JOURNAL OF Surgical Simulation

Journal of Surgical Simulation (2015) **2,** 42–46
DOI: 10.1102/2051-7726.2015.0010

SIMULATION CENTRES

CRESENT: the Center for Research, Education and Simulation Enhanced Training, King Fahad Medical City, Riyadh, Saudi Arabia

H. Lababidi,[1,*] F. Munshi,[1] M. AlAmar,[1] L. Konge,[2] L. Lonn,[3,4] T.V. Schroeder[2] and F. AlSenani[1]

[1]King Fahad Medical City, Riyadh, Saudi Arabia; [2]Center for Clinical Education, The Capital Region of Denmark, Rigshospitalet and University of Copenhagen, Denmark; [3]Department of Radiology, Rigshospitalet and University of Copenhagen, Denmark; [4]Department of Vascular Surgery, Rigshospitalet and University of Copenhagen, Denmark

**Corresponding author at: King Fahad Medical City, Riyadh, Saudi Arabia. Email: hlababidi@kfmc.med.sa*

Date accepted for publication: 12 June 2015

Abstract

The simulation center at King Fahad Medical City (KFMC) in Riyadh, CRESENT (Center for Research, Education & Simulation Enhanced Training), is a leading training center in the region. It is intended to partly cover the great demand for training of health care givers in the Kingdom of Saudi Arabia. One of the strategic projects of CRESENT is to develop simulation curricula for postgraduate training programs. CRESENT has developed global partnerships with leading universities, institutes and industry to facilitate simulation-based education in the region. The future simulation hospital of CRESENT is a futuristic model of multidisciplinary, immersive and longitudinal simulation training for all categories of health care givers.

Keywords: *simulation center; medical education; simulation-based education*

Introduction

The simulation center at King Fahad Medical City (KFMC) in Riyadh, Saudi Arabia, was established in 2006 as a Life Support Training Center (LSTC) and grew progressively to include simulation training. CRESENT (Center for Research, Education & Simulation Enhanced Training), the new name for the KFMC Simulation Center, utilizes the Clinical Skills Center (CSC), the LSTC, the Nursing Simulation Center, and in situ simulation. There are great challenges and unmet needs for health care training in the Kingdom of Saudi Arabia. The multinational health workforce of around 175,000 (physicians, nurses, and allied health)[1] requires stringent training to achieve uniformity of practice to secure patient safety. Add to this the immense increase in the number of health trainees, distributed as follows: medicine (16,230), dentistry (4152), pharmacy (7394), applied sciences (20,292) and nursing (4815),[1] who require training in teaching facilities. The mission of CRESENT is to train health care givers, in Saudi Arabia and beyond, in a safe, risk-free, and realistic environment to gain competence and confidence in clinical skills centered on evidence-based practice, patient safety, and professionalism. The vision of CRESENT is to be the benchmark in clinical simulation nationally and regionally. There are four departments under CRESENT: Postgraduate Simulation, Undergraduate Simulation, Curriculum Development, and Life Support Training.

Facilities and equipment

The CSC is a 2300 m^2 (24,750 ft^2) facility occupying the fifth floor of the Faculty of Medicine building (Fig. 1). It is composed of the following areas:

(1) Standardized patient (SP) rooms: 19 SP rooms are equipped with audio-visual equipment linked to 19 instructors' (monitoring) stations and controlled centrally in two control rooms. The SP areas are laid out with double corridors, one for the trainees and the other for the SPs and staff. Each SP room is furnished like an outpatient clinic setting. They are used extensively for communication skills and physical examination training, and for Objective Structured Clinical Examinations (OSCEs).

(2) Common simulation area: an operating room, an emergency room, a delivery room, three multipurpose hospital-like rooms, one large room for virtual reality training, an endovascular simulation room (Fig. 2), four debriefing rooms, and a meeting room for instructors.

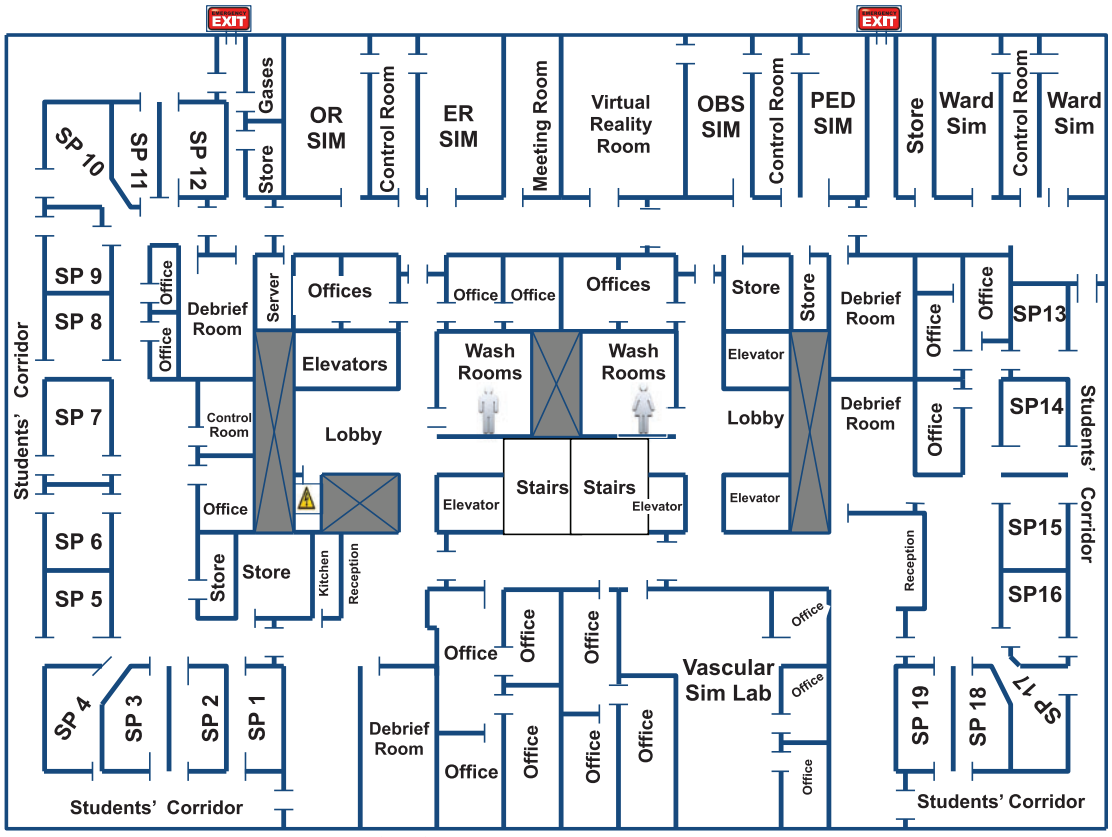

Figure 1 Layout of the Clinical Simulation Center (CSC) at KFMC.

Figure 2 The endovascular simulation room at CRESENT.

(3) Support services: offices, IT network, audio-visual systems (B-line Medical Simcapture and Simbridge Solution, Washington, DC, USA), social areas, storage areas, and a server room.

The LSTC is 600 m^2 (6,500 ft^2) and is composed of ten training rooms, two large classrooms, and instructors' offices. The Nursing Simulation Center is 200 m^2 (2,150 ft^2) and consists of a large simulation area, a debriefing room, and a storage area.

CRESENT is well equipped with various categories of simulators to serve the target population. There is a large number of phantoms and models for undergraduate simulation use including, but not limited to, Harvey, gynecologic examination models, suturing sets, lung sound simulators, ear and eye examinations, etc. The list of so-called high-fidelity mannequins at CRESENT is presented in Table 1.

Courses

One of the main strategic objectives of CRESENT is to develop simulation curricula for postgraduate medical training programs.[2] CRESENT has been collaborating with the Saudi Commission for Health Specialties (SCFHS), the regulatory body for health care professional training in the Kingdom of Saudi Arabia, toward designing unified simulation curricula for residents in Saudi Arabia.[3] Four pilot courses have been made available for medical residents: adult airway management, pediatric airway management, central venous catheter insertion under ultrasound guidance, and basic laparoscopic training.[4,5] Furthermore, CRESENT in collaboration with SCFHS has created five mandatory simulation courses for adult pulmonary fellows.[6] These courses include basic bronchoscopy, advanced bronchoscopy, mechanical ventilation, lung ultrasonography, and cardiopulmonary exercise testing. CRESENT has

Table 1 List of high-fidelity mannequins and virtual reality simulators available at CRESENT

Name	Number	Company
METI HPS	1	CAE Healthcare, Sarasota, FL, USA
SimMan 3G	4	Laerdal, Stavanger, Norway
SimJunior	2	Laerdal, Stavanger, Norway
SimNewB	2	Laerdal, Stavanger, Norway
SimBaby	2	Laerdal, Stavanger, Norway
NOELLE	2	Gaumard, Miami, FL, USA
NewBorn HAL	1	Gaumard, Miami, FL, USA
EndoVR	3	CAE Healthcare, Sarasota, FL, USA
LapVR	3	CAE Healthcare, Sarasota, FL, USA
LapSim	1	Surgical Sciences, Göteborg, Sweden
MIMIC	1	Mimic Technologies, Inc, Seattle, WA
ORCamp	1	Orzone AB, Göteborg, Sweden

worked together with the Methodist Institute for Technology, Innovation, and Education (MITIE) in Houston, Texas, to become the first accredited Fundamentals of Laparoscopic Surgery (FLS) test center outside North America.[7] Currently, FLS certification is mandatory at KFMC for all senior residents in general surgery, urology, and gynecology. Other courses that are given on a regular basis are lumbar puncture, basic vascular interventional catheterization for radiologists, mechanical ventilation for pediatrics, basic cardiac catheterization, advanced trauma life support (ATLS), bronchoscopy for intensivists, critical care ultrasonography, and anesthesia crisis resource management. In addition, there is a long list of nursing simulation competencies that are delivered on a regular basis to all nursing staff at KFMC. The multidisciplinary simulation courses are airway management, postpartum hemorrhage, transcatheter aortic valve implantation (TAVI), and Ebola preparedness.

Undergraduate simulation training is embedded in the medical school curriculum. The curriculum is built conceptually on problem-based learning (PBL). In a small group setting, simulated patient scenarios are used as a trigger to identify learning objectives. After students study independently, the group reconvenes to discuss their acquired knowledge.[8]

By using simulation from year one, early clinical exposure is integrated into learning. In a safe learning environment, undergraduate students have the opportunity to learn and perform procedures. Initial blocks include basic procedural skills training such as scrubbing, gowning and gloving, infection control and hand washing, and measurement of vital signs. More advanced training such as venipuncture and urinary catheterization are introduced in later years. This ultimately enhances students' confidence and proficiency in clinical skills while maintaining patient safety.[9]

CRESENT emphasizes partnership with key stakeholders in the field of simulation both in academia and industry. We have developed a strategic partnership with General Electric (GE) and established the Healthcare Skill and Training Institute (HSTI) under CRESENT. HSTI currently delivers world-class leadership and technical simulation courses.

Instructors and support staff

All simulation instructors at CRESENT are practicing health care workers. Simulation-based education (SBE) is practical hands-on training, and there is a significant added value when delivered by active health care givers. Other advantages include increasing the pool of simulation teachers and cutting the operational costs. All instructors take special training in SBE in the form of simulation instructor courses or structured fellowship in simulation. Currently, there are around 45 simulation instructors at CRESENT; all are physicians, nurses, or emergency medical staff.

There are ten support personnel at CRESENT and they are simulation technicians, coordinators or secretaries. The three simulation technicians are in charge of operating the mannequins, assist in curriculum development, booking and scheduling, designing the simulation environment and performing moulage. The coordinators are in charge of coordinating the courses between instructors and CRESENT, trainee attendance, arrangement of the educational materials and controlling the logistics during the course. The secretaries are responsible for trainee registration, issuing certificates, charting evaluation forms, and typing the final reports about the courses.

Trainees

A total of 14,843 health care givers were trained at CRESENT in 2014. Medical students are trained at CSC on a regular basis and have priority in terms of scheduling and allocating resources. The Clinical Skills Center trained 7712 medical students and health care workers in 295 sessions. The LSTC conducted a total of 669 courses: 552 Basic Life Support (BLS), 46 Advanced Cardiac Life Support (ACLS), 40 Pediatric Advanced Life Support (PALS), 22 Neonatal Resuscitation Program (NRP), and 9 Advanced Trauma Life Support (ATLS) courses. A total of 4521

health care workers were trained at LSTC and 2610 nurses in the nursing simulation.

Research

CRESENT has established two areas of research interest. The first is related to postgraduate curriculum development and assessment. The second area of interest is pertaining to innovations in affordable self-assessment simulators. Recently, collaboration has been established with the Medical Physics Laboratory Simulation Centre at the University of Athens, Greece, and the Simulation Centre at Rigshospitalet, University of Copenhagen, Denmark.[10] An exchange of PhD students has been initiated to encourage multicenter educational studies. This will provide the necessary number of participants for high-powered studies and ensure the generalizability of the results. Common national and international studies are being planned.

The future

CRESENT is moving into a new 22,000 m^2 (237,000 ft^2) simulation hospital by the end of 2017 (Fig. 3). The new simulation hospital will most likely be the largest and most modern facility of its kind globally. We defined a simulation hospital as a replica of a real full hospital environment where various types of health care workers can be trained in an immersive, multidisciplinary, and longitudinal fashion throughout the entire continuum of the patient pathway. This definition stresses important concepts in simulation training. First, the target population for training in the simulation hospital encompasses various health care workers employed in a real hospital setting, including clinical and non-clinical staff. Second, multidisciplinary training, or team training, is essential in medical practice. Third, the simulation hospital is unique in its ability to train health care workers in a longitudinal fashion to include skills like handover, leadership, and communication.

Figure 3 The future simulation hospital at CRESENT.

The international architects PM Devereux designed the simulation hospital. The design won the Best Conceptual Healthcare Design Award and the Building Better Healthcare Awards, and was highly commended in the Hospital Build and Infrastructure 2013 Awards (Best Technology Initiative Category) in 2013.

The physical structure of the future CRESENT can be divided into simulation areas, educational and support services. It has the capacity to train around 60,000 trainees annually. A cardinal characteristic of future CRESENT is its flexibility. Two principles of flexibility were incorporated in the design of the new CRESENT: brief flexibility defined as the possibility of daily and/or hourly changing of the space components, and long flexibility expressed as modification adaptability with longer timings (years). To attain flexibility, the simulation functional areas were not interrupted by service functions, giving a high level of brief and long-term flexibility in the design of the simulation areas. In addition, movable walls were used heavily in the operating rooms, surgical skills stations, and debriefing rooms to maximize utilization of space depending on the course requirements, allowing a high level of brief flexibility.[11]

Key personnel and contact information

Dr. Hani Lababidi, Director of Center for Research, Education & Simulation Enhanced Training (CRESENT), hlababidi@kfmc.med.sa

Conflict of interest

The authors have no conflicts of interest.

References

1. Health Statistics Annual Book 2013 G/1434 H, Kingdom of Saudi Arabia. General Directorate of Statistics & Information, Ministry of Health Kingdom of Saudi Arabia. http://www.moh.gov.sa/en/Ministry/Statistics/book/Pages/default.aspx.
2. Lababidi H, Munshi F. Development of simulation curriculum in postgraduate programs. J Health Specialties 2015; 3: 17–21.
3. Lababidi H, AlAmar M, Al Froukh J, AlYousef S, Hasanein A, Ware J. Toward unified simulation curricula for medical residents: a novel approach by the Saudi Commission for Health Specialties & King Fahad Medical City, Riyadh. Simul Healthc 2013; 8: 554.

4. Lababidi H, AlAmar M, Al Froukh J, Hasanein A, Jackson C. Evaluation of airway management simulation course in the Kingdom of Saudi Arabia. Simul Healthc 2013; 8: 554.
5. Alyousef S, AlMaani M, Zahraa J, Lababidi H. The efficacy of high-fidelity simulation course on improving ultrasound guided central venous catheter insertion. Pediatr Crit Care Med 2014; 15(Suppl): 197.
6. Lababidi H, AlAmar M, Al Froukh J, AlHajjaj MS, Ware J, Hasanein A. Toward simulation curriculum for adult pulmonary medicine fellowship program in the Kingdom of Saudi Arabia. Simul Healthc 2013; 8: 453.
7. Dunkin BJ, Wilcox V, Lababidi H, Harthi BA, Froukh JA, AlAmar MA, et al. Successful fundamentals of laparoscopic surgery (FLS) testing for practicing surgeons in the Middle East. http://www.sages.org/meetings/annual-meeting/abstracts-archive/successful-fundamentals-of-laparoscopic-surgery-fls-testing-for-practicing-surgeons-in-the-middle-east/.
8. Wood D. Problem based learning. BMJ 2003; 326: 328.
9. Aggarwal R, Darzi A. Simulation to enhance patient safety. Chest 2011; 140: 854–8. doi: 10.1378/chest.11-0728.
10. Konge L, Ringsted C, Bjerrum F, Tolsgaard MG, Bitsch M, Sorensen JL, et al. The Simulation Centre at Rigshospitalet, Copenhagen, Denmark. J Surg Educ 2015; 72: 362–5. doi: 10.1016/j.jsurg.2014.11.012..
11. Lababidi H, AlQahtani A, Harford J. Flexibility in the design of a simulation hospital. Simul Healthc 2013; 8: 452.