Association of Medical Appointment Cancellation Rates on Survival After Esophagectomy for Esophageal Cancer

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Abstract

Background Cancelled healthcare appointments, especially in patients with complex cancers, such as esophageal cancer, risk delayed treatment and adverse outcomes. We hypothesized that patients with greater rates of healthcare appointment cancellations would have decreased survival after esophagectomy for esophageal cancer.

Methods A retrospective analysis of patients from a single institution who underwent esophagectomy for esophageal cancer between 2004 and 2020 was performed. Appointment cancellations were queried 2 years pre-/post-esophagectomy and categorized as medical or ancillary. Continuous and categorical variables were compared by Mann–Whitney and chi-squared analyses, respectively. Survival associations post-esophagectomy were made by Kaplan–Meier analysis.

Result Seventy-six patients were identified. Total medical and ancillary appointments post-esophagectomy increased by 188% and 136%, respectively. Per patient, there was a median increase of 57.5 medical appointments in the post-esophagectomy period. Of medical appointments, 23.7% were cancelled pre-esophagectomy but 33.4% post-esophagectomy ($p < 0.001$). This trend held true for ancillary appointments. Patients with increased medical cancellation rates post-esophagectomy had shortened recurrence-free ($p = 0.09$) and overall survival ($p < 0.01$) versus patients with low cancellation rates.

Conclusion A significant increase in healthcare appointments is seen after esophagectomy. Patients with increased healthcare appointment cancellations have decreased post-esophagectomy survival which presents an opportunity to intervene in patients who historically have a high cancellation rate.

Keywords Esophageal cancer · Clinic cancellation

Introduction

It is estimated that 20,640 new cases of esophageal cancer will be diagnosed in the USA in 2022 with approximately 16,410 deaths and an estimated 5-year survival rate of about 20%.1 Despite improvement in recent decades, the poor prognosis that accompanies a diagnosis of esophageal cancer underscores the significance of determining additional factors which may influence patient survival.

As with other cancer subtypes, patients with esophageal cancer require complex coordination of care as survivors are often afflicted by additional medical comorbidities that impact post-cancer treatment.2 Unfortunately, reports show that cancer survivors, in general, fail to acquire suitable post-diagnosis medical services.3–5 One challenge regarding the care of the cancer survivor is ensuring appropriate and timely follow-up care. Whereas the negative impact of non-attendance at cancer screening6,7 and urgent referral appointments for
suspected cancer is well-documented, knowledge of the association between missed healthcare appointments and survival outcomes in the patient with known cancer is limited. One tumor type in which appointment attendance associates with enhanced survival is colorectal cancer, highlighting the need to identify patients at risk for appointment non-attendance. Finally, a new cancer diagnosis imparts a significant financial and emotional burden on patients and their families related to additional medical care. Evaluating factors associated with this additional medical care and its potential impact on cancer survival is important to address and overcome potential hurdles that prevent patients from maintaining routine post-operative care after a diagnosis of esophageal cancer. Further investigation is thus needed to determine whether appointment cancellations independently affect survival outcomes in other cancer subtypes.

To further investigate the effect of healthcare follow-up on survival outcomes, we sought to analyze the impact of appointment cancellation rates pre- and post-esophagectomy in patients diagnosed with esophageal cancer. This study tests the hypothesis that medical appointment cancellations are inversely proportional to esophageal cancer survival post-esophagectomy.

### Methods

An IRB-approved retrospective analysis of patients who underwent esophagectomy for esophageal carcinoma at the Malcom Randall Veterans Administration Medical Center (VAMC) was performed. Inclusion criteria for this study population were any patient with a diagnosis of esophageal carcinoma (adenocarcinoma or squamous cell subtype) who ultimately underwent oncologic treatment with an esophagectomy, all oncologic care related to the treatment of their malignancy was rendered within the Malcom Randall VAMC health system, and the patient had an assigned primary care provider such that routine healthcare was performed solely within the VAMC. Exclusion criteria were those patients...
without a definitive diagnosis of esophageal cancer, patients treated with definitive chemoradiation without esophagec- tomy, patients with T1 esophageal cancer treated with endo-scopic submucosal dissection (with/without chemoradia- tion), and patients who underwent salvage esophagectomy for esophageal cancer originally treated with definitive chemoradiation. Routine clinicopathologic criteria were collected including the query of total healthcare appoint- ments and cancelled appointments 2 years pre-esophagec- tomy and 2 years post-esophagectomy. Healthcare appoint- ments were classified as either “medical” or “ancillary”. Medical appointments included any visit conducted by a medical doctor, advanced registered nurse practitioner, physi- cian assistant, physical therapist, registered dietician, or pharmacist along with appointments in which the patient met with a chemotherapy nurse or an anticoagulation spe- cialist. The “ancillary” visits included scheduled routine lab work, radiologic imaging, and procedures, such as endoscopy. Data describing patient clinical follow-up included the total amount of scheduled appointments, cancellations made by the clinic, cancellations made by the patient, no-shows, and total cancellations. Oncologic outcomes were based on recurrence-free survival (RFS; period defined as the elapsed time from esophagectomy to cancer recurrence) and overall survival (OS; defined as the elapsed time from esophagectomy to death). Overall survival was reported instead of cancer-specific survival because a specific cause of death was not available for some patients but the date of death is routinely reported to the VA for all patients. Thus, to not limit the power of survival analysis, as patients with the missing cause of death would have to be censored, overall survival was reported where appropriate.

Statistical analyses were performed utilizing Stata v13 software (StataCorp LLC; College Station, TX) and GraphPad Prism v8 (GraphPad Software; San Diego, CA). Normality of variable distribution was performed using the Shapiro–Wilk test whereby the comparison of medians between two groups of non-normally distributed
continuous variables was made by the Wilcoxon rank sum test with the interquartile range (IQR) listed. Categorical variables were compared using chi-squared analysis. Kaplan–Meier logistic regression analysis was performed to assess the RFS and OS of the study population comparing medical appointment cancellation rates based on dichotomized cohorts at the median for cancelled/missed appointments where described. A 2-sided $p$-value of 0.05 was considered statistically significant.

### Results

A total of 76 patients were identified between 2004–2020 who received a diagnosis of esophageal carcinoma and underwent subsequent esophagectomy with a median follow-up of 16 months after surgery. Seventy-one patients (93%) were diagnosed with adenocarcinoma at a median age of 64.2 years (IQR 7.5). All patients in the study cohort were male, not unexpected for a VAMC-based study. Additional clinicopathologic data are summarized in Table 1.

### Esophageal Cancer Diagnosis Results in a Significant Increase in Healthcare Appointments

The total number of pre-esophagectomy medical visits for the entire cohort was 1657 with 678 ancillary visits. In comparison, the total number of post-esophagectomy medical and ancillary visits for the entire cohort was 4770 and 1603, respectively. This represents a 188% and 136% increase in medical and ancillary visits, respectively, after esophagectomy.

On a per-patient basis, there was an increase in the median number of medical post-esophagectomy visits (57.5, IQR 43) compared to pre-esophagectomy visits (18, IQR 24; $p < 0.0001$). Furthermore, the median number of ancillary visits also increased between the pre-esophagectomy and post-esophagectomy time period (8, IQR 11.5 vs. 18, IQR 19; $p < 0.0001$). A summary of healthcare appointment cancellations is detailed in Table 2 based on the entire cohort.

| Medical Visits | 30-day Post-op ED visit | 90-day readmission |
|----------------|-------------------------|--------------------|
|                | No | Yes | $p$ | No | Yes | $p$ |
| Total visits (n, %) | 2562 (100) | 2088 (100) | 0.74 | 2462 (100) | 2026 (100) | 0.8 |
| Mean (SD) | 61 (29.2) | 69.6 (43.3) | 66.5 (32.4) | 67.5 (39.3) | 62 (37) | 56.5 (45) |
| Median (IQR) | 61.5 (2) | 54.5 (45) | 354 (14.4) | 308 (15.2) | 9.6 (5.9) | 10.3 (5.5) |
| Administrative Cx (n, %) | 383 (14.9) | 309 (14.8) | 0.46 | 354 (14.4) | 308 (15.2) | 0.4 |
| Mean (SD) | 9.1 (5.3) | 10.3 (6.1) | 9.6 (5.9) | 10.3 (5.5) | 8 (7) | 9 (7) |
| Median (IQR) | 8 (7) | 8.5 (8) | 8 (7) | 9 (7) |
| Patient Cx (n, %) | 262 (10.2) | 270 (12.9) | 0.3 | 256 (10.4) | 256 (12.6) | 0.8 |
| Mean (SD) | 6.2 (3) | 9 (8.5) | 6.9 (4.9) | 8.5 (8.2) | 6 (7) | 5 (7) |
| Median (IQR) | 5.5 (5) | 6 (8) | 6 (7) | 5 (7) |
| Patient no-show (n, %) | 129 (5) | 101 (4.8) | 0.4 | 96 (3.9) | 131 (6.5) | 0.66 |
| Mean (SD) | 3.1 (3.6) | 3.4 (6.4) | 2.6 (2.8) | 4.4 (6.8) | 2 (3) | 2 (6) |
| Median (IQR) | 2 (5) | 1 (3) | 2 (3) | 2 (6) |
| Total Cx (n, %) | 774 (30.2) | 680 (32.6) | 0.5 | 706 (28.7) | 695 (34.3) | 0.52 |
| Mean (SD) | 18.4 (10.2) | 22.7 (18.6) | 19.1 (10.5) | 23.2 (18.3) | 16 (15) | 18 (12) |
| Median (IQR) | 17 (12) | 16.5 (15) | 16 (15) | 18 (12) |

### Ancillary visits

| Medical Visits | 30-day Post-op ED visit | 90-day readmission |
|----------------|-------------------------|--------------------|
|                | No | Yes | $p$ | No | Yes | $p$ |
| Total visits (n, %) | 992 (100) | 652 (100) | 0.95 | 830 (100) | 760 (100) | 0.6 |
| Mean (SD) | 23.6 (18.4) | 21.7 (13) | 22.4 (15.5) | 25.3 (17.7) | 19 (18) | 19 (22) |
| Median (IQR) | 19.5 (20) | 18 (17) | 19 (18) | 19 (22) |
| Administrative Cx (n, %) | 136 (13.7) | 109 (16.7) | 0.5 | 138 (16.6) | 99 (13) | 0.5 |
| Mean (SD) | 3.2 (2.4) | 3.6 (2.6) | 3.7 (2.6) | 3.3 (2.5) | 3 (3) | 3 (3) |
| Median (IQR) | 2 (3) | 3 (3) | 3 (3) | 3 (3) |
| Patient Cx (n, %) | 152 (15.3) | 68 (10.4) | 0.86 | 139 (16.7) | 76 (10) | 0.4 |
| Mean (SD) | 3.6 (9.2) | 2.3 (2.2) | 3.6 (9.8) | 2.5 (2.3) | 2 (2) | 2 (2) |
| Median (IQR) | 2 (4) | 2 (2) | 2 (4) | 2 (2) |
| Patient no-show (n, %) | 37 (3.7) | 15 (2.3) | 0.39 | 24 (2.9) | 26 (3.4) | 0.3 |
| Mean (SD) | 0.9 (2) | 0.5 (1.1) | 0.65 (2) | 0.9 (1.4) | 0 (1) | 0 (1) |
| Median (IQR) | 0 (1) | 0 (1) | 0 (1) | 0 (1) |
| Total Cx (n, %) | 325 (32.8) | 192 (29.4) | 0.52 | 301 (36.3) | 201 (26.4) | 0.7 |
| Mean (SD) | 7.7 (10.8) | 6.4 (3.9) | 8.1 (11.3) | 6.7 (4.3) | 5 (7) | 6 (5) |
| Median (IQR) | 5 (6) | 5 (4) | 5 (7) | 6 (5) |
The Frequency of Healthcare Appointment Cancellations Increased After the Diagnosis of Esophageal Cancer

Cancellation of healthcare appointments (either medical or ancillary) was categorized as administrative (cancelled by hospital personnel), patient cancellation (active process of a patient cancelling an appointment either by phone or electronically), and patient no-show (patient fails to attend a scheduled appointment). Pre-esophagectomy, an average of 23.7% and 23.1% of medical and ancillary appointments were cancelled per patient, respectively. In comparison, 33.4% \( (p = 0.0001) \) and 32.7% \( (p = 0.03) \) of medical and ancillary appointments were cancelled post-esophagectomy per patient, respectively. The trend for increased cancellation of healthcare appointments after the diagnosis of esophageal cancer is summarized for each cancellation category in Fig. 1 based on cancellation rates for the entire cohort.

Cancellation Rates Did Not Associate with Post‑Operative Emergency Department Visits or Readmission

Given that cancellation of healthcare appointments post-esophagectomy may be explained by increased visits to the emergency department (ED) or readmission (as previously scheduled appointments may be subsequently cancelled because of care rendered in the ED or during readmission), healthcare appointment cancellation rates were compared amongst patients with/without an ED visit 30-day post-operatively and with/without a 90-day hospital readmission (Table 3). This did not demonstrate differences in healthcare cancellation rates for any of the cancellation cohorts based on 30-day ED visit or 90-day readmission and suggests that differences in cancellation rates are not secondary to ED visits or hospital readmission post-esophagectomy.

Post‑Esophagectomy Cancer Survival is Inversely Associated with Post‑Esophagectomy Healthcare Appointment Cancellation

To test the hypothesis that healthcare appointment cancellations are inversely proportional to survival after esophagectomy for esophageal cancer, Kaplan–Meier logistic regression analysis was performed. The RFS and OS of the entire cohort are illustrated in Fig. 2. Kaplan–Meier logistic regression of RFS and OS was subsequently performed on the cohort dichotomized at the median percentage of total medical visits cancelled (high/low) pre-esophagectomy and post-esophagectomy (Fig. 3). Pre-esophagectomy, there was no significant difference in RFS \( (p = 0.41) \) or OS \( (p = 0.24) \) for patients regardless of the proportion of medical visits cancelled. However, patients with a higher percentage of medical visit cancellations post-esophagectomy had a shortened, but not statistically significant, RFS \( (p = 0.09) \) but a statistically shortened OS \( (p < 0.01) \) compared to patients with a low cancellation rate. Because stage, primarily nodal
Pre-Esophagectomy Medical Appt Cancellations

- Probability Recurrence-Free Survival

- Time (months)

- \( p = 0.41 \)

Post-Esophagectomy Medical Appt Cancellations

- Probability Recurrence-Free Survival

- Time (months)

- \( p = 0.09 \)

Post-Esophagectomy Medical Appt Cancellations (LN+ Patients)

- Probability Recurrence-Free Survival

- Time (months)

- \( p = 0.051 \)

Pre-Esophagectomy Medical Appt Cancellations

- Probability Overall Survival

- Time (months)

- \( p = 0.24 \)

Post-Esophagectomy Medical Appt Cancellations

- Probability Overall Survival

- Time (months)

- \( p = 0.009 \)

Post-Esophagectomy Medical Appt Cancellations (LN+ Patients)

- Probability Overall Survival

- Time (months)

- \( p = 0.41 \)
visits is associated with improved cancer survival. As Kosmider et al. noted, identifying patients at risk for low appointment attendance may both independently and positively impact survival outcomes in patients with cancer. Our study supports these findings but in the context of patients with esophageal cancer. Unique to our study is that it incorporates the complexities of appointment cancellation rates both before and after esophagectomy with special attention paid to the types of cancellation. The COVID-19 pandemic has provided a modern-day view of healthcare appointment cancellations and its patient care impact given the noted reductions in both new cancer diagnoses and procedures utilized to diagnose cancer. As challenges associated with the pandemic, such as financial adversity, social isolation, and complex restrictions have affected the cancer survivor, our data demonstrate that these issues likely play a role in patient healthcare appointment cancellations independent of a global pandemic.

Our study is limited in that data was compiled from a single institution involving only male patients, limiting generalizability to other practice settings. Additionally, only patients with esophageal cancer were included in this study but provide an opportunity to study other malignancies that require the coordination of multiple specialties to optimize care, such as pancreatic cancer. Furthermore, no data could be gathered on specific reasons for the patient or administrative cancellations (such as the inability to secure transportation, lack of clinical staffing, or equipment issues). It should be noted that a process is in place to reschedule these patients who cancel or fail to show to their appointment. Specific data on the reasons for the cancellation subtype could not be gathered from the medical record as this was not consistently recorded but should be made a routine part of cancellation documentation. While a limitation of the study, it appears not associated with visits to the ED or readmission. As with other patient populations, the veteran population is susceptible to healthcare disparities because of a variety of social determinants of health. While VAMC healthcare systems often provide transportation to patients without a reliable ability to attend appointments, even this is limited as not all catchment areas may be served and patients may lack transportation to be dropped off at the local shuttle site for subsequent long-distance travel to their appointments. Additionally, states such as Florida have large areas of rural communities such that public transportation does not service these areas. The creation of transportation networks for at-risk patients would serve a critical function to the healthcare community and potentially improve the cancer survivorship of patients such as those illustrated herein. Cancellations are not limited to patient-centric reasons and system-based improvements should be taken into account to maintain timely follow-up. While unforeseeable reasons for cancellations such as a provider being out sick, equipment failure, or even weather cannot be prepared for, several areas of process improvement would help to facilitate timely and consistent follow-up. Notably, incomplete workup by other services can have a cascading effect that results in several downstream healthcare appointment cancellations. Having
appropriate hospital resources and investment can help mitigate this factor. The reported effects of healthcare appointment cancellations on survival have the potential to become worse with increased COVID-19 pandemic healthcare personnel resignations (“The Great Resignation”). Healthcare system retention and career development practices for their employees can have a positive effect on more than just the healthcare worker. Finally, because of the relatively small cohort numbers, there was not enough statistical power to perform a Cox proportional hazard test to identify independent predictors of survival in the context of high appointment cancellation rates. As such, the presented findings may not be independent factors responsible for the reduction in survival post-esophagectomy for esophageal cancer. Although our study represents an opportunity to identify other cancer patients who may be at risk due to complicated cancer treatments, readers must proceed with caution when generalizing our results to patients with different cancer diagnoses or patient populations. It does, however, provide several opportunities to aid in healthcare post-cancer diagnosis and offers an opportunity to intervene in patients with a precedence for healthcare appointment cancellation or who may have socioeconomic factors that limit their ability to follow up.

In conclusion, our data demonstrate the negative impact increased appointment cancellation rates can have on survival in patients with esophageal cancer following esophagectomy, taking into account a variety of healthcare appointment types. Additionally, our study highlights the potential increased burden placed on patients through the increases in total appointments and cancellations post-esophagectomy. Implementing practice patterns that encourage patient healthcare appointment compliance as well as healthcare system changes that minimize cancellations/rescheduling may help to alleviate the emotional burden that often accompanies esophageal cancer, and lead to improved survival following esophagectomy.

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Date acquisition: DK, RMT.
Data analysis: AMC, RMT.
Manuscript preparation and editing: DK, AC, and RMT.

References
1. American Cancer Society. Cancer Facts & Figures 2022. Atlanta: American Cancer Society; 2022
2. Thrift, A.P., Esophageal Adenocarcinoma: The Influence of Medications Used to Treat Comorbidities on Cancer Prognosis. Clin Gastroenterol Hepatol, 2015. 13(13): p. 2225-32.
3. Elston Lafata, J., et al., Routine surveillance care after cancer treatment with curative intent. Med Care, 2005. 43(6): p. 592-9.
4. Salloum, R.G., et al., Adherence to surveillance care guidelines after breast and colorectal cancer treatment with curative intent. Cancer, 2012. 118(22): p. 5644-51.
5. Snyder, C.F., et al., Preventive care for colorectal cancer survivors: a 5-year longitudinal study. J Clin Oncol, 2008. 26(7): p. 1073-9.
6. Zackriss, S., et al., Non-attendance in breast cancer screening is associated with unfavourable socio-economic circumstances and advanced carcinoma. Int J Cancer, 2004. 108(5): p. 754-60.
7. Khanna, N. and M.D. Phillips, Adherence to care plan in women with abnormal Papanicolaou smears: a review of barriers and interventions. J Am Board Fam Pract, 2001. 14(2): p. 123-30.
8. Sheridan, R., et al., Patient non-attendance at urgent referral appointments for suspected cancer and its links to cancer diagnosis and one year mortality: A cohort study of patients referred on the Two Week Wait pathway. Cancer Epidemiol, 2019. 63: p. 101588.
9. Jefferson, L., et al., Non-attendance at urgent referral appointments for suspected cancer: a qualitative study to gain understanding from patients and GPs. Br J Gen Pract, 2019. 69(689): p. e850-e859.
10. Figueiredo, A., et al., Follow-up of patients with curatively resected colorectal cancer: a practice guideline. BMC Cancer, 2003. 3: p. 26.
11. Renehan, A.G., et al., Impact on survival of intensive follow-up after curative resection for colorectal cancer: systematic review and meta-analysis of randomised trials. Brmj, 2002. 324(7341): p. 813.
12. Kosmider, S., et al., Predictors of clinic non-attendance: opportunities to improve patient outcomes in colorectal cancer. Intern Med J, 2010. 40(11): p. 757-63.
13. Yi, J.C. and K.L. Syrjala, Anxiety and Depression in Cancer Survivors. Med Clin North Am, 2017. 101(6): p. 1099-1113.
14. Johansen, S., M. Cvancarova, and C. Ruland, The Effect of Cancer Patients’ and Their Family Caregivers’ Physical and Emotional Symptoms on Caregiver Burden. Cancer Nurs, 2018. 41(2): p. 91-99.
15. Delgado Guay, M.O., et al., Characteristics and outcomes of advanced cancer patients who miss outpatient supportive care consult appointments. Support Care Cancer, 2014. 22(10): p. 2869-74.
16. Smith, D.K., E.H. Castellanos, and B.A. Murphy, Financial and socio-economic factors influencing pre- and post-cancer therapy oral care. Support Care Cancer, 2018. 26(7): p. 2143-2148.
17. Englum, B.R., et al., Impact of the COVID-19 pandemic on diagnosis of new cancers: A national multicenter study of the Veterans Affairs Healthcare System. Cancer, 2022. 128(5): p. 1048-1056.
18. Jammu, A.S., et al., Systematic rapid living review of the impact of the COVID-19 pandemic on cancer survivors: update to August 27, 2020. Support Care Cancer, 2021. 29(6): p. 2841-2850.
19. Edge, R., et al., Psychosocial impact of COVID-19 on cancer patients, survivors, and carers in Australia: a real-time assessment of cancer support services. Support Care Cancer, 2021. 29(9): p. 5463-5473.

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