The Epidemiology of Tracheostomy in the US 2002-2017: a Serial Cross-Sectional Study

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Table 1. ICD-9-CM Codes Utilized in Case Definitions for Respiratory Failure and Mechanical Ventilation

ICD−9CM.Code	Description
Diagnosis Codes	
799.1	Respiratory arrest
518.5	Pulmonary insufficiency following trauma and surgery
518.51	Acute respiratory failure following trauma and surgery
518.52	Other pulmonary insufficiency, not elsewhere classified, following trauma and surgery
518.53	Acute and chronic respiratory failure following trauma and surgery
518.81	Acute respiratory failure
518.82	Other pulmonary insufficiency not elsewhere classified
518.83	Chronic respiratory failure
518.84	Acute and chronic respiratory failure
Procedure Codes	
96.04	Insertion of endotracheal tube
96.70	Continuous mechanical ventilation of unspecified duration
96.71	Continuous mechanical ventilation of < 96 h consecutively
96.72	Continuous mechanical ventilation for ≥ 96 h consecutively
31.1	Temporary tracheostomy
31 .21	Mediastinal tracheostomy
31.29	Other permanent tracheostomy

Table 2. ICD-9CM to ICD-10CM Crosswalk

Diagnosis Codes			Procedure Codes	
ICD9CM	ICD10CM		ICD9CM	ICD10CM
518.51	J958.21		31.x	0B110F4
518.51	J96.00		31.x	0B110Z4
518.51	J96.01		31.x	0B113F4
518.51	J96.02		31.x	0B113Z4
518.52	J95.1		31.x	0B114F4
518.52	J95.2		31.x	0B114Z4
518.52	J95.3		39.65	5A15223
518.53	J958.22		93.9	5A09357
518.53	J96.20		93.9	5A09457
518.53	J96.21		93.9	5A09557
518.53	J96.22		96.04	0BH17EZ
518.81	J96.00		96.04	0BH18EZ
518.81	J96.01		96.7	5A1935Z
518.81	J96.02		96.7	5A1945Z
518.81	J96.90		96.7	5A1955Z
518.81	J96.91		96.71	5A1935Z
518.81	J96.92		96.71	5A1945Z
518.82	J80		96.72	5A1955Z
518.83	J96.10			
518.83	J96.11			
518.83	J96.12			
518.84	J96.20			
518.84	J96.21			
518.84	J96.22			
799.1	R09.2			

Table 3. ICD-10-CM Codes Utilized in Case Definitions for Respiratory Failure and Mechanical Ventilation

ICD-10CM Code	Description
Diagnosis Codes	
J95.1	Acute pulmonary insufficiency following thoracic surgery
J95.2	Acute pulmonary insufficiency following nonthoracic surgery
J95.3	Chronic pulmonary insufficiency following surgery
J95.821	Acute postprocedural respiratory failure
J95.822	Acute and chronic postprocedural respiratory failure
J96.00	Acute respiratory failure unspecified whether with hypoxia or hypercapnia
J96.01	Acute respiratory failure with hypoxia
J96.02	Acute respiratory failure with hypercapnia
J96.20	Acute and chronic respiratory failure, unspecified whether with hypoxia or hypercapnia
J96.21	Acute and chronic respiratory failure with hypoxia
J96.22	Acute and chronic respiratory failure with hypercapnia
J96.90	Respiratory failure unspecified whether with hypoxia or hypercapnia
J96.91	Respiratory failure with hypoxia
J96.92	Respiratory failure with hypercapnia
J80	Acute respiratory distress syndrome
J96.10	Chronic respiratory failure, unspecified whether with hypoxia or hypercapnia
J96.11	Chronic respiratory failure with hypoxia
J96.12	Chronic respiratory failure with hypercapnia
R09.2	Respiratory Arrest
Procedure Codes	
Tracheostomy	
0B110F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Open Approach
0B110Z4	Bypass Trachea to Cutaneous, Open Approach
0B113F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Percutaneous Approach
0B113Z4	Bypass Trachea to Cutaneous, Percutaneous Approach
0B114F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Percutaneous Endoscopic Approach
0B114Z4	Bypass Trachea to Cutaneous, Percutaneous Endoscopic Approach
Invasive Mechanical Ventilation	
0BH17EZ	Insertion of Endotracheal Airway into Trachea, Via Natural or Artificial Opening
0BH18EZ	Insertion of Endotracheal Airway into Trachea, Via Natural or Artificial Opening Endoscopic
5A1935Z	Respiratory Ventilation, Less than 24 Consecutive Hours
5A1945Z	Respiratory Ventilation, 24-96 Consecutive Hours
5A1955Z	Respiratory Ventilation, Greater than 96 Consecutive Hours

Table 4. Recategorization of HCUP ICD-9 Clinical Classification Categories

HCUP Clinical Classification Code	HCUP Clinical Classification Description	Recategorization
100	Acute myocardial infarction	Cardiovascular
101	Coronary atherosclerosis and other heart disease	Cardiovascular
103	Pulmonary heart disease	Cardiovascular
105	Conduction disorders	Cardiovascular
106	Cardiac dysrhythmias	Cardiovascular
107	Cardiac arrest and ventricular fibrillation	Cardiovascular
108	Congestive heart failure; nonhypertensive	Cardiovascular
118	Phlebitis; thrombophlebitis and thromboembolism	Cardiovascular
226	Fracture of neck of femur (hip)	Trauma
228	Skull and face fractures	Trauma
229	Fracture of upper limb	Trauma
230	Fracture of lower limb	Trauma
231	Other fractures	Trauma
234	Crushing injury or internal injury	Trauma
235	Open wounds of head; neck; and trunk	Trauma
236	Open wounds of extremities	Trauma
240	Burns	Trauma
85	Coma; stupor; and brain damage	Neurological
109	Acute cerebrovascular disease	Neurological
110	Occlusion or stenosis of precerebral arteries	Neurological
111	Other and ill-defined cerebrovascular disease	Neurological
227	Spinal cord injury	Neurotrauma
233	Intracranial injury	Neurotrauma
127	Chronic obstructive pulmonary disease and bronchiectasis	Respiratory
128	Asthma	Respiratory
129	Aspiration pneumonitis; food/vomitus	Respiratory
131	Respiratory failure; insufficiency; arrest (adult)	Respiratory
132	Lung disease due to external agents	Respiratory
133	Other lower respiratory disease	Respiratory
134	Other upper respiratory disease	Respiratory
221	Respiratory distress syndrome	Respiratory
2	Septicemia (except in labor)	Infection
3	Bacterial infection; unspecified site	Infection
4	Mycoses	Infection
7	Viral infection	Infection
76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)	Infection
77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)	Infection
122	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	Infection
123	Influenza	Infection
197	Skin and subcutaneous tissue infections	Infection

For space, the total 285 Clinical Classification Codes are not included here

Table 5. Recategorization of HCUP ICD-9 Clinical Classification Categories

HCUP Clinical Classification Code	HCUP Clinical Classification Description	Recategorization
CIR009	Acute myocardial infarction	Cardiovascular
CIR010	Complications of acute myocardial infarction	Cardiovascular
CIR011	Coronary atherosclerosis and other heart disease	Cardiovascular
CIR013	Acute pulmonary embolism	Cardiovascular
CIR014	Pulmonary heart disease	Cardiovascular
CIR016	Conduction disorders	Cardiovascular
CIR017	Cardiac dysrhythmias	Cardiovascular
CIR018	Cardiac arrest and ventricular fibrillation	Cardiovascular
CIR019	Heart failure	Cardiovascular
CIR027	Arterial dissections	Cardiovascular
CIR029	Aortic; peripheral; and visceral artery aneurysms	Cardiovascular
CIR030	Aortic and peripheral arterial embolism or thrombosis	Cardiovascular
CIR033	Acute phlebitis; thrombophlebitis and thromboembolism	Cardiovascular
CIR034	Chronic phlebitis; thrombophlebitis and thromboembolism	Cardiovascular
CIR020	Cerebral infarction	Neurological
CIR021	Acute hemorrhagic cerebrovascular disease	Neurological
CIR022	Sequela of hemorrhagic cerebrovascular disease	Neurological
CIR023	Occlusion or stenosis of precerebral or cerebral arteries without infarction	Neurological
CIR024	Other and ill-defined cerebrovascular disease	Neurological
CIR025	Sequela of cerebral infarction and other cerebrovascular disease	Neurological
INJ008	Traumatic brain injury (TBI); concussion, initial encounter	Neurotrauma
INJ009	Spinal cord injury (SCI), initial encounter	Neurotrauma
RSP007	Other specified and unspecified upper respiratory disease	Respiratory
RSP008	Chronic obstructive pulmonary disease and bronchiectasis	Respiratory
RSP009	Asthma	Respiratory
RSP010	Aspiration pneumonitis	Respiratory
RSP011	Pleurisy, pleural effusion and pulmonary collapse	Respiratory
RSP012	Respiratory failure; insufficiency; arrest	Respiratory
RSP013	Lung disease due to external agents	Respiratory
RSP014	Pneumothorax	Respiratory
RSP015	Mediastinal disorders	Respiratory
RSP016	Other specified and unspecified lower respiratory disease	Respiratory
INF002	Septicemia	Infection
INF003	Bacterial infections	Infection
INF004	Fungal infections	Infection
INF008	Viral infection	Infection
RSP002	Pneumonia (except that caused by tuberculosis)	Infection
RSP003	Influenza	Infection
RSP004	Acute and chronic tonsillitis	Infection
RSP005	Acute bronchitis	Infection
RSP006	Other specified upper respiratory infections	Infection
SKN001	Skin and subcutaneous tissue infections	Infection
EXT001	External cause codes: cut/pierce; initial encounter	Trauma
EXT002	External cause codes: drowning/submersion; initial encounter	Trauma
EXT003	External cause codes: fall; initial encounter	Trauma
EXT004	External cause codes: fire/burn; initial encounter	Trauma

EXT005	External cause codes: firearm; initial encounter	Trauma
EXT006	External cause codes: machinery; initial encounter	Trauma
EXT007	External cause codes: motor vehicle traffic (MVT); initial encounter	Trauma
EXT008	External cause codes: pedal cyclist; not MVT; initial encounter	Trauma
EXT009	External cause codes: pedestrian; not MVT; initial encounter	Trauma
EXT010	External cause codes: transport; not MVT; initial encounter	Trauma
EXT011	External cause codes: natural/environment; initial encounter	Trauma
EXT012	External cause codes: bites; initial encounter	Trauma
EXT013	External cause codes: overexertion; initial encounter	Trauma
EXT014	External cause codes: poisoning by drug	Trauma
EXT015	External cause codes: poisoning by non-drug	Trauma
EXT016	External cause codes: struck by; against; initial encounter	Trauma
EXT017	External cause codes: suffocation/inhalation; initial encounter	Trauma
EXT018	External cause codes: other specified, classifiable and NEC; initial encounter	Trauma
EXT019	External cause codes: unspecified mechanism	Trauma
INJ001	Fracture of head and neck, initial encounter	Trauma
INJ002	Fracture of the spine and back, initial encounter	Trauma
INJ003	Fracture of torso, initial encounter	Trauma
INJ004	Fracture of the upper limb, initial encounter	Trauma
INJ005	Fracture of the lower limb (except hip), initial encounter	Trauma
INJ006	Fracture of the neck of the femur (hip), initial encounter	Trauma
INJ007	Dislocations, initial encounter	Trauma
INJ010	Internal organ injury, initial encounter	Trauma
INJ011	Open wounds of head and neck, initial encounter	Trauma
INJ012	Open wounds to limbs, initial encounter	Trauma
INJ013	Open wounds of trunk, initial encounter	Trauma
INJ014	Amputation of a limb, initial encounter	Trauma
INJ015	Amputation of other body parts, initial encounter	Trauma
INJ016	Injury to blood vessels, initial encounter	Trauma
INJ017	Superficial injury; contusion, initial encounter	Trauma
INJ018	Crushing injury, initial encounter	Trauma
INJ019	Burn and corrosion, initial encounter	Trauma
INJ020	Effect of foreign body entering opening, initial encounter	Trauma
INJ021	Effect of other external causes, initial encounter	Trauma

For space, the total 530 Clinical Classification Codes are not included here

Table 6. Annual Case Volume by Case Definitions

	02			03			04			05			06			07			08			09			10			11			12			13			14			16			17		
	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95
N of tracheostomy	80612	74439.7	86785.1	86115	79129.9	93100.1	86843	80132.5	93554.1	85941	79445.7	92436.9	88874	82755.6	94992.5	88639	80979.3	96297.6	89545	81820.8	97268.2	86353	79606.1	93100.1	89159	80993	97325.1	82112	74316.4	89907.4	79615	75785.5	83444.5	77075	73728.7	80421.3	73890	70828.4	76951.7	75105	72072.1	78137.8	71550	68537.3	74562.7
Tracheostomies per 100,000 US adults	37.5	34.7	40.4	39.7	36.5	42.9	39.6	36.5	42.6	38.7	35.8	41.6	39.6	36.8	42.3	39.0	35.6	42.4	38.9	35.6	42.3	37.1	34.2	40.0	37.9	34.4	41.4	34.5	31.3	37.8	33.1	31.5	34.7	31.7	30.4	33.1	30.1	28.9	31.4	30.1	28.9	31.3	28.4	27.2	29.6
Percent of RF-IMV discharges with tracheostomy	10.4	9.4	10.9	10.8	10.3	11.3	10.9	10.4	11.4	10.6	10.0	11.1	10.6	10.1	11.1	10.6	9.9	11.2	10.4	9.9	10.9	9.9	9.3	10.4	9.9	9.3	10.5	9.4	8.9	9.9	9.0	8.7	9.3	8.5	8.3	8.8	8.2	80.0	8.5	8.0	7.7	8.2	7.4	7.2	7.6

Table 7. Demographic Characteristics of Patients with Respiratory Failure, Invasive Mechanical Ventilation and Tracheostomy

	02			03			04			05			06			07			08			09			10			11			12			13			14			16			17		
	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95
Age, years																																													
Mean	63.8	63.0	64.6	63.0	62.2	63.8	61.9	61.1	62.8	63.2	62.2	64.1	62.2	61.5	63.0	61.5	60.4	62.5	61.9	61.2	62.6	61.0	60.3	61.7	60.1	59.5	60.8	60.8	60.0	61.6	60.8	60.3	61.2	60.6	60.1	61.0	60.3	59.8	60.7	59.7	59.3	60.1	59.6	59.2	60.1
Categories																																													
< 18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-29	4.5	3.8	5.2	4.6	3.9	5.3	5.9	5.0	6.7	4.5	3.8	5.1	5.3	4.7	6.1	6.2	5.2	7.2	5.0	4.4	5.7	5.7	5.0	6.3	6.5	5.8	7.3	5.9	5.2	6.7	5.8	5.3	6.4	6.2	5.7	6.8	6.4	5.9	7.0	6.8	6.3	7.4	6.8	6.2	7.3
30-39	6.0	5.3	6.7	5.6	5.0	6.2	6.1	5.5	6.8	5.5	4.9	6.1	5.0	4.4	5.5	6.0	5.5	6.6	5.5	4.9	6.2	5.7	5.1	6.2	6.5	6.0	7.0	6.1	5.5	6.7	5.6	5.2	6.0	5.8	5.4	6.3	6.0	5.6	6.5	6.5	6.0	7.0	6.9	6.4	7.4
40-49	10.2	9.5	10.8	10.9	10.1	11.6	11.5	10.8	12.3	11.1	10.3	11.8	11.5	10.7	12.3	11.7	11.0	12.5	11.4	10.7	12.0	11.8	11.1	12.6	11.9	11.2	12.7	10.8	10.1	11.5	11.1	10.5	11.7	10.4	9.8	10.9	10.3	9.8	10.9	10.5	10.0	11.1	10.1	9.6	10.7
50-59	14.8	14.0	15.6	16.5	15.7	17.3	16.5	15.8	17.2	17.4	16.4	18.3	18.1	17.3	18.9	17.6	16.7	18.5	19.1	18.3	19.9	19.7	18.9	20.5	20.1	19.4	20.8	20.4	19.6	21.2	20.6	19.9	21.3	20.7	20.0	21.4	20.8	20.1	21.5	20.6	20.0	21.3	21.0	20.2	21.7
60-69	20.0	19.1	20.9	20.6	19.9	21.4	20.8	19.9	21.6	20.5	19.7	21.4	21.5	20.8	22.3	21.2	20.3	22.1	22.2	21.4	23.0	23.4	22.5	24.2	22.3	21.5	23.0	23.3	22.5	24.2	24.2	23.5	25.0	24.7	23.9	25.4	24.9	24.1	25.8	25.3	24.5	26.1	24.8	24.0	25.6
70-79	26.8	25.5	28.1	25.9	24.9	27.0	23.4	22.4	24.5	23.8	22.8	24.9	23.2	22.2	24.2	21.8	20.7	22.8	21.8	20.7	22.8	20.2	19.3	21.1	20.2	19.2	21.1	20.5	19.5	21.5	20.3	19.5	21.0	20.2	19.4	20.9	20.0	19.2	20.8	20.1	19.3	20.8	20.8	19.9	21.6
>= 80	17.8	16.6	19.0	15.9	14.7	17.1	15.8	14.6	17.0	17.3	15.4	19.2	15.4	14.2	16.6	15.5	13.6	17.3	15.0	13.9	16.1	13.5	12.5	14.6	12.6	11.7	13.4	12.9	11.7	14.1	12.3	11.6	13.1	12.1	11.3	12.8	11.4	10.7	12.1	10.1	9.5	10.8	9.6	9.0	10.3
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Female, %																																													
Female	46.7	45.4	48.0	46.1	44.8	47.4	45.2	43.9	46.5	46.4	45.3	47.6	45.5	44.3	46.7	44.1	42.7	45.4	45.2	44.0	46.4	44.6	43.5	45.7	43.5	42.3	44.6	43.7	42.6	44.8	43.6	42.7	44.5	42.8	41.9	43.8	43.4	42.4	44.3	41.3	40.3	42.2	41.3	40.4	42.3
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payer																																													
Medicare	57.5	55.4	59.7	56.6	54.6	58.6	52.6	50.3	55.0	56.8	54.4	59.1	54.8	52.7	56.8	52.5	50.0	55.0	52.8	50.7	54.9	51.1	49.3	53.0	48.9	46.9	50.8	52.4	50.2	54.5	51.9	50.6	53.1	52.6	51.3	53.9	51.4	50.2	52.6	50.3	49.1	51.5	49.8	48.6	51.0
Medicaid	12.3	11.2	13.4	13.5	12.3	14.7	14.2	12.9	15.5	13.9	12.8	15.0	14.3	13.0	15.7	15.2	13.9	16.6	15.6	14.4	16.8	16.7	15.3	18.1	17.9	16.3	19.4	16.4	15.2	17.5	17.1	16.2	17.9	17.2	16.4	18.1	18.5	17.6	19.4	20.2	19.3	21.2	20.4	19.4	21.3
Private including HMO	23.9	22.3	25.5	23.0	21.5	24.6	24.9	23.0	26.8	21.9	20.3	23.4	22.9	21.4	24.3	23.4	21.4	25.5	23.9	22.6	25.3	23.9	22.3	25.5	24.1	22.7	25.5	23.3	21.9	24.8	22.2	21.3	23.1	21.6	20.7	22.5	22.5	21.6	23.4	22.6	21.7	23.5	22.6	21.7	23.6
Self-pay	2.9	2.2	3.6	3.3	2.7	3.9	4.0	3.0	4.9	4.3	3.0	5.6	3.8	3.1	4.4	4.5	3.6	5.4	3.9	3.1	4.7	4.5	3.3	5.7	4.8	3.6	5.9	4.0	3.3	4.7	4.7	4.1	5.2	4.4	3.9	4.9	3.9	3.4	4.4	3.6	3.1	4.1	3.6	3.1	4.1
No charge	0.3	0.1	0.6	0.4	0.1	0.6	0.5	0.1	0.8	0.4	0.2	0.7	0.5	0.2	0.7	0.5	0.2	0.8	0.3	0.0	0.7	0.3	0.1	0.5	0.5	0.2	0.9	0.4	0.1	0.7	0.4	0.2	0.6	0.5	0.3	0.7	0.2	0.0	0.5	0.3	0.1	0.4	0.2	0.1	0.4
Other	2.8	2.2	3.4	3.1	2.5	3.8	3.5	2.6	4.3	2.5	2.1	3.0	3.8	3.0	4.5	3.6	2.9	4.4	3.3	2.7	3.9	3.3	2.7	3.9	3.6	2.9	4.4	3.3	2.6	3.9	3.5	3.1	3.9	3.5	3.1	4.0	3.3	2.9	3.7	3.2	2.6	3.8	3.2	2.8	3.6
Missing	0.1	0.0	0.2	0.1	0.0	0.1	0.3	0.0	0.7	0.2	0.0	0.3	0.0	0.0	0.1	0.2	0.0	0.4	0.2	0.1	0.3	0.2	0.0	0.3	0.3	0.1	0.5	0.2	0.0	0.4	0.2	0.0	0.3	0.2	0.1	0.3	0.1	0.0	0.1	0.2	0.0	0.3	0.1	0.0	0.2
Race																																													
White	52.2	48.4	55.9	52.6	48.8	56.4	48.5	44.3	52.6	54.8	50.9	58.7	50.8	46.6	54.9	48.1	44.2	52.0	55.0	51.1	59.0	53.7	49.7	57.7	56.0	52.1	60.0	57.5	53.7	61.2	59.4	57.4	61.5	58.7	56.9	60.4	58.4	56.7	60.1	56.1	54.4	57.8	55.0	53.3	56.7
Black	14.9	12.4	17.5	14.9	12.4	17.4	15.8	13.1	18.6	12.0	10.2	13.7	14.0	11.9	16.0	14.5	12.0	17.0	14.6	12.5	16.8	17.0	14.7	19.3	20.3	17.5	23.1	18.4	16.1	20.6	19.4	18.1	20.8	20.0	18.7	21.3	20.2	18.9	21.4	21.1	19.8	22.4	22.5	21.1	23.9
Hispanic	6.2	4.6	7.8	9.2	7.1	11.2	7.6	5.9	9.3	7.0	5.4	8.6	8.4	6.7	10.2	9.0	7.0	11.0	7.8	5.9	9.6	9.2	7.5	10.8	9.4	7.4	11.4	9.5	7.5	11.4	9.6	8.6	10.7	10.2	9.2	11.2	10.5	9.5	11.5	11.2	10.1	12.2	11.4	10.3	12.4
Asian or pacific islander	2.2	1.5	2.9	2.2	1.5	2.9	2.0	1.3	2.6	2.1	1.4	2.9	2.0	1.4	2.6	2.1	1.5	2.8	2.6	1.9	3.4	2.9	2.2	3.5	2.1	1.7	2.6	2.6	2.0	3.1	2.6	2.3	3.0	3.0	2.6	3.4	2.8	2.4	3.2	3.0	2.6	3.4	3.3	2.8	3.7
Native American	0.2	0.1	0.3	0.1	0.1	0.2	0.3	0.1	0.5	0.2	0.1	0.3	0.4	0.2	0.6	0.8	0.3	1.4	0.5	0.2	0.7	0.5	0.3	0.7	0.6	0.2	0.9	0.6	0.2	1.0	0.6	0.4	0.8	0.6	0.4	0.7	0.6	0.4	0.8	0.7	0.5	0.9	0.5	0.4	0.7
Other	2.4	1.5	3.3	2.8	1.5	4.0	2.7	1.4	4.1	2.8	1.7	4.0	2.4	1.7	3.1	2.4	1.7	3.0	3.0	2.2	3.9	3.5	2.3	4.7	2.5	1.9	3.0	3.1	2.2	4.0	4.1	3.2	4.9	3.5	3.0	4.1	3.6	3.1	4.1	3.6	3.0	4.3	4.0	3.4	4.7
Missing	21.9	17.5	26.3	18.3	14.1	22.4	23.1	18.1	28.2	21.1	16.7	25.4	22.0	17.1	26.9	23.0	17.8	28.3	16.4	12.6	20.2	13.3	8.6	18.0	9.0	5.7	12.3	8.4	4.3	12.6	4.2	3.1	5.3	4.0	3.0	5.0	3.9	3.0	4.8	4.2	3.3	5.2	3.3	2.6	4.0

Table 8. Clinical Characteristics of Patients with Respiratory Failure, Invasive Mechanical Ventilation and Tracheostomy

	02			03			04			05			06			07			08			09			10			11			12			13			14			16			17		
	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95
Risk of Mortality, %																																													
No class	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minor	3.3	2.8	3.8	3.7	3.2	4.1	3.2	2.8	3.6	2.9	2.5	3.4	2.8	2.3	3.2	2.6	2.2	3.0	1.8	1.5	2.1	1.8	1.5	2.1	1.5	1.3	1.8	1.5	1.2	1.8	1.5	1.3	1.7	1.3	1.1	1.5	1.2	1.0	1.5	1.0	0.8	1.2	0.8	0.7	1.0
Moderate	12.1	11.1	13.0	12.2	11.3	13.2	12.8	11.8	13.8	10.9	10.0	11.9	10.8	9.8	11.8	9.1	8.2	9.9	7.2	6.6	7.9	7.5	6.8	8.1	5.5	4.9	6.0	5.9	5.4	6.4	5.2	4.8	5.7	4.6	4.1	5.0	4.2	3.8	4.7	3.9	3.5	4.3			
Major	37.3	35.6	39.0	36.0	34.3	37.8	38.6	37.5	39.6	36.8	35.4	38.3	34.7	33.6	35.8	33.8	32.3	35.2	29.9	28.7	31.1	29.7	28.6	30.9	28.5	27.4	29.6	27.5	26.4	28.6	30.0	29.1	30.9	28.8	27.9	29.8	27.5	26.5	28.4	26.1	25.2	27.0	24.3	23.4	25.2
Extreme	42.2	39.8	44.6	42.7	40.2	45.2	45.4	43.7	47.2	49.3	47.1	51.5	51.7	49.8	53.6	54.6	52.4	56.8	61.0	59.3	62.8	61.0	59.4	62.6	63.0	61.3	64.6	65.5	64.0	67.1	62.6	61.5	63.7	64.6	63.5	65.7	66.7	65.6	67.9	68.7	67.6	69.7	71.0	69.9	72.0
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Elixhauser composite mortality score																																													
Mean	13.7	13.0	14.4	13.2	12.6	13.7	13.3	12.7	13.8	14.2	13.5	14.8	14.4	13.8	15.0	15.3	14.6	16.0	15.7	15.1	16.2	15.8	15.2	16.3	16.4	15.7	17.1	17.7	17.2	18.2	17.9	17.6	18.2	18.1	17.8	18.5	18.3	17.9	18.6	17.8	17.5	18.1	18.2	17.9	18.6
Elixhauser composite readmission score																																													
Mean	22.3	21.1	23.5	21.7	20.8	22.5	21.6	20.7	22.5	23.0	22.1	23.9	24.3	23.2	25.3	25.2	24.1	26.4	26.3	25.2	27.3	26.8	25.9	27.8	27.1	25.9	28.2	30.1	29.0	31.1	30.4	29.9	31.0	30.7	30.2	31.2	30.9	30.4	31.4	31.5	31.0	32.0	32.0	31.4	32.5
HIV/AIDS																																													
Present	0.4	0.2	0.5	0.4	0.2	0.6	0.4	0.3	0.6	0.6	0.4	0.8	0.6	0.4	0.7	0.5	0.4	0.7	0.5	0.3	0.7	0.6	0.4	0.8	0.6	0.3	0.9	0.5	0.3	0.6	0.5	0.4	0.6	0.5	0.4	0.6	0.4	0.3	0.5	0.7	0.5	0.8	0.6	0.5	0.8
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alcohol abuse																																													
Present	6.3	5.6	7.0	6.4	5.7	7.2	6.8	6.2	7.4	7.0	6.4	7.7	7.8	7.1	8.5	7.5	6.8	8.1	7.3	6.5	8.1	7.5	6.9	8.2	8.5	7.7	9.3	8.5	7.8	9.2	9.3	8.7	9.8	9.2	8.6	9.7	9.7	9.1	10.2	10.0	9.4	10.6	9.1	8.6	9.7
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Deficiency anemias																																													
Present	13.7	11.9	15.5	15.1	13.4	16.8	14.5	12.6	16.3	15.0	13.2	16.7	18.1	16.0	20.1	19.6	17.2	22.0	25.4	23.2	27.5	26.6	24.6	28.6	26.2	24.1	28.4	29.8	27.4	32.3	30.0	28.7	31.3	29.1	27.9	30.2	29.6	28.4	30.8	29.1	28.0	30.3	28.1	26.9	29.2
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rheumatoid arthritis																																													
Present	1.4	1.1	1.6	1.6	1.3	1.8	1.5	1.3	1.8	1.6	1.4	1.8	1.7	1.5	2.0	1.6	1.4	1.8	1.9	1.6	2.1	2.0	1.8	2.3	2.3	2.0	2.6	2.8	2.5	3.2	2.4	2.1	2.6	2.6	2.4	2.9	2.5	2.2	2.8	2.5	2.2	2.7	2.6	2.3	2.8
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blood loss anemia																																													
Present	2.9	2.4	3.4	2.4	2.0	2.8	2.7	2.3	3.1	2.5	2.2	2.9	3.1	2.5	3.6	2.9	2.5	3.3	2.1	1.7	2.5	2.0	1.7	2.4	1.8	1.4	2.1	1.9	1.6	2.2	1.6	1.3	1.8	1.4	1.1	1.6	1.5	1.3	1.7	1.6	1.3	1.8	1.3	1.1	1.5
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Congestive heart failure																																													
Present	28.7	26.8	30.7	28.4	26.4	30.3	29.5	27.7	31.4	31.9	29.9	33.9	31.4	29.5	33.3	29.6	27.5	31.7	24.9	23.4	26.5	25.6	24.1	27.1	24.0	22.5	25.5	27.6	25.8	29.4	27.4	26.2	28.5	27.5	26.4	28.6	27.8	26.8	28.9	27.6	26.6	28.6	30.6	29.5	31.6
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pulmonary disease																																													
Present	32.2	30.2	34.2	32.0	30.0	33.9	30.8	29.2	32.4	34.3	32.8	35.8	32.8	31.1	34.5	30.6	28.8	32.4	28.3	26.8	29.7	28.1	26.6	29.7	25.7	24.0	27.5	29.9	28.1	31.7	29.4	28.3	30.4	29.1	28.0	30.2	28.3	27.3	29.3	28.6	27.6	29.6	29.5	28.4	30.5
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coagulopathy																																													
Present	11.0	9.9	12.0	12.8	11.9	13.8	13.5	12.5	14.4	14.4	13.4	15.4	14.7	13.6	15.9	16.3	15.1	17.6	15.4	14.2	16.5	16.1	14.8	17.4	17.8	16.4	19.2	19.9	18.5	21.3	20.7	19.9	21.5	20.6	19.8	21.4	20.9	20.0	21.7	21.9	21.0	22.8	22.5	21.6	23.4
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Depression																																													
Present	2.9	2.5	3.3	3.1	2.6	3.5	3.7	3.0	4.4	3.6	3.0	4.1	4.5	3.9	5.2	4.7	4.2	5.2	6.1	5.5	6.7	6.3	5.7	6.9	6.5	5.8	7.1	8.8	7.9	9.7	8.6	8.0	9.1	8.8	8.3	9.4	8.7	8.1	9.3	10.1	9.5	10.7	9.8	9.2	10.4
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diabetes without complications																																													
Present	13.4	12.2	14.7	14.4	12.9	16.0	15.7	14.2	17.1	14.8	13.6	16.1	16.7	15.4	18.0	18.0	16.6	19.4	19.8	18.5	21.0	20.9	19.6	22.2	19.5	18.1	20.9	22.5	21.1	23.9	23.1	22.1	24.1	23.3	22.4	24.1	22.6	21.8	23.5	12.5	11.9	13.2	9.2	8.6	9.7
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diabetes with complications																																													
Present	4.0	3.5	4.6	3.8	3.3	4.3	3.8	3.4	4.3	4.1	3.6	4.6	4.6	4.0	5.2	4.6	4.1	5.1	5.3	4.7	5.9	5.2	4.6	5.7	4.9	4.3	5.4	5.7	5.1	6.3	6.2	5.7	6.7	6.1	5.6	6.6	6.4	5.9	6.9	18.2	17.4	19.0	20.8	19.9	21.7
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Drug abuse																																													
Present	2.3	1.9	2.7	2.6	2.2	3.0	3.0	2.6	3.4	3.4	2.9	3.9	3.7	3.3	4.2	3.9	3.4	4.4	3.5	3.1	4.0	3.6	3.1	4.1	3.8	3.3	4.3	4.4	3.9	4.9	5.0	4.5	5.4	5.2	4.7	5.6	5.6	5.1	6.0	5.3	4.9	5.7	5.8	5.3	6.2
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hypertension																																													
Present	20.3	18.4	22.2	30.7	28.3	33.2	32.2	29.8	34.6	33.7	31.6	35.8	38.1	35.8	40.4	37.7	35.1	40.2	43.5	41.4	45.7	46.7	44.4	48.9	44.8	42.1	47.4	51.6	49.0	54.1	53.5	52.0	54.9	53.1	51.9	54.4	55.4	54.2	56.6	57.7	56.5	58.9	58.8	57.5	60.1
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hypothyroidism																																													
Present	3.8	3.3	4.4	3.8	3.3	4.3	3.7	3.2	4.2	4.3	3.7	4.9	5.3	4.7	6.0	5.4	4.8	6.0	6.8	6.2	7.5	6.4	5.8	7.0	7.3	6.6	8.0	8.6	7.9	9.2	8.8	8.3	9.4	9.1	8.5	9.6	9.4	8.8	9.9	9.5	8.9	10.1	8.8	8.2	9.3
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Liver disease																																													
Present	2.7	2.3	3.0	3.0	2.6	3.3	3.3	2.9	3.7	3.2	2.8	3.7	3.5	3.2	3.8	3.6	3.2	4.0	3.5	3.2	3.9	4.1	3.7	4.5	4.3	3.7	4.8	4.8	4.3	5.3	4.9	4.5	5.3	5.1	4.7	5.6	5.1	4.7	5.5	6.0	5.6	6.4	6.1	5.7	6.6
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lymphoma																																													
Present	0.8	0.6	1.0	0.9	0.7	1.1	1.1	1.0	1.3	1.0	0.8	1.2	0.9	0.7	1.0	0.9	0.7	1.1	0.9	0.7	1.0	1.2	1.0	1.4	1.1	0.9	1.2	1.1	0.9	1.3	1.1	0.9	1.2	1.2	1.0	1.4	1.0	0.9	1.2	1.2	1.0	1.3	1.0	0.8	1.2
Missing	5.1	2.1	8.1	5.3	1.6	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Fluid and electrolyte disorders																																														
Present	**43.1**	40.4	45.9	**43.0**	40.5	45.6	**46.6**	44.6	48.5	**50.2**	48.2	52.2	**52.1**	50.0	54.2	**55.1**	52.7	57.6	**60.6**	58.2	63.0	**60.2**	58.1	62.3	**62.4**	60.0	64.9	**67.4**	65.4	69.5	**69.6**	68.4	70.7	**71.2**	70.0	72.4	**73.7**	72.6	74.8	**73.5**	72.4	74.7	**74.8**	73.5	76.1
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Metastatic cancer																																														
Present	**3.0**	2.6	3.4	**3.2**	2.7	3.6	**3.1**	2.8	3.5	**3.2**	2.9	3.6	**3.0**	2.7	3.4	**3.4**	2.8	3.9	**3.5**	3.1	3.9	**3.2**	2.8	3.6	**3.2**	2.7	3.7	**3.3**	2.9	3.7	**3.1**	2.8	3.4	**3.0**	2.7	3.4	**2.7**	2.4	3.0	**3.2**	2.8	3.5	**2.9**	2.6	3.2
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Other neurological disorders																																														
Present	**20.9**	19.4	22.4	**14.9**	13.8	15.9	**16.2**	15.2	17.2	**16.2**	15.3	17.1	**16.8**	15.8	17.8	**17.2**	16.1	18.4	**16.0**	15.0	17.0	**16.2**	15.2	17.2	**18.2**	17.0	19.4	**19.1**	18.0	20.2	**20.8**	20.0	21.5	**21.6**	20.8	22.4	**21.8**	21.0	22.7	**25.1**	24.3	26.0	**25.0**	24.2	25.9
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Obesity																																														
Present	**4.5**	3.9	5.1	**4.3**	3.7	5.0	**4.5**	4.0	5.0	**5.3**	4.7	6.0	**7.0**	6.2	7.8	**7.4**	6.6	8.2	**12.0**	11.0	13.0	**13.8**	12.7	14.9	**12.5**	11.4	13.5	**18.0**	16.9	19.1	**18.9**	18.0	19.8	**19.2**	18.4	20.1	**20.7**	19.8	21.5	**21.9**	21.1	22.8	**21.5**	20.7	22.4
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Paralysis																																														
Present	**6.7**	5.9	7.5	**7.3**	6.5	8.0	**6.9**	6.3	7.5	**6.9**	6.2	7.7	**7.5**	6.8	8.2	**8.8**	8.1	9.5	**11.9**	11.1	12.7	**11.6**	10.8	12.3	**13.6**	12.7	14.5	**13.2**	12.4	14.1	**14.4**	13.7	15.1	**15.1**	14.4	15.8	**15.3**	14.6	16.1	**19.1**	18.3	19.8	**20.3**	19.5	21.2
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Peripheral vascular disease																																														
Present	**3.3**	2.7	3.8	**3.6**	3.2	4.1	**3.2**	2.7	3.7	**3.4**	2.9	3.8	**4.0**	3.5	4.5	**4.8**	4.4	5.3	**6.7**	6.2	7.3	**7.0**	6.4	7.6	**6.7**	6.1	7.3	**8.0**	7.3	8.8	**8.4**	7.9	9.0	**9.0**	8.4	9.5	**8.7**	8.2	9.3	**9.1**	8.5	9.6	**8.6**	8.1	9.1
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Psychoses																																														
Present	**2.7**	2.3	3.1	**2.6**	2.2	2.9	**3.0**	2.6	3.3	**3.2**	2.8	3.6	**3.5**	3.1	4.0	**3.8**	3.4	4.3	**4.6**	4.2	5.1	**4.9**	4.5	5.3	**5.0**	4.6	5.4	**5.7**	5.2	6.3	**6.0**	5.5	6.4	**6.0**	5.5	6.4	**6.4**	6.0	6.8	**4.7**	4.3	5.1	**4.7**	4.3	5.1
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Pulmonary circulation disorders																																														
Present	**3.3**	2.7	4.0	**3.0**	2.6	3.4	**2.7**	2.3	3.1	**3.2**	2.7	3.7	**3.5**	2.9	4.0	**6.6**	6.0	7.2	**8.7**	8.0	9.4	**9.1**	8.4	9.7	**9.3**	8.5	10.0	**10.5**	9.7	11.3	**10.9**	10.3	11.5	**10.5**	9.9	11.1	**10.9**	10.4	11.5	**5.0**	4.7	5.4	**5.2**	4.8	5.6
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Renal failure																																														
Present	**9.8**	8.8	10.8	**10.3**	9.4	11.2	**10.8**	9.9	11.7	**13.0**	11.9	14.1	**17.5**	16.3	18.7	**17.4**	16.3	18.5	**16.9**	15.7	18.1	**17.3**	16.0	18.6	**16.6**	15.3	17.9	**19.4**	18.0	20.7	**18.9**	18.0	19.8	**20.2**	19.3	21.0	**20.1**	19.2	21.0	**21.5**	20.6	22.3	**21.2**	20.3	22.0
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Solid tumor without metastasis																																														
Present	**4.3**	3.8	4.8	**2.0**	1.7	2.3	**2.0**	1.7	2.2	**1.9**	1.7	2.2	**2.0**	1.7	2.2	**1.9**	1.6	2.1	**2.3**	2.0	2.6	**2.2**	2.0	2.5	**2.3**	2.0	2.5	**2.5**	2.2	2.8	**2.4**	2.1	2.7	**2.2**	1.9	2.4	**2.1**	1.8	2.3	**2.5**	2.2	2.8	**2.7**	2.4	3.0
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Peptic ulcer disease																																														
Present	**1.2**	0.9	1.5	**0.1**	0.0	0.1	**0.0**	0.0	0.0	**0.1**	0.0	0.1	**0.1**	0.1	0.2	**0.0**	0.0	0.1	**0.1**	0.0	0.1	**0.1**	0.1	0.2	**0.1**	0.0	0.1	**0.0**	0.0	0.1	**0.1**	0.1	0.2	**0.0**	0.0	0.1	**0.1**	0.0	0.1	**3.1**	2.8	3.4	**3.1**	2.8	3.5
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Valvular disease																																														
Present	**6.9**	6.0	7.7	**6.9**	6.1	7.6	**6.2**	5.5	6.9	**7.6**	6.7	8.4	**7.7**	6.8	8.6	**7.6**	6.8	8.5	**5.8**	5.1	6.6	**5.6**	4.9	6.3	**5.0**	4.4	5.6	**6.3**	5.6	6.9	**6.2**	5.7	6.7	**6.5**	5.9	7.0	**6.8**	6.2	7.3	**6.7**	6.2	7.2	**6.3**	5.8	6.8
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA
Weight loss																																														
Present	**19.3**	16.7	21.9	**17.5**	15.6	19.4	**20.9**	18.5	23.3	**21.2**	18.7	23.6	**21.3**	19.2	23.4	**25.6**	22.7	28.6	**31.6**	28.8	34.4	**33.4**	30.8	36.1	**35.5**	32.2	38.7	**39.0**	36.0	42.0	**38.3**	36.7	39.8	**37.8**	36.3	39.3	**37.7**	36.3	39.2	**33.3**	32.0	34.7	**33.3**	31.9	34.7
Missing	**5.1**	2.1	8.1	**5.3**	1.6	9.1	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA	**NA**	NA	NA

Table 9. Hospital Characteristics of Patients with Respiratory Failure, Invasive Mechanical Ventilation and Tracheostomy

	02			03			04			05			06			07			08			09			10			11			12			13			14			16			17		
	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95
Region																																													
Northeast	24.2	21.2	27.2	24.9	21.4	28.6	24.4	21.3	27.5	26.0	22.2	29.8	24.3	21.5	27.1	22.6	18.9	26.3	21.8	18.5	25.2	21.5	18.2	24.8	20.6	17.2	23.9	22.1	17.9	26.3	20.8	19.0	22.5	20.4	18.7	22.2	19.1	17.6	20.6	18.8	17.3	20.2	18.0	16.5	19.5
Midwest	21.4	17.6	25.2	20.1	16.5	23.6	21.8	18.4	25.2	21.8	18.9	24.8	19.9	16.8	23.0	19.5	16.7	22.3	19.9	16.9	23.0	21.1	17.7	24.6	20.6	17.2	23.9	20.6	16.4	24.9	18.6	17.0	20.2	17.7	16.2	19.2	17.9	16.5	19.3	19.0	17.5	20.6	19.0	17.5	20.5
South	37.7	33.9	41.5	37.2	33.4	41.0	38.5	34.6	42.5	33.5	30.1	37.0	36.9	33.4	40.4	39.9	35.0	44.9	38.8	34.6	43.0	36.2	32.4	40.0	40.6	36.0	45.3	37.6	33.3	41.9	41.5	38.9	44.2	42.6	40.3	44.9	42.7	40.6	44.9	42.0	40.0	44.1	44.0	41.8	46.1
West	16.7	14.2	19.2	17.8	15.2	20.3	15.3	12.6	18.0	18.6	15.7	21.5	18.9	16.2	21.7	18.0	15.3	20.8	19.4	16.9	22.0	21.2	18.2	24.2	18.2	14.8	21.7	19.7	16.2	23.2	19.1	17.5	20.7	19.3	17.7	20.9	20.2	18.7	21.8	20.1	18.5	21.8	19.1	17.5	20.6
Urban/Rural																																													
Rural	5.3	4.1	6.5	5.5	4.3	6.8	4.4	3.1	5.7	4.6	3.6	5.7	3.6	2.5	4.7	4.0	2.8	5.2	4.4	3.3	5.5	3.7	2.6	4.7	3.9	2.6	5.2	3.7	2.3	5.0	3.5	2.9	4.2	3.7	3.1	4.4	2.5	2.0	3.0	2.4	1.9	2.9	2.6	2.1	3.2
Urban non-teaching	40.5	37.0	44.1	39.8	36.2	43.5	37.0	33.6	40.5	44.6	41.0	48.2	35.6	32.4	38.7	34.3	30.6	38.0	36.3	32.9	39.8	36.1	32.7	39.6	32.5	28.9	36.1	34.2	30.4	38.0	31.5	29.6	33.4	32.1	30.3	33.8	21.2	19.9	22.6	20.6	19.4	22.0	16.6	15.3	17.9
Urban - teaching	54.2	50.4	58.0	54.6	50.8	58.5	58.5	54.9	62.2	50.8	47.0	54.5	60.7	57.4	64.0	61.5	57.5	65.5	59.2	55.6	62.9	58.1	54.0	62.3	61.6	57.3	65.9	60.0	55.5	64.5	64.9	62.9	66.9	64.2	62.3	66.1	76.3	74.8	77.7	76.9	75.5	78.3	80.7	79.3	82.1
Missing	NA	NA	NA	0.0	0.0	0.0	NA	NA	NA	NA	NA	NA	0.2	0.0	0.4	0.2	0.0	0.7	0.0	0.0	0.0	2.1	0.1	4.1	2.0	0.0	4.1	2.1	0.0	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ownership																																													
Government, nonfederal	11.6	7.7	15.5	14.6	9.8	19.5	15.0	9.7	20.3	15.2	10.2	20.2	12.2	8.3	16.0	14.9	8.7	21.2	16.0	10.2	21.8	12.7	8.3	17.2	15.5	9.7	21.4	10.2	5.9	14.5	14.0	11.4	16.6	13.3	11.5	15.1	14.2	12.6	15.9	13.9	12.6	15.3	13.7	12.2	15.1
Private, not-for-profit	75.7	71.0	80.4	71.6	66.3	76.9	70.5	64.4	76.5	69.7	64.3	75.0	72.9	67.8	77.9	69.5	62.7	76.3	72.0	66.1	77.8	69.7	63.9	75.5	71.7	65.3	78.0	75.3	69.7	80.9	71.5	68.9	74.0	71.5	69.5	73.5	70.2	68.3	72.1	69.4	67.5	71.2	69.9	68.0	71.8
Private, invest-own	12.0	9.4	14.7	11.8	9.5	14.1	11.8	9.2	14.4	14.1	11.4	16.8	13.2	9.9	16.5	13.1	9.8	16.3	12.0	9.7	14.3	15.5	11.4	19.5	10.8	8.2	13.5	12.4	9.0	15.8	14.5	13.2	15.9	15.2	13.9	16.5	15.6	14.2	16.9	16.7	15.2	18.1	16.4	15.0	17.9
Missing	0.7	0.0	1.8	2.0	0.0	4.3	2.7	0.0	5.5	1.0	0.0	2.1	1.8	0.2	3.4	2.5	0.3	4.7	0.0	0.0	0.0	2.1	0.1	4.1	2.0	0.0	4.1	2.1	0.0	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bedsize																																													
Small	7.7	6.0	9.5	6.6	5.3	7.9	6.8	5.3	8.2	5.9	4.5	7.4	7.6	6.1	9.0	6.2	4.8	7.5	6.0	4.5	7.4	6.0	4.6	7.5	6.3	5.0	7.7	5.6	4.4	6.9	7.8	6.9	8.8	7.8	6.9	8.7	12.2	11.0	13.3	11.5	10.3	12.6	12.0	10.9	13.1
Medium	23.3	20.1	26.4	24.2	20.9	27.5	23.2	20.3	26.2	24.8	21.4	28.2	23.6	20.6	26.6	22.6	19.5	25.7	21.7	18.9	24.5	22.8	19.6	26.0	19.1	16.2	21.9	20.4	17.5	23.2	24.4	22.6	26.2	25.9	24.1	27.8	27.7	25.9	29.5	28.0	26.3	29.8	29.1	27.3	31.0
Large	69.0	65.6	72.4	69.2	65.7	72.7	70.0	66.8	73.3	69.3	65.8	72.8	68.7	65.5	71.9	71.0	67.6	74.5	72.3	69.2	75.4	69.0	65.2	72.9	72.6	69.1	76.2	71.9	68.1	75.7	67.7	65.7	69.8	66.3	64.3	68.3	60.1	58.2	62.1	60.5	58.5	62.4	58.9	56.8	60.9
Missing	NA	NA	NA	0.0	0.0	0.0	NA	NA	NA	NA	NA	NA	0.2	0.0	0.4	0.2	0.0	0.7	0.0	0.0	0.0	2.1	0.1	4.1	2.0	0.0	4.1	2.1	0.0	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 10. Outcomes of Patients with Respiratory Failure, Invasive Mechanical Ventilation and Tracheostomy

	02			03			04			05			06			07			08			09			10			11			12			13			14			16			17		
	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95	Est	L95	U95
DIED																																													
Died	**25.7**	24.4	27.0	**24.9**	23.4	26.4	**22.8**	21.5	24.0	**22.6**	21.3	23.9	**21.9**	20.7	23.1	**19.8**	18.5	21.1	**19.4**	18.2	20.6	**17.5**	16.5	18.5	**16.0**	15.0	17.0	**14.8**	13.8	15.7	**15.0**	14.3	15.7	**14.8**	14.1	15.5	**14.4**	13.8	15.1	**13.8**	13.1	14.4	**12.7**	12.0	13.4
Missing	**0.2**	0.0	0.4	**0.1**	0.0	0.2	**0.1**	0.0	0.2	**0.3**	0.0	0.9	**0.0**	0.0	0.1	**0.1**	0.0	0.1	**0.2**	0.0	0.3	**0.1**	0.0	0.1	**0.3**	0.0	0.7	**0.2**	0.0	0.3	**0.1**	0.0	0.2	**0.1**	0.0	0.1	**0.0**	0.0	0.1	**0.1**	0.0	0.2	**0.0**	0.0	0.1
Discharge location																																													
Routine	**8.2**	6.9	9.5	**8.1**	6.8	9.4	**8.3**	6.5	10.0	**8.4**	6.2	10.7	**7.5**	5.9	9.0	**7.7**	5.9	9.4	**6.5**	5.2	7.9	**6.7**	5.4	8.0	**8.2**	6.2	10.2	**5.6**	4.7	6.5	**6.7**	6.0	7.3	**5.8**	5.3	6.4	**6.3**	5.7	6.8	**6.0**	5.3	6.7	**6.1**	5.5	6.7
Transfer to short-term	**7.0**	6.0	8.0	**6.7**	5.7	7.7	**5.5**	4.6	6.3	**5.6**	4.9	6.4	**5.8**	4.8	6.9	**7.4**	6.1	8.7	**8.5**	6.0	11.0	**6.3**	5.2	7.4	**6.3**	5.1	7.6	**6.6**	4.8	8.3	**6.8**	6.0	7.6	**6.3**	5.6	7.0	**6.0**	5.3	6.8	**4.6**	4.0	5.1	**4.9**	4.4	5.4
Transfer to intermediate	**52.6**	50.7	54.6	**52.1**	49.8	54.4	**57.3**	55.1	59.6	**57.3**	54.9	59.6	**59.1**	56.9	61.2	**59.1**	56.9	61.3	**58.5**	55.7	61.3	**63.3**	61.3	65.3	**62.7**	60.0	65.4	**67.0**	64.7	69.3	**65.9**	64.8	67.1	**67.8**	66.6	68.9	**67.4**	66.3	68.5	**70.0**	69.0	71.0	**70.2**	69.1	71.3
Home health care	**5.0**	4.3	5.8	**5.6**	5.0	6.2	**5.6**	5.0	6.3	**5.3**	4.8	5.9	**5.4**	4.8	5.9	**5.6**	5.0	6.3	**6.1**	5.5	6.8	**5.7**	5.0	6.3	**5.9**	5.0	6.8	**5.6**	5.1	6.1	**5.3**	4.8	5.7	**4.8**	4.4	5.3	**5.5**	5.0	5.9	**5.2**	4.8	5.7	**5.7**	5.2	6.2
AMA	**0.1**	0.1	0.2	**0.1**	0.0	0.1	**0.2**	0.1	0.4	**0.1**	0.1	0.2	**0.1**	0.1	0.2	**0.1**	0.1	0.2	**0.1**	0.0	0.2	**0.2**	0.1	0.2	**0.1**	0.1	0.2	**0.1**	0.0	0.1	**0.1**	0.0	0.2	**0.1**	0.0	0.2	**0.2**	0.1	0.3	**0.3**	0.2	0.4	**0.3**	0.2	0.4
Died in hospital	**25.7**	24.4	27.0	**24.9**	23.4	26.4	**22.8**	21.5	24.0	**22.6**	21.3	23.9	**21.9**	20.7	23.1	**19.8**	18.5	21.1	**19.4**	18.2	20.6	**17.5**	16.5	18.5	**16.0**	15.0	17.0	**14.8**	13.8	15.7	**15.0**	14.3	15.7	**14.8**	14.1	15.5	**14.4**	13.8	15.1	**13.8**	13.1	14.4	**12.7**	12.0	13.4
Alive, destination unknown	**0.2**	0.1	0.3	**0.5**	0.2	0.8	**0.1**	0.0	0.3	**0.2**	0.1	0.3	**0.2**	0.0	0.3	**0.2**	0.0	0.4	**0.5**	0.1	0.9	**0.3**	0.1	0.6	**0.4**	0.1	0.7	**0.1**	0.0	0.3	**0.2**	0.1	0.3	**0.3**	0.2	0.5	**0.2**	0.1	0.3	**0.0**	0.0	0.0	**0.0**	0.0	0.0
Missing	**0.2**	0.0	0.4	**0.1**	0.0	0.2	**0.1**	0.0	0.2	**0.3**	0.0	0.9	**0.0**	0.0	0.1	**0.1**	0.0	0.1	**0.2**	0.0	0.3	**0.1**	0.0	0.1	**0.3**	0.0	0.7	**0.2**	0.0	0.3	**0.1**	0.0	0.2	**0.1**	0.0	0.1	**0.0**	0.0	0.1	**0.1**	0.0	0.2	**0.0**	0.0	0.1
Length of stay, Mean	**39.4**	38.0	40.7	**38.7**	37.2	40.2	**37.8**	36.4	39.2	**36.3**	35.1	37.5	**36.7**	35.5	37.9	**36.6**	35.0	38.2	**36.6**	35.1	38.2	**34.8**	33.6	36.0	**34.9**	33.2	36.6	**32.5**	31.2	33.7	**32.9**	32.2	33.6	**32.5**	31.8	33.2	**33.0**	32.3	33.8	**33.2**	32.4	34.0	**32.8**	32.1	33.5
Total charges, Mean	**233949.0**	221692.3	246204.9	**252887.0**	238815.5	266959.3	**251331.0**	238744.1	263918.5	**261126.0**	247720.0	274532.8	**275808.0**	262928.3	288688.5	**319046.0**	299966.4	338126.1	**332784.0**	314653.1	350915.3	**355349.0**	335432.8	375265.0	**360747.0**	337423.2	384070.9	**405373.0**	370393.0	440353.3	**420951.0**	404973.6	436929.2	**445440.0**	428238.1	462641.8	**470727.0**	454006.2	487447.3	**529024.0**	509250.3	548797.7	**566857.0**	543750.2	589964.8

Table 11. Most Frequent Principle Diagnosis Classes for Respiratory Failure, Invasive Mechanical Ventilation and Tracheostomy

Diagnosis	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2016	2017
Respiratory	25.5	24.2	22.8	27.4	25.5	22.2	22.8	20.3	17.6	18.8	18.3	17.0	16.3	15.3	15.1
Infection	11.5	11.7	12.5	14.3	15.3	17.1	18.5	20.2	19.0	22.2	21.4	23.7	25.8	26.9	25.4
Cardiovascular	10.2	9.5	9.2	8.5	7.9	6.7	7.1	7.0	5.9	6.1	6.7	6.7	6.5	7.8	8.0
Neurological	8.2	9.0	8.8	8.3	8.6	8.7	8.4	8.4	9.3	8.2	9.4	9.2	9.5	9.4	10.2
Neurotrauma	8.1	7.9	10.2	7.6	9.1	10.3	8.8	9.6	11.4	9.1	10.5	10.0	10.1	9.0	9.4
Trauma	6.1	6.3	7.6	5.3	6.9	7.4	6.2	6.1	8.6	6.7	6.9	6.9	6.8	8.9	8.8