

ORIGINAL ARTICLE

Adherence to therapeutic gastroscopy guidelines for acute esophageal food bolus impaction: Impact on adverse outcomes and length of stay

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Key words

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Abstract

Background and Aim: According to the European Society of Gastrointestinal Endoscopy (ESGE), gastroscopy should be conducted within 6 h for complete obstruction and 24 h for incomplete obstruction due to food bolus impaction. This study explores whether adults with acute esophageal food bolus (FB) impaction experience adverse outcomes when their time to esophagogastroduodenoscopy (EGD) deviates from the recommended guidelines.

Methods: A retrospective review was performed on the records of 248 patients who presented at the study site between 2015 and 2022 with symptoms of FB impaction.

Results: Two hundred and forty-eight patients underwent EGD for FB impaction. Grade 1 (erosion, ulceration), Grade 2 (tear), and Grade 3 (perforation) complications were present in 31.6%, 6.9%, and 0.8% of cases, respectively. Of the 134 (54.0%) patients with complete obstruction, 51 (38.1%) received EGD within the recommended 6 h. Of the 114 (46%) patients with incomplete obstructions, 93 (81.6%) received EGD within the recommended 24 h. There was no statistically significant correlation between length of stay (LOS) post-EGD and any of ingestion to presentation time, presentation to EGD time, or ingestion to EGD time. Age and complication level were greater predictors of longer LOS than presentation to EGD time. Patients who presented in hours were significantly more likely to receive EGD within the 6- and 24-h guidelines than those who presented out of hours (50.7% vs 22.0%).

Conclusion: Neither time to EGD from ingestion of food bolus nor time to EGD from hospital presentation correlated with complication rate, complication severity, or length of stay post-EGD.

Introduction

Food bolus (FB) impaction is a gastrointestinal emergency and is estimated to have an annual incidence of between 13 and 25 per 100 000.¹ The majority of food boluses (80–90%) will pass spontaneously, while the remaining 10–20% require endoscopic intervention.² Presentations can range from subtle dysphagia and retrosternal discomfort to an inability to tolerate secretions and respiratory compromise. Eosinophilic esophagitis (EoE) is the most common risk factor, present in up to 33% of cases.³ Other risk factors include structural abnormalities (such as esophageal strictures or rings) and age, predominantly due to the increased incidence of esophageal dysmotility.⁴ FB impaction is categorized into two types: incomplete and complete obstruction.

Initial pharmacological management such as glucagon plays a role while patients await esophagogastroduodenoscopy

(EGD), with a response rate of 32.8%.⁵ Endoscopic techniques however, including mechanical removal of impacted material and stricture dilatation, are the mainstay in FB impaction management. The European Society of Gastrointestinal Endoscopy (ESGE) recommends performing EGD within 6 and 24 h for complete and incomplete FB obstruction, respectively. These guidelines are driven by the association between delayed EGD and poorer patient outcomes. Compared with patients who receive EGD within 12 h of impaction, those who receive EGD after 24 and 72 h of impaction have a 14-fold and 26.81-fold increase in major complications (perforation and associated sequelae), respectively.^{6,7} Complete obstruction has a further added risk of airway compromise, aspiration, and mortality due to reduced secretion tolerance.^{8,9}

To the best of our knowledge, no group has assessed the real-world effect of these guidelines. Limited data exist on

the correlation between the length of hospital stay (LOS) post-EGD and time from presentation to EGD. Additionally, no previous studies, to our knowledge, have categorized patients into complete and incomplete obstructions to explore the differences between complication rates and LOS post-EGD.

This study explores whether deviation from the ESGE guidelines for adults with either complete or incomplete FB impaction affects rates of complications or LOS post-EGD.

Methods

This was a retrospective, observational study using electronic records of 248 patients aged 18 years or older who presented to Wollongong Hospital Emergency Department (ED) between January 2015 and January 2022 with symptoms of FB impaction. Local endoscopy software was used to identify patients meeting the inclusion criteria, and data were extracted from the patients' electronic medical records. Age, sex, timestamps (patient reported FB ingestion, ED presentation, EGD, and discharge), type of FB, glucagon usage, evidence of complete obstruction (defined as an inability to swallow saliva), biopsy status and results, endoscopic technique, and complications were collated. Time between ingestion and ED presentation, ED presentation and EGD, EGD and discharge, and overall LOS were calculated. Complications were categorized as Grade 1 (erosions, ulcerations), Grade 2 (tears), or Grade 3 (perforations), with aspiration as a separate category. Due to the project's classification as an audit, formal ethics review was not required.

Descriptive and statistical analysis was conducted using RStudio V4.1.¹⁰ Continuous variables were evaluated using means and standard deviations (SDs), with categorical variables using counts and proportions. Statistical differences were evaluated using chi-squared tests of association for categorical variables, and Mann-Whitney *U* tests for continuous data. Magnitudes of association were according to Rosenthal's benchmarks,¹¹ and phi-coefficients were according to Yule.¹² Linear regression modeling was conducted where continuous variables were compared. Correlations were considered statistically significant when $P < 0.05$.

Results

Two hundred and forty-eight patients underwent EGD for FB impaction, with 174 having confirmed impaction on EGD. The mean age was 59.7 years (SD = 20.3) and most were male ($n = 142$, 57.3%). FB type was predominantly meat ($n = 197$, 79.4%). Glucagon was administered to 123 patients (49.8%). Overall, 134 (54.0%) had complete obstruction, with 29 (21.6%) of these passing the FB prior to EGD. The history of FB impaction was known in 144 (58.1%) of the cases. The preferred endoscopic technique was removal with the Olympus oblique distal attachment device (D-206-04) ($n = 38$, 31.9%). Biopsies were taken in 91 cases (36.7%), with 31 (33%) of these having confirmed EoE. Table 1 provides a summary of cohort demographic information.

Complications. In total, 146 (59.1%) had no complications. Grade 1 complications were the most prevalent ($n = 78$, 31.6%), followed by Grade 2 ($n = 17$, 6.9%) and Grade 3 ($n = 2$, 0.8%).

There was a total of four aspirations ($n = 4$, 1.6%). Only two cases of perforation occurred, and both underwent EGD in adherence to ESGE guidelines; the incomplete obstruction was addressed with EGD within 4 h, and the complete obstruction within 3.5 h. However, both cases resulted in extended hospital stays—40 days for the incomplete case and 4 days for the complete case—compared with the respective averages of 1.5 days for incomplete obstructions and 0.9 days for complete ones. Complication grade was not correlated with either ingestion to presentation time or presentation to EGD time ($P = 0.7$ and $P = 0.3$, respectively); however, it was significantly correlated with post-EGD LOS ($U = 20.3$, $\eta^2 = 0.067$, $P < 0.001$), showing a moderate effect size.

Regression modeling evaluated the correlation between post-EGD LOS and three time intervals: ingestion to presentation, presentation to EGD, and ingestion to EGD. Overall, no significant correlations were found. However, for patients with complete obstruction, a significant positive correlation was identified between the time from presentation to EGD and post-EGD LOS. Specifically, longer wait times from presentation to EGD were associated with longer hospital stays ($\beta = 0.9549$, $R^2 = 0.0328$). This indicates that while the correlation is statistically significant, the impact on LOS is relatively small, explaining only 3.28% of the variance. Table 2 summarizes these findings, emphasizing the significant correlation between presentation to EGD time and post-EGD LOS in this patient group.

Further regression models evaluated the impact of time to EGD on post-EGD LOS alongside factors traditionally associated with increased LOS such as complication grade and age, and these results are summarized in Table S1, Supporting information. Results suggested that complication grade and age were greater predictors of post-EGD LOS than time to EGD.

Adhering to the ESGE guidelines for time to EGD.

Of the 134 patients with complete obstruction, 51 (38.1%) received EGD within the ESGE recommended guideline of 6 h from ED presentation. Of the 114 patients with incomplete obstructions, 93 (88.7%) received EGD within the recommended 24 h. Time of day at which the patient presented was a significant factor in whether each of the 6- and 24-h guidelines were adhered to. For patients with complete obstruction, 50.7% ($n = 38$) adhered to the ESGE guideline when the presentation was within regular working hours (7 am to 7 pm) compared with 22.0% ($n = 13$) when the presentation was outside regular working hours (7 pm to 7 am) ($\chi^2 = 11.5$, $\phi = 0.277$, $P < 0.001$). For patients with incomplete obstruction, 75.9% ($n = 63$) adhered to the ESGE guideline when the presentation was within regular working hours compared with 96.8% ($n = 30$) when the presentation was outside regular working hours ($\chi^2 = 6.54$, $\phi = 0.214$, $P < 0.05$).

Post-EGD LOS for both complete and incomplete obstructions according to whether the ESGE guidelines were adhered to were also evaluated. Median post-EGD LOS are shown in Figure 1. For patients with complete obstruction, there was no significant difference between post-EGD LOS for those who received their EGD within 6 h compared with those who did not ($P > 0.9$). However, for patients with incomplete obstruction, there was a statistically significant relationship between not

Table 1 Summary of cohort descriptives, including stratification to complete or obstruction

Mean [95% CI] or <i>n</i> (%)	Total cohort (<i>n</i> = 248)	Incomplete obstructions (<i>n</i> = 114)	Complete obstructions (<i>n</i> = 134)	<i>P</i> -values
Age (years)	59.7 [57–62]	66.1 [63–70]	54.2 [51–58]	<0.001
Sex				0.4
Female	106 (42.7%)	52 (45.6%)	54 (40.3%)	
Male	142 (57.3%)	62 (54.4%)	80 (59.7%)	
History of FB	144 (58.1%)	63 (55.3%)	81 (60.4%)	0.4
Time of day				<0.01
In hours	158 (63.7%)	83 (72.8%)	75 (56.0%)	
Out of hours	90 (36.3%)	31 (27.2%)	59 (44%)	
Glucagon administered	123 (49.8%)	68 (60.2%)	56 (41.8%)	<0.01
Ingestion to presentation time (h)	17.2 [14–21]	22.0 [17–27]	13.1 [7.9–18]	<0.001
Presentation to EGD time (h)	13.5 [12–15]	16.8 [14–20]	10.8 [9.5–12]	<0.001
Ingestion to EGD time (h)	30.7 [27–35]	38.8 [33–45]	23.9 [18–29]	<0.001
Complete obstruction and EGD within 6 h	51 (38.1%)	—	—	—
Incomplete obstruction and EGD within 24 h	93 (81.6%)	—	—	—
FB present during EGD	174 (70.4%)	69 (61.1%)	105 (78.4%)	<0.01
Type of FB				<0.05
Meat	198 (79.8%)	82 (72.8%)	115 (85.8%)	
Other	46.0 (18.5%)	29 (25.4)	17 (12.7%)	
Unknown	4.0 (1.6%)	2 (1.8%)	2 (1.5%)	
Complication grade				0.9
0	146 (59.1%)	71 (62.3%)	75 (56.4%)	
1	78 (31.6%)	33 (28.9%)	45 (33.8%)	
2	17 (6.9%)	7 (6.1%)	10 (7.5%)	
3	2 (0.8%)	1 (0.9%)	1 (0.8%)	
Aspirations	4 (1.6%)	2 (1.8%)	2 (1.5%)	
Total LOS (days)	1.7 [1.3–2.1]	2.2 [1.3–3.0]	1.3 [1.0–1.6]	<0.01
LOS post-EGD (days)	1.1 [0.73–1.6]	1.5 [0.64–2.3]	0.9 [0.58–1.1]	0.3
Esophageal biopsy obtained	91 (36.7%)	34 (29.8%)	57 (42.5%)	<0.05

CI, confidence interval; EGD, esophagogastroduodenoscopy; FB, food bolus; LOS, length of stay.

Note: Bold values are to highlight significant results.

Table 2 Regression modeling for time intervals as predictors of post-esophagogastroduodenoscopy (EGD) length of stay (LOS)

Time interval (days)	Post-EGD LOS (days)	Post-EGD LOS (days) <i>Complete only</i>	Post-EGD LOS (days) <i>Incomplete only</i>
Ingestion to presentation	$\beta = 0.3085$ $R^2 = 0.0125$ $F(1,246) = 3.11$ $P = 0.079$	$\beta = 0.0807$ $R^2 = 0.0040$ $F(1,132) = 0.529$ $P = 0.5$	$\beta = 0.6081$ $R^2 = 0.0203$ $F(1,112) = 2.32$ $P = 0.131$
Presentation to EGD	$\beta = 0.2808$ $R^2 = 0.00174$ $F(1,246) = 0.429$ $P = 0.5$	$\beta = 0.9549$ $R^2 = 0.03284$ $F(1,132) = 4.483$ $P < 0.05$	$\beta = -0.1203$ $R^2 = 0.0002678$ $F(1,112) = 0.03$ $P = 0.9$
Ingestion to EGD	$\beta = 0.2683$ $R^2 = 0.0125$ $F(1, 246) = 3.12$ $P = 0.079$	$\beta = 0.1224$ $R^2 = 0.0103$ $F(1,132) = 1.368$ $P = 0.2$	$\beta = 0.3579$ $R^2 = 0.0111$ $F(1,112) = 1.262$ $P = 0.3$

Note: Bold values are to highlight significant results.

meeting the 24-h benchmark and longer post-gastroscopy LOS, although this was of small effect size ($U = 5.30$, $\eta^2 = 0.038$, $P < 0.05$). Patients however who received EGD beyond the

recommended ESGE guidelines were not more likely to develop complications in either the complete or incomplete obstruction groups ($P = 0.8$ and $P = 0.3$, respectively).

Median LOS Post-Endoscopy by Obstruction and Guidelines Adherence

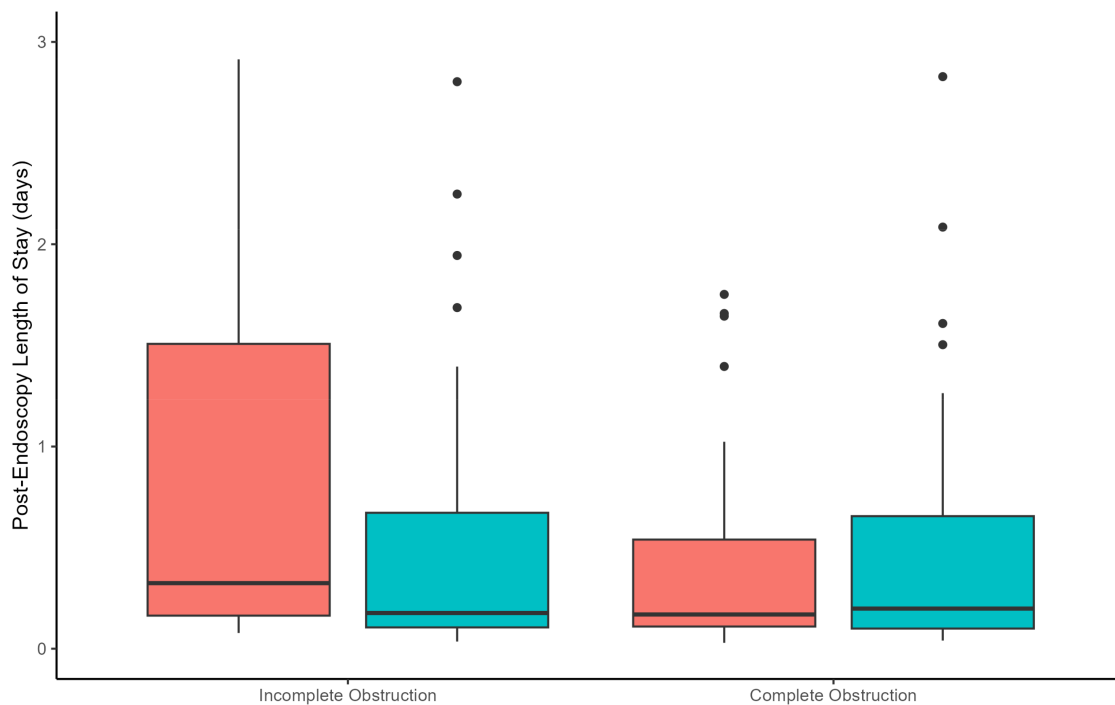




Figure 1 Median length of hospital stay for obstructions that did or did not meet the recommended guidelines. Met guidelines: , No; , yes.

Discussion

Despite the 2016 ESGE guidelines advocating for EGD within 6 h of presentation for complete obstruction and 24 h for incomplete obstructions, it is important to note that they are supported by low-quality evidence, including expert opinion and retrospective studies.⁹ In this study cohort, variables such as presentation to EGD time, total ingestion to EGD time, and adherence to the ESGE guideline for time to EGD did not significantly correlate with complication rate, complication grade, or LOS post-EGD. However, among patients with incomplete obstruction, a statistically significant association was observed between meeting the 24-h benchmark and longer post-gastroscopy hospital stay, albeit with a small effect size. However, caution is warranted in interpreting this finding, as the mean post-gastroscopy hospital stay was nearly identical (1.49 days when the 24-h guideline was met and 1.48 days when not met). Therefore, the apparent statistical significance might be partly attributed to this considerable variance, particularly among those who underwent gastroscopy within the 24-h timeframe (4.97 days compared with 1.74 days for those who did not receive gastroscopy within 24 h).

Additionally, a correlation between increasing complication grade and increasing LOS post-EGD was observed. Given time to EGD did not influence complication rate or grade in our cohort; it is therefore possible that other factors relating to either patient characteristics or the endoscopist might account for this

correlation. Furthermore, EoE was not associated with an increased complication rate.

Krill *et al.* also examined the effect of delayed EGD for FB impaction. Similarly, they found that patients who received EGD at least 12 h after presentation had a similar rate of 30-day mortality and 30-day adverse events compared with those who received EGD within 12 h of presentation. Notably, they found that the use of accessories during the EGD led to a higher rate of adverse events.¹³

In this study, increased age was not associated with an increased complication rate, but it was associated with a significantly increased LOS post-EGD. This divergence in predictors emphasizes the complexity of factors influencing patient outcomes and highlights the need for further research into predictors of extended LOS post-EGD in FB impactions, including the implications of prolonged wait times for EGD on both complications and post-EGD LOS. Identifying such factors could help prevent extended LOS, reduce healthcare costs, and enhance patient experiences.

Not surprisingly, individuals presenting during regular work hours (7 am to 7 pm) had a significantly shorter mean presentation to EGD time, underscoring the challenges associated with performing endoscopic procedures after hours. However, this study demonstrated that those presenting outside regular hours (7 pm to 7 am) who waited longer for EGD did not have increased complications or LOS post-EGD. These findings

suggest that urgent after-hours EGD may not be as imperative as previously believed. Nonetheless, patient comfort should be considered when determining the timing of EGD after presentation.

This study has several limitations. First, patients were recruited from a single Health Service, limiting the study's generalizability. Additional limitations arise from the retrospective nature of the study, potentially overlooking unmeasured or unmeasurable confounding variables. Recall of the time of ingestion by patients may be inaccurate, practitioner documentation may not be clear, and generic timestamps such as 12 pm for lunch and 7 pm for dinner may influence results. LOS differences may also be confounded by a few outlier patients, such as the one with a 40-day LOS. Additionally, the study period did overlap with the COVID-19 pandemic. In 2020, ingestion to presentation time increased and post-gastroscopy LOS was longer, but both metrics returned to normal by 2021. Time to gastroscopy was quicker in 2020, likely due to reduced elective procedures, with overall LOS showing no significant changes. However, the comprehensive evaluation of relevant variables and covariates in this study represents a robust assessment of factors determining patient outcomes from FB impaction.

In conclusion, further prospective, multicenter studies may evoke a revision of the current ESGE guidelines on time to EGD for FB impaction. Standardized protocols in emergency departments can streamline initial management and facilitate timely referrals to the local gastroenterology or surgical team. In conclusion, while the importance of prompt therapeutic EGD is necessary for patient comfort, our study did not illustrate a reduced complication rate, complication grade, or post-EGD LOS by doing so. Continued research is needed to optimize patient care and outcomes in cases of FB impaction.

Data availability statement. Data from the study can be made available upon evaluation of request.

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Supporting information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. Regression modelling on complications and age impacting LOS.