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Theatre & Surgery: Virtual training

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The increased importance being given to patient security in our field of surgery, coupled with the reduction in the working day imposed by the European Working Time Directive and the higher technical demands in minimally invasive surgery (MIS), has created changes in the training of surgeons. Before incorporating some of these complex surgical techniques into clinical practice, surgeons must get to know the new equipment and tools, develop specific skills for their adequate use and meet certain competency levels. Furthermore, they must do so outside the operating room (OR), due both to the high cost of surgical time and to the financial and social consequences of any medical failure that might occur.(1,2) In the last few years, simulation dynamics have been developed that facilitate proper training. These systems can allow the surgeon to acquire the skill and dexterity necessary to undertake any given procedure using the resources found in the MIS.(3)

Although mannequins have been widely used for years, they are far more advanced nowadays in anaesthetics and ER (eg, the Laerdal SimMan® or the METI HPS® patient simulator). However, simulators have been incorporated into MIS only recently, due to their higher complexity. The available models can mimic both endoscopy and ultrasonography manoeuvres with flexible tubes and laparoscopies. Several types of simulator can be distinguished, ranging from simple boxes that limit instrument mobility in the case of a laparoscopy, or more or less dynamic viscera holders for endoscopies/ultrasonographies, to virtual models and the usage of anaesthetised living animals. The latter technique has been indispensable so far, in order to achieve some realistic similarity for such procedures as trocar insertions at the abdominal wall, cutting intestinal adhesions and endostapler usage.(4) Table 1 details the simulation capabilities of the laparoscopy and digestive endoscopy virtual simulators developed so far.

Table 1. Laparoscopy and flexible digestive endoscopy: virtual simulations developed

Laparoscopy simulator	Company name	Website	Simulation capabilities
• Reaclin's Laparoscopic Trainer (R and BC)	Reaclin Technologies	www.reaclin.es	Basic skills,* advanced skills.**
• Sim Surgery	Sim Surgery AS	www.simsurgery.no	BC cholangiography Touch and move the needle to suture and tie
• MIST-VR (Classic and Procadia)	Mentice	www.mentice.com	Basic skills and for Procadia
• VSOne	Select-IT Systems AG	www.select-it.de	advanced skills except dissection
• Lap Sim (basic skills, dissection)	Surgical Science	www.surgical-science.com	Basic and advanced skills (BIT, Cho and Gyr)
• VLI and LSW	Immersion	www.immersion.com/medical	Basic and advanced skills
• LapMentor	Simblonix	www.simblonix.com	Other specific applications (eg, digestive-vascular)
• LS600	Xitact	www.xitact.com	Basic and advanced skills Cholecystectomy, incisional hernia, Gastric bypass
• Pro MIS Digestive endoscopy simulator	Haptica	www.haptica.com	Basic skills (except positioning) and advanced skills (except suturing and knot tying)
• Qi Mentor II	Simblonix	www.simblonix.com	Basic and advanced skills
• AccuTouch Endoscopy Simulator	Immersion	www.immersion.com/medical	Oesophagogastrroduodenoscopy, ERCP*** EUS*** Colonoscopy
• Olympus Colonoscopy Simulator	Olympus	www.olympus-europe.com	Gastrointestinal, ERCP
			Colonoscopy, EUS (EUS-FNA phantoms)

* Positioning and instrument usage

** Clip application, cutting, dissection, diathermy, suturing and knot tying

*** Endoscopic retrograde cholangiopancreatography

**** Endoscopic ultrasound

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In Europe, in addition to the consolidation of prestigious centres such as the European Institute of Telesurgery (EITS) in Strasbourg, France (www.eits.fr), the Cuschieri Skills Centre in Dundee, UK (www.dundee.ac.uk/surgicalsills), and the Minimally Invasive Surgery Centre (CCMI) in Cáceres, Spain (www.ccmi.es), other centres have proliferated that, in many cases, are associated with universities and teaching hospitals where the different simulation systems can be used as students progressively acquire knowledge and skills. Following are details of some smaller centres, which are oriented towards the qualification and training of staff associated with a given health system or university (universities are getting ready for the changes in pregraduate education that the new European Space for Higher Education will bring):

- Centre for Advanced Medical Simulation Karolinska Hospital, Stockholm, Sweden: www.simulatorcentrum.se/press.html
- Erlangen Chirurgie und Endoskopie Training GmbH, Erlangen, Germany: www.endo-trainer.de
- Trent Simulation and Clinical Skills Centre, Nottingham, UK:

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- European Endoscopy Training Centre, Rome, Italy: www.eetc.it

A similar approach is being fostered on other continents. In fact, the American College of Surgeons has launched the ACS Program for the Accreditation of Education Institutes, favouring the establishment of centres equipped with simulators throughout the USA so as to make them accessible.

What do training programmes in centres with simulators achieve?

- Surgeons effectively acquire the necessary skills, shortening their proficiency-gain curves, avoiding harm to patients and preventing negative consequences to the health system (eg, errors, complications, complaints).
- Evaluation systems can be introduced that can assess the competency level achieved before trainees start to use the treatment in patients.
- Surgeons can be exposed to difficult and uncommon scenarios, and therapeutic alternatives can be tried out with the help of the whole team, outside the OR.

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