

ACS 2022 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Challenges in Surgical Education

Low-Resource Surgical Simulation Curriculum: Lessons Learned from a Novel Paradigm in Surgical Education During a Challenging Pandemic

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Background: Residency programs are required by the Accreditation Council for Graduate Medical Education (ACGME) to have a dedicated standardized simulation program. Several anatomical models have been used to meet this requirement from very expensive, sophisticated models to low fidelity, low-cost ones; however, not all programs have access to high-end simulation devices on which to train residents.

Current Challenges: The ongoing COVID-19 pandemic, along with the strict protective and social distancing measures that are associated with it, resulted in a major setback in surgical simulation education in many residency programs, thus potentially compromising surgical hands-on education. In conjunction with the overall decrease in operative volume in most hospitals in the country due to cancellation of elective cases, resident training experience has been limited.

Need of Innovation: With the decrease in operative volume and the concomitant decrease in simulation educational funding, surgery residency training curricula need an innovative and inexpensive approach to ensure adequate hands-on training of all residents. This study presents a pilot surgical simulation curriculum based on low-resource, low-fidelity anatomical models in an academic institution during the COVID-19 pandemic. The models developed used colored felt, cardboard and glue to replicate skin, fascial layers, blood vessels, and mimic normal anatomic findings. Standard surgical instruments, sutures, and laparoscopic box trainers were used. The Table summarizes the human-hours (hours needed for one person to develop and build the model), financial cost for assembly of the anatomical models, and training duration required to implement a simulation session, for each of 5 common surgical operations. Resident feedback was very positive on a 5-point Likert scale (average > 4.5). With the increasing difficulties in providing high-quality surgical simulation, a change of paradigm is needed to support novel low-cost curricula that can evolve into a feasible module of education for surgical trainees.

Human-hours, Financial cost, and Session duration associated with low-resource simulation training

| Simulation Session | Human-Hours (hours) | Financial Cost (US dollars) | Session Duration (minutes) |
|---------------------------------------|---------------------|-----------------------------|----------------------------|
| Laparoscopic cholecystectomy | 0.5 | \$ 2 | 20 |
| Intestinal anastomosis | 0.25 | \$ 1 | 30 |
| Vascular anastomosis | 0.1 | \$ 1 | 20 |
| Open inguinal hernia repair with mesh | 0.5 | \$ 2 | 30 |
| Thyroidectomy | 0.5 | \$ 5 | 30 |