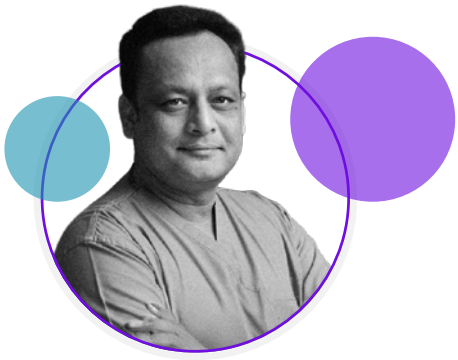
Citation: EMJ Innov. 2026;10[1]:22-25. https://doi.org/10.33590/emjinnov/MXLC6000



Rajesh Sivaprakasam

Lead for Robotic Renal Failure Surgery; Consultant in Transplant, Access, and General Surgery, Barts Health NHS Trust, London, UK

> **Digital innovations allow us to measure wellbeing and implement supportive solutions**

Q1 As Lead for Robotic Renal Failure Surgery at Barts Health NHS Trust, London, UK, how has the operating theatre changed in the last 10 years, and how has this impacted patient safety?

This is an area that I am very passionate about, particularly patient safety in the operating room. In the UK, there has been an increasing focus over the last 2 decades on patient safety and on how we can implement solutions and processes that help everyone to follow it. This applies not just to the surgeon, but to all members of the team. These processes can be standardised so that we can be benchmarked, whether between theatre sessions of the same team, between teams in the same hospital, or between hospitals. This gives patients and families a transparent understanding that hospitals are genuinely focused on patient safety, and that they can rely on data-driven systems that are consistently followed.

Innovations, in general, always get us to focus a bit more. When new solutions are introduced, such as laparoscopic surgery 30 years ago, and in the last decade, robotic surgery, additional devices enter the operating theatre. This encourages us to think more carefully about delegation and allocation of responsibility. There are already established devices in the operating theatre, such as anaesthetic machines, which are managed by anaesthetists and their supporting teams. With surgical devices, particularly robotic systems, the focus becomes even more structured. In practice, the device becomes part of the team rather than a standalone solution. We allocate specific tasks to key team members, ensuring that they are trained not only in surgical use, but also in how to position the robot, how to respond if the power supply fails, and what to do if a device does not function as expected. Although such incidents are rare in the UK, all teams are trained to manage them.

We are also very clear about delegation of activities. The operating component is managed by the surgeon, supported by an assistant surgeon, a scrub nurse, and a bedside assistant. For any robotic procedure, four people from the surgical team are directly involved. These roles are confirmed before the case begins, and responsibilities are reviewed step by step. All individuals are required to complete formal training programmes. Although we do not need to repeat the training on the day of the procedure, all team members must complete structured, certified training before participating in robotic procedures.

Over the past 2 decades, a single robotic platform has been used across the NHS, allowing the development of a structured national training programme. Surgeons and nurses complete hands-on certified training before using the robot on patients. There is currently no autonomous robotic surgery in the NHS or globally. We therefore ensure that we understand these systems, are trained to manage them, and are prepared to deal with any problem, because we owe it to our patients and their families to provide care in the safest possible way.

Q2 How do you see wearable technologies influencing perioperative care and long-term patient monitoring, particularly for renal failure and transplant patients?

This is an area of increasing interest, driven largely by patients themselves, many of whom already use lifestyle wearable devices. I was fortunate to work with a team in the USA that developed the world's first wearable device capable of performing blood tests, measuring potassium and haemoglobin through a skin patch. The purpose of these technologies is to shift more care into the home and ensure that patient care begins at home rather than in a hospital. Wearable devices play an important role in what we call 'remote patient monitoring'. When used in healthcare, these solutions must be evaluated comprehensively for patient safety, usability, efficacy, and integration of the results into their management, approved by national regulatory bodies, and registered as medical devices. They cannot simply be consumer wearables; they must meet the same standards as hospital equipment. That means, over the next decade, wearable technologies will become a key part of patient care.

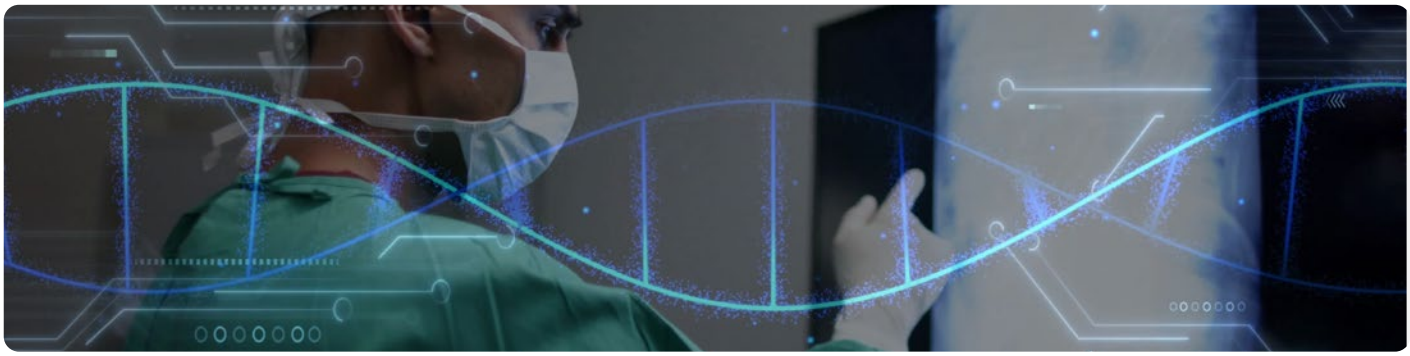
The greatest impact of wearables will be in the period before surgery, helping patients prepare physically and emotionally, and after surgery, enabling ongoing monitoring at home. Prehabilitation, which is rehabilitation that begins before surgery, was previously delivered through manual advice such as step targets and breathing exercises. There are now digital solutions delivered through mobile devices that guide patients through preparation and can also monitor mood and psychological wellbeing. After surgery, virtual wards are increasingly being implemented across the NHS. Patients who are clinically stable may be discharged earlier and monitored remotely through video calls, wearable devices, and digital platforms. This allows hospital-level support to continue at home. At present, the number of solutions being implemented is very few, simply because of the stringent, safe approach we want to have in implementing these solutions. But I do anticipate that it's going to significantly increase in the next decade. We are also exploring wearable monitoring solutions for in-hospital use, allowing patients to walk around more freely while still being monitored, rather than being restricted to their beds. These solutions will also help NHS to manage the surgical waiting list through enhanced pre-surgical preparation of patients, reduced length of stay in the hospital, and continued, more frequent reviews of patients beyond discharge from the hospital.

Q3 As chairperson for 'The Operating Theatre in the Year 2030', what key insights do you hope attendees took away from the conference?

I chose to focus on the operating theatre because there is much we can learn from how multidisciplinary teams work together in this environment. The conference explored the entire patient journey through surgery, demonstrating the current state of practice, emerging solutions, and the transformations occurring within operating theatres. It is inevitable that change is required to enhance the patient experience and staff wellbeing. Staff wellbeing was not widely discussed 2 decades ago, but it is now rightly recognised as essential, because we all underestimate the stress on ourselves. Digital innovations allow us to measure wellbeing and implement supportive solutions. Robot-assisted surgery and other advanced technologies enhance precision and enable real-time second opinions, as well as improved documentation through digital operation notes and video integration. We also need to consider how we can train our healthcare staff so that they understand all the aspects of the operating theatre. It's a functional area with specific tasks, with experts trained to do them, but we want to make sure that the environment is made easier for them. Studies have been done that show that using virtual reality devices before surgery makes them relax. There are certain principles we will never change, which are patient safety, efficient patient care, and surgical care, but the surrounding systems and environments are evolving to support patients and staff more effectively. So, those are the things I really feel that the attendees can take away from the conference, and what we got from the initial feedback was that they all enjoyed it.

Q4 With the rapid expansion of robotic surgery, how can the NHS ensure equitable access to training, particularly for trainees in regions or hospitals without advanced technology?

When you introduce a new technology, you can increase health inequalities if access is limited to certain hospitals or regions. Robotic systems are expensive, and not all hospitals will have the funding to both buy the devices straight away and have the expertise to do these things. But this was the challenge we faced maybe 15 years ago. Now, all aspects of robotic surgery are becoming



standardised. The approaches for different procedures and different specialties are standardised. More suppliers have entered the market, reducing costs and increasing availability. We have also recognised that not all procedures require the same robotic platform. These changes will enable wider adoption across the NHS. Some regions, such as Scotland, have implemented national programmes that centralise robotic surgery in specialist centres, so the patient can go to where rates of robotic-assisted surgery are higher, rather than having more robots in multiple places performing a lower number of procedures.

Q5 How can hospitals prepare their workforce for a future where robotics and AI play a central role in surgery?

That's one of the things we are working on. Training has evolved significantly. Mixed and virtual reality technologies now allow clinicians to gain experience with robotic systems without direct access to physical robots.
We are developing solutions where people can use virtual reality glasses to do robotic surgery training virtually. Over the last 5 years, particularly following COVID-19, training organisations such as the Royal College of Surgeons in London and Edinburgh, have developed clear frameworks for robotic training. Now, I want us to be cautious about telling all the future surgeons that everyone is going to be a robotic surgeon. I think that is unrealistic. I'm sure that patients don't want everyone to be a robotic surgeon, because it is a specialist skill, but we want everybody to be familiar with robotic surgery. Then there are experts who can use it with a standardised training, and specialists who will perform it on the patients. Virtual training platforms allow widespread exposure while reserving advanced procedural training for specialists. These approaches are now being introduced at undergraduate level, and formal national frameworks are expected to develop further in the coming years. I expect that in the next 2–3 years, there will be frameworks on how to get these experiences and increase the implementation of robotic surgical programmes in more hospitals. These processes will aid patients to undergo surgical procedures by teams trained at high standards and gain more information from their local teams, similar to laparoscopic (keyhole) surgery, and thereby, address healthcare inequity.

Q6 Are there risks to relying too heavily on robotics and AI in surgery, and how should clinicians navigate them responsibly?

This is a very important question, because robotics and AI are additional tools, they do not replace clinical judgement. Their greatest value lies in improving efficiency, documentation, communication, and access to care. AI-based solutions are likely to be implemented first in low-risk, high-volume processes rather than high-risk clinical decision-making. We learnt from delivering clinical care during COVID-19 that in selected clinical conditions, we can use these solutions, and presently, the NHS long-term plan includes increasing home-based care, improving our operational efficiency by using these tools. Sharing information about these innovations to all stakeholders will help out patient's questions, such as clinical review (video clinics), getting information more easily, and whether they can be seen in a video clinic. Can we get the documentation quickly? Can we make it understandable so that the letters can be easily translated into different languages? Can it cut the admin time?

We discussed at the event about many of these solutions and I anticipate that, in the next 3–5 years, years, that will be the area where it will be implemented more, instead of AI being directly involved in patient care. I do not see a state where, in the next 1 or 2 decades, a robot or AI solution will replace the clinical function of healthcare professionals. I think the technology is not advanced enough, and it is not validated sufficiently for us to confirm that at this point. In selected clinical

scenarios, I anticipate it might happen in the future. I think it would be a good addition to have, but for now, I certainly do not foresee it replacing any of these clinical activities.

Q7 Looking back on your career, what lessons about embracing innovation would you pass on to young surgeons entering the NHS today?

I reflect a lot on a regular basis about how things are. Being open-minded about innovation is not a personal choice; it is something we owe to our patients. We must apply academic rigour to ensure that every solution is evaluated and validated to the same standards as other devices used in patient care. The only suggestion I have for future surgeons is that they need to understand these solutions and digital technology more. In undergraduate schools across the UK, we are implementing these knowledge-sharing solutions. An increasing number of medical conferences have sessions on these technologies, and events such as Global Innovation And New Technology (GIANT) Health is an excellent example of bringing people together. But we also want to engage with undergraduate students so that when they become surgeons, they're already informed about these things.

The other thing that I always tell everyone is to engage with patients and patient organisations early on. We enable our students and trainee resident doctors to work with patient organisations, because that is where you learn a lot more. So, for me, the key messages to future doctors are to be open towards these solutions, and to learn early on about the principles of the solutions, like we do for any surgical principles; and secondly, be transparent with the patients and their families about what we are trying to do to enhance their care.

Mixed and virtual reality technologies now allow clinicians to gain experience with robotic systems without direct access to physical robots