



Readmission after esophageal resection for esophageal cancer: incidence and risk factors

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Esophageal resection for malignant neoplasms is a procedure associated with high morbidity—in fact, morbidity rates have been reported to be as high as 59% (1,2). Common early postoperative complications include cardiac and pulmonary complications (arrhythmias, pneumonitis, etc.), anastomotic complications (leak and stricture), vocal cord paralysis, conduit necrosis or failure, and chyle leak (2). Thromboembolic events, infection, and wound-related morbidities further complicate the postoperative course. The median hospital stay after an uncomplicated esophageal resection at high-volume centers is around 8 days (3). Early postoperative complications prolong the hospital stay and increase the incidence of unplanned readmissions after a patient has been discharged (3).

Hospital stay and readmission rates are considered potential markers of the success of the esophageal resection. It may seem intuitive that a potential reverse relationship exists between the hospital stay and readmission rates, where too much emphasis on reducing hospital stay may increase the likelihood of readmission, as some have reported (4). Several other published studies, however, dispute this finding by reporting a higher readmission rate in patients who had a previous longer hospital stay, which reflects the higher morbidity rate in this subgroup of patients (5).

The recent study “Incidence and risk factors of readmission after esophagectomy for esophageal cancer” by Park and colleagues at Yonsei University College

of Medicine, South Korea reported a readmission rate of 13.4% within 30 days of discharge after esophageal resection (6). In their analysis, they found postoperative anastomotic leakage and wound-related problems to be significant risk factors predictive of readmission. They also reported a significant financial burden associated with readmission. Anastomotic strictures requiring balloon dilatation were reported in more than 30% of patients, and were the most common cause of readmission in their study, with other common causes being wound problems (18%), pneumonia (15%), and poor oral intake (10%). Additionally, bowel dysfunction (including delayed gastric emptying and prolonged ileus) were present in approximately 13% of cases. Despite 21% of patients developing vocal cord palsy postoperatively, this was not a significant factor for readmission. Furthermore, 38% of patients who were readmitted required intervention for their associated complication(s). In this study, Park *et al.* emphasized the importance of a postoperative intensive patient education program to prevent common complications, such as aspiration due to vocal cord palsy and gastric fullness due to delayed gastric emptying. The mean hospital stay in their study (25.6 days) was longer than the average length of stay reported by most major centers (12–13 days) (3,4,6).

Several authors have reported on factors associated with readmission after esophageal resection. *Table 1* shows the reported factors associated with readmission in major

Table 1 Studies reporting factors associated with readmission following esophageal resection for malignancy

Author, year	Country	Patient population	Study participants (n)	Readmission rate	Factors associated
Kelly <i>et al.</i> , 2014 (7)	USA	NSQIP (2011)	1,400*	13.5%	Postoperative complications, chronic steroid use, discharge to facility other than home
Fernandez <i>et al.</i> , 2015 (8)	USA	SEER database (2002–2009)	1,744	18.6% [†]	Comorbidity score 3+, urgent admission, urban residence
Stitzenberg <i>et al.</i> , 2015 (9)	USA	SEER database (2001–2007)	1,573	19% [†]	Discharge to facility other than home, comorbidities, higher stage at diagnosis, postoperative complications, longer travel distance, LOS
Sundaram <i>et al.</i> , 2015 (4)	USA	NSQIP database (2011–2012)	1,068	12.6% [†]	Preoperative pulmonary disease, postoperative wound-related complications, LOS
Shah <i>et al.</i> , 2015 (3)	USA	Single center (1993–2011)	306	13.7% [†]	LOS, >1 postoperative complications (including cardiac, pulmonary, septic, anastomotic leak, wound infection)
Hu <i>et al.</i> , 2015 (10)	USA	SEER registry (2000–2009)	1,543	20.7% [†]	Induction chemotherapy
Chen <i>et al.</i> , 2016 (11)	USA	NSQIP database (2005–2013)	4,483	12.8% [‡]	BMI >25 kg/m ² *
Bhagat <i>et al.</i> , 2018 (5)	USA	NSQIP database (2012–2015)	3,723	10.7% [‡]	In-hospital UTI, prolonged LOS, post-discharge infection, pulmonary, venous or thromboembolic complications and UTI
Makiura <i>et al.</i> , 2018 (12)	Japan	Single center (2011–2014)	95	10.5% [†]	Sarcopenia**
Goel <i>et al.</i> , 2020 (13)	USA	NRD (2010–2014)	13,282	19.4% [†]	Perioperative blood transfusion, discharge to a nursing facility, drug abuse, chronic renal failure, major illness on APRDRG score
Park <i>et al.</i> , 2019 (6)	South Korea	Single center (2006–2017)	291	13.4% [†]	Anastomotic leak

Pooled rate of readmission: 16.6%. *, BMI >25 kg/m² was risk factor for post-discharge complications which in turn were associated with significantly higher rate of readmissions; **, Sarcopenia was not a significant factor for within 30-day readmission but was significant if data was studied for within 90-day admission post discharge; [†], 30-day readmission following discharge; [‡], 30-day readmission following esophagectomy; *, described as resection of foregut cancers. APRDRG, All Patient Refined Diagnostic Related Group; BMI, body mass index; LOS, length of hospital stay; NRD, Nationwide Readmissions Database; NSQIP, National Surgical Quality Improvement Program; UTI, urinary tract infection; SEER, Surveillance, Epidemiology, and End Results.

published literature to date, with a pooled readmission rate of 16.6%. Anastomotic leak is the Achilles heel of esophageal resection surgery and is the major determinant of overall hospital stay, in-hospital morbidity, and mortality. Leak after anastomotic stricture rates as high as 56% have been reported in the literature (14). Increased surgeon experience, advancements in surgical anastomotic techniques, and use of staplers have lowered the incidence of clinically significant leaks, which is reflected in shorter hospital stays and greater patient satisfaction (1,14). In our opinion, stapled anastomosis by an expert surgeon is more reliable than hand-sewn anastomosis and achieves better

short- and long-term outcomes (1). The effects of surgeon experience and technical innovation are further reflected in *Table 1*. The three studies that used the American College of Surgeons National Surgical Quality Improvement Program database showed a decreasing trend of readmission rates with the inclusion of more recent database entries. A similar trend is visible for patients in the Surveillance, Epidemiology, and End Results database as well. Hu and colleagues included a larger proportion of patients before 2012 and reported a higher readmission rate than Fernandez and colleagues (8,10).

A minimally invasive technique for esophageal

resection surgery has become the standard of practice. This technique has been reported to have better outcomes in terms of perioperative complications and in-hospital mortality; however, studies have shown no significant improvement in bowel-related complications, anastomotic leak, or recurrent laryngeal nerve palsy with the minimally invasive approach (15,16). In addition, many centers are now adopting enhanced recovery after surgery (ERAS) protocols to enhance patient outcomes. A pooled analysis of randomized trials showed shorter hospital stays and decreased rates of anastomotic leak with the use of an ERAS protocol; however, there has been no significant effects on rates of postoperative complications and readmission after esophagectomy (17).

Unsurprisingly, co-morbidities and poor functional status at the time of admission are major risk factors for a poorer overall outcome and increased chances of readmission (8,13). Most patients undergoing esophagectomy for treatment of esophageal adenocarcinoma in the US are generally older than 60 years of age. In addition, patients diagnosed with squamous cell carcinoma tend to be sarcopenic and cachectic. These are potentially non-modifiable risk factors. However, patient education and nutritional build-up in the preoperative phase should decrease the overall impact of these factors. In addition, detailed counseling of patients in the clinic as well as on the day before surgery may help level patients' expectations about common postoperative complications and required lifestyle changes. Wound complication is one of the major reasons for emergency room visits after discharge. Proper wound care and thorough wound assessment before discharge may decrease readmission rates due to wound complications. Wound complication is a potentially modifiable risk factor.

In conclusion, several identifiable risk factors may predict readmission following discharge after esophageal resection. Several technical and perioperative factors are particularly modifiable. Greater surgeon experience, adoption of advanced surgical techniques, increased patient education, perioperative critical care, and prevention of postoperative infectious, pulmonary, and cardiac complications may decrease readmission rates after esophagectomy for esophageal cancer. Reduced readmission rates may improve overall short- and long-term patient outcomes.

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Footnote

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