

# Malnutrition and Post-Endoscopic Retrograde Cholangiopancreatography Complications: Nationwide Inpatient Sample Database Analysis

Anjella Manoharan, MS MD<sup>1</sup>, Vincent Wong, MD<sup>1</sup>, Dayna Panchal, DO<sup>2</sup>, Weizheng W. Wang, MD<sup>2</sup>

<sup>1</sup>Department of Internal Medicine-Pediatrics, Rutgers NJMS, <sup>2</sup>Department of Gastroenterology, Rutgers NJMS

## Background

- Many complications can arise from endoscopic retrograde cholangiopancreatography (ERCP) including pancreatitis, perforation, hemorrhage, and infection such as cholangitis
- Malnutrition has been known to be a predictive factor of negative postsurgical outcomes and predisposes patients to infection
- Few studies have studied the relationship between malnutrition and post-ERCP complications
- One study identified malnutrition as a risk factor for post-ERCP cholangitis
- Another study found malnourished patients had increased post-ERCP inpatient mortality and higher risks for sepsis, hemorrhage, and intestinal perforation

## Study Aim

- To elucidate the relationship between malnutrition and post-ERCP complications

## Methods

- National Inpatient Sample database was used to identify hospitalized patients over 18 years old who had an ERCP procedure between 2007 - 2017 using ICD-9 and ICD-10 codes
- Patients were divided into two groups: those with and without malnutrition
- Primary outcomes were length of stay, payor status, and total charges
- Secondary outcomes were rates of post-ERCP pancreatitis, cholangitis, cholecystitis, infection, hemorrhage, perforation, and overall mortality
- Patients were matched by age, race, sex, and Elixhauser comorbidity index
- Chi-squared tests compared categorical data, independent t-tests compared continuous data, multivariate analyses assessed secondary outcomes

## Results

Demographic	Control (%)	Malnourished (%)
<b>Age (in years)</b>	Mean = 67.0	Mean = 67.0
18-27	2972 (2.1)	2984 (2.1)
28-37	5074 (3.6)	5079 (3.6)
38-47	9416 (6.7)	9407 (6.7)
48-57	19376 (13.7)	19398 (13.7)
58-67	29570 (20.9)	29582 (20.9)
68-77	32895 (23.3)	32905 (23.3)
78-87	30525 (21.6)	30537 (21.6)
>=88	11413 (8.1)	11393 (8.1)
<b>Gender</b>		
Male	69264 (49.0)	69287 (49.0)
Female	71979 (51.0)	71998 (51.0)
<b>Total Charges</b>	\$80135.7	\$139345.9
<b>Mortality</b>		
Alive	136848 (96.9)	132851 (94.1)
Deceased	4315 (3.1)	8382 (5.9)

Demographic	Control (%)	Malnourished (%)
<b>Race</b>		
White	98417 (69.7)	98426 (69.7)
Black	16328 (11.6)	16324 (11.6)
Hispanic	14492 (10.3)	14515 (10.3)
Asian or Pacific Islander	6234 (4.4)	6250 (4.4)
Native American	1005 (0.7)	1009 (0.7)
Other	4766 (3.4)	4761 (3.4)
<b>Length of Stay (in days)</b>	Mean = 7.9	Mean = 13.9
0-9	106418	69727
10-19	26972	43180
20-29	5122	15285
30-39	1464	6317
40-49	601	2868
>=50	658	3903

Demographic	Control (%)	Malnourished (%)
<b>Elixhauser Comorbidity Index</b>	Mean = 15.0	Mean = 19.8
<b>Payor</b>		
Medicare	85611 (60.7)	86807 (60.7)
Medicaid	13169 (9.3)	15225 (9.3)
Private	33515 (23.8)	31333 (23.8)
Self-pay	5158 (3.7)	4367 (3.7)
No charge	599 (0.4)	374 (0.4)
Other	3009 (2.1)	2934 (2.1)
<b>Median household income</b>		
Quartile 1	32201 (27.0)	35742 (28.5)
Quartile 2	29399 (24.7)	32030 (25.6)
Quartile 3	29788 (25.0)	31132 (24.9)
Quartile 4	27677 (23.2)	26329 (21.0)

**Table 1. Characteristics of Study Population.** Of 282,526 patients who met inclusion criteria, 141,285 had malnutrition. For both groups, the mean ages were 67 years old with 49% males, 69.7% White and 11.6% Black. The Elixhauser Comorbidity Index was 19.8 in the malnutrition group and 15.0 in the control group. Primary outcomes were significant for length of stay (13.9 days vs 7.9 days,  $p < 0.001$ ), payor status ( $p < 0.001$ ) with more patients in the malnutrition group having Medicare or Medicaid, and higher total charges (\$139,346 vs \$80,136,  $p < 0.001$ ).

Post-ERCP Complication	Odds Ratio	P-Value	95% Confidence Interval
Pancreatitis	2.3	<0.001	2.1-2.6
Perforation	2.4	<0.001	2.0-3.0
Cholangitis	1.8	<0.001	1.6-2.0
Cholecystitis	3.6	<0.001	2.6-4.9
Infection	3.3	<0.001	3.0-3.6
Hemorrhage	3.8	<0.001	2.9-5.0
Mortality	2.0	<0.001	2.0-2.1

**Table 2. Post-ERCP Complications in Malnourished Patients vs Control Group.** Secondary outcomes were significant ( $p < 0.001$ ) for the odds ratio of post-ERCP pancreatitis (OR 2.3), perforation (OR 2.4), cholangitis (OR 1.8), cholecystitis (OR 3.6), infection (OR 3.3), hemorrhage (OR 3.8), and mortality (OR 2.0).

## Discussion

- Malnutrition can be characterized as increased catabolic state versus decreased anabolic state
- Catabolism, which involves the body expending energy, can occur in response to an acute stressor
- Decreased anabolism can occur due to food insecurity or feeding issues
- Malnutrition increases morbidity and mortality for patients undergoing procedures
- Our data shows malnourished patients have increased risks for multiple post-ERCP complications
- Patients' nutritional statuses should be assessed and optimized prior to ERCP

## References

- Anderson, Michelle A., et al. "Complications of ERCP." *Gastrointestinal Endoscopy*, vol. 75, no. 3, 2012, pp. 467-473., <https://doi.org/10.1016/j.gie.2011.07.010>.
- Macallan, Derek. "Infection and Malnutrition." *Medicine*, vol. 37, no. 10, 2009, pp. 525-528., <https://doi.org/10.1016/j.mpmed.2009.07.005>.
- Mallath, Mohandas K., et al. "Is Malnutrition a Cause of Post ERCP Cholangitis?" *Gastrointestinal Endoscopy*, vol. 61, no. 5, 1 Apr. 2005, [https://doi.org/10.1016/s0016-5107\(05\)01183-1](https://doi.org/10.1016/s0016-5107(05)01183-1).
- Mosquera, Catalina, et al. "Impact of Malnutrition on Gastrointestinal Surgical Patients." *Journal of Surgical Research*, vol. 205, no. 1, 2016, pp. 95-101., <https://doi.org/10.1016/j.jss.2016.05.030>.
- Rim, Daniel, et al. "Malnutrition Is Associated with Worse Outcomes of Endoscopic Retrograde Cholangiopancreatography: A Nationwide Analysis." *American Journal of Gastroenterology*, vol. 116, no. 1, 2021, <https://doi.org/10.14309/01.ajg.0000777420.44244.0d>.