

## Accuracy Matters

*Will robots and AI technology replace our surgeons in the future? Unlikely, but we're happy they are around to guide them.*

Earlier this year, Mediclinic City Hospital in Dubai, U.A.E. conducted the first robotic-assisted knee surgeries in the Middle East, using Artificial Intelligence (AI) technology to conduct the partial and total knee replacements on two patients. The private hospital, which is part of Mediclinic International, is one of many regional healthcare facilities taking part in a growing trend of investment into future AI tools that will add precision and accuracy in surgery.

The uptake in the use of cutting-edge surgical robots and the increasing application of AI technologies in healthcare has been very visible, particularly in the U.A.E., since the launch of the U.A.E. Strategy for Artificial Intelligence in 2017; a major initiative within the U.A.E. Centennial 2071 objectives. The strategy aims to make the country a world leader in the field of AI investments in healthcare in order to minimize chronic and dangerous diseases. The U.A.E has also appointed its first AI minister to implement this vision.

For Dr Ali Al Belooshi,—who along with his colleague Dr Saeed AlThani, both consultant orthopaedic surgeons at Mediclinic City Hospital, conducted the robotic-assisted knee surgeries—while the technical question we should be asking ourselves is “Do we control surgical variables with a robot?”, the essential question is whether or not the control of these variables actually impacts clinical outcomes for the patients. “After all, in surgery, it is accuracy that really matters,” he explains.

The numbers back him up. Recent studies are demonstrating superior short-term survivorship for robotic-assisted partial knee replacement, with only a 1% revision rate at two years after operation (four times lower than that of conventional techniques). As well as short-term functional gains when compared to manually-implanted partial knees, studies show that patients have less pain in the first 60 days after the procedure compared to the conventional technique.

“Using a robotics-assisted hand piece such as the NAVIO Surgical System enables a surgeon to plan the surgery accurately intraoperative, position the implants, and reduce the risk of errors during the procedure while decreasing the length of time it takes for a patient to recover,” says Dr Al Belooshi.

“The future of health and science is going to revolutionize the way surgeons like myself work, as technology like this will help us be at the forefront of research and education when it comes to the science of knee replacement surgery. Also, we can provide this cutting-edge technology to our patients so they do not need to travel abroad seeking such services.”

The NAVIO Surgical System, created by Smith & Nephew, works in conjunction with the surgeon's hands to achieve the precise positioning of the knee implant based on each patient's unique anatomy. This added level of accuracy can help improve the function, feel

and potential longevity of the partial knee implant. It provides robotic assistance through an advanced computer program that relays precise information about the patient's knee to a robotics-assisted hand piece used by the surgeon during the procedure. By collecting patient-specific information, boundaries are established for the hand piece so the surgeon can remove the damaged surfaces of the knee, balance the joint, and position the implant with greater precision.

Today's medical robots have come a long way from the bulky pieces of equipment that were hard to manipulate and took up enormous amounts of space in the surgical theatre. Dr Rolf Hartung, who is the medical director of Mediclinic City Hospital, explains: "I have worked with robots in the past that looked completely different—they looked similar to robots used in the car industry. They disappeared from the market, as there was not enough volume of surgery in those days. Today, our surgeons have conducted hundreds of successful surgeries using these new, incredibly sophisticated robots to guide them and now that the market is open, smaller robots and other robotic-assisted tools could be developed to be used by the surgeons in the future."

Will AI eventually replace human physicians in the future? According to Hartung, the master-slave system ensures that this will never be the case. "The master is still the surgeon; the human takes the decision and uses AI to end up with a better outcome. The technology allows us to be more precise."

From a regulators point of view, it is not about investing in technology just for the sake of investing in it—it has to add value. "This means improving patient satisfaction, reducing pain, reducing cost and improving the clinical outcome and overall patient experience. So if a surgery costs the same while actually improving outcomes, this is the ultimate goal from a regulatory perspective," says Dr Haider Al Yousuf, director of public health funding at the Dubai Health Authority.

The direction of the government is very clear—it is for Dubai to be one of the best health systems in the world. "You cannot get there by following. You have to lead, innovate and challenge the norms. You need to actually leap ahead," adds Al Yousuf.

For private medical technology companies such as GE Healthcare, their focus is on Applied Intelligence. This is a step away from a general AI approach by taking a very specific problem statement such as solving the needs of a hospital and the patients. "For example, as a radiologist, I am looking at an X-ray scan, and I am asking the AI if this particular area of the lung looks normal. So it is a very specific application of a general artificial intelligence. This allows us to focus our energy and to reduce the amount of data generated to concentrate on that particular outcome," says Rajat Karol, who is the general manager of GE Healthcare Digital, Eastern Growth Markets & Africa.

In fact, GE's new strategy for 2018 is Precision Healthcare—how to make healthcare more precise. According to Karol, medicine today is like throwing darts at a board and seeing what sticks, which he explains can be harmful from a patient perspective, and from a healthcare provider's perspective can lead to unnecessary expense.

"We are using AI to create products that allow you to accurately and efficiently diagnose, but causes minimum harm," Karol explains. "This is our whole model of Applied Intelligence and we are trying to apply it to make our products work in the best possible way, to provide the best possible outcome."

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