# OUTCOMES AND TRENDS OF ENDOSCOPIC RETROGRADE CHOLANGIO-PANCREATOGRAPHY IN BARIATRIC SURGERY PATIENTS - A NATIONAL INPATIENT SAMPLE (NIS) STUDY

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## Introduction

- Bariatric surgery (BS) is a widely used modality of treatment in patients with morbid obesity.
- The lifetime risk of these patients needing Endoscopic Retrograde Cholangio-Pancreatography (ERCP) has increased.
- ERCP in bariatric surgery population is time-consuming and technically challenging due to altered anatomy[1].
- Despite several techniques, there are complications associated with each type of ERCP.
- Our aim was to assess trends and outcomes of ERCP in BS patients.

## Methods and materials

- We utilized the Nationwide Inpatient Sample (NIS) database from 2007 to 2018.
- We identified adult hospitalized patients who underwent ERCP using CPT procedure codes.
- These were divided based on the presence of bariatric surgery (BS) status and nonbariatric surgery (NBS).
- All procedures were captured using previously validated CPT codes, comorbidities were captured using previously validated ICD 9 and 10 codes.
- Univariate and multivariate logistic regression for categorical variables and linear regression for continuous variables was carried out to identify independent associations at $p < 0.05$.
- Statistical Analysis was performed using R studio.

***Table 1. Demographics***

| | Non Bariatric Surgery Group (n = 2,142,270) | Bariatric Surgery Group (n= 36,713) | p-value |
|---|---|---|---|
| **AGE** | 62 (46, 76) | 57 (44, 67) | < 0.001 |
| **AGE GROUP** | | | < 0.001 |
| 18-27 | 116,840 (5.5%) | 425 (1.2%) | |
| 28-37 | 343,200 (16%) | 2,262 (6.2%) | |
| 38-47 | 391,922 (18%) | 5,754 (16%) | |
| 48-57 | 387,558 (18%) | 8,811 (24%) | |
| 58-67 | 313,532 (15%) | 8,042 (22%) | |
| 68-77 | 216,827 (10%) | 6,094 (17%) | |
| 78-87 | 197,928 (9.2%) | 4,015 (11%) | |
| 88 and above | 174,463 (8.1%) | 1,311 (3.6%) | |
| **GENDER** | | | < 0.001 |
| Male | 879,110 (41%) | 11,618 (32%) | |
| Female | 1,262,064 (59%) | 25,080 (68%) | |
| Unknown | 1,097 (< 0.1%) | 15 (< 0.1%) | |
| **RACE** | | | < 0.001 |
| White | 1,326,854 (68%) | 24,424 (72%) | |
| African American | 178,702 (9.1%) | 3,558 (10%) | |
| Hispanic | 305,630 (16%) | 4,081 (12%) | |
| Asian/Pacific Islander | 72,335 (3.7%) | 852 (2.5%) | |
| Native American | 13,664 (0.7%) | 153 (0.4%) | |
| Other | 66,140 (3.4%) | 1,016 (3.0%) | |
| Unknown | 178,946 (8.4%) | 2,628 (7.2%) | |
| Length of stay(Days) | 4.0 (3.0, 7.0) | 6.0 (3.0, 12.0) | < 0.001 |
| **YEAR** | | | < 0.001 |
| 2007 | 157,405 (7.3%) | 1,593 (4.3%) | |
| 2008 | 172,320 (8.0%) | 1,829 (5.0%) | |
| 2009 | 170,895 (8.0%) | 2,135 (5.8%) | |
| 2010 | 176,302 (8.2%) | 2,661 (7.2%) | |
| 2011 | 179,012 (8.4%) | 2,440 (6.6%) | |
| 2012 | 168,425 (7.9%) | 2,500 (6.8%) | |
| 2013 | 167,540 (7.8%) | 2,540 (6.9%) | |
| 2014 | 168,515 (7.9%) | 3,145 (8.6%) | |
| 2015 | 174,610 (8.2%) | 3,440 (9.4%) | |
| 2016 | 200,030 (9.3%) | 4,595 (13%) | |
| 2017 | 201,935 (9.4%) | 4,760 (13%) | |
| 2018 | 205,280 (9.6%) | 5,075 (14%) | |
| **Obesity** | 309,544 (14%) | 11,259 (31%) | < 0.001 |
| **Total Charges($)** | $55,252 (34,801, 87,258) | $76,902 (46,432, 139,565) | < 0.001 |
| **INDICATIONS FOR ERCP** | | | |
| Acute Pancreatitis | 14,015 (0.7%) | 255 (0.7%) | 0.7 |
| Acute Cholangitis | 124,546 (5.8%) | 1,498 (4.1%) | < 0.001 |
| Choledocholithiasis | 30,785 (1.4%) | 765 (2.1%) | < 0.001 |
| Pancreatic Cancer | 25,946 (1.2%) | 460 (1.3%) | 0.7 |
| Hilar Cholangiocarcinoma | 20,022 (0.9%) | 278 (0.8%) | 0.12 |

***Table 2: Multivariate Logistic Regression of ERCP-Complications and Inpatient Mortality***

| | Adjusted Odds Ratio | 95% CI | p-value |
|---|---|---|---|
| Inpatient Mortality | 1.75 | 1.49-2.07 | < 0.01 |
| Acute Pancreatitis | 0.36 | 0.15-0.86 | 0.02 |
| Acute Cholangitis | 1 | 0.92-1.11 | 0.84 |
| Bleeding | 2.05 | 1.71-2.45 | < 0.01 |
| Cholecystitis | 1.18 | 0.79-1.77 | 0.42 |
| Intraabdominal Infections | 4.12 | 3.33-5.11 | < 0.01 |
| Bile Duct Perforation | 3.77 | 3.07-4.63 | < 0.01 |

**Table 1. Demographics, indications of bariatric and nonbariatric surgery patients**
**Table 2: Multivariate logistic regression of ERCP complications and inpatient mortality.**

## Results

- Total 2,178,983 patients had ERCP between 2007 and 2018, from which 36,713 (1.7%) were performed in BS patients.
- Among the patients who received ERCP, 68% were females, 72% were Caucasians (Table 1).
- Rates of ERCP in BS patients increased from 1,593 (4.3%) in 2007 to 5075 (14%) in 2018 ($p < 0.01$).
- Total charges associated with BS was $76,902 vs $55,252 ($p< 0.001$).
- ERCP for Cholecdocholithiaisis (2.1% vs 1.4%) was more common in BS patients.
- On univariate analysis, bleeding, intra-abdominal infections, bile duct perforation, and inpatient mortality were statistically significant amongst BS patients as compared to NBS patients.
- On multivariate analysis, BS patients had higher risk of death (aOR: 1.38, 1.18-1.63) and bleeding complications (aOR: 1.73, 1.44-2.07) as compared to NBS patients.
- While acute pancreatitis was significantly higher in NBS patients as compared to BS patients. Acute cholangitis was comparable in BS and NBS patients (Table 2).

## Discussion

- The utilization of ERCP has been increasing over the last decade.
- The bariatric surgery group had younger females and had higher utilization of health care resources.
- BS group despite being younger had a higher mortality rate and had more bleeding complications as compared to NBS.
- ERCP should be performed with caution in patients with BS to avoid mortality and worse inpatient outcomes.

## References

1. Banerjee N, Parepally M, Byrne TK, Pullatt RC, Coté GA, Elmunzer BJ. Systematic review of transgastric ERCP in Roux-en-Y gastric bypass patients. Surg Obes Relat Dis. 2017 Jul;13(7):1236-1242. doi: 10.1016/j.soard.2017.02.005. Epub 2017 Feb 10. PMID: 28336200.