CI: confidence interval; AKI: acute kidney injury

**Supplemental Table 1.** ICD-9-CM Codes

|  |  |
| --- | --- |
| **Diagnosis** | **ICD-9 Code** |
| HE | 572.2 |
| Cirrhosis | 571.2, 571.5, 571.6 |
| Alcoholic Cirrhosis | 571.2 |
| Non-alcoholic Cirrhosis | 571.5, 571.6 |
| SBP | 567.23 |
| Variceal bleed | 456 |
| Ascites | 789.5, 789.59 |
| Hyponatremia | 276.1 |
| AKI | 584, 584.5, 584.6, 584.7, 584.8, 584.9 |
| Paracentesis | 54.91 |
| EGD | 45.12, 45.13 |
| TIPS | 39.1 |
| Mechanical ventilation | 96.71, 96.72 |
| ESRD | 585.6 |
| CVA | 434.91 |
| Liver Transplant | V42.7 |

HE: hepatic encephalopathy; SBP: spontaneous bacterial peritonitis; AKI: acute kidney injury; EGD: esophagogastroduodenoscopy; TIPS: transjugular intrahepatic portosystemic shunts; ESRD: end stage renal disease; CVA: cerebrovascular accident

**Supplemental Table 2.** Baseline comorbidities in patients with hepatic encephalopathy, comparing those not-readmitted and those readmitted within 30-day

|  |  |  |  |
| --- | --- | --- | --- |
|  | **No readmission within 30 days** | **30-day readmission** | **p-value** |
| **n=16,541** | **n=7931** |
| **Elixhauser Comorbidities** |   |   |   |   |   |
| AIDS | 34 | 0.21% | 23 | 0.29% | 0.376 |
| Alcohol Abuse | 8113 | 49.05% | 3648 | 46.00% | 0.009 |
| Deficiency Anemias | 5495 | 33.22% | 3076 | 38.78% | <0.001 |
| Rheumatoid Arthritis | 239 | 1.44% | 122 | 1.54% | 0.733 |
| Chronic Blood Loss Anemia | 387 | 2.34% | 211 | 2.66% | 0.444 |
| Congestive Heart Failure | 1677 | 10.14% | 857 | 10.81% | 0.343 |
| Chronic Pulmonary Disease | 2809 | 16.98% | 1249 | 15.75% | 0.103 |
| Depression | 2412 | 14.58% | 989 | 12.47% | 0.011 |
| Diabetes, Uncomplicated | 5781 | 34.95% | 2724 | 34.35% | 0.585 |
| Diabetes with Chronic Complications | 994 | 6.01% | 528 | 6.66% | 0.237 |
| Drug Abuse | 977 | 5.91% | 553 | 6.97% | 0.043 |
| Hypertension | 8254 | 49.90% | 3693 | 46.56% | 0.002 |
| Hypothyroidism | 2410 | 14.57% | 1095 | 13.81% | 0.31 |
| Lymphoma | 62 | 0.37% | 43 | 0.54% | 0.234 |
| Fluid and Electrolyte Disorders | 8330 | 50.36% | 4117 | 51.91% | 0.15 |
| Metastatic Cancer | 217 | 1.31% | 106 | 1.34% | 0.906 |
| Other Neurological Disorders | 1973 | 11.93% | 849 | 10.70% | 0.079 |
| Obesity | 2104 | 12.72% | 934 | 11.78% | 0.202 |
| Paralysis | 156 | 0.94% | 72 | 0.91% | 0.844 |
| Peripheral Vascular Disorders | 498 | 3.01% | 221 | 2.79% | 0.544 |
| Psychoses | 1026 | 6.20% | 532 | 6.71% | 0.362 |
| Pulmonary Circulation Disorders | 466 | 2.82% | 220 | 2.77% | 0.924 |
| Renal Failure | 2737 | 16.55% | 1542 | 19.44% | 0.001 |
| Solid Tumor without Metastasis | 685 | 4.14% | 406 | 5.12% | 0.037 |
| Peptic Ulcer Disease | ≤10 | 0.02% | ≤10 | 0.05% | 0.425 |
| Valvular Disease | 560 | 3.39% | 306 | 3.86% | 0.281 |
| Weight Loss  | 2135 | 12.91% | 960 | 12.10% | 0.305 |

**Supplemental Table 3.** Full multivariable analysis model of predictors for 30-day readmission in patients with hepatic encephalopathy

|  |  |  |
| --- | --- | --- |
|   | **OR** | **95% CI** |
| **Age** |   |   |
| <45 | 1.57 | (1.29, 1.90) |
| 45-54 | 1.15 | (0.99, 1.32) |
| 55-64 | 1.06 | (0.93, 1.21) |
| ≥65 | Reference |   |
| **Gender** |   |   |
| Male | Reference |   |
| Female | 0.91 | (0.83, 1.01) |
| **Type of insurance** |   |   |
| Private | Reference |   |
| Medicare | 1.11 | (0.94, 1.31) |
| Medicaid | 1.33 | (1.13, 1.58) |
| Other | 0.9 | (0.75, 1.08) |
| **AHRQ-Elixhauser Index** |   |   |
| < 4 | Reference |   |
| ≥ 4 | 1.02 | (0.92, 1.14) |
| **Type of hospital** |   |   |
| Urban Teaching | Reference |   |
| Urban Non-Teaching | 0.99 | (0.90, 1.09) |
| Rural | 0.98 | (0.84, 1.14) |
| **Etiology of Cirrhosis** |   |   |
| Alcoholic | Reference |   |
| Non-Alcoholic | 1.18 | (1.07, 1.30) |
| **Paracentesis** | 1.44 | (1.26, 1.64) |
| **EGD** | 1.03 | (0.83, 1.28) |
| **Mechanical Ventilation** | 0.79 | (0.58, 1.07) |
| **AKI** | 1.11 | (1.00, 1.23) |
| **Variceal Bleed** | 0.92 | (0.39, 2.18) |
| **SBP** | 0.83 | (0.60, 1.14) |
| **Hyponatremia** | 1.1 | (0.97, 1.23) |
| **Ascites** | 1.18 | (1.05, 1.32) |
| **Length of Stay** |   |   |
| ≤ 3 days | Reference |   |
| > 3 days | 1.06 | (0.96, 1.17) |
| **Disposition** |   |   |
| Home (self-care) | Reference |   |
| Short Term Hospital | 0.76 | (0.50, 1.14) |
| Skilled Nursing Facility | 0.86 | (0.75, 0.99) |
| Home healthcare | 0.96 | (0.85, 1.09) |

OR: odds ratio; CI: confidence interval; AHRQ: Agency for Healthcare and Quality Research; EGD: esophagogastroduodenoscopy; AKI: acute kidney injury; SBP: spontaneous bacterial peritonitis

**Supplemental Table 4.** Validation and Comparison of the Test Cohort (2013 NRD) and Validation Cohort (2014 NRD)

|  |
| --- |
| **Rates of Readmission** |
|   | **Test Cohort** | **Validation Cohort** |
| Score Group | No Readmission within 30 days | 30-day Readmission | Percent Readmitted | No Readmission within 30 days | 30-day Readmission | Percent Readmitted |
| 0-6 | 12,225 | 5017 | 29% | 12,660 | 5103 | 29% |
| 7-19 | 4300 | 2904 | 40% | 4588 | 3057 | 40% |
| **Logistic Regression Odds of Readmission** |
|   | **Test Cohort** | **Validation Cohort** |
| Score Group | OR | 95% CI | p-value | OR | 95% CI | p-value |
| 0-6 | Reference |  |   | Reference |  |   |
| 7-19 | 1.65 | (1.51, 1.80) | <0.001 | 1.65 | (1.51, 1.82) | <0.001 |

NRD: Nationwide Readmission Database; OR: odds ratio; CI: confidence interval

**Supplemental Table 5.** Full multivariable analysis of predictors for calendar-year mortality in patients with hepatic encephalopathy

|  |  |  |
| --- | --- | --- |
|   | **HR** | **(95% CI)** |
| **Age** |   |   |
| <45 | 1.06 | (0.79, 1.42) |
| 45-54 | 1.12 | (0.90, 1.40) |
| 55-64 | 1.2 | (1.00, 1.45) |
| ≥65 | Reference |   |
| **Gender** |   |   |
| Male | Reference |   |
| Female | 1.1 | (0.96, 1.27) |
| **Type of insurance** |   |   |
| Private | Reference |   |
| Medicare | 0.81 | (0.65, 0.99) |
| Medicaid | 0.92 | (0.75, 1.13) |
| Other | 0.96 | (0.74, 1.26) |
| **AHRQ-Elixhauser Index** |   |   |
| < 4 | Reference |   |
| ≥ 4 | 1.02 | (0.87, 1.18) |
| **Type of hospital** |   |   |
| Urban Teaching | Reference |   |
| Urban Non-Teaching | 1.03 | (0.88, 1.20) |
| Rural | 1.13 | (0.88, 1.45) |
| **Etiology of Cirrhosis** |   |   |
| Alcoholic | Reference |   |
| Non-Alcoholic | 1.09 | (0.95, 1.25) |
| **Paracentesis** | 1.06 | (0.87, 1.30) |
| **EGD** | 1.09 | (0.83, 1.43) |
| **Mechanical Ventilation** | 0.7 | (0.43, 1.13) |
| **AKI** | 1.3 | (1.10, 1.55) |
| **Variceal Bleed** | 0.64 | (0.19, 2.18) |
| **SBP** | 0.94 | (0.60, 1.49) |
| **Hyponatremia** | 1.08 | (0.91, 1.27) |
| **Ascites** | 1.32 | (1.10, 1.59) |
| **Length of Stay** |   |   |
| ≤ 3 days | Reference |   |
| > 3 days | 1.07 | (0.91, 1.25) |
| **Disposition** |   |   |
| Home (self-care) | Reference |   |
| Short Term Hospital | 1.25 | (0.72, 2.18) |
| Skilled Nursing Facility | 1.38 | (1.14, 1.67) |
| Home healthcare | 1.21 | (1.01, 1.44) |
| **Readmission** |   |   |
| Not within 30-days | Reference |   |
| Within 30-days | 4.03 | (3.49, 4.65) |

HR: hazard ratio; CI: confidence interval; AHRQ: Agency for Healthcare and Quality Research; EGD: esophagogastroduodenoscopy; AKI: acute kidney injury; SBP: spontaneous bacterial peritonitis