Commentary: Have mitral valve simulators made it to reality?

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The past decade has seen tremendous growth in the role of simulation in cardiothoracic surgery training. Simulators may have a role in teaching and shortening the learning curve associated with complex cardiothoracic procedures.¹ In parallel, minimally invasive mitral valve surgery (MIMVS) is increasingly accepted as a feasible and efficacious approach for patients with mitral valve disease. What has been lacking, especially in the field of MIMVS, is a high-fidelity simulator that provides objective feedback on components of the operation.

Nia and colleagues² report the development of a mitral valve surgery simulator that bridges that gap and provides real-time validated measurements of suture width and depth in a silicone valve using multiple cameras and a novel optical analysis algorithm. The model thorax is designed for a variety of mitral approaches, including endoscopic with an access port in the fourth intercostal space, robotic with 3 trocar-like ports, and full sternotomy. Surgeons testing the simulator found the look and feel realistic, and agreed it is a good tool for training MIMVS.

Such an innovative technology may be useful for skills assessment and certification, but applications toward deliberate practice for trainees new to MIMVS are even more exciting. Gamification—using principles of game design to make education more engaging³—is more and more prevalent in surgical training.⁴ Ideally, this simulator could provide real-time, objective scoring on suture placement in progressively more challenging valve models, intrinsically (or extrinsically) motivating continued practice and improvement.

Before such applications become reality, more validation is required. Although simulation has been shown to improve comfort level in operating rooms,⁵ no data yet exist on whether this translates into safer, more reproducible technique in clinical settings. To take full advantage of the feedback system, learners need standards and tolerances for

suture width and depth against which their performances can be measured.

The authors' contribution² represents an important advance in the fields of MIMVS and simulation. Simulators may dramatically aid skill acquisition; however, they will make teachers more, not less important. In my earliest and most vivid cardiothoracic simulation memory, a mentor took me through a root replacement on a porcine heart, constantly providing context and guidance. Trainees will always need expert mentors to teach them where (and when) to place the stitches.

Central Message

High-fidelity mitral simulation with objective feedback shows promise in developing the skills needed to perform minimally invasive mitral surgery, but validation is still needed.

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