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Editorial

# Clinical simulation in surgical training in the xxi century

## La simulación clínica en la formación quirúrgica en el siglo xxi

Less than 10 years ago, the 1999 report from the American Institute of Medicine, titled "To err is human",[1] estimated that around 100 000 people died every year from preventable medical mistakes. In aviation terms that would be the equivalent of a Boeing 747 full of passengers being involved in a fatal accident every day.

This paper changed the way research into medical results was looked at. Traditionally, surgical complications were measured almost exclusively from a technical point of view: haemorrhages, wound dehiscences, infections, thrombosis, etc., without considering that many of these events are the result of performing very complicated medical procedures. Clinical practice has now changed from being an individualistic practice to one involving a large group of professionals. It has been found that 16.8% of patients hospitalised for more than 10 days change department more than 3 times. After 4 days in hospital, the patient has had contact with more than 70 health care professionals.[2] In light of this situation, coordination, communication and training of all professionals are key factors to medical results. It is estimated that around 85% of adverse effects are due to system failure and not caused by an individual error or negligence. The health care professional is today faced with the challenge of making sure that their cognitive and psychomotor skills are always up-to-date with new advances. The challenge is to adapt to the significant and rapid changes in knowledge and technology application in modern medicine. Communication, teamwork and leadership and professionalism skills have hardly been developed in the syllabus of traditional medical training, meaning that new approaches to medical training need to be found. In 1999, the Accreditation Council for the Graduate Medical Education (ACGME) created 6 general core competences that later became the bases of the Outcome project. These competencies were grouped into: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and systems-based practice. Two years later, ACGME recommended that a syllabus based on these 6 competences be implemented within 10 years for the residency programmes of all the medical specialities in the USA, including the assessment programme to measure the resident's achievements throughout the programme.[3]

As early as 2003, Gary Dunnington and Reed Williams published their experience in implementing the first surgical training programme designed with this methodology.[4] At present, it has been developed in the whole of the USA, the United Kingdom, Canada and other countries.[5]

The training programme in general and digestive tract surgery in Spain should adopt this idea and methodology as soon as possible.

The need to try and avoid these medical errors by improving medical training was already put forward in the report from the American Institute of Medicine. The committee that prepared the document came to the conclusion that "health care organisations should establish team-training programs for personnel in critical care areas (e.g., the emergency department, intensive care unit, operating room) using proven methods such as the crew resource management techniques employed in aviation, including simulation."

Simulation is a revolution in medical training. Firstly, it eliminates any ethical problems, given that it is not legally viable for health care professionals to train on patients if they have not already acquired the necessary abilities and skills.[6] These abilities and skills should be acquired using systems that enable the user to repeat specific manoeuvres or techniques as many times as necessary until they masters it with the necessary guarantees to be able to perform it on actual patients.

Faced with the enormous progress made in health care and the complexity of health care organisations, health care professionals (doctors and nurses) realised that new training models were needed to guarantee patients' safety. On the one hand, there is a need to train in order to incorporate new action protocols and diagnostic and treatment techniques without putting the patients at risk. While on the other hand, the need for a multi-professional approach to patient care makes it necessary to change the model being based on one person's opinion to include the findings of a team. Simulation meets these needs and has emerged as a radical innovation in the traditional medical teaching methods.[7]

A series of factors have recently promoted the use of simulation in medical education even further,[8,9] among which we note the following:

1. Programmes for patient safety and rights are promoted, amongst others, by the World Health Organisation.
2. The claims for medico-legal responsibility that make the traditional method of learning on patients difficult.
3. In western countries, the reduction in the number of hours that health care professionals spend working in regulated training has restricted medical education as students spend less contact time with patients. Therefore, alternatives have to be found to guarantee a rich and structured clinical exposure.
4. Changes in the health care model ensure that hospitalised patients do not undergo repeated tests and procedures for the benefit of training our students. This may be a nuisance for patients, slow down procedures, and entail possible risks as they are carried out by inexperienced hands.
5. The workload placed on doctors makes it difficult for the professors to pay enough attention to and supervise the students' actions.
6. There is evidence that the health care professionals' actions in uncommon critical situations and coordination between them can only be acquired by simulation-based training.
7. The importance of ensuring that residents have acquired clinical skills and clinical reasoning to the same standard as their medical knowledge and also promoting autonomous learning.
8. The promotion by certification bodies, such as the Educational Commission for Foreign Medical Graduates and others, of assessing health care professionals' performance instead of performing assessments based on knowledge or cognitive assessments in order to obtain the licence to practice medicine or the processes of reaccreditation or recertification.
9. The impressive development in recent simulation research has led to new, more realistic and reliable learning and training simulation models. This has brought about the appearance of large companies that are investing significant amounts of money to create these models.

The first structured clinical skills laboratory in a European school of medicine was formally opened in the University of Maastricht in Holland in 1974. This laboratory provides training in 4 well defined areas: physical examination skills, therapeutic skills, laboratory skills and communication skills. From that moment on, and for the last 25 years, a huge number of these laboratories have appeared throughout the world, in medical schools, hospitals, or as centres dedicated solely to medical simulation. They can be found in nearly all the schools of medicine in the USA, Canada, the United Kingdom, Israel and other developed European countries.

According to the database: http://www.bmsc.co.uk/sim_database/centres_europe.htm,[10] to date there are more than 1430 of these kinds of centres in the world. Approximately 1000 of these are located in the USA and Canada, more than 200 in European countries, including Israel, 23 in South America, 6 in African countries, more than 160 in Asia and around 30 in Australia.

They are very different in nature and have very diverse levels of sophistication. In addition to the use of animals and corpses for training in different surgical procedures, they use mannequins too, ranging from simple models to practice technical skills and simple manoeuvres (basic life support or suturing) to computerised mannequins. The computerised mannequins' simulated anatomy and physiology enable training in complex and high-risk clinical situations, such as critical patient management, treatment of trauma and anaesthesia, and team training. There are also computer simulators which range from programmes to train and assess clinical knowledge and decision-making to more complex high-fidelity tools with integrated audiovisual and tactile stimuli of the procedure and real-time help. Virtual-reality technology also can recreate different medical tasks, such as ultrasound, colonoscopy, bronchoscopy or laparoscopic and robotic surgery. There are also simulated patients, actors trained to play the role of a patient. They help students how to take a medical history or perform a physical examination. Simulated patients are also helpful in assessing student's communication skills.[11]

Medical simulation is not only useful for training doctors and students, it can also be used to assess their competencies. The best example of this is the objective structured clinical examination (OSCE), a series of simulations of different scenarios that the student or health care professional has to perform sequentially. The simulations in this examination are accurate and reliable because they can be objectively assessed. In the framework of the Bologna Plan, simulation may play an important role in the objective structured clinical assessment of medical students. This examination should be used to assess resident doctors and as an accreditation method in the continuous training of surgeons. Its use in staff recruitment should also be evaluated.[12]

In Spain some training and teaching centres have already started to use medical simulation. Furthermore, in our current training plan for internal resident doctors in general and digestive tract surgery, resident doctors must carry out a basic and advanced training course in endoscopic surgery using this method, but these courses are only focussed on cognitive aspects and surgical skills.

A change needs to happen in the culture of health care professionals in charge of training, decision-makers in health care organisations and professionals who care for the patients for medical simulation to take on a significant role in Spain and for it to reach its potential in health care.

This cultural change involves adopting the concept of training into the dynamic of health care organisations, as has been done in other high-risk disciplines such as aviation. Safety must be made a prime objective of the organisation, integrating medical simulation activities into the training syllabus for resident doctors and in the professional development of specialist doctors and nurses; and adopting an organisational model in which the working unit is the team rather than a single individual.

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