Expert commentary: Cardiothoracic surgical simulation

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The Visioning Simulation Conference held in April 2007 and summarized in this issue may well go down in history as a landmark event for the specialty of cardiothoracic surgery. As stated in this report to our specialty, the Visioning Simulation Conference established a framework by which our specialty can explore the use of simulation to address a broad range of issues facing it. These are the quality of cardiothoracic resident education, ongoing education of the practicing surgeon, skill set acquisition for new technology, improving patient safety, certification, and maintenance of certification. It would be hard to argue that being able to duplicate the essentials of our specialty in a training setting is not going to be essential for our future. The field of surgical simulation, however, is still quite young and there are challenges that remain to be overcome.

Surgical training in cardiothoracic surgery has traditionally relied on an apprentice-ship model provided almost exclusively in a hospital setting. The federal government has always recognized the need to finance resident education and has done so by making payments directly to these teaching hospitals through Medicare. If indeed a significant portion of the teaching can be done better and more efficiently in a simulated environment out of the hospital, the way resident education is financed may well need to change. Simulation will also bring any conflict between service and education to the forefront. Meeting patient care demands, already stressed by restricted work hours, will be further stressed by having residents partially educated with simulators. Funding must be provided not only to pay for resident education but also to compensate for the loss of resident patient care services that simulation curriculums will mandate.

A second challenge is who will be the teachers in a simulation curriculum. It is widely accepted within the simulator community that learning on a simulator must be supervised by a skilled and trained mentor, lest bad habits develop. In our present academic environment, with its emphasis on productivity, it is hard to envision that academic cardiothoracic surgeons will have the time to do this correctly. The United States Navy solved a similar problem by using retired navy pilots as its simulator instructors. In cardiothoracic surgery, with few practice options not involving the operating room, there are likely a large number of retired surgeons who would welcome the opportunity to become involved in resident education in an environment free of the pressures of patient care. We should find a way to allow them to do that.

Of course, for there to be a simulation-based curriculum, there must be simulators that can do the job. If one looks at the field of surgical simulators today, one finds that they are in large part endoscopically based, use virtual reality, and are expensive. Yet, cardiothoracic surgery for the most part still uses the traditional surgical skills of cutting and sewing. This is especially true in cardiac surgery. For our specialty, it should be quite possible to use a preserved, specially prepared pig heart placed in a model of the mediastinum and teach most of the basic skills of cardiac cannulation, on-pump coronary bypass, off-pump coronary bypass, aortic valve replacement, and mitral valve repair or replacement. Such a hybrid simulator is presently under development and could cost as little as $10,000. A similar hybrid simulator is also under development for open and thoracoscopic lobectomies. Both of these simulators appear to achieve “suspension of disbelief,” which is the gold standard for simulation and means that the operator truly believes he or she is performing the procedure for real. Our profession must find a way to stimulate development of more simulators specific to cardiothoracic surgery.

Finally, while teaching surgery with simulation intuitively seems to have significant advantages, in fact, there is still very little hard data that proves this concept. It
is essential that research be done in a rigorous manner to test the validity of the concept that this type of training is in some way better than the traditional model of learning it “on the job.” It is not enough to merely think it is correct. By developing the tools that will allow us to equate performance on a simulated task with performance in real life, we will be able to better judge whether a resident should advance, a graduate should be certified, or a practicing surgeon should maintain certification. It is essential, though, that the methodology be valid and truly reflect a surgeon’s technical skill and judgment.

Much as has occurred in the aviation industry, it is quite likely that the use of simulators will revolutionize education in cardiothoracic surgery in the near future, but it will require creativity, hard work, leadership, and money. The Visioning Simulation Conference has helped to start us on our way.