test of time, such as prolonged length of stay, end-organ insufficiency, frailty index, and multiple important comorbidities. A head-to-head comparison of a validated ML models against best physician judgment or against traditional models or even hybrid models would be necessary to accelerate adoption of artificial intelligence in surgical practice after esophagectomy. After all, it is an article of faith among surgeons that good outcomes after esophagectomy are often the result of good judgment by surgeons seasoned by many years of hard-won and sometimes painful experience. Model that!

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Commentary: How to catch a boomerang: Learning from hospital readmissions after thoracic surgery

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Esophagectomy continues to be a mainstay of treatment for early and locally advanced esophageal cancer. Despite recent advances in technique, such as minimally invasive esophagectomy and robotic-assisted esophagectomy, esophagectomy remains a relatively high-risk procedure even in expert hands, with reported morbidity of 49% and mortality of 1%.¹ Esophagectomy has changed not only in approach,

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CENTRAL MESSAGE

Machine learning can aid in the development of readmission models to evaluate quality and to guide clinical practice.

but also in difficulty with the wide application of neoadjuvant chemoradiotherapy. Ultimately the margin for error is thin, with data identifying postoperative complications and readmission as predictive of poor short-term and long-term survival.² Moreover, in the current health care climate, provision of high-quality surgery must be married to cost-efficient care.

In this issue of the *Journal*, Bolourani and colleagues³ demonstrate the utility of machine learning to the application of predicting early (within 30 days) readmission after esophagectomy. To do so, they analyze the National Readmission Databases from 2016, and report a total early readmission rate of 18.8%. As expected, early readmission was

associated with increased risk of mortality. The most common reasons for readmission were cardiopulmonary complications, anastomotic leak, and sepsis. A novel and interesting finding was that patients who underwent pyloroplasty/pyloromyotomy were less likely to be readmitted. In our experience, pyloroplasty is a key component of esophagectomy to promote proper conduit function and perhaps to prevent pulmonary soilage. The National Readmission Databases lacks the granularity to provide more detail regarding some clinically relevant factors, such as tumor stage, use of neoadjuvant therapies, or pulmonary function testing. Moreover, there is likely to be a high degree of heterogeneity in terms of the specific surgical approaches used.

Nonetheless, despite these limitations, the authors were able to develop a quality prediction model with 99.3% specificity and a clinical guidance model with 90.4% sensitivity. They suggest that this clinical model may be used to guide pre-discharge intervention, such as optimization of the gastric conduit, pyloric intervention, or nutritional optimization, which may be the most valuable product of this work. Overall, this sophisticated approach shows that reasonable models for predicting readmission and potentially guiding clinical therapy can be derived from large administrative datasets.

Postoperative complications that beget readmissions continue to be the Achilles heel of esophagectomy. With rates of esophageal cancer continuing to rise, any effort to predict and limit complications represents a pathway forward to safer and more accessible surgery. The influx of machine learning methodology in surgical science has the potential to enhance and potentially confound our approach to treatment of surgical pathology. However, these approaches remain limited by the quality and granularity of the data available and the capability of the data scientists guiding the scope of the data included.

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