

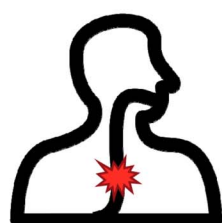
Postendoscopy Care for Patients Presenting With Esophageal Food Bolus Impaction: A Population-Based Multicenter Cohort Study

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INTRODUCTION: Esophageal food bolus impactions (FBI) are a common gastrointestinal emergency. Appropriate management includes not only index endoscopy for disimpaction but also medical follow-up and treatment for the underlying esophageal pathology. We evaluated the appropriateness of postendoscopy care for patients with FBI and assessed patient-related, physician-related, and system-related factors that may contribute to loss to follow-up.

METHODS: We conducted a retrospective, population-based, multicenter cohort study of all adult patients undergoing endoscopy for FBI in the Calgary Health Zone, Canada, from 2016 to 2018. Appropriate postendoscopy care was defined by a composite of a clinical or endoscopic follow-up visit, appropriate investigations (e.g., manometry), or therapy (e.g., proton-pump inhibitors or endoscopic dilation). Predictors of inappropriate care were assessed using multivariable logistic regression.

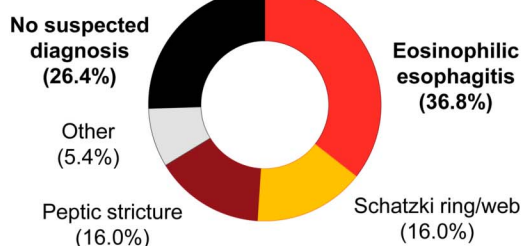
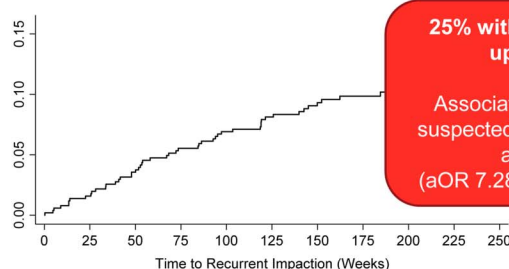
Post-Endoscopy Care for Esophageal Food Bolus Impaction: A Population-Based Multicenter Cohort Study



519 adult patients presenting with esophageal food bolus impaction undergoing upper endoscopy (2016-2018)



From 4 tertiary care hospitals in Calgary Health Zone, Alberta Health Services, Canada (single payer, fully integrated, provincial health authority)



20%

Diagnosis changed after follow-up evaluation

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RESULTS: A total of 519 patients underwent endoscopy for FBI: 25.2% (131/519) did not receive appropriate postendoscopy care. Half of the patients (55.3%, 287/519) underwent follow-up endoscopy or attended clinic, and among this group, 22.3% (64/287) had a change in their initial diagnosis after follow-up, including 3 new cases of esophageal cancer. Patients in whom a suspected underlying esophageal pathology was not identified at the index endoscopy were 7-fold (adjusted odds ratio 7.28, 95% confidence interval 4.49–11.78, $P < 0.001$) more likely to receive inappropriate postendoscopy follow-up and treatment, even after adjusting for age, sex, rural residence, timing of endoscopy, weekend presentation, and endoscopic interventions.

DISCUSSION: One-quarter of patients presenting with an FBI do not receive appropriate postendoscopy care. This is strongly associated with failure to identify a potential underlying pathology at index presentation.

KEYWORDS: appropriateness; esophagus; endoscopy; food bolus impaction; foreign body; quality of care

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INTRODUCTION

Esophageal food bolus impactions (FBI) are the third most common nonbiliary gastrointestinal (GI) emergency after upper and lower GI bleeding, with an annual incidence rate of ~13/100,000 population/year (1). FBI are uncommon in the setting of a normal esophagus; rather, they almost exclusively occur in patients with underlying esophageal pathology (2). Historically, Schatzki rings and peptic strictures were believed to be the most common etiologies of FBI, but more recent studies have shown an increasing proportion of patients diagnosed with eosinophilic esophagitis (EoE) (3,4). Although many impactions will resolve spontaneously, ~20% of patients will require urgent endoscopic evaluation (5) and current guidelines recommend therapeutic upper endoscopy be performed within 2–24 hours of presentation for persistent obstructions (6,7).

The appropriate treatment of FBI requires technical proficiency in endoscopic interventions to relieve the acute impaction, in addition to implementing effective medical treatment and/or follow-up for the underlying esophageal pathology (6). Few studies have evaluated the appropriateness of postendoscopy care in patients presenting with FBI, yet this population may be at high risk for loss to follow-up due to the acute and episodic nature of FBI (8). Kassim et al (9) conducted a retrospective cohort study demonstrating that approximately 40% of patients presenting with FBI and recommended for interval dilation were subsequently lost to follow-up. Similarly, Chang et al (10) evaluated 220 patients with FBI and showed that fewer than half had adequate outpatient follow-up within 1 year of presentation. The potential implications of inadequate diagnostic and/or therapeutic follow-up include the progression of the underlying esophageal disease or repeated impactions and health care utilization for recurrent obstructions (11). Loss to follow-up may relate patient-based, physician-based, or system-based factors (8), yet these have not been well studied in patients with FBI. Therefore, we aimed to characterize the appropriateness of treatment and follow-up of patients who present with esophageal FBI and assess predictors of inappropriate postendoscopy care in a multicenter cohort study.

METHODS

Study design and data source

We performed a population-based multicenter retrospective cohort study using administrative data validated by medical chart reviews at 4 acute care hospitals within the Calgary Health Zone

(CHZ) of Alberta Health Services. Alberta Health Services is Canada's largest provincial, fully integrated, single-payer health authority, delivering all health care services (including all endoscopy) to ~4.3 million residents. A repository of information across multiple data sets is collected for all patients accessing health care services: patients are tracked across databases using a unique personal health number. Owing to the single payor, provincial nature of the health system, patients are not lost to follow-up should they be readmitted to another hospital for any indication within the province. However, patients do leave the health system and are lost to follow-up if they emigrate from Alberta, although this typically accounts for <1% of the total population in any given calendar year. Details from all endoscopy procedures performed within the CHZ were captured synoptically using PENTAX endoPRO IQ (Pentax Medical, Montvale, NJ).

Study population

The population of interest included adult patients (≥ 18 years) who underwent an unplanned upper endoscopy for FBI managed by a gastroenterologist within the CHZ between January 1, 2016, and December 31, 2018. All subjects who underwent an unscheduled (nonroutine) upper endoscopy were identified using endoPRO IQ and a medical chart review was then conducted to confirm the indication for procedure. Almost all patients with an FBI presented to the emergency department (ED) for initial care: the typical process for managing an acute FBI involves admission of the patient to the ED, consultation with gastroenterology for upper endoscopy, transportation to the endoscopy unit for the procedure, upper endoscopy performed under conscious sedation, and recovery and discharge from the ED. A standardized ED discharge form is provided with contact information. Any biopsies taken are the responsibility of the performing gastroenterologist to follow-up. Any follow-up visits to gastroenterology would be arranged and booked by the administrative office of the on-call gastroenterologist (not booked by the patient directly).

All patients for whom a suspected FBI was the primary indication for upper endoscopy were included. We excluded patients who had established care with a gastroenterologist within 2 years of the inclusion date (i.e., patients who had undergone endoscopy or had clinical follow-up in the preceding 2 years): these patients may already have had established follow-up plans, and therefore, postendoscopy decisions may have been deferred to the patient's primary gastroenterologist. Patients who underwent an upper

Table 1. Composite definitions of appropriate postendoscopy care after presentation with food bolus impaction

Patient population	Criteria defining appropriate postendoscopy care	Data sources evaluated to confirm appropriateness
All patients with food bolus impaction	<ul style="list-style-type: none"> • A postendoscopy clinic follow-up visit with a gastroenterologist within 12 mo of presentation • A repeat upper endoscopy for re-evaluation (not performed for recurrent food bolus impaction) within 12 mo of presentation • Esophageal biopsies, taken either at index presentation or at follow-up, to evaluate for potential esophageal mucosal pathology 	<ul style="list-style-type: none"> • Medical chart review • National Ambulatory Care Reporting System • endoPRO IQ procedure logs • Provincial histopathology database
Patients with suspected eosinophilic esophagitis	<ul style="list-style-type: none"> • Treatment with a proton-pump inhibitor or swallowed topical corticosteroid • Referral to dietician 	<ul style="list-style-type: none"> • Medical chart review • Provincial pharmacy database
Patients with suspected peptic stricture or reflux esophagitis	<ul style="list-style-type: none"> • Treatment with a proton-pump inhibitor • Treatment with endoscopic dilation 	<ul style="list-style-type: none"> • Medical chart review • Provincial pharmacy database • endoPRO IQ procedure logs
Patients with suspected esophageal ring or web	<ul style="list-style-type: none"> • Treatment with a proton-pump inhibitor • Treatment with endoscopic dilation 	<ul style="list-style-type: none"> • Medical chart review • Provincial pharmacy database • endoPRO IQ procedure logs
Patients with suspected dysmotility	<ul style="list-style-type: none"> • Treatment with a proton-pump inhibitor (empirically) • Ordering esophageal manometry 	<ul style="list-style-type: none"> • Medical chart review • Provincial pharmacy database • endoPRO IQ procedure logs specifically for manometry studies

endoscopy for ingested foreign bodies were excluded because these cases may occur accidentally or intentionally, rather than due to an underlying esophageal pathology.

Outcome and covariables

Our primary outcome was the proportion of patients undergoing endoscopy for FBI who received *appropriate* postendoscopy management and/or follow-up. Appropriateness was defined conservatively using a composite end point that captured clinic or endoscopic assessment, histologic evaluation of the mucosa through esophageal biopsies, referral for manometry, or treatment of a suspected underlying esophageal pathology (Table 1). Conversely, patients were classified as receiving *inappropriate* postendoscopy care if they met *all* the following criteria: (i) no follow-up clinic or endoscopy visit, (ii) no esophageal biopsies taken, (iii) no empiric therapy with either proton-pump inhibitors (PPI) or swallowed topical corticosteroids (in patients with suspected EoE or peptic etiologies), (iv) no referral for manometry (in patients with suspected dysmotility), and (v) no empiric endoscopic dilation (for patients with a suspected ring/web or stricture). To ensure comprehensive capture of all potential follow-up evaluations, multiple data sources were searched, including the endoPRO IQ procedure logs for repeat endoscopies or manometry studies, the National Ambulatory Care Reporting System that records community-based clinic follow-up visits, and the province-wide pharmacy and histopathology databases for prescriptions and biopsy results, respectively.

Secondary objectives included evaluation of the proportion of patients who had a subsequent recurrent FBI requiring endoscopy and the predictors of potentially inappropriate postendoscopy care. Covariables of interest included patient characteristics (age, sex,

urban vs rural residence, and presence of atopic comorbidities), index endoscopy procedure details (date, time, duration, collection of biopsies, endoscopic method to manage impaction [extraction by pull technique, gentle push through to the stomach, or FBI refractory to endoscopic removal requiring referral for thoracic surgery]), the suspected etiology of FBI (EoE, esophageal Schatzki ring or web, peptic stricture, esophageal dysmotility, malignancy, or other), management after index endoscopy (prescription of PPI or swallowed topical corticosteroids, follow-up clinic visit or endoscopy, and time to follow-up), and recurrence of FBI. There were cases where the treating gastroenterologist did not record any esophageal pathology in the index endoscopy report: these cases were classified as having no suspected diagnosis pertaining to an underlying esophageal disorder. All data were extracted using a standardized case report form.

Statistical methods

Descriptive statistics were used to summarize baseline characteristics. Comparisons between groups were tested using the Pearson χ^2 test, Student *t* test, or Wilcoxon Mann-Whitney test as appropriate based on the data type and distribution. Univariable and multivariable logistic regression were used to assess predictors of inappropriate care, expressed as unadjusted or adjusted odds ratios (OR) with 95% confidence intervals (CI). Potential confounders were selected *a priori* and included age, sex, rural vs urban residence, first presentation vs previous history of FBI, time of presentation (defined as daytime endoscopy 07:00–18:59, after-hours endoscopy 19:00–23:59, and overnight endoscopy 00:00–06:59), weekend vs weekday presentation, duration of endoscopy, initial endoscopic management, and initial suspected esophageal diagnosis. Sex and weekend endoscopy were modeled

Table 2. Baseline patient demographics, stratified by appropriateness of postendoscopy follow-up and medical care

Characteristic	Total population (n = 519)	Appropriate postendoscopy care (n = 388)	Inappropriate postendoscopy care (n = 131)	P value
Age, yr, mean (SD)	51.9 (19.0)	51.2 (18.8)	54.1 (19.5)	0.13
Male sex, n (%)	357 (68.8)	276 (71.1)	81 (61.8)	0.047
Residence, n (%)				
Urban	419 (80.7)	317 (81.7)	102 (77.9)	0.39
Nonurban	98 (18.9)	70 (18.0)	28 (21.4)	
First food bolus, n (%)	390 (75.1)	281 (72.4)	109 (83.2)	0.02
Comorbidities, n (%)				
Asthma	93 (17.9)	78 (20.1)	15 (11.5)	0.03
Eczema	21 (4.0)	18 (4.6)	3 (2.3)	0.24
Allergic rhinitis	49 (9.4)	45 (11.6)	4 (3.1)	0.004
Food allergy	21 (4.0)	18 (4.6)	3 (2.3)	0.24
Endoscopy timing, n (%)				
Daytime (07:00–18:59)	196 (37.8)	147 (37.9)	49 (37.4)	0.80
Evening (19:00–23:59)	211 (40.7)	155 (39.9)	56 (42.7)	
Overnight (00:00–06:59)	112 (21.6)	86 (22.2)	26 (19.8)	
Admission to hospital, n (%)	29 (5.4)	18 (4.6)	10 (7.6)	0.16
Suspected pathology at endoscopy, n (%)				
Eosinophilic esophagitis	191 (36.8)	165 (42.5)	26 (19.8)	<0.001
Ring/web	83 (16.0)	74 (19.1)	9 (6.9)	0.001
Peptic stricture	82 (15.8)	80 (20.6)	2 (1.5)	<0.001
Esophageal dysmotility	12 (2.3)	8 (2.1)	4 (3.1)	0.49
Malignancy	4 (0.8)	4 (1.0)	0 (0)	0.25
Other diagnosis	28 (5.4)	18 (4.6)	10 (7.6)	0.16
No suspected diagnosis	137 (26.4)	59 (15.2)	78 (59.5)	<0.001
Postendoscopy treatment, n (%)				
Proton-pump inhibitor	391 (75.3)	328 (84.5)	63 (48.1)	<0.001
Swallowed topical corticosteroid	22 (4.2)	22 (5.7)	0 (0)	0.006

both as covariables and explored as potential effect modifiers. Risk of recurrent FBI was evaluated using Kaplan-Meier survival methods, and comparisons between patients receiving appropriate vs inappropriate care were assessed using the log-rank test. A sensitivity analysis was conducted excluding patients who passed their food bolus spontaneously by the time of endoscopic evaluation.

All analyses were performed using Stata 17.0 (StataCorp LLC, College Station, TX). This study was approved by the Conjoint Health Research Ethics Board of the University of Calgary (REB20-1486).

RESULTS

Study population

A total of 519 adult patients undergoing endoscopy for FBI from 2016 to 2018 were included in our cohort. The baseline demographic characteristics are summarized in Table 2. Approximately 70% of patients were male, and 75.1% (390/519) of patients presented with their first FBI (the remaining patients had a history of FBI but no gastroenterology follow-up or impaction within 2 years of cohort enrollment). The most common time for

presentation with FBI was in the evening after hours between 19:00 and 23:59 (40.7%, 211/519). A total of 60 different endoscopists were involved in upper endoscopies during the study period: these gastroenterologists had a median of 9 years of postfellowship experience (interquartile range [IQR] 5–14 years). Approximately 1 in 5 cases involved a trainee (17.5%, 91/519).

Index endoscopy for FBI

Table 3 summarizes the endoscopic details of the index procedure for FBI in our cohort. The median endoscopy duration was 16.6 minutes (IQR 10.1–24.9 minutes). Spontaneous passage of the food impaction occurred in 19.3% (100/519) of patients, although was least frequently observed in overnight procedures (13/112, 11.6%) as compared to evening or daytime endoscopies ($P = 0.03$). Among patients with an FBI that had not passed spontaneously, the bolus was gently pushed into the stomach in 68.3% (286/419) of patients, whereas it was extracted by pull techniques in 28.2% (118/419) of patients. The bolus could not be managed endoscopically by the treating gastroenterologist in 15 patients (3.6%). Endoscopic dilation was performed in 4.1% (17/419) of patients and esophageal biopsies

Table 3. Endoscopic characteristics, suspected diagnosis, and endoscopic treatment, stratified by timing of index endoscopy

Characteristic	Daytime endoscopy (07:00–18:59) (n = 196)	Evening endoscopy (19:00–23:59) (n = 211)	Overnight endoscopy (00:00–06:59) (n = 112)	P value
Endoscopy duration, min, median (IQR)	16.6 (10.1–24.9)	15.1 (9.1–24.2)	15.6 (8.6–25.0)	0.38
No bolus found on endoscopy, n (%)	37 (18.9)	50 (23.7)	13 (11.6)	0.03
Suspected pathology at endoscopy, n (%)				
Eosinophilic esophagitis	70 (35.7)	75 (35.5)	46 (41.1)	0.54
Ring/web	31 (15.8)	30 (14.2)	22 (19.6)	0.44
Peptic stricture	34 (17.3)	28 (13.3)	20 (17.9)	0.45
Esophageal dysmotility	8 (4.1)	4 (1.9)	0 (0.0)	0.07
Malignancy	2 (1.0)	2 (0.9)	0 (0.0)	0.58
Other diagnosis	8 (4.1)	15 (7.1)	5 (4.5)	0.34
No suspected diagnosis	24.5 (0.32)	59 (28.0)	24 (21.4)	0.32
Endoscopic management, n (%)				
Bolus pushed into the stomach ^a	114 (71.7)	108 (67.1)	64 (64.6)	0.46
Bolus extracted ^a	40 (25.2)	48 (29.8)	30 (30.3)	0.56
Bolus refractory to endoscopy management ^a	5 (3.1)	5 (3.1)	5 (5.1)	0.67
Dilation performed at index endoscopy	10 (6.3)	5 (3.1)	2 (2.0)	0.18
Biopsies obtained at index endoscopy	52 (32.7)	42 (26.1)	27 (27.3)	0.39

IQR, interquartile range.
^aDenominator consists of only patients with an impacted food bolus on endoscopy (excluding patients undergoing upper endoscopy for suspected impaction but none found); n = 159 for daytime cases, n = 161 for evening cases, and n = 99 for overnight cases.

were taken in 28.9% (121/419) of patients at the index presentation. There was no significant difference in endoscopy duration, endoscopic interventions, or method of endoscopic management by the time of presentation. EoE was the most common suspected underlying diagnosis (36.8%, 191/519), followed by esophageal Schatzki rings (16.0%, 83/519) and peptic strictures (15.8%, 82/519). An esophageal malignancy was the culprit lesion in 4 patients, whereas no suspected etiology was reported for one-quarter of our cohort (25.2%, 131/519).

Appropriateness of postendoscopy care and follow-up

One-quarter of patients (25.2%, 131/519) presenting with an FBI did not receive appropriate postendoscopy care or follow-up. There was no difference in appropriateness of postendoscopy care by time of presentation, although it did vary significantly by initial suspected diagnosis: all patients with a suspected malignancy (100%, 4/4) and nearly all patients with a peptic stricture (97.6%, 80/82) received appropriate management or follow-up, and 86.4% (165/191) of patients with suspected EoE received appropriate treatment, investigations, or follow-up. By contrast, 56.9% (78/137) of patients who did not have a suspected diagnosis recorded at the time of the index endoscopy subsequently did not receive additional investigations (including esophageal biopsies or manometry), undergo empiric treatment with a PPI, swallowed corticosteroids, receive endoscopic dilation, or have a follow-up clinic or endoscopy visit.

A total of 287 patients (55.3%) had follow-up either in the outpatient gastroenterology clinic (111/519, 21.4%) or at a repeat outpatient endoscopy (265/519, 51.1%). The median time to follow-up after the index procedure was 64 days (IQR 44–107 days). At the

follow-up endoscopy, biopsies were taken in 74.0% (196/265) of patients and a dilation was performed in 28.7% (76/265) of cases. Among patients who underwent follow-up, the final diagnosis was changed in 22.3% (64/287) of patients to EoE (n = 22), esophageal Schatzki ring (n = 12), peptic stricture (n = 14), or other causes (n = 10, e.g., dysmotility, hiatal hernia, or reflux esophagitis). Notably, 3 new cases of esophageal cancer were diagnosed on the follow-up endoscopy.

Predictors of inappropriate postendoscopy care

Unadjusted and adjusted predictors of inappropriate care are summarized in Table 4. On univariable analysis, absence of a suspected underlying esophageal pathology (OR 8.06, 95% CI 5.13–12.65, $P < 0.001$) was most strongly associated with inappropriate postendoscopy care. By contrast, male sex, recurrent food impactions, and requirement for endoscopic extraction were significantly associated with appropriate follow-up and management. In multivariable analysis, patients with no clear diagnosis on the index procedure were approximately 7 times more likely to not receive appropriate care after procedure (aOR 7.28, 95% CI 4.49–11.78, $P < 0.001$), even after adjusting for sex, age, urban residence, first vs recurrent FBI, timing of endoscopy, weekend presentation, and duration/interventions performed. Prolonged index procedure was also associated with inappropriate postendoscopy care (aOR for each 5-minute increase in procedure duration 1.04, 95% CI 1.00–1.09, $P = 0.047$), whereas patients who required endoscopic extraction (aOR 0.39, 95% CI 0.18–0.88, $P = 0.02$) were protected. There was no evidence of effect modification by sex or weekend status on any of the covariables explored.

Table 4. Univariable and multivariable predictors of inappropriate care or follow-up postendoscopy for food bolus impaction

Predictor	Univariable OR (95% CI)	P value	Multivariable aOR (95% CI)	P value
Male	0.66 (0.43–1.00)	0.05	0.75 (0.45–1.25)	0.27
Age per 10 yr	1.08 (0.98–1.20)	0.13	0.98 (0.85–1.13)	0.79
Residence				
Urban	Reference	—	Reference	—
Rural	1.24 (0.76–2.03)	0.39	1.63 (0.90–2.99)	0.11
First food bolus impaction	1.86 (1.12–3.11)	0.02	1.53 (0.84–2.78)	0.17
Endoscopy timing				
Daytime (07:00–18:59)	Reference	—	Reference	—
Evening (19:00–23:59)	1.08 (0.69–1.69)	0.72	0.92 (0.54–1.56)	0.75
Overnight (00:00–06:59)	0.91 (0.52–1.56)	0.73	1.05 (0.54–2.02)	0.89
Weekend presentation	1.07 (0.72–1.59)	0.73	1.11 (0.69–1.79)	0.67
Duration of endoscopy (per 5 min)	1.02 (0.99–1.05)	0.15	1.04 (1.00–1.09)	0.05
Type of endoscopic treatment				
No treatment	Reference	—	Reference	—
Push	0.60 (0.37–0.99)	0.04	1.06 (0.58–1.94)	0.84
Extraction	0.29 (0.15–0.56)	<0.001	0.39 (0.18–0.88)	0.02
Refractory	2.08 (0.70–6.24)	0.19	1.13 (0.32–3.99)	0.85
Suspected pathology at endoscopy ^a				
No underlying disorder	Reference	—	Reference	—
Eosinophilic esophagitis	0.13 (0.08–0.22)	<0.01	0.14 (0.08–0.27)	<0.01
Esophageal ring/web	0.09 (0.04–0.20)	<0.01	0.08 (0.04–0.19)	<0.01
Peptic stricture	0.03 (0.01–0.09)	<0.01	0.03 (0.01–0.10)	<0.01
Dysmotility	0.28 (0.07–1.11)	0.07	0.42 (0.10–1.85)	0.25
Other	0.42 (0.18–0.97)	0.04	0.49 (0.20–1.20)	0.12

Bold indicates statistically significant.

aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

^aNo patients with peptic stricture or malignancy received inappropriate postendoscopy management.

Endoscopist's experience or presence of a trainee did not affect the appropriateness of postendoscopy care.

Recurrent FBI

Recurrence of FBI occurred in 10.2% (53/519) of cases, at a median time of 72.3 weeks (IQR 39.0–119.1 weeks) after the index endoscopy. There was no statistical difference in the risk of recurrent FBI when stratified by initial appropriateness of care, although this trended toward significance ($P = 0.10$). No difference in the hazard of recurrent FBI was observed based on attendance to clinical or endoscopic follow-up ($P = 0.90$), timing of initial endoscopy ($P = 0.45$), or initial etiology of FBI ($P = 0.26$) (Figure 1). Appropriateness of care did not affect the hazard of recurrent impaction for different etiologies of FBI (Figure 2).

DISCUSSION

In this population-based cohort study of 519 patients who underwent an endoscopy for FBI, we demonstrated that conservatively, at least 25% of patients did not receive appropriate postendoscopy care. Inappropriate care was associated most strongly with the absence of a suspected underlying esophageal pathology at the time of the index endoscopy, highlighting that

physician cognitive bias may be associated with loss to follow-up (12). Finally, we demonstrate that appropriate postendoscopy care is crucial because nearly 1 in 5 patients had a change in the final diagnosis at a subsequent follow-up visit, including the identification of 3 additional cases of esophageal cancer that would have been otherwise missed. Taken together, our findings highlight that clinicians must be cognizant of the risk of loss to follow-up among patients who present with an FBI and that system-level interventions should be implemented to mitigate this risk.

The absence of a clear endoscopic esophageal abnormality or suspected underlying esophageal diagnosis at the index endoscopy, particularly in patients presenting with their first FBI, was associated with inappropriate postendoscopy care. Indeed, inappropriate follow-up was more strongly associated with an unclear index diagnosis than previously established patient-related or system-related risk factors such as patient sex, rural residence, overnight procedure timing, or weekend presentation (13–16). We hypothesize that this strong association represents a potential cognitive bias: when no underlying esophageal pathology is considered at the time of FBI, it is less likely that clinicians or patients will pursue follow-up investigations or treatment. Cognitive bias is defined by the use of automatic, intuitive, or

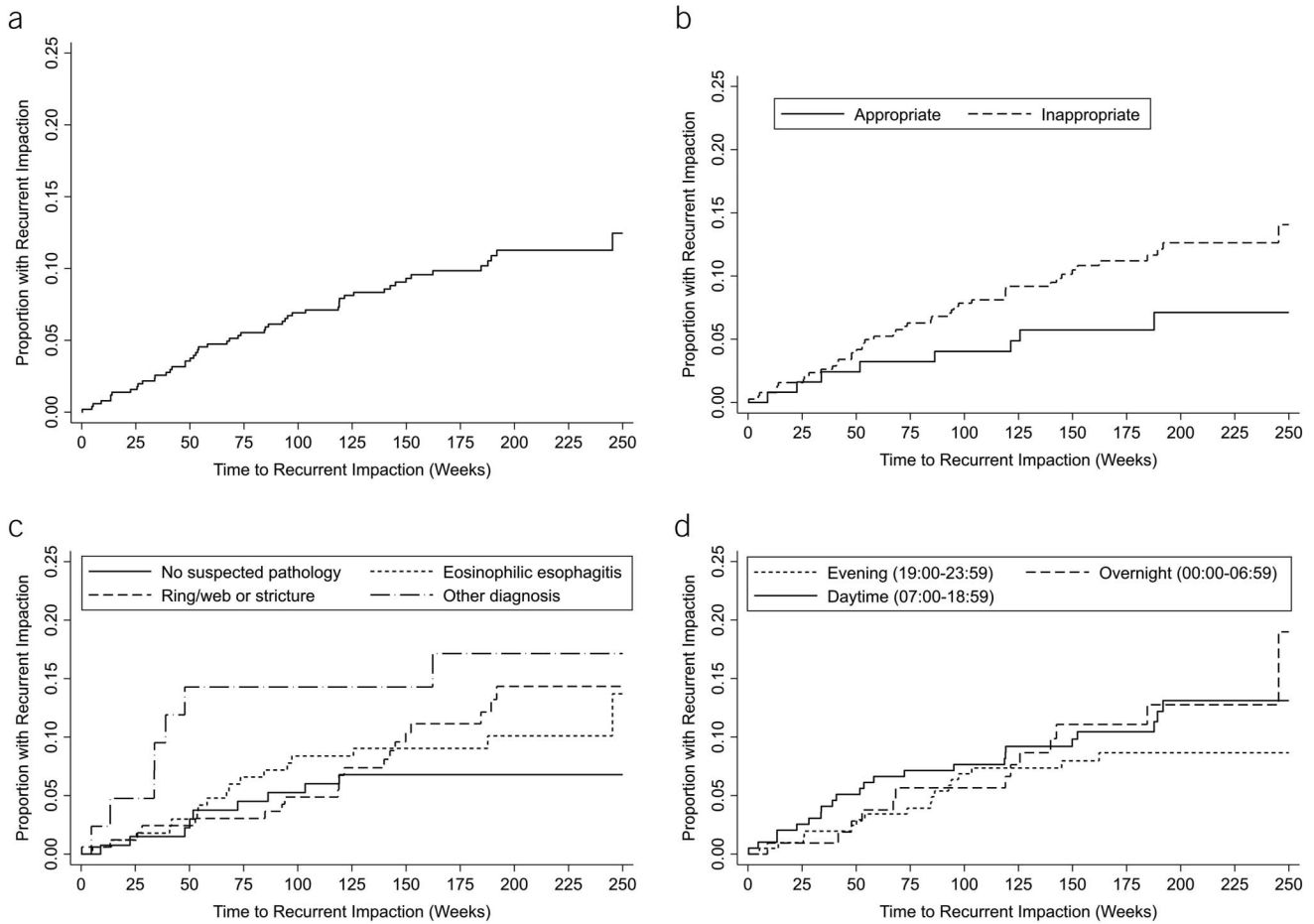


Figure 1. Kaplan-Meier survival curve for time to recurrent food bolus impaction. (a) Overall population, (b) by appropriateness of postendoscopy care (log-rank P value = 0.10), (c) by underlying esophageal pathology (P = 0.26), and (d) by time of presentation (P = 0.45).

routine mechanisms to make decisions, which override conscious, deliberate decision-making (17). Cognitive biases have been associated with lower diagnostic accuracy and occurrence of medical error (12,18). When managing an FBI, the clinician’s attention is typically focused on immediate technical factors relating to impaction removal. This can result in anchoring, which may then detract from careful inspection for other endoscopic evidence of esophageal pathology. We hypothesize that this may be why prolonged index procedure duration was also associated with an increased likelihood of inappropriate postendoscopy follow-up. Finally, premature closure bias when the endoscopic appearance is normal can lead to a failure of recognition that additional postendoscopy investigations such as manometry or biopsies may be warranted.

Importantly, the absence of endoscopic findings does not exclude the presence of potentially important esophageal pathology. For example, Sperry et al (19) also showed that only 27% of patients with an esophageal FBI underwent the requisite biopsies needed to make a diagnosis of EoE, and patients who are not biopsied after an esophageal impaction are at significantly higher risk for loss to follow-up (10). In our cohort, only 30% of patients had biopsies taken at the index presentation, and although this may reflect some hesitancy to biopsy acutely inflamed mucosa at the time of an impaction, the final diagnosis changed in approximately 20% of patients who did have subsequent follow-

up visits. The initial suspected cause may be incorrect because endoscopic visualization may be limited by esophageal irritation or food debris, the interpretation of abnormalities such as esophageal trachealization or a Schatzki ring may be confounded by impaction-related retching, and esophageal biopsies, which are diagnostically helpful, are infrequently taken during the acute episode (20). Nevertheless, accurate identification of the cause of the food impaction is critical because almost all patients have an underlying pathology (1). Not only were 3 additional cases of esophageal cancers diagnosed on follow-up in our cohort but also missing the diagnosis even for benign etiologies such as EoE or peptic strictures results in a missed opportunity for appropriate therapy and the potential for disease progression (e.g., esophageal stricturing) (21). Inappropriate follow-up was associated numerically but not statistically with recurrent impactions in our study, but this outcome alone does not capture the substantial burden of progressive esophageal symptoms such as chronic reflux, dysphagia, accommodative eating behaviors, food avoidance, and poor quality of life for untreated patients (22–24).

What are the implications of this work for clinical practice? First, we hope these results increase awareness among gastroenterologists that careful inspection of the esophagus and establishing the root cause of an FBI is a critical component of the index procedure, beyond just the technical aspects of acute impaction. Second, our results highlight that this is a patient

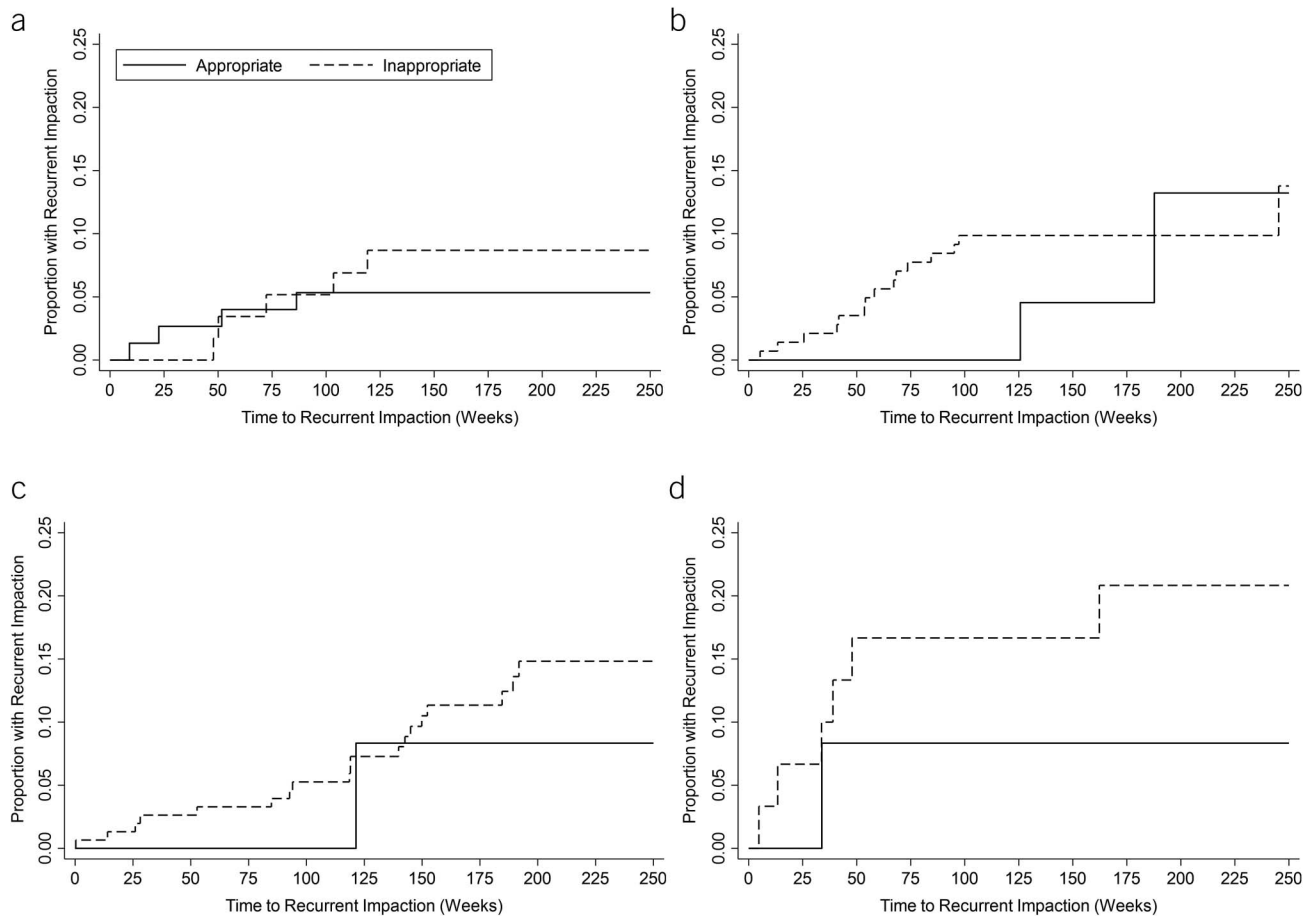


Figure 2. Kaplan-Meier survival curve for time to recurrent food bolus impaction by appropriateness of postendoscopy care (appropriate care solid line vs inappropriate care dashed line) for patients with (a) no suspected underlying diagnosis (log-rank P value = 0.47), (b) eosinophilic esophagitis (P = 0.71), (c) Schatzki ring/web or peptic stricture (P = 0.65), and (d) other etiologies (P = 0.36).

population at high risk for loss to follow-up. Systematic quality improvement measures targeting the appropriateness of postendoscopy care and follow-up after an esophageal FBI should be considered. A previous trial showed that the use of an automated phone and text messaging system allowing patients to schedule follow-up appointments immediately after ED discharge resulted in a 25.9% improvement in follow-up adherence (25). Previous studies have also demonstrated that the incorporation of a standardized patient navigator, who helps guide patients through the health care system by communicating with other providers, setting up appointments, and accessing community resources, results in improved follow-up (26).

We do caution that our findings are only generalizable to patients undergoing endoscopy because we used the need for an unplanned upper endoscopy as a criterion for defining cohort inclusion. However, in many ED, pharmacologic therapy may be tried as a low-cost and relatively low-risk intervention before endoscopic evaluation. For example, in a cohort of over 400 patients presenting with food impaction and receiving glucagon, Haas et al (27) demonstrated that nearly 40% resolved with pharmacotherapy alone. Oral nitroglycerin has also been tried, albeit with less potent efficacy compared with glucagon (28). The American Society of Gastrointestinal Endoscopy recommends that intravenous glucagon remains an acceptable option for treatment, but should not delay definitive endoscopic removal

(7). Even among patients who resolve a food impaction with pharmacotherapy alone, it should be noted that subsequent gastroenterology evaluation for a potential underlying etiology is warranted and particular care should be taken to ensure these patients are not lost to follow-up.

Our study has several strengths. To the best of our knowledge, this is the largest, population-based multicenter cohort study evaluating outcomes after esophageal FBI. We used multiple data sources to ascertain accurate and comprehensive patient-level and procedure-level data. However, we also acknowledge important limitations. First, retrospective studies may be limited by recall, observation, or confirmation bias. To reduce this risk, we used a highly conservative composite definition of appropriate care, given that it may be difficult to accurately adjudicate a gastroenterologist's intent for follow-up at the time of FBI from their endoscopy report alone. This likely explains the lower rate of inappropriate postendoscopy reported here compared with other cohorts, where up to 50% of patients are lost to follow-up after FBI (10). Second, our study could not adjust for long-term patient symptoms (e.g., preceding dysphagia history) because these were poorly recorded in the medical record but may influence probability of follow-up. Finally, our analysis could not identify cases in which inappropriate care may be driven by patients who were noncompliant with follow-up; this datapoint is difficult to accurately ascertain retrospectively. Other data points that are difficult to evaluate in this retrospective design include *ad hoc* follow-ups

outside of routine clinic visits. For example, the treating gastroenterologist would be responsible for all biopsy results, but it was impossible for us to accurately ascertain whether they may have called a patient by telephone with the biopsy findings outside of a scheduled clinic encounter. During the study period, a dedicated gastroenterology or endoscopy after-visit summary was not in use in our health system but has recently been introduced when we migrated to an Epic Systems Corporation electronic health record in 2022. During the study period, all patients presenting through the ED received standardized discharge instructions on an ED discharge form: because this was uniformly used as the ED record, we could not differentiate appropriateness of care based on the discharge instructions alone. Rather, we used a composite of different potential appropriate interventions, including follow-up visits, biopsies, and prescriptions.

In conclusion, in this cohort of 519 patients who presented to hospital with an esophageal FBI requiring endoscopic intervention, we showed that one-quarter of patients received inappropriate postendoscopy care or follow-up and that physician factors such as cognitive bias may play an important role in loss to follow-up. Finally, our study highlights a quality-of-care gap because appropriate follow-up resulted in a change in the diagnosis for 20% of patients. Quality improvement studies targeting physician-level, patient-level, and system-level interventions are required to improve postendoscopy care for this population.

CONFLICTS OF INTEREST

Guarantor of the article: Christopher Ma, MD, MPH.

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Data availability: Deidentified patient data are available on request.

Study Highlights

WHAT IS KNOWN

- ✓ Esophageal food bolus impactions (FBI) are a common gastrointestinal emergency.
- ✓ Management of esophageal FBI requires both urgent endoscopic evaluation and treatment of any underlying esophageal pathology.

WHAT IS NEW HERE

- ✓ In this population-based multicenter cohort study of 519 patients presenting with FBI, 25% of patients did not receive appropriate postendoscopy care.
- ✓ The strongest predictor of inappropriate care was the absence of a suspected esophageal pathology at the time of index endoscopy.
- ✓ Twenty percent of patients who did undergo follow-up had a change in diagnosis for the etiology of their FBI.

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