Michigan, as they remain on the forefront in terms of teaching the art and science of esophageal surgery.

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Commentary: Practice makes perfect in cervical esophagogastric anastomosis

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CENTRAL MESSAGE

A novel, purpose-built cervical esophagogastric simulation model designed for surgical education demonstrated fidelity among experienced thoracic surgeons and trainees.

Cervical esophagogastric anastomotic leakage remains a serious complication after esophagectomy, with substantial impact on patient functional outcomes and quality of life.[1,2] Although certain contributors to anastomotic breakdown, such as previously irradiated tissue and pre-existing patient comorbidities, are rarely modifiable at the time of an operation, surgical technique may be optimized before entering the operating theater through high-fidelity simulation training.[3] Contemporary simulation training in cardiothoracic surgery ranges from simple bench prototypes to mixed-reality programs and cadaveric models.[4] The majority focus on microvascular anastomosis, as well as bronchoscopic and endoscopic techniques. Few existing high-fidelity simulation tools are dedicated to open components of esophageal operations, including the cervical esophagogastric reconstruction in the transhiatal or McKeown esophagectomy.

In this issue of the *Journal*, Orringer and colleagues[5] introduce a novel, purpose-built cervical esophagogastric simulation model for use in thoracic surgical education. The simulation curriculum and bench model, both informed by the authors' extensive previous clinical experience and biomedical human-centered design principles, were then pilot tested for fidelity and feasibility first among 7 faculty and subsequently 8 thoracic surgery trainees. There was no difference in overall perceived value between experienced faculty and trainees. Combined observed averages among the 15 surgeon participants underscored the perceived value

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and relevance of a high-fidelity cervical esophagogastric simulation model and also identified design elements that could be further enhanced to mimic esophageal and gastric tissues. An important limitation of the study design was the use of a convenience sample with existing and unreported previous experience in cervical esophagogastric anastomosis, which allows for establishing proof-of-principle, but may limit generalizability.

Nevertheless, Orringer and colleagues' findings are timely. The rates of cervical esophagogastric anastomotic leakages may be in part due to variation in operative technique and associated learning curves for components of esophagectomy.[6,7] An opportunity for simulation-based training may allow both surgical trainees and early-career surgeons to develop competence in both technical and nontechnical skills outside of the critical moments of an operation.[8,9] Furthermore, as open, thoracoscopic, robotic, and endoscopic techniques continue to evolve in terms of variety and complexity, simulation training will likely play an even greater role in surgical education.

Further work is needed to compare the perceived value of simulation training in cervical esophagogastric anastomosis with intraoperative surgeon performance. Ultimately, demonstrating an association between effective simulation and patient-centered outcome measures after esophagectomy will determine the impact of high-fidelity simulation. Only then will we know whether practice indeed makes perfect.

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