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Editorial

Health Care Simulation in Cardiology: Promises and Realities

Simulación clínica en cardiología: promesas y realidades

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Cardiovascular disease is the leading cause of death and hospitalization in the Spanish population. It is thus imperative for cardiologists to receive continuous first-rate training in all aspects of patient care. Unfortunately, theoretical training, based on publications or audiovisual media, leads to learning retention of less than 20%,[1] and people learn more through actions than through listening or reading. "Learning by doing", a classic methodology of the Spanish resident training program, undoubtedly represented a major advance as a method of learning in all areas of Spanish medicine. However, in the M IR system, residents first observe how a specific technique or action is performed and then have to practice it directly on patients; this process is of course associated with stress, risks, and uncertainties that may lead to errors with direct repercussions on patients.[2] *Primum non nocere*, the oldest ethical principle in medicine, is attributed to Hippocrates, the father of modern medicine, and lies at the heart of the profession itself. Sadly, medical error is estimated to be the third most common cause of death in the United States.[3] Accordingly, improvements in patient safety are a priority. As Seneca said, *"errare humanum est, sed perseverare diabolicum"*. One effective educational approach to possibly mitigate this problem involves the use of simulation systems.[4]

Health care simulation, understood as a training method based on guided experiences that evoke or reproduce substantial aspects of the real world in a completely interactive manner,[5] has become more and more relevant over the past 3 decades. It is applied to both students and working health care professionals to improve technical and nontechnical skills alike, enhance quality of care, and bolster patient safety.[6,7] It generates a learning space that exposes participants to situations similar to real ones in a safe and risk-free environment where errors are accepted.

For simulation-based learning activities, the simulation design must correspond with the predefined objectives and the ability requiring improvement. The skills improved by simulation are both technical and nontechnical, such as decision-making and communication.[8] In addition to the appropriate equipment, the involvement of multiple staff is critical. Such participants include someone carefully trained to mimic a real patient in a reproducible yet dynamic way, who reacts to the student's performance (standardized patient), and nonpatient individuals who provide information and increase realism (confederate staff), such as a family member, orderly, or nursing assistant. Also required is a simulation technology specialist or staff member who helps to achieve the learning outcome (facilitator). In addition, special care must be taken with fidelity. In simulation, fidelity has several dimensions that encompass the realism of the environment where the simulation takes place, the equipment used for the scenario, and the participant's perception of how closely the setting resembles the real one. If the level of fidelity is insufficient for the defined objective, it can be frustrating for the student and the facilitator, with a negative impact on the learning objectives. Finally, 2 of the simulation phases require special care: the orientation and the debriefing. An orientation presenting the material and the environment is essential, and special attention must be paid to the simulation rooms and simulators, their content and limitations, and the desired objectives to create a safe container supported by a fiction contract.[9] Also key to a good learning outcome is debriefing, defined as a discussion among several people for reviewing a real or simulated event. In this process, participants analyze their actions and reflect on the role of thought-processes, psychomotor skills, and emotional states to improve or support their future performance.[10]

Evidence indicates that health care simulation not only improves patient safety, but also health care performance and the degree of learning retention compared with traditional teaching methods.[11] Simulation-based training has mostly been used in anesthesiology, obstetrics, surgery, and pediatrics. Although cardiovascular simulation has received less attention, it has been under development for more than 5 decades. Indeed, the scientific sessions of the American Heart Association in 1968 presented Harvey, the first modern manikin capable of simulating 27 cardiac conditions to train medical skills. Its effectiveness in the teaching of cardiological skills was reported a few years later,[12] which promoted the integration of simulation into cardiology. Since then, simulation has been gaining ground.[13,14] Even debriefing itself has a quantifiable impact on patients. For example, the implementation of a debriefing program after pediatric cardiopulmonary resuscitation significantly improved cardiopulmonary resuscitation quality and survival with favorable neurological outcomes.[15]

A wide variety of cardiology simulators is available, from basic and handmade simulators to virtual reality. To simulate physical examination, particularly for cardiac auscultation, approaches vary from a CD-ROM to standardized patients with electronic stetho-

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scopes. In addition, technological advances have made it possible to practice many technical cardiological skills using simulators.[16] Some experiences with transesophageal echocardiogram simulators have shown that they improve the acquisition time of images on the manikin, although they did not improve patient outcomes. Coronary angiography simulators have not been shown to directly benefit patients, but they have the advantage of reducing radiation exposure in simulation-trained physicians. Although the evidence is limited, technical skill training through simulation can reduce complications in clinical practice, as in the case of femoral artery access training. There are even simulation training programs for cardiology care skills, such as for patients with ST-segment elevation acute coronary syndrome.[13]

The Spanish Society of Cardiology has chosen simulation with debriefing as a training tool for residents for both technical skills and nontechnical skills, such as crisis management. The aim is to boost trainees' professional development in a discipline that is rapidly progressing in technology and complexity. This first experience was described in a recent letter published in REC: CardioClinics.[17] The program included 181 cardiology residents, with the degree of learner satisfaction reflecting the high approval of the students of simulation with debriefing as a training tool. In addition, the most highly rated aspect was the debriefing. Above all, the main value of this educational experience is that errors are not penalized, but retooled, to emphasize that mistakes are not mere failures, but useful opportunities for learning.

Despite the growing use of simulation in cardiology, there are barriers to overcome. The most important point is that it must be shown that this educational intervention affects not only simulated scenarios, but also routine clinical practice.[6,18] Much of the current evidence comes from studies with multiple limitations, such as small sample sizes and the absence of proper control groups, among other biases.[16] In addition, in most cases, validation is required of the simulator's ability to reproduce real situations. Finally, other challenges to overcome are the cost and lack of suitably trained staff, cost-benefit studies, and a cardiology simulation curriculum.

In summary, faced with a growing awareness of human error, health care simulation with debriefing represents a complementary educational tool to improve health care quality and patient safety. In a specialty such as cardiology, which shows ever-increasing complexity and technological innovations, and whose methodologies are supported by clinical trials with well-defined efficacy and safety endpoints, the full integration of health care simulation will be a challenge. However, its acceptance will be expedited through the use of appropriately designed studies that permit understanding of how this educational tool affects our patients' outcomes.

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CONFLICTS OF INTEREST

None declared.

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