In-hospital outcomes of patients with liver cirrhosis undergoing colorectal cancer surgery: an analysis of the National Inpatient Sample

Analysis for RCOP 2025Apr-NIS-7-Gastro

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## Preamble:

* **Study Objective**: Examine the impact of liver cirrhosis on outcomes among inpatient admissions with colorectal cancer undergoing colectomy.
* **Data Source**: Cross-sectional analysis of the National Inpatient Sample (NIS) from 2018 to 2020.
* **Patient Selection**: Included all inpatient admissions with a principal diagnosis of colorectal cancer.
* **Primary Outcomes**:
  + In-hospital all-cause mortality
  + Total hospital length of stay (days)
  + Total charge, inflation adjusted to 2020 ($)
* **Secondary Outcomes**:
  + Wound Infection
  + Sepsis
  + Pneumonia
  + Gastrointestinal Hemorrhage
  + Acute Respiratory Failure
  + Acute Kidney Injury
* **Covariates for Adjustment:** All models adjusted for the following
  + Patient Demographics: Age, sex, race, household income, insurance, hospital region, hospital bedsize, hospital location, and teaching status.
  + Hospital Characterstics: Type of admission (non-elective, elective), Bed size of hospital (small, medium, large), Teaching status of hospital (nonteaching, teaching), Location of hospital (rural, urban), Type of insurance (Medicare, Medicaid, private insurance, self-pay, no charge, other), Location of the hospital (northeast, Midwest or north central, south, west), Type of surgery(Laparoscopic, Open, Robotic colectomy)
  + Comorbidities: Hypertension, diabetes mellitus, obesity, hyperlipidemia, coronary artery disease, peripheral vascular disease, congestive heart failure, chronic kidney disease, chronic pulmonary disease, anemia, fluid and electrolyte disorders, HIV/AIDS, weight loss, lymphoma, alcohol abuse, drug abuse, depression, psychoses, rheumatoid disease, valvular disease, paralysis, neurological disorders, coagulopathy
* **Statistical Methods:**
  + **Univariable Analysis:**
    - Categorical variables: Compared using Pearson’s chi-square test with Rao & Scott adjustment
    - Continuous variables: Analyzed using the design-based Kruskal–Wallis test, a non-parametric alternative suitable for survey-weighted data
  + **Multivariable Analysis:**
    - Binary outcomes (e.g., mortality): Survey-weighted logistic regression using the quasibinomial family
    - Continuous outcomes (e.g., LOS, hospital charges): Survey-weighted linear regression using the gaussian family
    - Results reported as adjusted odds ratios (aORs) or beta coefficients with 95% confidence intervals
* **Software:** All statistical analyses were performed using the R Statistical Language (Version 4.5.0; R Foundation for Statistical Computing, Vienna, Austria), incorporating survey-weighted procedures via the *survey* package to account for the complex sampling design of NIS.

## Baseline Table:

| **Characteristic** | **With liver cirrhosis** N = 245*1* | **Without liver cirrhosis** N = 17,760*1* | **p-value***2* |
| --- | --- | --- | --- |
| Age, y | 69 (9) | 67 (13) | 0.2 |
| Sex |  |  | 0.8 |
| Female | 115 (47%) | 8,720 (49%) |  |
| Male | 130 (53%) | 9,040 (51%) |  |
| Race |  |  | 0.2 |
| White | 190 (78%) | 12,855 (75%) |  |
| Asian or Pacific Islander | 5 (2.0%) | 570 (3.3%) |  |
| Black | 5 (2.0%) | 1,810 (10%) |  |
| Hispanic | 40 (16%) | 1,525 (8.8%) |  |
| Native American | 0 (0%) | 110 (0.6%) |  |
| Other | 5 (2.0%) | 380 (2.2%) |  |
| Residential income |  |  | 0.016 |
| $1 - $51,999 | 100 (41%) | 4,155 (24%) |  |
| $52,000 - $65,999 | 80 (33%) | 5,305 (30%) |  |
| $66,000 - $87,999 | 30 (12%) | 4,295 (24%) |  |
| $88,000 or more | 35 (14%) | 3,780 (22%) |  |
| Expected primary payer |  |  | 0.6 |
| Private | 60 (24%) | 5,640 (32%) |  |
| Medicaid | 15 (6.1%) | 1,430 (8.1%) |  |
| Medicare | 160 (65%) | 9,890 (56%) |  |
| Other | 10 (4.1%) | 785 (4.4%) |  |
| PL\_NCHS |  |  | 0.12 |
| Central metro ≥1 million | 45 (18%) | 4,435 (25%) |  |
| Fringe metro ≥1 million | 55 (22%) | 4,645 (26%) |  |
| Metro 250,000-999,999 | 50 (20%) | 3,615 (20%) |  |
| Metro 50,000-249,999 | 35 (14%) | 1,815 (10%) |  |
| Micropolitan | 15 (6.1%) | 1,735 (9.8%) |  |
| Other | 45 (18%) | 1,455 (8.2%) |  |
| Hospital region |  |  | 0.6 |
| Midwest | 70 (29%) | 4,200 (24%) |  |
| Northeast | 45 (18%) | 3,300 (19%) |  |
| South | 100 (41%) | 6,690 (38%) |  |
| West | 30 (12%) | 3,570 (20%) |  |
| Hospital bedsize |  |  | >0.9 |
| Large | 130 (53%) | 9,545 (54%) |  |
| Medium | 70 (29%) | 4,885 (28%) |  |
| Small | 45 (18%) | 3,330 (19%) |  |
| Hospital location and teaching status |  |  | 0.3 |
| Rural | 15 (6.1%) | 1,425 (8.0%) |  |
| Urban, non-teaching | 25 (10%) | 3,220 (18%) |  |
| Urban, teaching | 205 (84%) | 13,115 (74%) |  |
| No. of comorbidities |  |  |  |
| Two or more comorbidities | 245 (100%) | 17,760 (100%) |  |
| *1*Mean (SD); n (%) | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | |

## Outcomes Table:

| **Characteristic** | **With liver cirrhosis** N = 245*1* | **Without liver cirrhosis** N = 17,760*1* | **p-value***2* |
| --- | --- | --- | --- |
| In-hospital mortality | 20 (8.2%) | 250 (1.4%) | <0.001 |
| Length of stay (days) | 7.0 (4.0, 14.0) | 5.0 (3.0, 8.0) | 0.002 |
| Inflation-adjusted total hospital charges | 103,297 (56,908, 204,404) | 78,379 (52,050, 127,478) | 0.018 |
| Sepsis | 25 (10%) | 535 (3.0%) | 0.005 |
| Wound disruption and infection | 5 (2.0%) | 230 (1.3%) | 0.6 |
| Pneumonia | 10 (4.1%) | 435 (2.4%) | 0.5 |
| VTE | 0 (0%) | 395 (2.2%) | 0.3 |
| GIHemorrhage | 30 (12%) | 1,250 (7.0%) | 0.2 |
| Acute respiratory failure | 25 (10%) | 630 (3.5%) | 0.014 |
| Acute kidney injury | 55 (22%) | 1,885 (11%) | 0.010 |
| *1*n (%); Median (Q1, Q3) | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | |

## Multivariable Logistic Regression:

### All-Cause Mortality:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 0.53 | 0.11, 2.45 | 0.4 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.38 | 0.65, 2.94 | 0.4 |
| Robotic colectomy | 1.01 | 0.22, 4.61 | >0.9 |
| Age, y | 1.02 | 0.99, 1.06 | 0.2 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.00 | 0.53, 1.88 | >0.9 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.84 | 0.09, 7.63 | 0.9 |
| Black | 0.42 | 0.10, 1.86 | 0.3 |
| Hispanic | 0.47 | 0.16, 1.33 | 0.2 |
| Native American | 0.00 | 0.00, 0.00 | <0.001 |
| Other | 0.00 | 0.00, 0.00 | <0.001 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 2.41 | 0.64, 9.08 | 0.2 |
| Medicare | 1.50 | 0.58, 3.91 | 0.4 |
| Other | 2.51 | 0.42, 15.0 | 0.3 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.24 | 0.56, 2.78 | 0.6 |
| $66,000 - $87,999 | 0.89 | 0.33, 2.41 | 0.8 |
| $88,000 or more | 0.40 | 0.11, 1.40 | 0.2 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.13 | 0.41, 3.11 | 0.8 |
| South | 1.52 | 0.68, 3.44 | 0.3 |
| West | 1.34 | 0.48, 3.75 | 0.6 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.69 | 0.84, 3.39 | 0.14 |
| Small | 1.05 | 0.44, 2.52 | >0.9 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.53 | 0.16, 1.75 | 0.3 |
| Urban, teaching | 0.53 | 0.20, 1.40 | 0.2 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 1.05 | 0.52, 2.13 | 0.9 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.91 | 0.42, 1.98 | 0.8 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 1.25 | 0.57, 2.73 | 0.6 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 1.19 | 0.61, 2.30 | 0.6 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 1.21 | 0.54, 2.70 | 0.6 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 1.54 | 0.59, 4.01 | 0.4 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 1.15 | 0.58, 2.28 | 0.7 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 5.47 | 2.78, 10.8 | <0.001 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.33 | 0.10, 1.13 | 0.078 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.64 | 0.28, 1.47 | 0.3 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.38, 2.62 | >0.9 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 2.45 | 1.19, 5.03 | 0.015 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 1.58 | 0.85, 2.96 | 0.15 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 2.46 | 0.34, 17.6 | 0.4 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.14 | 0.03, 0.74 | 0.021 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 4.14 | 1.99, 8.61 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 1.14 | 0.12, 11.3 | >0.9 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 0.46 | 0.13, 1.73 | 0.3 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 9.32 | 0.82, 106 | 0.072 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 3.81 | 1.78, 8.18 | <0.001 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 3.53 | 1.39, 8.95 | 0.008 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Wound Infection:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 1.49 | 0.12, 18.5 | 0.8 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.63 | 0.78, 3.40 | 0.2 |
| Robotic colectomy | 1.53 | 0.40, 5.82 | 0.5 |
| Age, y | 1.01 | 0.97, 1.05 | 0.6 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 2.08 | 1.08, 4.01 | 0.029 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.49 | 0.31, 7.12 | 0.6 |
| Black | 1.69 | 0.72, 3.97 | 0.2 |
| Hispanic | 0.90 | 0.27, 3.01 | 0.9 |
| Native American | 0.00 | 0.00, 0.00 | <0.001 |
| Other | 0.00 | 0.00, 0.00 | <0.001 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 1.76 | 0.52, 5.93 | 0.4 |
| Medicare | 0.98 | 0.38, 2.56 | >0.9 |
| Other | 1.90 | 0.55, 6.58 | 0.3 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.69 | 0.28, 1.70 | 0.4 |
| $66,000 - $87,999 | 1.29 | 0.52, 3.21 | 0.6 |
| $88,000 or more | 0.46 | 0.13, 1.62 | 0.2 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.65 | 0.22, 1.96 | 0.4 |
| South | 1.35 | 0.59, 3.10 | 0.5 |
| West | 1.17 | 0.42, 3.23 | 0.8 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.46 | 0.19, 1.09 | 0.076 |
| Small | 0.49 | 0.20, 1.22 | 0.12 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.56 | 0.15, 2.07 | 0.4 |
| Urban, teaching | 0.62 | 0.21, 1.84 | 0.4 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 1.38 | 0.70, 2.75 | 0.4 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.83 | 0.41, 1.68 | 0.6 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 0.58 | 0.17, 1.96 | 0.4 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 1.01 | 0.47, 2.19 | >0.9 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 0.79 | 0.31, 2.01 | 0.6 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 1.61 | 0.50, 5.23 | 0.4 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 1.39 | 0.74, 2.61 | 0.3 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 2.02 | 0.70, 5.80 | 0.2 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 1.12 | 0.43, 2.90 | 0.8 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.94 | 0.40, 2.24 | 0.9 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 0.21 | 0.03, 1.68 | 0.14 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 4.73 | 2.17, 10.3 | <0.001 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 5.31 | 0.59, 47.8 | 0.14 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 0.82 | 0.41, 1.65 | 0.6 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.81 | 0.21, 3.19 | 0.8 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 2.15 | 1.03, 4.50 | 0.042 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 0.26 | 0.03, 2.10 | 0.2 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 1.70 | 0.60, 4.77 | 0.3 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 1.19 | 0.38, 3.67 | 0.8 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Sepsis:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 0.86 | 0.23, 3.31 | 0.8 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.86 | 1.02, 3.38 | 0.044 |
| Robotic colectomy | 1.08 | 0.32, 3.60 | >0.9 |
| Age, y | 1.00 | 0.97, 1.02 | >0.9 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.39 | 0.85, 2.25 | 0.2 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.74 | 0.20, 2.68 | 0.6 |
| Black | 1.40 | 0.67, 2.90 | 0.4 |
| Hispanic | 0.81 | 0.36, 1.82 | 0.6 |
| Native American | 0.00 | 0.00, 0.00 | <0.001 |
| Other | 0.00 | 0.00, 0.00 | <0.001 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 1.21 | 0.50, 2.93 | 0.7 |
| Medicare | 1.22 | 0.61, 2.43 | 0.6 |
| Other | 0.56 | 0.17, 1.86 | 0.3 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.37 | 0.73, 2.56 | 0.3 |
| $66,000 - $87,999 | 1.11 | 0.56, 2.21 | 0.8 |
| $88,000 or more | 1.22 | 0.56, 2.67 | 0.6 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.96 | 0.47, 1.93 | 0.9 |
| South | 1.38 | 0.78, 2.46 | 0.3 |
| West | 1.13 | 0.58, 2.18 | 0.7 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.74 | 0.44, 1.25 | 0.3 |
| Small | 1.13 | 0.63, 2.03 | 0.7 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.83 | 0.28, 2.43 | 0.7 |
| Urban, teaching | 1.12 | 0.43, 2.92 | 0.8 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 2.17 | 1.28, 3.68 | 0.004 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.86 | 0.52, 1.44 | 0.6 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 1.22 | 0.62, 2.39 | 0.6 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.90 | 0.51, 1.57 | 0.7 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 0.70 | 0.36, 1.38 | 0.3 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 1.27 | 0.58, 2.79 | 0.5 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 0.89 | 0.53, 1.49 | 0.7 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 2.31 | 1.25, 4.28 | 0.008 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.68 | 0.32, 1.41 | 0.3 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.91 | 0.52, 1.58 | 0.7 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 1.28 | 0.66, 2.48 | 0.5 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 2.48 | 1.52, 4.05 | <0.001 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 0.64 | 0.38, 1.05 | 0.076 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 0.57 | 0.08, 4.15 | 0.6 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.95 | 0.43, 2.10 | >0.9 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 6.91 | 3.79, 12.6 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 0.31 | 0.05, 1.99 | 0.2 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 0.55 | 0.08, 3.96 | 0.6 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 0.55 | 0.19, 1.57 | 0.3 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 0.49 | 0.04, 5.96 | 0.6 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 4.44 | 2.50, 7.88 | <0.001 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 2.48 | 1.19, 5.19 | 0.016 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Pneumonia:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 1.73 | 0.34, 8.76 | 0.5 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.48 | 0.84, 2.62 | 0.2 |
| Robotic colectomy | 0.56 | 0.13, 2.40 | 0.4 |
| Age, y | 1.00 | 0.97, 1.02 | 0.8 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.67 | 1.03, 2.72 | 0.039 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.71 | 0.14, 3.55 | 0.7 |
| Black | 0.59 | 0.24, 1.45 | 0.3 |
| Hispanic | 0.98 | 0.46, 2.11 | >0.9 |
| Native American | 0.00 | 0.00, 0.00 | <0.001 |
| Other | 1.45 | 0.28, 7.58 | 0.7 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 1.12 | 0.39, 3.21 | 0.8 |
| Medicare | 1.90 | 0.89, 4.08 | 0.10 |
| Other | 0.32 | 0.03, 3.03 | 0.3 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.12 | 0.63, 2.00 | 0.7 |
| $66,000 - $87,999 | 0.69 | 0.34, 1.41 | 0.3 |
| $88,000 or more | 0.68 | 0.30, 1.54 | 0.4 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.57 | 0.74, 3.32 | 0.2 |
| South | 1.39 | 0.74, 2.60 | 0.3 |
| West | 1.54 | 0.73, 3.24 | 0.3 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.08 | 0.63, 1.85 | 0.8 |
| Small | 1.22 | 0.66, 2.26 | 0.5 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.02 | 0.40, 2.58 | >0.9 |
| Urban, teaching | 0.92 | 0.40, 2.13 | 0.8 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 1.99 | 1.12, 3.53 | 0.019 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 1.28 | 0.71, 2.31 | 0.4 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 1.65 | 0.88, 3.10 | 0.12 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 1.22 | 0.72, 2.05 | 0.5 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 1.37 | 0.78, 2.40 | 0.3 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.97 | 0.41, 2.32 | >0.9 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 1.14 | 0.71, 1.83 | 0.6 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.38 | 0.71, 2.70 | 0.3 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.51 | 0.23, 1.13 | 0.10 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.99 | 0.56, 1.76 | >0.9 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 1.56 | 0.82, 2.96 | 0.2 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 2.36 | 1.43, 3.89 | <0.001 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 1.21 | 0.73, 2.01 | 0.5 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 1.64 | 0.40, 6.68 | 0.5 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.64 | 0.24, 1.72 | 0.4 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 3.35 | 1.96, 5.75 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 1.54 | 0.22, 10.6 | 0.7 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 1.25 | 0.24, 6.46 | 0.8 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 0.54 | 0.17, 1.71 | 0.3 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 5.02 | 0.67, 37.4 | 0.12 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 1.27 | 0.58, 2.76 | 0.6 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 1.51 | 0.64, 3.58 | 0.3 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Gastrointestinal Hemorrhage:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 0.74 | 0.26, 2.13 | 0.6 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 0.82 | 0.59, 1.13 | 0.2 |
| Robotic colectomy | 1.04 | 0.53, 2.01 | >0.9 |
| Age, y | 1.01 | 0.99, 1.03 | 0.2 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.91 | 0.67, 1.22 | 0.5 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.29 | 0.52, 3.21 | 0.6 |
| Black | 1.49 | 0.95, 2.32 | 0.082 |
| Hispanic | 1.07 | 0.64, 1.80 | 0.8 |
| Native American | 3.28 | 0.70, 15.4 | 0.13 |
| Other | 1.22 | 0.41, 3.57 | 0.7 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 0.71 | 0.39, 1.31 | 0.3 |
| Medicare | 1.03 | 0.65, 1.66 | 0.9 |
| Other | 0.97 | 0.45, 2.11 | >0.9 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.84 | 0.56, 1.24 | 0.4 |
| $66,000 - $87,999 | 1.23 | 0.81, 1.88 | 0.3 |
| $88,000 or more | 0.75 | 0.46, 1.23 | 0.3 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.83 | 0.50, 1.38 | 0.5 |
| South | 1.11 | 0.74, 1.65 | 0.6 |
| West | 0.93 | 0.57, 1.51 | 0.8 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.99 | 0.70, 1.39 | >0.9 |
| Small | 0.92 | 0.63, 1.33 | 0.7 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.19 | 0.64, 2.19 | 0.6 |
| Urban, teaching | 1.12 | 0.64, 1.96 | 0.7 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 7.96 | 5.48, 11.6 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 1.35 | 0.96, 1.90 | 0.084 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 1.35 | 0.91, 1.99 | 0.13 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.82 | 0.57, 1.16 | 0.3 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 1.04 | 0.72, 1.51 | 0.8 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 1.16 | 0.71, 1.91 | 0.6 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 0.83 | 0.61, 1.14 | 0.2 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.77 | 1.19, 2.63 | 0.005 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.90 | 0.59, 1.35 | 0.6 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 1.41 | 1.02, 1.96 | 0.040 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 1.26 | 0.81, 1.95 | 0.3 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 1.15 | 0.79, 1.69 | 0.5 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 2.21 | 0.44, 11.1 | 0.3 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 1.15 | 0.82, 1.59 | 0.4 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 1.68 | 0.62, 4.54 | 0.3 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.88 | 0.52, 1.47 | 0.6 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 1.12 | 0.82, 1.51 | 0.5 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 2.93 | 1.00, 8.57 | 0.049 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 1.07 | 0.34, 3.42 | >0.9 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 1.21 | 0.71, 2.06 | 0.5 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 0.59 | 0.05, 6.77 | 0.7 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 1.52 | 0.94, 2.45 | 0.089 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 1.30 | 0.70, 2.41 | 0.4 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Acute Respiratory Failure:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 0.87 | 0.31, 2.44 | 0.8 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.29 | 0.80, 2.08 | 0.3 |
| Robotic colectomy | 1.82 | 0.87, 3.81 | 0.11 |
| Age, y | 1.02 | 1.00, 1.04 | 0.12 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.12 | 0.74, 1.70 | 0.6 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.94 | 0.26, 3.36 | >0.9 |
| Black | 0.92 | 0.46, 1.85 | 0.8 |
| Hispanic | 1.65 | 0.92, 2.97 | 0.10 |
| Native American | 1.45 | 0.23, 8.95 | 0.7 |
| Other | 1.68 | 0.39, 7.28 | 0.5 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 1.11 | 0.49, 2.48 | 0.8 |
| Medicare | 0.98 | 0.53, 1.83 | >0.9 |
| Other | 1.57 | 0.61, 4.03 | 0.3 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.11 | 0.65, 1.88 | 0.7 |
| $66,000 - $87,999 | 0.77 | 0.41, 1.42 | 0.4 |
| $88,000 or more | 0.88 | 0.46, 1.68 | 0.7 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.76 | 0.39, 1.46 | 0.4 |
| South | 0.75 | 0.46, 1.24 | 0.3 |
| West | 0.89 | 0.50, 1.58 | 0.7 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.33 | 0.83, 2.14 | 0.2 |
| Small | 1.34 | 0.80, 2.23 | 0.3 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.66 | 0.66, 4.18 | 0.3 |
| Urban, teaching | 1.30 | 0.55, 3.06 | 0.5 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 1.58 | 0.99, 2.52 | 0.057 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 1.10 | 0.67, 1.80 | 0.7 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 1.07 | 0.60, 1.90 | 0.8 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.75 | 0.47, 1.20 | 0.2 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 1.25 | 0.76, 2.06 | 0.4 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.89 | 0.43, 1.84 | 0.7 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 1.32 | 0.86, 2.03 | 0.2 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 2.35 | 1.34, 4.12 | 0.003 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 1.33 | 0.78, 2.28 | 0.3 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.76 | 0.45, 1.28 | 0.3 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 0.91 | 0.50, 1.68 | 0.8 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 1.94 | 1.22, 3.07 | 0.005 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 1.33 | 0.87, 2.03 | 0.2 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 1.15 | 0.25, 5.33 | 0.9 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.81 | 0.38, 1.76 | 0.6 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 3.75 | 2.34, 6.02 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 0.27 | 0.06, 1.20 | 0.085 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 0.75 | 0.15, 3.83 | 0.7 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 0.77 | 0.34, 1.72 | 0.5 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 4.66 | 0.80, 27.2 | 0.087 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 3.63 | 2.10, 6.26 | <0.001 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 3.36 | 1.84, 6.13 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Acute Kidney Injury:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | 0.69 | 0.31, 1.54 | 0.4 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.25 | 0.93, 1.68 | 0.14 |
| Robotic colectomy | 1.34 | 0.85, 2.11 | 0.2 |
| Age, y | 1.01 | 1.00, 1.02 | 0.14 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.92 | 1.47, 2.50 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.97 | 1.05, 3.68 | 0.035 |
| Black | 2.01 | 1.38, 2.93 | <0.001 |
| Hispanic | 1.72 | 1.10, 2.68 | 0.017 |
| Native American | 1.47 | 0.25, 8.68 | 0.7 |
| Other | 0.63 | 0.18, 2.17 | 0.5 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 0.84 | 0.47, 1.49 | 0.5 |
| Medicare | 1.25 | 0.86, 1.83 | 0.2 |
| Other | 0.79 | 0.38, 1.61 | 0.5 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.32 | 0.93, 1.87 | 0.12 |
| $66,000 - $87,999 | 1.41 | 0.96, 2.06 | 0.076 |
| $88,000 or more | 1.37 | 0.88, 2.11 | 0.2 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.80 | 0.51, 1.25 | 0.3 |
| South | 1.14 | 0.81, 1.61 | 0.5 |
| West | 0.88 | 0.58, 1.34 | 0.6 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.76 | 0.56, 1.03 | 0.073 |
| Small | 0.92 | 0.65, 1.32 | 0.7 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.04 | 0.56, 1.94 | 0.9 |
| Urban, teaching | 1.22 | 0.70, 2.13 | 0.5 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 2.11 | 1.57, 2.83 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 1.07 | 0.79, 1.44 | 0.7 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 3.55 | 2.58, 4.89 | <0.001 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 1.58 | 1.20, 2.09 | 0.001 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 1.18 | 0.86, 1.63 | 0.3 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.79 | 0.49, 1.26 | 0.3 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 0.94 | 0.70, 1.25 | 0.7 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 2.16 | 1.50, 3.11 | <0.001 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 1.13 | 0.82, 1.57 | 0.5 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.77 | 0.55, 1.07 | 0.12 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 0.00 | 0.00, 0.00 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | 0.91 | 0.61, 1.36 | 0.6 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 2.29 | 1.66, 3.14 | <0.001 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 1.12 | 0.38, 3.31 | 0.8 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 1.03 | 0.78, 1.36 | 0.8 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | 1.57 | 0.63, 3.93 | 0.3 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.72 | 0.44, 1.17 | 0.2 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 3.40 | 2.59, 4.47 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 0.89 | 0.28, 2.89 | 0.9 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | 1.34 | 0.57, 3.16 | 0.5 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 1.04 | 0.59, 1.84 | 0.9 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 1.58 | 0.37, 6.77 | 0.5 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 1.38 | 0.88, 2.18 | 0.2 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 2.08 | 1.27, 3.40 | 0.004 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

## Multivariable Linear Regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | -0.91 | -3.9, 2.1 | 0.6 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 1.3 | 0.94, 1.7 | <0.001 |
| Robotic colectomy | 0.45 | -0.06, 0.96 | 0.081 |
| Age, y | 0.02 | 0.00, 0.04 | 0.094 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.59 | 0.23, 0.96 | 0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.99 | -0.69, 2.7 | 0.2 |
| Black | 0.46 | -0.20, 1.1 | 0.2 |
| Hispanic | 0.23 | -0.41, 0.86 | 0.5 |
| Native American | -1.2 | -2.8, 0.32 | 0.12 |
| Other | 0.56 | -0.52, 1.6 | 0.3 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 1.0 | 0.11, 1.9 | 0.027 |
| Medicare | 0.28 | -0.30, 0.86 | 0.3 |
| Other | 0.27 | -0.80, 1.3 | 0.6 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -0.02 | -0.54, 0.50 | >0.9 |
| $66,000 - $87,999 | -0.14 | -0.66, 0.38 | 0.6 |
| $88,000 or more | -0.16 | -0.72, 0.40 | 0.6 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.97 | 0.40, 1.5 | <0.001 |
| South | 0.78 | 0.26, 1.3 | 0.003 |
| West | -0.08 | -0.62, 0.46 | 0.8 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -0.26 | -0.68, 0.17 | 0.2 |
| Small | -0.60 | -1.2, -0.02 | 0.044 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.37 | -0.32, 1.1 | 0.3 |
| Urban, teaching | 0.73 | 0.21, 1.3 | 0.006 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 3.5 | 3.0, 4.1 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | -0.12 | -0.58, 0.33 | 0.6 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 0.36 | -0.27, 0.99 | 0.3 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.37 | -0.16, 0.91 | 0.2 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 0.24 | -0.24, 0.73 | 0.3 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -0.20 | -0.90, 0.51 | 0.6 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -0.53 | -0.90, -0.15 | 0.006 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.6 | 0.69, 2.4 | <0.001 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.52 | -0.06, 1.1 | 0.076 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 0.33 | -0.26, 0.92 | 0.3 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 5.4 | 0.96, 9.7 | 0.017 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | -0.18 | -0.67, 0.32 | 0.5 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 4.7 | 3.7, 5.8 | <0.001 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 0.89 | -2.3, 4.0 | 0.6 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 0.12 | -0.31, 0.55 | 0.6 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | -1.8 | -3.0, -0.56 | 0.004 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | 0.90 | -0.17, 2.0 | 0.10 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 3.3 | 2.8, 3.9 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | 5.5 | -2.3, 13 | 0.2 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | -0.76 | -1.8, 0.27 | 0.15 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 0.09 | -0.72, 0.90 | 0.8 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 6.6 | -2.9, 16 | 0.2 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 3.7 | 2.2, 5.3 | <0.001 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 2.2 | 0.86, 3.6 | 0.001 |
| Abbreviation: CI = Confidence Interval | | | |

### Inflation Adjusted Total Charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Liver cirrhosis |  |  |  |
| With liver cirrhosis | — | — |  |
| Without liver cirrhosis | -62,244 | -167,976, 43,488 | 0.2 |
| Type of Colectomy |  |  |  |
| Laparoscopic colectomy | — | — |  |
| Open colectomy | 4,571 | -2,313, 11,456 | 0.2 |
| Robotic colectomy | 28,733 | 18,762, 38,704 | <0.001 |
| Age, y | -469 | -860, -78 | 0.019 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 14,978 | 7,882, 22,075 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 6,839 | -15,464, 29,143 | 0.5 |
| Black | 1,874 | -10,436, 14,183 | 0.8 |
| Hispanic | 14,845 | 2,138, 27,552 | 0.022 |
| Native American | -18,287 | -45,931, 9,357 | 0.2 |
| Other | 36,655 | 10,281, 63,028 | 0.006 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 9,573 | -4,368, 23,514 | 0.2 |
| Medicare | 15,709 | 4,451, 26,968 | 0.006 |
| Other | -8,442 | -22,423, 5,540 | 0.2 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 2,928 | -5,882, 11,738 | 0.5 |
| $66,000 - $87,999 | -3,400 | -12,813, 6,013 | 0.5 |
| $88,000 or more | 4,951 | -9,177, 19,078 | 0.5 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 20,924 | 8,995, 32,854 | <0.001 |
| South | 24,455 | 14,758, 34,151 | <0.001 |
| West | 49,703 | 33,037, 66,369 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -10,282 | -19,784, -780 | 0.034 |
| Small | -13,861 | -23,139, -4,584 | 0.003 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 31,535 | 21,553, 41,517 | <0.001 |
| Urban, teaching | 36,972 | 28,833, 45,111 | <0.001 |
| Type of admission |  |  |  |
| Elective | — | — |  |
| Non-elective | 33,335 | 22,489, 44,181 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | -1,731 | -9,508, 6,047 | 0.7 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 8,768 | -3,542, 21,079 | 0.2 |
| Diabetes Mellitus |  |  |  |
| No | — | — |  |
| Yes | 8,855 | 940, 16,770 | 0.028 |
| Chronic pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 2,905 | -6,309, 12,119 | 0.5 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -1,287 | -15,719, 13,145 | 0.9 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -7,610 | -14,059, -1,161 | 0.021 |
| Congestive heart failure |  |  |  |
| No | — | — |  |
| Yes | 23,609 | 9,100, 38,119 | 0.001 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 4,961 | -3,707, 13,629 | 0.3 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | -2,626 | -11,606, 6,354 | 0.6 |
| HIV/AIDS |  |  |  |
| No | — | — |  |
| Yes | 98,076 | 67,945, 128,208 | <0.001 |
| Hypothyroidism |  |  |  |
| No | — | — |  |
| Yes | -676 | -10,207, 8,854 | 0.9 |
| Weight loss |  |  |  |
| No | — | — |  |
| Yes | 57,925 | 40,268, 75,581 | <0.001 |
| Lymphoma |  |  |  |
| No | — | — |  |
| Yes | 24,748 | -39,971, 89,468 | 0.5 |
| Alcohol abuse |  |  |  |
| No | — | — |  |
| Yes | 11,870 | 2,712, 21,028 | 0.011 |
| Drug abuse |  |  |  |
| No | — | — |  |
| Yes | -10,747 | -39,486, 17,992 | 0.5 |
| Depression |  |  |  |
| No | — | — |  |
| Yes | -2,479 | -13,809, 8,851 | 0.7 |
| Fluid and electrolyte disorders |  |  |  |
| No | — | — |  |
| Yes | 45,464 | 34,456, 56,473 | <0.001 |
| Psychoses |  |  |  |
| No | — | — |  |
| Yes | -2,252 | -47,330, 42,827 | >0.9 |
| Rheumatoid disease |  |  |  |
| No | — | — |  |
| Yes | -16,904 | -35,232, 1,425 | 0.071 |
| Valvular disease |  |  |  |
| No | — | — |  |
| Yes | 2,990 | -10,671, 16,650 | 0.7 |
| Paralysis |  |  |  |
| No | — | — |  |
| Yes | 149,640 | -25,683, 324,962 | 0.094 |
| Neurological disorders |  |  |  |
| No | — | — |  |
| Yes | 43,821 | 16,990, 70,652 | 0.001 |
| Coagulopathy |  |  |  |
| No | — | — |  |
| Yes | 69,677 | 24,877, 114,478 | 0.002 |
| Abbreviation: CI = Confidence Interval | | | |