Why are patients being readmitted after surgery for esophageal cancer?

Sneha P. Shah, BS,[a] Tim Xu, MPP,[a] Craig M. Hooker, PhD, MPH,[a] Alicia Hulbert, MD,[b] Richard J. Battafarano, MD, PhD,[a] Malcolm V. Brock, MD,[a,b] Benedetto Mungo, MD,[a] Daniela Molena, MD,[a] and Stephen C. Yang, MD[a]

Objective: Readmission after surgery is an unwanted adverse event that is costly to the healthcare system. We sought to evaluate factors associated with increased risk of readmission and to characterize the nature of these readmissions in patients who have esophageal cancer.

Methods: A retrospective cohort study was performed in 306 patients with esophageal carcinoma who underwent neoadjuvant chemoradiation followed by esophagectomy at Johns Hopkins Hospital between 1993 and 2011. Logistic regression was used to identify factors associated with 30-day readmission. Readmissions were defined as inpatient admissions to our institution within 30 days of discharge.

Results: The median age at surgery was 61 years; the median postoperative length of stay was 9 days; and 48% of patients had ≥1 postoperative complication (POC). The 30-day readmission rate was 13.7% (42 of 306). In univariate analysis, length of stay and having ≥1 POC were significantly associated with readmission. In multivariate analysis, having ≥1 POC was significantly associated with a >2-fold increase in risk for 30-day readmission (odds ratio 2.35, with 95% confidence interval [1.08-5.09], $P = .031$) when controlling for age at diagnosis and length of stay. Of the 42 patients who were readmitted, 67% experienced POCs after surgery; 50% of patients who experienced POCs were readmitted for reasons related to their postoperative complication. The most common reasons for readmission were pulmonary issues (29%), anastomotic complications (20%), gastrointestinal concerns (17%), and venous thromboembolism (14%).

Conclusions: Complications not adequately managed before discharge may lead to readmission. Quality improvement efforts surrounding venous thromboembolism prophylaxis, and discharging patients nothing-by-mouth, may be warranted. (J Thorac Cardiovasc Surg 2015;149:1384-91)

See related commentary pages 1392-3.

Hospital readmission rates have been argued to be a key measure of healthcare quality. In 2008, the Medicare Payment Advisory Commission advised the Centers for Medicare and Medicaid Services (CMS) to collect and publish key statistics on readmissions. According to 2004 estimates, unplanned readmissions cost Medicare an estimated $17 billion in expenditures, or 17% of total spending[1]; moreover, the commission reported that >75% of readmissions within 30 days, and 84% of readmissions within 7 days, were potentially preventable.[2]

With the 2012 Patient Protection and Affordable Care Act, the application of CMS payment incentives is expected to increase. Under the Hospital Readmissions Reduction Program, hospitals with higher readmission rates will receive penalties in CMS reimbursement. These penalties, implemented in 2013, currently apply to only heart failure, acute myocardial infarction, and pneumonia, but they are expected to expand to include other conditions in the coming years.[2] Beginning in 2015, the program will include penalties for readmissions after hip and knee arthroplasty.[3] This development has raised considerable interest among providers, patients, and payers in reducing the number of preventable readmissions.

Esophageal cancer has a relatively poor prognosis compared with other cancers and is associated with a high rate of readmission. Thirty-day readmission rates have been reported at 12% to 25%, which is above the national average for all Medicare-billed admissions, and well higher than those for most other cancer surgeries.[4] However, very little research has focused on factors that predispose patients who have esophageal cancer to readmission after surgery.

In this retrospective study of a single-institution cohort, we set out to evaluate factors associated with an increased risk of 30-day readmission and to characterize the nature of 30-day readmissions after surgery in such patients.

Division of Thoracic Surgery,[a] Department of Surgery; and Division of Cancer Biology,[b] Department of Oncology, Johns Hopkins School of Medicine, Baltimore, Md.

This work was funded by a Lawrence R. Katz Internship Award.

Read at the 94th Annual Meeting of The American Association for Thoracic Surgery, Toronto, Ontario, Canada, April 26-30, 2014.

Received for publication April 28, 2014; revisions received Dec 19, 2014; accepted for publication Jan 24, 2015.

Address for reprints: Stephen C. Yang, MD, Division of Thoracic Surgery, The Johns Hopkins Medical Institutions, 600 N Wolfe St, Blalock 240, Baltimore, MD 21287 (E-mail: syang7@jhmi.edu).

0022-5223/$36.00

http://dx.doi.org/10.1016/j.jtcvs.2015.01.064

Abbreviations and Acronyms
CI = confidence interval
CMS = Centers for Medicare and Medicaid Services
OR = odds ratio
POC = postoperative complication
VTE = venous thromboembolism

Our cohort includes 19 years of data from patients who have esophageal cancer and underwent neoadjuvant chemoradiation and esophagectomy (multimodality therapy) at our institution. We hypothesized that the occurrence of postoperative complications would increase the odds of 30-day readmission among these patients.

METHODS

Study Population

Using the Johns Hopkins Hospital Cancer Registry, we identified 314 patients with esophageal cancer who were treated, between July 1993 and December 2011, with combined neoadjuvant chemoradiation therapy and subsequent esophagectomy at the Sidney Kimmel Comprehensive Cancer Center. This study was approved by the Johns Hopkins Medicine Institutional Review Board.

Exposure Assessment

Patient factors, past medical history, and surgical and postoperative stay information were abstracted from the electronic patient record system. Patient factors include age, gender, race, marital status, tumor site, histology, pathologic state, clinical response, comorbidities, and smoking. Patient surgical factors include the American Society of Anesthesiology physical status classification number and surgical procedure. Postoperative factors include length of stay and postoperative complications, which were deduced from surgeon summaries and include unexpected events. Specific categories of postoperative complication data collected include: cardiac, vascular, pulmonary, sepsis and infection, wound infection, anastomotic leak, chylous leak, vocal cord complication, hemodynamic instability, mental health and neurologic complications, and miscellaneous.

Outcome Measurement

Our primary endpoint was 30-day readmission, which we defined as inpatient admission to our institution within 30 days of discharge from a postoperative stay. Thirty-day readmissions were identified from the Johns Hopkins Hospital administrative billing database (Casemix) and were confirmed by looking at the patient's electronic chart. Readmissions include those to the intensive care unit, emergency room, and inpatient wards. Three patients in inpatient rehabilitation who were readmitted to the intensive care unit were counted as readmissions.

Readmissions were identified using our institution's administrative billing database, by subtracting the date of readmission from the discharge date of the inpatient stay associated with the esophagectomy. Patient electronic chart review was used to show whether the readmission was related to the patient's postoperative inpatient stay, and to verify the accuracy of all readmissions identified from the hospital administrative billing database. Categories for readmission include: venous thromboembolism (VTE), anastomotic complications, other pulmonary concerns, gastrointestinal dismotility, cardiac concerns, fever, wound infection, pyloric stenosis, metastasis, and miscellaneous causes.

Statistical Methods

Comparison of means and medians of continuous variables was performed using the Student t test (2-sided) and nonparametric Mann-Whitney U test, respectively. Comparisons between proportions for binary and categorical variables were performed using the X^2 test for homogeneity. Fisher's exact test was used to compare differences in proportions when numbers in cells were <5 units. All hypothesis tests were 2-sided.

Logistic regression was used to identify factors associated with 30-day readmission. Variables identified as significant in univariate models were included as covariates in the multivariable model. We tested for interactions between length of stay and having ≥1 postoperative complication. Crude and adjusted odds ratios (ORs) and corresponding 95% confidence intervals (CIs) are reported. All analyses were performed using the Stata SE 12 statistical package (Stata Corporation, College Station, Tex).

RESULTS

A total of 314 patients met the study inclusion criteria. Eight patients were excluded because they died during surgery or before discharge, leaving 306 patients in the study. Characteristics of the study population and the distribution of perioperative and postoperative complications are shown in Tables 1 and 2. The median age at surgery was 61 years. A total of 89% of patients were men; 86% had adenocarcinoma histology; 77% had at ≥1 comorbidity; and 84% reported a smoking history with a median of 30 pack-years. Operatively, 78% had transhiatal surgery, and 14% had 3-incision approaches. The median postoperative length of stay was 9 days, with an interquartile range of 8 to 11 days. Cardiac complications (18%) were the most common type, followed by pulmonary (15%). In all, 48% of patients experienced ≥1 postoperative complication (POC), and 25% had ≥2 POCs.

The distributions of study characteristics for patients who experienced, versus did not experience, a postoperative complication are presented in Table 3. Compared with patients with no postoperative complications, patients who experienced ≥1 POC were more likely to be older, female, and African-American; they underwent fewer transhiatal procedures and had longer lengths of stay. Otherwise, patients with, versus without, POCs were comparable in pathologic stage, clinical response, prevalence of ≥1 comorbidity, and American Society of Anesthesiology classification.

Crude and adjusted ORs were used to estimate the association between clinical factors and 30-day readmission and are shown in Table 4. In univariate analysis, the odds of 30-day readmission increased by 5% for each day spent in the hospital, a statistically significant increase (OR = 1.05; 95% CI, 1.00-1.08). Patients who experienced ≥1 POC were significantly associated with having a 2.8 times greater odds of readmission within 30 days after discharge, compared with those with no POCs (OR = 2.8; 95% CI, 1.39-5.63).

Although the difference is not statistically significant, the OR of 30-day readmission for women was more than twice that for men (OR = 2.15; 95% CI, 0.90-5.14). Additionally, the distribution for 30-day readmission did not differ by 5-year categories (1990-1994; 1995-1999; 2000-2004;

GTS