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Cost and logistics of implementing a tissue-based American College of Surgeons/Association of Program Directors in Surgery surgical skills curriculum for general surgery residents of all clinical years

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Abstract

BACKGROUND: The cost and logistics of deploying the American College of Surgeons (ACS)/Association of Program Directors in Surgery (APDS) National Technical Skills Curriculum across all training years are not known. This information is essential for residency programs choosing to adopt similar curricula.

METHODS: A task force evaluated the authors' institution's existing simulation curriculum and enhanced it by implementing the ACS/APDS modules. A 35-module curriculum was administered to 35 general surgery residents across all 5 clinical years. The costs and logistics were noted, and resident satisfaction was assessed.

RESULTS: The annual operational cost was $110,300 ($3,150 per resident). Cost per module, per resident was $940 for the cadaveric module compared with $220 and $240 for dry simulation and animal tissue–based modules, respectively. Resident satisfaction improved from 2.45 to 4.78 on a 5-point, Likert-type scale after implementing the ACS/APDS modules.

CONCLUSIONS: The ACS/APDS skills curriculum was implemented successfully across all clinical years. Cadaveric modules were the most expensive. Animal and dry simulation modules were equivalent in cost. The addition of tissue-based modules was associated with high satisfaction.

The American College of Surgeons (ACS) and Association of Program Directors in Surgery (APDS) released the National Skills Curriculum for Residents in 2007 to increase the effectiveness of simulation-based surgical skills development for general surgery residents through curricular standardization. The ACS/APDS skills curriculum has 45 modules and is divided into 3 phases. Phase 1 consists of 20 basic skills modules. Phase 2 has 15 procedural and advanced skills modules. Phase 3 includes 10 team-based skills modules. In addition, the curriculum was intended to be affordable, reproducible, and simple for many institutions to implement.[1,2] Since its release, 41% of programs have reported incorporating ACS/APDS modules into their training programs.[3] However, the modules implemented have primarily been inanimate modules for junior residents.[4–6]

Senior residents may find these types of modules less interesting because they have had an opportunity to participate in real operations. They are also more interested in

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learning the nuances of anatomy and entire operations. Cadaveric training models have been described as the "gold standard" for surgical skills training because they provide anatomic reality that is currently absent in dry simulations.[7,8] However, widespread implementation of tissue-based high-fidelity curricula has been limited by a number of factors, including significant costs for simulation center development and curricular maintenance as well as logistic challenges.[9,10] Institutions also have variability in available resources, with some lacking either a vivarium or a human tissue laboratory. If such high-fidelity technical skills modules are unavailable, residents will continue to learn operations in real patients, under the guidance of an attending surgeon. However, this model of learning is under increased scrutiny in the era of patient safety, quality, and cost containment. Complications can triple the length of stay and increase the cost of patient care by as much as 600%.[11] There is also an increased need for efficiency in the operating room. It has been demonstrated that teaching residents increases operative time by 8 to 44 minutes, resulting in significant loss of opportunity costs.[12] Thus, small increases in the duration of an operation can have a substantial financial impact.[13] Therefore, it has become imperative that residents learn in a low-pressure and low-risk environment.

In consideration of these issues and on the basis of resident feedback, we decided to redesign our technical skills curriculum from inanimate models, virtual reality simulators, and didactic presentations to a new curriculum that included the tissue-based, animate, and cadaveric modules of the ACS/APDS skills curriculum. Our preexisting curriculum had no tissue-based skills modules (Appendix). However, descriptions of the cost and logistics of implementing all 3 phases of the ACS/APDS curriculum were lacking. We therefore prospectively gathered information on costs and logistics with the hope that it will provide useful guidance to other residency programs interested in implementing the ACS/APDS modules.

Methods

In an effort to improve our didactic, inanimate, and simulator-based simulation curriculum, a needs assessment survey of residents and faculty members was conducted at the conclusion of the 2011 academic year. Participation in this 16-question survey was solicited by e-mail. In addition to surveying opinions about overall satisfaction with simulation training at our institution, the questionnaire asked residents to use a 5-point, Likert-type scale to rate their desire for various modalities of skills training, including boot camps, tissue laboratories, and live case observation. The survey identified a strong desire for tissue-based simulation. To design and implement such a curriculum, a steering committee composed of residency program leadership, the department vice chair of education, key faculty members, and resident representatives was assembled. The steering committee selected the ACS/APDS skills curriculum as a template for improving the curriculum. After curriculum selection, the infrastructure of the simulation center and its capacity to accommodate the ACS/APDS skills curriculum was assessed. Next, departmental leadership was engaged to obtain financial support. Faculty members who expressed an interest in teaching simulation during the needs assessment survey were recruited and matched to modules on the basis of their areas of clinical expertise. As backup, a rotating schedule of coverage by the associate medical directors and the vice chair of education was put in place to prevent last-minute module cancellations related to unexpected faculty scheduling conflicts. To facilitate ownership of each module, faculty members were instructed to review the assigned ACS/APDS module and notify the simulation administrative staff of any specific equipment needs and any modifications to the module that were deemed necessary. In addition, faculty members were asked to develop pretest and posttest quizzes for each module. The committee then protected simulation time by moving simulation activities from after hours to a 3-hour morning session on a week day. One hundred percent faculty and resident attendance was expected.

The curriculum steering committee designed the curriculum with the goal of maximizing implementation of the 45 ACS/APDS skills curriculum modules. To economize on resources, some modules were combined, and more simulation sessions were assigned to junior residents to help them learn basic surgical skills and ease their transition to clinical surgery. The curriculum was designed in a graduated fashion such that junior residents primarily experienced basic skills and dry simulation–based modules, while senior laboratory sessions focused on complex, tissue-based simulations. At the end of each module, residents submitted written evaluation forms that rated the quality of the session and faculty instruction using a 5-point, Likert-type scale. A midterm survey of residents was also conducted to assess satisfaction with the new curriculum using a Likert-type scale.

Simulation center administrative staff members prospectively tabulated the operational costs of each module, and several elements were included in the cost calculations. In the dry simulation laboratory, infrastructure costs were calculated in the form of hourly overhead recovery costs, and equipment and instrumentation were itemized to calculate the incurred expenses. In the vivarium and the human fresh tissue laboratory, instruments were not itemized. Instead, a facility use fee was charged that included the costs associated with such equipment. The operational cost of the high-end simulators was calculated by amortizing the capital cost of each simulator over 5 years and then breaking this down to an hourly usage value rate assuming 20% utilization for each unit (average 8 hours per week). The hourly rate for faculty teaching time was calculated using the Medical Group Management Association's 2011 median general surgery faculty salary. These were