Does guideline adherence lead to empty stomachs?

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Introduction

Glucagon-like peptide-1 receptor agonists (GLP1) have become widely used for the treatment of diabetes and for weight loss. These medications delay gastric emptying, an effect that helps regulate blood sugar and manage weight. While delayed gastric emptying contributes to these benefits, it is problematic in a procedural setting where retained gastric contents increase the risks of aspiration and aborting a procedure. Current multispecialty guidelines recommend either prolonged fasting or holding GLP1s for a prolonged period to reduce these risks (Kindel et al, 2024). However, limited data support these guidelines and important questions remain regarding the duration that GLP1s should be held, the duration of fasting, and which patients are at risk. Therefore, we examined the records of patients who underwent upper endoscopy procedures to determine how these factors contribute to having residual gastric contents.

Methods

We performed a retrospective cohort study of patients who underwent upper endoscopy procedures at an outpatient clinic at the University of Wisconsin, Madison (IRB 2024-0710). Adult patients having elective upper endoscopy procedures at the Digestive Health Center between 1/1/2014 and 12/31/2024 were included. Patients who underwent a repeat endoscopy within 7 days, with a body mass index <15, or who were fasting from solid food for >72 hours were excluded from the study. We searched procedure notes for the primary outcome of having residual solid food on endoscopy. GLP1 medication use was manually reviewed for accuracy and separated into medication formulations with daily or weekly dosing. Our primary analysis assessed the effect of GLP1 medications on gastric emptying adjusted for age, sex, body mass index, fasting time, diabetes, and other medical comorbidities and medications using a generalized additive model with a logit link and binomial distribution, with non-linear effects estimated using penalized regression splines. Secondary analyses assessed the effects of fasting and/or holding GLP1 medications prior to the procedure.

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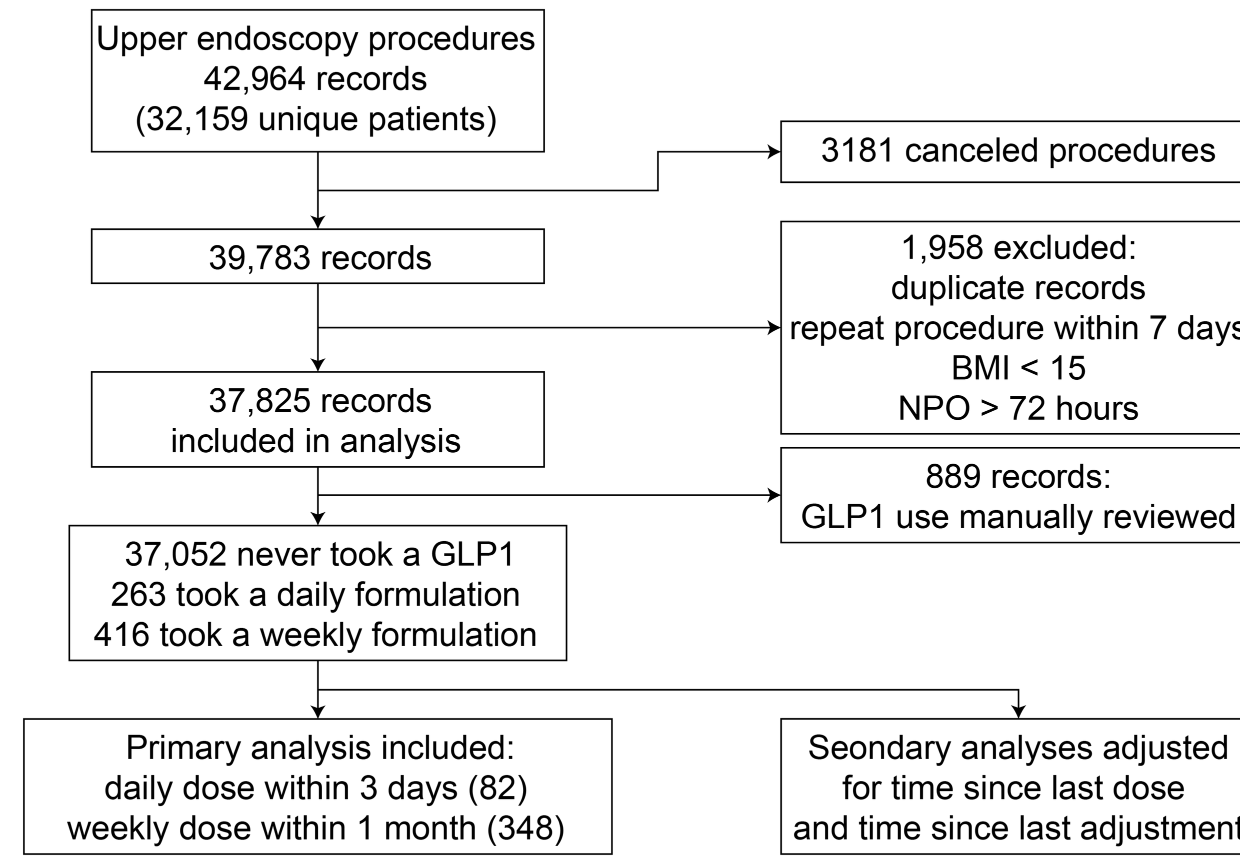


Patient characteristics & GLP1 use

Patient characteristics

GLP1R agonist use:	No N = 37,395[1]	Yes N = 430[1]
Age	51 (16)	57 (12)
Sex		
Female	22,370 (60%)	278 (65%)
Male	15,025 (40%)	152 (35%)
BMI	28 (6)	34 (6)
Race		
White	33,573 (90%)	375 (87%)
Black or African American	1,322 (3.5%)	27 (6.3%)
Asian	1,264 (3.4%)	12 (2.8%)
American Indian or Alaska Native	257 (0.7%)	2 (0.5%)
Multiracial	400 (1.1%)	8 (1.9%)
Unknown	579 (1.5%)	6 (1.4%)
Charlson index	1.10 (1.72)	2.22 (2.04)
Hypertension	12,751 (34%)	333 (77%)
Diabetes	4,315 (12%)	378 (88%)
Current smoker	3,479 (9.3%)	32 (7.4%)
Past smoker	11,031 (30%)	160 (37%)
Marijuana use	2,933 (7.9%)	34 (7.9%)

[1] Mean (SD); n (%)

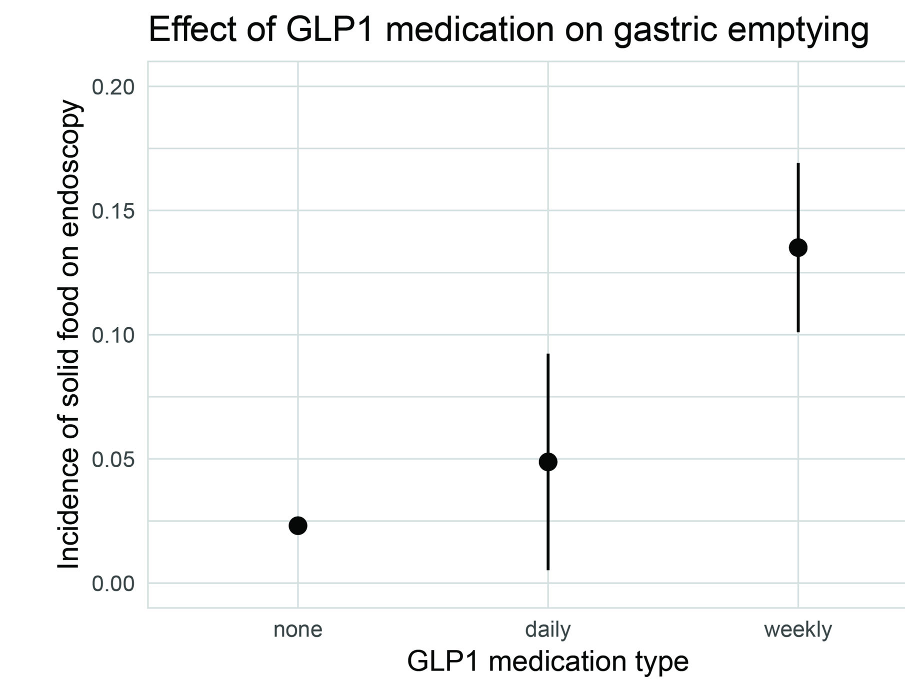
Characteristic	Food absent n = 36911[1]	Food present n = 914[1]
Age	51 (16)	53 (17)
BMI	28 (6)	29 (7)
Fasting time	20 (9)	16 (8)
Diabetes	4,456 (12%)	237 (26%)
Gastroparesis	453 (1.2%)	67 (7.3%)
Opioids	1,334 (3.6%)	79 (8.6%)
GLP1 type		
none	36,532 (99%)	863 (94%)
daily	78 (0.2%)	4 (0.4%)
weekly	301 (0.8%)	47 (5.1%)

[1] Mean (SD); n (%)

Characteristic	daily dose N = 82[1]	weekly dose N = 348[1]
GLP1		
dulaglutide	0 (0%)	205 (59%)
exenatide	15 (18%)	0 (0%)
liraglutide	56 (68%)	0 (0%)
none	0 (0%)	0 (0%)
semaglutide	11 (13%)	115 (33%)
tirzepatide	0 (0%)	28 (8.0%)
Last dose	1.0 [1.0, 1.0]	5.0 [3.0, 7.0]
Dose	1.80 [1.20, 2.00]	1.50 [0.75, 3.00]

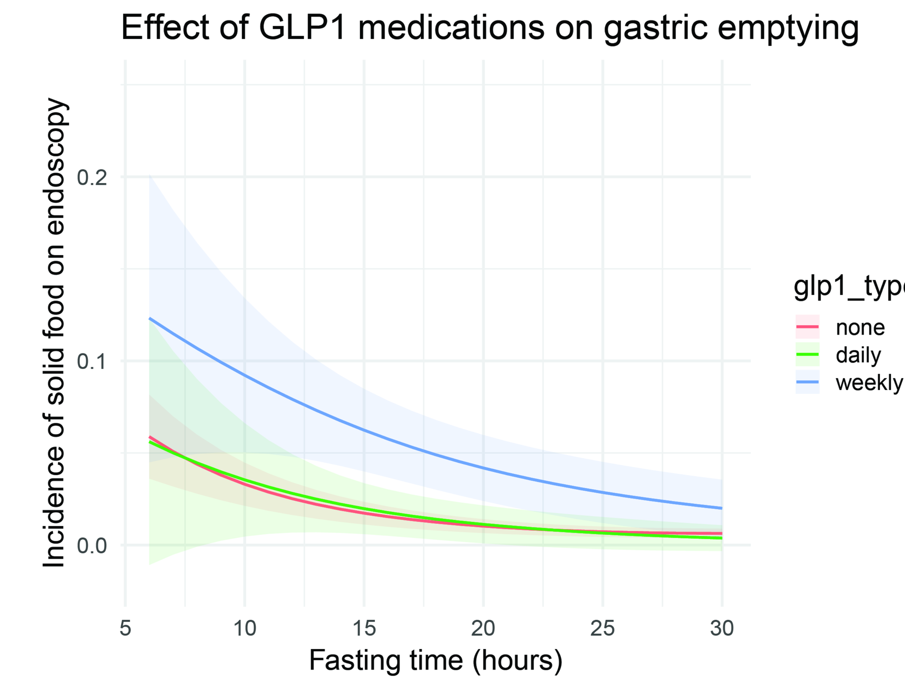
[1] n (%); Median [Q1, Q3]

Effect of GLP1s on residual food



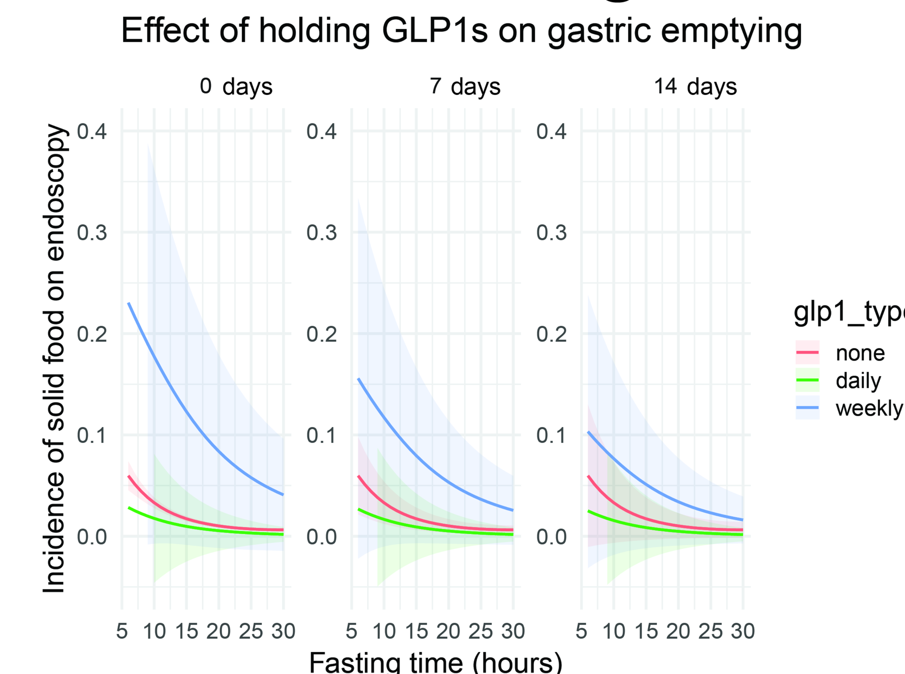
The effect of GLP1 medications on gastric emptying was estimated using counterfactual comparisons after fitting a logistic regression model. There was no difference in the predicted incidence of finding food on endoscopy between patients taking a GLP1 with daily dosing and those not taking one (0.1%, 95% CI [-2.2, 2.5]). However, GLP1 medications with weekly dosing increased the incidence of finding food on endoscopy (5.5%, 95% CI [3.1, 7.9]).

Effect of GLP1s with longer fasting



Longer periods of fasting reduce the predicted incidence of finding food on endoscopy for patients not taking GLP1 medications (-5.0%, 95% CI [-5.9, -4.1]) and especially for patients taking a GLP1 medication with weekly dosing (-17.6%, 95% CI [-26.6%, -5.6%]; 24 hours compared to 8 hours).

Effect of holding GLP1 medications



Holding GLP1 medications with weekly dosing for longer periods reduced the predicted incidence of finding food on endoscopy.

Residual food, worse outcomes

Complications associated with food on endoscopy

	Food absent n = 36911[1]	Food present n = 914[1]	OR	95% CI	p-value
Poor visualization	11 (<0.1%)	19 (2.1%)	71.2	34.3, 155	<0.001
Aborted procedure	56 (0.2%)	35 (3.8%)	26.2	16.9, 40.0	<0.001
Patient aspiration	19 (<0.1%)	32 (3.5%)	70.4	40.2, 127	<0.001

[1] n (%)

Abbreviations: CI = Confidence Interval, OR = Odds Ratio

Residual food is associated with worse outcomes such as poor visualization during the procedure, aborted procedures, and aspiration.

Discussion

We used routine endoscopy procedures to assess gastric emptying. Patients taking a GLP1 medication with weekly dosing had residual solid food on endoscopy more often than patients not taking a GLP1. Our analysis accounted for confounding by diabetes and other factors, supporting a causal role for these medications. We did not observe an effect for patients taking a GLP1 medication with daily dosing, congruent with previous studies (Ahmann et al., 2017) suggesting these medications have less frequent gastrointestinal side effects. Maintaining a liquid diet for at least 24 hours reduced the incidence of finding residual food, especially for patients with weekly dosing, supporting the multispecialty guideline recommendation. Holding GLP1 medications with weekly dosing reduced the incidence of residual food on endoscopy, but our results suggest that at least 2 weeks may be needed to improve gastric emptying.

References

Ahmann A, Capehorn M, Charpentier M, et al., 2017, Diabetes Care
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