the concept of what happens.

But. maybe just outline a little bit for those who don't know quite as much. A robotic surgery, some of my patients think, does that mean a robot's doing my surgery?

No, it's the surgeon, but the tools and the controls are not necessarily on the patient's abdomen or at their pelvis. They're sitting a few feet away.

And so it is a change. I wanted to kind of hear your perspective on that as you went from classic training to robotic surgery, and now a person who's really leading in the field of robotic How has that affected your surgical capability and also what kind of cases can you take on that maybe you couldn't have taken on with the previous techniques?

Yeah, it's a great question. It's fascinating field. And the reason why I got into it, again, using the same theme of trying to develop a niche practice.

So when I go into residency, robotics was in its infancy. At Wayne State, as an OBGYN resident, they had just gotten their first Da Vinci. around that time when we were junior residents.

And that was a time, I'm talking about 2006, is that senior physicians were still training their junior partners. I guess it was Da Vinci S version that had come out.

It was very clunky, big. And by the way, the question you asked that, hey, you know, my patients think that the robot will be doing the surgery. A lot of my patience will ask me exactly that question actually, that oh, Dr.

Kumar, does it mean that robot would be operating on me and it will not be you? And so I used to actually take all my time to explain that hey even though it is called robotic surgery, I'm still controlling the machine.

Although the machines does the operation, but I'm the master of the machine. And I'll tell you a funny story. One day a patient came in and she said, I want to see this thing that is going to operate on me.

Obviously the DaVinci is always parked in the operating room. So I said I am like a huge fan of patient focused care and great transparency and things like that.

So I was like, okay, I mean, we're talking about 7 a.m. surgery start at 7.30. So said, well, if you are that insistent on looking at the robot, let's go walk in the operating room.

And so she's in her gown and we are walking, I'm in scrubs and you know, my white coat and, we're walking towards the OR and all the nurses are like, what's happening?

We've never given a patient the tour immediately before surgery. I was like guys, it's a great idea if you let the patient tour and actually see. And I think a lot of the hospitals now have like a replica of The Robot in a lobby or

someplace like that.

So where patients and community members can actually What this thing is all about, but it's amazing tool. Coming back to what type of edge it provides, right?

So I can talk about two very specific areas. So let's say you have a tumor in the retroperitoneum, but very deep in pelvis, let say in hollow of the sacrum, right?

So like sacram is like this and the tumor is sitting right in a hollow. If you are trying to do open surgery on a patient, that's very challenging because the tools, they're not bent like that.

They don't match the shape of the sacrum, and there's so many structures between the anterior access point and the back of sacum. You're right, that would be very challenging.

Exactly. Also, everybody's pelvis shape is actually different. Some people have a very narrow, long and funnel type of a pelvis. Others have little bit of broader pelvis, so manual access to these tumors becomes very challenging.

## Robotic Surgery Benefits and Case Examples

And you realize that if it's a large tumor that is growing in, let's say, sacral foramenia, in all the spaces of the pelvis, wrapping around all of nerves, it becomes very, very difficult with the naked eye, even if you have magnifying glasses, to actually see it.

Robotically, your vision is magnified multiple times. So let's say routine magnification, let says six times, sometimes can be even 10 times so you can actually just see so much better.

Like even the very, very small blood vessels, they pop at you. And so, you're able to navigate and do those type of surgeries in a much, better fashion.

There's the operation I can tell you about. It's called radical nerve sparing robotic trachelectomy. Okay. So in this particular operation, let's say if somebody has cervix cancer, right?

Cervix cancers notorious for spreading in the paramecia, which is the tissue surrounding the cervics. And it often will go and trap the nerves of the pelvis.

So in a traditional approach, when you clamp, cut, clamp cut open surgery, you end up damaging a lot of nerves. So traditionally, if you get a radical trachelectomy for cervix cancer, You can have a lots of bladder dysfunction and sexual dysfunction after that operation.

Take a corresponding operation in men. Somebody has prostatic cancer. It's very common. I mean, if you live long enough, every man is going to develop prostate cancer.

And if, you undergo an open prostatectomy, a lot of men develop impotence, erectile dysfunction. After that, it's because the nerves have been damaged.

They will require catheterization because the bladder doesn't function because it's basically denorved. And a lot of times they can develop defecatory dysfunction as well where stool will not pass.

Robotically, since you can see everything much more magnified and it is 3D vision, it isn't 2D. It is three-dimensional vision where you actually feel as if you live in that pelvis.

You can actually see all around. Imagine watching like a 3D movie and the anatomy is magnified 6 to 10 times. So you can actually trace those nerves and preserve them.

In this operation, robotic nerve-sparing radical trachelectomy, you actually save these nerves, and post-operative

bladder dysfunction, sexual dysfunction is much less or negligible.

So like in the past, after doing the open operation, we will be sending the patient full with a bladder catheter. But after the robotic nerve sparing radical trachelectomy, patients can actually pass urine just fine.

And they will not require cathetization and not develop bladder infections and things of that nature. Sexual function is much better. So it's day and night.

In terms of specifically benefits robotics, second main area is operating in obese patients. So after specializing in robotics I realized a lot of people started sending me patients that are at extreme body weight.

And I'm talking about bodyweight of 400 pounds, 500 pounds. Body mass index 70, 60. Since obesity is a main cause of uterine cancer, endometrial cancer.

That's the number one cancer that we as Jeevan oncologists treat. So started getting a lot of very, very obese patients. And in that particular patient population, the benefits of robotics is like magnified because you're using keyhole surgery, very tiny little incisions.

These patients can go home the same day. Infection rate is minimal. So imagine The wound infection rates, if you're doing like open surgery, it is said that if the BMI of the patient is let's say in the range of 45 to 50 to 60, after open-surgery the wound-infection rate is about one-third, 30% of patients develop wound infections.

After robotics, gets minimal, maybe one or two percent. So it's drastically different. And so this segment of patient population is the greatest beneficiary of robotics.

Then you talk about rare things like if a cancer is wrapping around the blood vessel, now you can peel it off robotically because you just see much more.

And many times you will not need to reset or put a graft on. So more cancers have become respectable, which previously could not be respected. This is a tremendous advantage.

And if you look at the future, increasingly people are discussing cutting edge concepts like telesurgery. If you go historically, robotic surgery actually developed with the initial funding from the department of defense and robots were initially conceptualized that you could operate in space or you can operate the battlefield from.

The carriers or even mainland. So that was the original application of this technology, but it kept sitting on the shelves with department defense in Pentagon.

And then when the technology broke out, then the commercial players started developing it and it found its application initially in fields like urology, gynecology.

And people would ask that, hey, you know, why urology and gynaecology first? And the underlying fundamental is that Robotics fits well when you're operating in a localized field.

So let's say if you have ovarian cancer, right? Ovarians cancer is widely spread in the abdomen. You can have tumor nodules in right upper quadrant. left lower quadrant, all the four quadrants of the abdomen.

So that's not an ideal tumor for the robot to remove. Although it has its applications there as well, but because the tumor is widespread, the application is less.

Whereas if you're operating in a focal regional area, like let's say prostate operation, you are right there. You're not moving in different quadrants of the abdomen and similarly hysterectomies.

And therefore this technology developed in those fields first and now it is expanding. So tele-surgery is now coming up. There's a company that I personally know out of India that has performed many, many tele surgeries.

It is finding its application in heart surgery, gallbladder surgery. Things of that nature. So things are moving forward. with an exciting base actually.

We were talking before we hit record about the important work being done in other countries. I've had a chance to do volunteer work in parts of Africa with very limited medical resources and it's a developing technology But the ability to bring some of these things to underserved communities is pretty neat and still something we need to work the kinks out.

But it sounds like it's already being done in real time. It's interesting, like you said, that it had a background with the Department of Defense because there's a lot of need for remote surgery.

But the thing that I've also found interesting, not in the world of gyna-onc, but even in our small communities, like I work in a rural area, even the small hospitals in my region, almost every hospital has a da Vinci because that's become the standard for urologic surgeries and routine gynecologic surgeries.

As you said, there's been a tremendous advancement in that field and it's pretty amazing to watch. Where do you see it going over the next few years? Obviously, it's been sort of this moving target.

You've been in it for several years, and I'll bet it changes rapidly. But I'm curious, where do see this going in the era of artificial intelligence and large language models as we go forward over next 5 to 10, 15 years.

## Future of Robotics, Access, and Telesurgery

Yeah, you know, that's a very, very important question. And let me go back to where the field is going. So Da Vinci is from intuitive surgical and pretty much has had monopoly on the market.

I mean, and you have other surgical robots. Don't get me wrong. You have like Mako system. Makoe is used for knee replacements in orthopedics. but da Vinci is probably the most complex robotic system and is the more advanced robotic systems and as they call it the true robot meaning that it has let's say four arms so traditionally when I'm doing surgery I only have two arms and I need good assistance right but this alone has four arm so I can actually control way more than I can do with my hands.

But now a lot of other companies are actually manufacturing the equipment because a of the patents that were developed by Intuitive Surgical, the embargo on that has gone away.

So the market is becoming more and more open and few companies have applied for FDA approvals even in the US market. I personally know that SSI Innovations, for example, it's a new company developed by a heart surgeon out of India that has applied to be in US markets and they're going through the FD evaluations right now.

But as more and more devices come in market, I think you'll have a rapidly developing technology. And the monopoly is, as you see in the past, not real good for development, right?

Anytime you have a monopoly, the developmental rate is a little bit lower than what it can be if there are many, many other competitors competing and improving the technology at a faster rate.

So now that it's starting to happen, what I foresee is as compared to just the DaVinci alone, I think more and more models will come into the market and the cost will decrease.

The accessibility will increase because believe it or not, although pretty much every hospital in the US has a machine, robotic machine now, I mean the main hospital systems.

But even then the staff training is not as good. So for example, in the market where I would do my operations, you could see that you have a robotic crew.

So people that are well trained on the machine. You know, all the parts, how to dock it, How to troubleshoot. And

they are on a shift from let's say six to three.

so you did your three, four operations then they go home and then it becomes a nightmare. So if, you know, your list lasts beyond 330, the robotic crew is gone.

Now you have somebody in the OR that will say, I have no idea. I mean, how? No, they haven't used it. They're not work. they have worked with it day by day, like the Robotic Crew.

Yes. And with, so that limits the accessibility. So I've seen some surgeons, They could do four or five surgeries. But since the accessibility is so limited, they will only do three.

So with the cost declining and more other devices coming in the market, I think the accessability will improve. And that will be greatly beneficial for the patients.

And I think the ultimate thing will be to have remote surgery where you can have an expert surgeon that could apply their skills to even remote locations.

Also, traditional areas where, let's say, heart surgery or even spine surgery, where robotic applications were at a lower level, are now coming into the picture.

as the instruments are improving as well. So it's rapidly evolving. You know, a question that I get pretty often, primarily from students, high school students medical students.

The question is, okay, AI is going to take my job. Our artificial intelligence, large language models are going modify how I do it. I think there will always be a need for a physician.

I don't ever see a time where you're going to put all your care under the direction of some, you know, large language models just connect sentences and phrases and they may have all the data in the world, but you still have some judgment and wisdom that has to come from someone that does this and can actually think.

And so I'm interested in how you see AI affecting the field of robotic surgery and telesurgery and all those things. And then also, how does this affect the choices of those who are rising medical students, pre-med students residents as they contemplate what's the potential effect of AI on the Field of Surgery from your standpoint?

Yeah, it's a great question. So I was watching a YouTube show one day and it was Elon Musk speaking to a reporter and I think you might have watched it.

He's saying something like, within three years, the optimist will be able to perform surgeries that will much more precise than any human surgeon alive within 3 years.

And that's a fascinating and very, very interesting comment. I don't believe that right now because There's just so much judgment involved in surgery, and every patient is just different.

But still, technology is improving at a very, very rapid rate. I don't think that physicians are going away anytime soon, so I do not think the medical students have anything to worry about.

## AI in Surgery and Medical Training

They should understand this, that the kind of things that they will be applying their judgment, the problems will because, so let's say our days, like mine and your days when we were reading, probably, you know, I was learning a lot from up to date, for example.

And even before that, when I in India, let say in med school, talking about 1998, 1999, textbooks were the main thing. I kid you not, if I could see a 3D picture, That just made the anatomy learning so much easier.

And now you can actually build these anatomy images on grok, like with, you know, a few buttons. So learning has become so easier, right? But then it has shifted the pendulum of what you actually need to learn.

The learning probably is, hey, what is actually the best AI model that can be applied to cancer surgery learning? Because we have covered so much ground already.

What is the next frontier? So as these models keep evolving, I think the spectrum will change. As somebody said, the only job that is never going to go away is to the job of solving a problem.

So what kind of problem you solve will be different. So now let's say we can ask Chad GPT, you know, I got this type 2 hypertensive or type two diabetic.

What's the standard of care? And it will rattle off a few things. Sometimes it'll be wrong. That's why I cannot rely on it. But by and large, it would give you like generalized medical knowledge.

Every year it will become better and better, but then every year the nature of problems will be different as well. And so that's why I think learning how to learn is not going to go away.

So I think current medical students, they need to have an open mind and they do embrace this technology and master it rather than being scared of it. So, I, think at least in my view, no doctors are not going to go away.

Problems will still remain, but the nature of them will change. I You'll probably pretty soon have fellowships specializing into just robotic surgery, for example, or AI-generated robotic surgeries.

Now, let me see what I have seen so far, how AI is integrated into robotics. So the robotic systems now, they track literally every movement a surgeon makes.

The robotic platform, connected with a computer, and every surgeon that is using that system, their data is fed into it. So let's say we talk about hysterectomy.

The companies now, they have data on at what step surgeons are taking the longest amount of time. Is it at the right uterine clamping or left uterus clamp?

Or is it coming at a vaginal cuff, or it is dissection of the left or right IP ligament? And now they are able to build models that, okay, we see maximum amount bleeding at the time of right uterine cauterization.

So that's the area where we need to teach more, and that is the areas that needs to come into focus. Things like, okay, at time the dissection of the right ureter, people are getting into most trouble.

Those kind of hardcore data models are now being developed. because with literally thousands and thousands of operations being done daily, these machines are learning that.

It's no different than, you know, let's say Google Maps and you started using Google maps. And Google has now information that, OK, XYZ left turn has the maximum fatality rate.

So those type of things are being fed into these systems, which, if you can imagine what we can build on top of that data, will be pretty fascinating.

Imagine going into an operation where the moment you put your head down, you already see that in this operation, these are the critical points. right uterine, be careful when you're in that area, right ureter, and then left IP ligament.

That's where we see most surgeons spend most of the time and most or the bleeding. and then going one step further, then since all of these movements are recorded, trying to develop models of if you run into this problem, how do you resolve it?

So let's say there's an anatomic variation. Let's says somebody's uterine vein is coming in front of the ureter, behind the urter and that's developmental anomaly, right?

Traditional anatomy teaching has been on traditional atlases. Now, I kid you not, the robotic anatomy is completely different because you can actually see way more.

You could see vessels that you had no idea existed because the thing is magnified. So that's where the AI is helping in developing these tools. A great answer.

And I think when I answer people on these questions, just like you did, I, think it's better to go forward with hope and say I'm not worried about replacement.

I am excited about what this can help us do instead of saying I need to look that up. the information, the data will be immediately available. And if you're an expert in the field and you already know it, that information is very powerful in your hands.

Very similar to what you just described. If you have that about the variance of anatomy, hot spots or trouble spots on the surgery, suddenly instead of being worried about AI, you are thankful for the AI to say, how could this help me navigate this complex problem so that this patient gets the very, very best outcome.

Anyway, I love your perspective. I appreciate it. As we get a little closer to our time finishing, i wanted to just ask you if you have some resources or a website or how can people follow your work because I think this is very important and obviously you've had a tremendous role in developing this field and it'll be very interesting to watch over the next several years as other surgeons come into this and develop this process where we can take it Yeah, no, absolutely.

So I'll give you another example. Nowadays, if you see a person using a flip phone, you'll be surprised, right?

## Closing Remarks and Podcast Outro

You'll like, hey, where's the touch screen right here? Robotics and AI are no different. It's better to inculcate the technology, learn it, so we don't get left behind.

Because every year, the pace of learning the technological evolution is actually increasing the speed is increasing so either embrace it or get left behind and you definitely don't want to get let behind now but you wanna stay ahead and people can follow me on my linkedin which is probably the best and then i have my website will post the link as well okay any questions i'll be happy to take them by email or even phone and I will be happy to discuss any questions, any issues, things of that nature.

Hey Dr. Kumar, I really appreciate it. I think it's fascinating both from a technological standpoint but I love your perspective on helping patients using your skills to develop a niche skill set that you can really help folks and that started out just like you did from the very beginning.

and I want to use a skill set that I can really develop deeply so that i can help people and that's what you're doing so thank you for what You're, doing I said the podcast is called doctors making a difference you are one of the doctors, making the difference and you Are leaving medicine better than you found it it's really cool and i want, to express appreciation gratitude for, what, you, are doing thank.

You Yes, no thank, so much for the opportunity and the time it is exciting time with evolving technology and And I wish everybody good luck in learning and applying it.

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