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SPECIAL SUPPLEMENT

Top Killers

5G opens the future of telesurgery

A pilot project will use 5G cellular technology to enable remote assistance for surgical procedures in real time.

Antonio de Lacy
Professor of Surgery
Director of Gastrointestinal Surgery
Department of Surgery
Hospital Clinic
University of Barcelona

ALACY@clinic.cat

@AntoniodeLacy

aischannel.com

Technology that enables telepresence has facilitated complex surgical procedures to be carried out in regions that lack expert surgeons, such as in small hospitals, developing countries, and also for militaries in combat. At the same time, robotics provide invaluable assistance, allowing procedures to be performed less invasively, thus reducing complications and delivery times. An aspect that will advance telesurgery even further is the attainment of a fast enough internet connection that will permit telepresence in real time. This is what our team in Barcelona is moving towards. Mobile World Capital Barcelona, Hospital Clínic de Barcelona and Advances in Surgery (AIS) Channel, a company I founded to improve training and performance, have implemented a pilot project that will use 5G technology to enable remote assistance for surgical procedures in real time.

The incorporation of 5G technology will make it possible to overcome barriers and reduce the current 0.27-second latency period to 0.01 seconds, a crucial time reduction in any surgical procedure. 5G will also make it possible to increase image quality and definition, a key factor for medical teams to take decisions with as much information as possible.

Our team presented the pilot project as part of the GSMA Mobile World Congress in Barcelona on 28 February, attracting many top surgeons who are keen to get involved with the technology.

An operating theatre with an upper hand

The project is being conducted in Optimus, the most advanced operating theatre in the world, which is located in Hospital Clínic de Barcelona. Optimus is an integrated, robotic and digital operating theatre that incorporates big data and smart lighting. A team is already testing a solution there that audiovisually records all that happens in the operating theatre from every possible angle, and sends the information live to the outside of the operating theatre. Our proposal for real remote mentoring based on 5G technology will take the concept of telesurgery a step further by enabling a specialised surgeon to guide the surgeon in the operating theatre without being physically present and in real time.

Success in the first phase

The pilot will consist of three stages that test the technology's use in facilitating real time communication and assistance in surgical operations. The first phase of the pilot project has already been conducted and has produced positive results. It tested remote assistance between surgeons inside the Hospital Clínic de Barcelona, and after three tests with real patients the team verified that knowledge from senior surgeons can be transferred in real time without putting the patient at risk.

The first test was carried out in May between a cardiac haemodynamics surgeon's office and a cardiac haemodynamics operating room (OR) with a NUCLeUS system—a platform that provides centralised and coordinated access to all audio and video technology in the OR, and which offers various ergonomic enhancements such as control over surgical lamps, cameras, ventilation and more. The test demonstrated smooth communication and fast acclimatisation to the system, including telestration—a drawing tool with which the specialist surgeon can make freehand sketches on the video screen.

At the beginning of June, another couple of phase one tests were conducted at Hospital Clínic de Barcelona and presented on AIS Channel. Both were sleeve gastrectomies, each conducted by a surgeon whilst another specialist surgeon communicated via the 5G technology. The system enabled discussion in real time, with the expert able to share advice, eased significantly by the use of telestration to guide the procedure where needed.

Transferring knowledge to serve patients

Phase two of the pilot will involve collaboration

between various Barcelona hospitals. Surgery has advanced more in the last 15 years than in the past 150. For this reason, it is vital to create bridges of collaboration and transfer of knowledge in real time between hospitals. It is the future.

After this, phase three of the pilot project will involve communication between the hospital and a moving vehicle, ie an ambulance. If the previous phases have the consequence of offering a better service to patients, the obvious derivative is to be able to do it at the most critical moments—when the patient is transferred to the hospital.

Implementation in daily practice

The next step will be to implement the system as part of daily practice. You just have to imagine having a source of knowledge in real time. This will accelerate learning curves and improve the quality of life and the safety of patients.

New technology is only one aspect of the project, as there is a deeper message to impart, which can be of use to all doctors, with or without state-of-the-art technology. I believe that cultural change—the ability to understand that knowledge can be received and applied in real time—is more relevant than the technology. 5G, or the technology that comes, should facilitate the transmission of knowledge, but the challenge is to make it a daily practice.

Spreading knowledge across the globe

143 million surgical procedures are currently not performed across the globe due to a lack of knowledge of specific procedures, according to data given by *The Lancet* (Meara et al. 2015), making the new system all the more significant, since it presents a means for improving these figures. It is hard to say how soon 5G technology and ensuing research will lead to an improvement in these figures.

Developing countries will benefit the most from the new system, as they will be able to access the real-time knowledge of the world leaders from the first-world countries. These countries have an advantage; they need not replace old networks and transmission systems. They can directly access the newest ones, which in turn is easier.

Lifting a barrier for top quality training

The 5G technology is lifting a barrier in the provision of high-quality, continuous training, which only a tiny proportion of the world's surgeons have access to. Only 3% of surgeons in the world have access to high-quality continuous training. For this reason I founded AIS Channel and this project is a big step in that direction. I have been testing different systems for more than five years, but the barrier had always been the transmission of data and as a consequence the latency.

Rapid replication across the globe

The 5G technology has opened a door, whilst another advantage of technology is the potential for rapid uptake. If everything works, replication of the system in other countries will be instantaneous. It is one of the advantages of technology, which is well structured. It can be replicable and scalable in a very short period of time. We just need to show that it covers a real need for surgeons and improves the quality of procedures.

Joining AIS are Hospital Clínic de Barcelona, 5G Barcelona, Barcelona City Council, Mobile World Capital Barcelona, the i2CAT Foundation, the Technological Centre for Telecommunications of Catalonia (CTTC), Atos, and the Catalonia Polytechnic University (UPC) to turn the city into a 5G digital hub that will be a reference in Europe. ■

KEY POINTS

- ✓ The faster 5G internet connection will enable telepresence in real time
- ✓ Incorporation of the technology will reduce the latency period from 0.27 to 0.01 seconds
- ✓ The 5G connection will also make it possible to increase image quality and definition
- ✓ The three-part pilot project has produced positive results and is at its second stage
- ✓ Phase one tests were conducted in an advanced operating theatre, demonstrating remote assistance and use of telestration
- ✓ Phase two of the pilot will involve collaboration between various Barcelona hospitals
- ✓ Phase three of the pilot project will involve communication between the hospital and a moving vehicle

REFERENCE

Meara JG et al. (2015) Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. Lancet 386(9993): 569-624.