INPLASY

Endoscopic Safety and Risk of Retained Gastric Content in Patients Treated with GLP-1 Receptor Agonists: A Systematic Review and Meta-analysis

INPLASY202620033
doi: 10.37766/inplasy2026.2.0033
Received: 9 February 2026
Published: 9 February 2026

Huang, PF.

Corresponding author:
Pofeng Huang

td00125732@gmail.com

Author Affiliation:
Kaohsiung Armed Forces General Hospital.

ADMINISTRATIVE INFORMATION

Support - N/A.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202620033

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 9 February 2026 and was last updated on 9 February 2026.

INTRODUCTION

Review question / Objective Does the use of glucagon-like peptide-1 receptor agonists (GLP-1 RAs) increase the risk of retained gastric content and aspiration pneumonia in patients undergoing gastrointestinal endoscopy or anesthesia?

Rationale GLP-1 receptor agonists (GLP-1 RAs) are increasingly prescribed for type 2 diabetes and obesity. Their mechanism of action involves delaying gastric emptying, which poses a potential safety concern during anesthesia and sedation. While recent guidelines (e.g., American Society of Anesthesiologists) suggest withholding these medications prior to elective procedures, the evidence regarding the actual risk of retained gastric content and pulmonary aspiration remains conflicting. Some studies report a significant increase in gastric residue, while others find no difference. A comprehensive meta-analysis is needed to quantify these risks and identify patient-specific or drug-specific factors (such as specific agents like semaglutide or tirzepatide) that may influence clinical outcomes, thereby guiding perioperative management.

Condition being studied The primary condition of interest is retained gastric content (gastric residue) identified during gastrointestinal endoscopy or anesthesia induction. This condition serves as a surrogate marker for the risk of pulmonary aspiration, a serious perioperative complication that can lead to aspiration pneumonia, respiratory failure, and increased morbidity. The review focuses on how GLP-1 RAs influence gastric motility and the subsequent risk of these adverse events in fasted patients.

METHODS

Search strategy Terms and electronic databases included in the review. We will search electronic databases including PubMed, Embase, and the Cochrane Library from inception to the present,

without language restrictions. The search strategy will utilize a combination of Medical Subject Headings (MeSH) and free-text terms related to the intervention and outcomes. Keywords will include: (1) Intervention: "Glucagon-Like Peptide-1 Receptor Agonists", "GLP-1", "Semaglutide", "Tirzepatide", "Liraglutide", "Dulaglutide", "Exenatide", "Wegovy", "Ozempic", "Mounjaro". (2) Outcomes/Setting: "Gastric Emptying", "Gastric Content", "Gastric Residue", "Retained Food", "Aspiration Pneumonia", "Endoscopy", "Gastroscopy", "Anesthesia". Boolean operators (AND, OR) will be used to combine these terms. Reference lists of included studies and relevant reviews will also be manually screened.

Participant or population Adult patients (≥18 years old) undergoing gastrointestinal endoscopy (e.g., esophagogastroduodenoscopy, colonoscopy) or elective procedures requiring anesthesia/sedation. Both diabetic and non-diabetic (obese) populations will be included.

Intervention Patients who are taking GLP-1 receptor agonists (including but not limited to semaglutide, tirzepatide, liraglutide, dulaglutide, exenatide, and lixisenatide) prior to the procedure.

Comparator Patients undergoing similar procedures who are not taking GLP-1 receptor agonists (control group), or patients who withheld the medication for a specified duration if a comparison is made against active users.

Study designs to be included Observational studies (retrospective or prospective cohort studies, case-control studies) and randomized controlled trials (RCTs). Case reports, case series, and reviews will be excluded.Comparative studies, including randomized controlled trials (RCTs) and observational cohort studies (both prospective and retrospective). Single-arm studies, case series, case reports, reviews, and editorials will be excluded.

Eligibility criteria
Inclusion Criteria:
Studies reporting the incidence of retained gastric content (defined by endoscopic visualization of food residue or suction volume >1.5 ml/kg) or aspiration pneumonia.

Studies providing sufficient data to calculate odds ratios (OR) with 95% confidence intervals (CI).

Exclusion Criteria:

Animal studies or in vitro studies.

Studies lacking a non-GLP-1 RA control group.

Conference abstracts without full-text availability (unless sufficient data is provided in the abstract).

Information sources Electronic databases (PubMed, Embase, Cochrane Library) and manual searches of reference lists from eligible articles.

Main outcome(s) The primary outcome is the risk of retained gastric content (gastric residue). This is a binary outcome defined as the presence of solid food or significant fluid volume in the stomach despite adherence to fasting guidelines. The effect measure will be the Odds Ratio (OR).

Additional outcome(s) The secondary outcome is the incidence of aspiration pneumonia.

Data management Two independent reviewers will screen titles and abstracts, followed by full-text review. Data will be extracted into a standardized pre-piloted spreadsheet (e.g., Microsoft Excel). Extracted data will include: study characteristics (author, year, country), patient demographics (age, BMI, diabetes prevalence), GLP-1 RA details (type, duration), and outcome data (events of gastric residue and aspiration). Disagreements will be resolved by consensus or consultation with a third reviewer.

Quality assessment / Risk of bias analysis The methodological quality of observational studies will be assessed using the Newcastle-Ottawa Scale (NOS). Studies will be graded on three domains: selection, comparability, and outcome. A score of ≥7 stars will be considered high quality (low risk of bias). For RCTs (if any), the Cochrane Risk of Bias 2.0 tool will be used.

Strategy of data synthesis Meta-analysis will be performed using Comprehensive Meta-Analysis (CMA) software. Due to anticipated clinical and methodological heterogeneity, a random-effects model will be used to calculate the pooled Odds Ratio (OR) and 95% Confidence Intervals (CI). Heterogeneity will be assessed using the I2 statistic (I2 > 50% indicates significant heterogeneity).
For the rare outcome of aspiration pneumonia, the Peto odds ratio method will be employed to minimize estimation bias, and studies with double-zero events will be excluded from the synthesis.
Meta-regression will be conducted to explore the influence of continuous covariates such as BMI and proportion of diabetic patients on the effect size.

Subgroup analysis Subgroup analyses will be performed based on:

Specific type of GLP-1 RA

Indication for use (e.g., T2DM and Obesity/Weight loss).

Sensitivity analysis Sensitivity analysis will be conducted using the leave-one-out method to assess the robustness of the pooled results and to identify if any single study is driving the overall effect size.

Language restriction There were no language restrictions. Studies published in any language will be considered for inclusion, provided they meet the other eligibility criteria.

Country(ies) involved Taiwan.

Other relevant information Assessment of publication bias will be performed using funnel plots and Egger's regression test.

Keywords GLP-1 receptor agonists; Gastric emptying; Aspiration pneumonia; Endoscopy; Anesthesia; Semaglutide; Tirzepatide.Esophageal squamous cell carcinoma; Endoscopic submucosal dissection; Additional chemoradiotherapy; Esophagectomy.

Dissemination plans The results of this systematic review and meta-analysis will be submitted for publication in a peer-reviewed international journal and may be presented at relevant medical conferences.

Contributions of each author

Author 1 - Pofeng Huang - Conceptualization, data curation, formal analysis, methodology, software, writing – original draft.
Email: td00125732@gmail.com