**e-Table 1: ICD-9-CM codes used for acute organ dysfunctions**

|  |  |  |
| --- | --- | --- |
| **Organ Failure** | **ICD-9-CM Code** | **Description** |
| **Respiratory** | 518.81 | Acute respiratory failure |
| 518.82 | Other pulmonary insufficiency, not elsewhere classified. Includes - Acute respiratory distress, Acute respiratory insufficiency, Adult respiratory distress syndrome NEC |
| 518.84 | Acute and chronic respiratory failure |
| 518.5 | Pulmonary insufficiency following trauma and surgery |
| 786.09 | Respiratory distress NOS |
| 799.1 | Respiratory arrest |
| 96.7, 96.70, 96.71, 96.72 | Ventilator management |
| **Cardiovascular** | 785.5 | Shock without mention of trauma |
| 785.50 | Shock unspecified |
| 785.59 | Other shock without trauma (includes Hypovolemic Shock) |
| 785.51 | Cardiogenic shock |
| 785.52 | Septic shock |
| 427.5 | Cardiac arrest |
| 458.0, 458.8, 458.9, 796.3 | Hypotension NOS |
| **Renal** | 584, 584.5, 584.6, 584.7, 584.8, 584.9 | Acute Kidney Injury |
| **Hepatic** | 570 | Acute hepatic failure or necrosis |
| 572.2 | Hepatic encephalopathy |
| 573.4 | Hepatic infarction |
| **Hematologic** | 286.6 | Defibrination Syndrome |
| 286.9 | Other coagulation defect |
| 287.4, 287.5 | Thrombocytopenia - secondary or unspecified |
| **Metabolic** | 276.2 | Acidosis – metabolic or lactic |
| **Neurologic** | 293, 293.0, 293.1, 293.8, 293.81, 293.82, 293.83, 293.84, 293.89, 293.9 | Transient organic psychotic conditions |
| 348.1 | Anoxic brain injury |
| 348.3, 348.30, 348.31, 348.39 | Acute encephalopathy |
| 780.01 | Coma |
| 780.09 | Altered consciousness - unspecified |

**e-Table 2: ICD-9-CM codes used to identify hospitalizations with cardiogenic shock, cardiac surgery or heart transplant\***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Diagnosis Group** | **Type of Code** | **Codes** | **Description of codes used** | **Other Criteria** |
| **Cardiac Surgery** | **ICD-9-CM (Procedure)** | 35.X | Operations on valves and septa of Heart |  |
|  |  | 36.X | Operation on vessels of heart |  |
|  |  | 37.1X | Cardiotomy and Pericardiotomy |  |
|  |  | 37.3X | Pericardiectomy and Excision of Lesion of Heart |  |
| **Heart Transplant** | **ICD-9-CM (Procedure)** | 37.51 | Heart Transplantation | Absence of codes for Lung Transplant procedure (33.5 or 33.6) |
| **Cardiogenic Shock** | **CCS\* diagnoses** | 107 | Cardiac arrest and ventricular fibrillation | Without any codes for cardiac, heart/lung transplant surgeryANDEither without CCS codes for respiratory failure (3, 122, 123, 126, 130, 131, 132)Or with the CCS codes for cardiogenic shock in primary location |
|  |  | 108 | Congestive heart failure, not hypertensive |
|  |  | 100 | Acute Myocardial Infarction |
|  |  | 97 | Pericarditis, endocarditis and myocarditis |
|  |  | 106 | Cardiac dysrhythmia |
|  |  | 101 | Coronary atherosclerosis and other heart disease |
|  |  | 103 | Pulmonary heart disease |

\*Clinical Classification Software codes as developed by developed by Healthcare Cost and Utilization Project (available at https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp)

**e-Table 3: Risk Factors for development of AKI\***

|  |  |  |  |
| --- | --- | --- | --- |
| **Risk Factor** |  | **Odds Ratio** | **95 % Confidence Interval** |
| **Sex** | **Male** | 1 |  |
| **Female** | 0.70 | 0.58-0.84 |
| **Race** | **White** | 1 |  |
| **Black** | 1.19 | 0.90-1.57 |
| **Hispanic** | 0.79 | 0.58-1.08 |
| **Asian or Pacific Islander** | 0.95 | 0.48-1.86 |
| **Native American** | 0.37 | 0.13-1.04 |
| **Others** | 1.01 | 0.70-1.46 |
| **Primary Payer** | **Medicare** | 1 |  |
| **Medicaid** | 0.79 | 0.57-1.11 |
| **Private** | 0.97 | 0.72-1.30 |
| **Self-pay** | 0.92 | 0.56-1.52 |
| **No charge** | 0.94 | 0.23-3.74 |
| **Others** | 0.85 | 0.49-1.46 |
| **Hospital Location and Teaching Status** | **Urban Teaching** | 1 |  |
| **Urban Non Teaching** | 0.84 | 0.59-1.20 |
| **Rural** | 0.33 | 0.08-1.30 |
| **Hospital Bedsize** | **Small** | 1 |  |
| **Medium** | 1.65 | 0.92-2.95 |
| **Large** | 2.28 | 1.33-3.89 |
| **Hospital Region** | **Northeast** | 1 |  |
| **Midwest** | 0.94 | 0.65-1.34 |
| **South** | 1.20 | 0.95-1.51 |
| **West** | 1.23 | 0.94-1.61 |
| **Charlson’s Score** | 1.07 | 1.01-1.13 |
| **Admission Type** | **Non elective** | 1 |  |
| **Elective** | 0.91 | 0.73-1.14 |
| **Acute Respiratory Dysfunction** | 2.52 | 1.93-3.28 |
| **Acute Cardiovascular Dysfunction** | 1.75 | 1.42-2.16 |
| **Acute Hepatic Dysfunction** | 4.67 | 3.56-6.12 |
| **Acute Hematological Dysfunction** | 2.12 | 1.76-2.55 |
| **Acute Metabolic Dysfunction** | 2.30 | 1.91-2.78 |
| **Acute Neurological Dysfunction** | 1.42 | 1.10-1.83 |
| **Presence of Cardiogenic Shock, Cardiac Surgery or Heart Transplant that admission** | 0.82 | 0.68-0.99 |
| **Year of Admission** | **2003** | 1 |  |
| **2004** | 0.56 | 0.25-1.24 |
| **2005** | 0.77 | 0.33-1.80 |
| **2006** | 0.68 | 0.26-1.73 |
| **2007** | 0.59 | 0.24-1.46 |
| **2008** | 0.53 | 0.20-1.38 |
| **2009** | 0.65 | 0.31-1.35 |
| **2010** | 0.72 | 0.35-1.47 |
| **2011** | 0.53 | 0.26-1.05 |
| **2012** | 0.52 | 0.26-1.04 |
| **2013** | 0.76 | 0.38-1.52 |
| **2014** | 0.71 | 0.35-1.41 |

\*Model also adjusted for age with age as a restricted cubic spline (Fig 3a)

**e-Table 4: Risk Factors for development of AKI requiring dialysis\***

|  |  |  |  |
| --- | --- | --- | --- |
| **Risk Factor** |  | **Odds Ratio** | **95 % Confidence Interval** |
| **Sex** | **Male** | **1** |  |
| **Female** | **0.86** | **0.68-1.09** |
| **Race** | **White** | **1** |  |
| **Black** | **1.16** | **0.82-1.63** |
| **Hispanic** | **1.01** | **0.68-1.50** |
| **Asian or Pacific Islander** | **1.37** | **0.68-2.74** |
| **Native American** | **0.40** | **0.08-2.01** |
| **Others** | **1.09** | **0.68-1.77** |
| **Primary Payer** | **Medicare** | **1** |  |
| **Medicaid** | **0.87** | **0.56-1.35** |
| **Private** | **0.98** | **0.73-1.31** |
| **Self-pay** | **1.02** | **0.60-1.75** |
| **No charge** | **5.06** | **1.43-17.87** |
| **Others** | **0.77** | **0.40-1.47** |
| **Hospital Location and Teaching Status#** | **Urban Teaching** | **1** |  |
| **Urban Non Teaching** | **0.84** | **0.50-1.42** |
| **Hospital Bedsize** | **Small** | **1** |  |
| **Medium** | **0.71** | **0.33-1.52** |
| **Large** | **0.78** | **0.40-1.52** |
| **Hospital Region** | **Northeast** | **1** |  |
| **Midwest** | **2.84** | **1.84-4.38** |
| **South** | **1.73** | **1.15-2.60** |
| **West** | **2.26** | **1.42-3.58** |
| **Charlson’s Score** | **1.04** | **0.97-1.10** |
| **Admission Type** | **Non elective** | **1** |  |
| **Elective** | **0.95** | **0.71-1.27** |
| **Acute Respiratory Dysfunction** | **2.61** | **1.63-4.19** |
| **Acute Cardiovascular Dysfunction** | **1.70** | **1.26-2.29** |
| **Acute Hepatic Dysfunction** | **2.29** | **1.84-2.86** |
| **Acute Hematological Dysfunction** | **1.57** | **1.25-1.98** |
| **Acute Metabolic Dysfunction** | **1.63** | **1.29-2.04** |
| **Acute Neurological Dysfunction** | **1.41** | **1.12-1.78** |
| **Presence of Cardiogenic Shock, Cardiac Surgery or Heart Transplant that admission** | **0.66** | **0.51-0.85** |
| **Year of Admission** | **2003** | **1** |  |
| **2004** | **0.70** | **0.29-1.71** |
| **2005** | **1.33** | **0.61-2.88** |
| **2006** | **1.05** | **0.31-3.52** |
| **2007** | **0.29** | **0.09-0.93** |
| **2008** | **0.55** | **0.23-1.32** |
| **2009** | **0.46** | **0.17-1.19** |
| **2010** | **0.72** | **0.32-1.63** |
| **2011** | **0.39** | **0.16-0.94** |
| **2012** | **0.33** | **0.15-0.72** |
| **2013** | **0.40** | **0.18-0.88** |
| **2014** | **0.40** | **0.18-0.84** |

\*Model also adjusted for age with age as a restricted cubic spline (Fig 3b)

**#**No ECMO patients in Rural Hospitals received Dialysis

**Supplemental Figure Legends:**

**e-Fig 1a:** Age as a predictor for AKI in adjusted analysis when missing values of race were included as a separate level of race in the analysis

**e-Fig 1b:** Age as a predictor for AKI-D in adjusted analysis when missing values of race were included as a separate level of race in the analysis

**e-Fig 1c:** Age as a predictor for AKI in adjusted analysis when patients 65 years or older were excluded

**e-Fig 1d:** Age as a predictor for AKI-D in adjusted analysis when patients 65 years or older were excluded

**e-Fig 1e:** Age as a predictor for AKI in adjusted analysis when patients who died within 2 days of ECMO cannulation were excluded

**e-Fig 1f:** Age as a predictor for AKI-D in adjusted analysis when patients who died within 2 days of ECMO cannulation were excluded

**e-Fig 1g:** Age as a predictor for AKI in adjusted analysis when the sample was restricted to years 2010 – 2014

**e-Fig 1h:** Age as a predictor for AKI-D in adjusted analysis when the sample was restricted to years 2010 – 2014

**e-Fig 2:** Age as a predictor for Mortality in adjusted analysis when missing values of race were included as a separate level of race in the analysis

**e-Fig 1a**

**e-Fig 1b**

**e-Fig 1c**

**e-Fig 1d**

**e-Fig 1e**

**e-Fig 1f**

**e-Fig 1g**

**e-Fig 1h**

**e-Fig 2**

