

**Supplemental Table 1. List of International Classification of Diseases, Ninth Revision (ICD9) codes used.**

<b>Study variable</b>	<b>ICD9 code</b>	<b>Description</b>
Cerebral Edema	348.5	Cerebral Edema
Seizures / Epilepsy	345.x, 780.3	Epilepsy and recurrent seizures, convulsions
Alteration of consciousness	780.0	Alteration of consciousness
<b>Comorbidities</b>		
Non-alcoholic liver disease	571.8	Other chronic nonalcoholic liver disease
Chronic Kidney disease	585.0 - 585.5, 585.9	Chronic kidney disease, Stage I, II, III, IV, V, and unspecified
End stage Renal Disease	585.6	End Stage Renal Disease
Congestive heart failure	428	Congestive heart failure; non-hypertensive
Diabetes mellitus type-2	250.00 - 250.03	Diabetes mellitus with complications
Depression	296.2, 296.3, 300.4, 311.0	Major depressive disorder single or recurrent episodes, Dysthymic disorder
Bipolar disorder	296.4, 296.5, 296.6, 296.7, 296.8	Bipolar I disorder most recent episode maniac, depressed, or mixed; Bipolar I disorder unspecified
Schizophrenia	295.0 - 295.6	Schizophrenic disorder- disorganized, catatonic, paranoid, schizophreniform, latent, and residual type
Stroke	430.0, 431.0, 433.0, 434.0, 436.0	Subarachnoid and intracerebral hemorrhage, Occlusion and stenosis of precerebral and cerebral arteries
Epilepsy	345.0, 345.2 - 345.9	Epilepsy
Myocardial infarction	410.00 to 410.99	Acute myocardial infarction
HIV	042, V08	Human immunodeficiency virus [HIV] disease
COPD	490.0, 491.0, 492.0, 494.0, 496.0	Chronic Obstructive Pulmonary Disease- bronchitis, emphysema, asthma, bronchiectasis, allergic alveolitis
Hypertension	401.9	Hypertension with complications and secondary hypertension
Peripheral arterial disease	440.20 - 440.24, 440.29	Atherosclerosis of native arteries of the extremities

**Supplemental Table 2. Characteristics of adults admitted to ICU with hypernatremia at admission versus hospital-acquired.**

	<b>Admission Hypernatremia</b>	<b>Hospital-Acquired Hypernatremia</b>	<b>P-value</b>
<b>Total, n (%)</b>	122 (27.2)	327 (72.8)	
<b>Age (years), Median (IQR)</b>	82.0 (71.0 - 90.0)	63.0 (48.0 - 75.0)	<0.001
<b>Gender, n (%)</b>			<0.001
Male	56 (45.9)	215 (65.8)	
Female	66 (54.1)	112 (34.3)	
<b>In-hospital mortality, n (%)</b>	33 (27.1)	135 (41.3)	0.01
<b>DNR, n (%)</b>	55 (45.1)	84 (25.7)	<0.001
<b>Length of stay (days), Median (IQR)</b>	3.0 (1.9 - 5.3)	5.9 (2.7 - 13.1)	<0.001
<b>Cerebral edema (ICD-9/NLP), n (%)</b>	5 (4.1)	77 (23.6)	<0.001
<b>ICU first service, n (%)</b>			<0.001
MICU	98 (80.3)	107 (32.7)	
SICU	8 (6.6)	75 (22.9)	
CCU	8 (6.6)	29 (8.9)	
TSICU	5 (4.1)	83 (25.4)	
CSRU	1 (0.8)	29 (8.9)	
<b>Admission type, n (%)</b>			0.01
Elective	1 (0.8)	24 (7.3)	
Urgent/Emergency	121 (99.2)	303 (92.7)	
<b>Insurance, n (%)</b>			<0.001
Government	3 (2.5)	13 (4.0)	
Medicaid	5 (4.1)	31 (9.5)	
Medicare	97 (79.5)	147 (45.0)	
Private	17 (13.9)	120 (36.7)	
Self-pay	0	16 (4.9)	
<b>Ethnicity, n (%)</b>			0.001
White	74 (60.7)	182 (55.7)	
Black	21 (17.2)	42 (12.8)	
Hispanic	6 (4.9)	11 (3.4)	
Asian	9 (7.4)	8 (2.5)	
Others/Unknown	12 (9.8)	84 (25.7)	
<b>Charlson comorbidity index, n (%)</b>			0.4
0	31 (25.4)	75 (22.9)	
1	35 (28.7)	84 (25.7)	
2	24 (19.7)	54 (16.5)	
≥3	32 (26.2)	114 (34.9)	
<b>Comorbidities, n (%)</b>			
Chronic kidney disease	20 (16.4)	31 (9.5)	0.04
End-stage renal disease	0	5 (1.5)	0.3
Liver disease (NA)	1 (0.8)	1 (0.3)	0.5
Congestive heart failure	29 (23.8)	68 (20.8)	0.5
Diabetes mellitus type 2	20 (16.4)	53 (16.2)	1

Depression	18 (14.8)	17 (5.2)	0.001
Bipolar disorder	4 (3.3)	18 (5.5)	0.5
Schizophrenia	1 (0.8)	1 (0.3)	0.5
Epilepsy	5 (4.1)	7 (2.1)	0.3
Stroke (infarction, ICH, SAH)	7 (5.7)	89 (27.2)	<0.001
Myocardial infarction	11 (9.0)	29 (8.9)	1
HIV infection	2 (1.6)	1 (0.3)	0.2
Chronic obstructive pulmonary disease	11 (9.0)	28 (8.6)	0.9
Hypertension	37 (30.3)	105 (32.1)	0.7
Peripheral arterial disease	1 (0.8)	6 (1.8)	0.7
<b>Laboratory Values at peak sodium level, Median (IQR)</b>			
Creatinine (mg/dL)	1.8 (1.2 - 2.7)	1.2 (0.9 - 1.7)	<0.001
BUN (mg/dL)	56.0 (35.0 - 82.0)	31.8 (17.0 - 52.8)	<0.001
Potassium (mmol/L)	3.9 (3.6 - 4.2)	3.8 (3.5 - 4.1)	0.4
Phosphorus (mg/dL)	3.1 (2.3 - 3.9)	3.0 (2.3 - 3.8)	0.6
Magnesium (mg/dL)	2.3 (2.0 - 2.6)	2.2 (2.0 - 2.4)	0.1
Serum osmolality (mOsm/kg)	357.5 (245.0 - 365.0)	328.3 (322.5 - 339.0)	<0.001
Serum bicarbonate (mmol/L)	23.0 (19.0 - 26.0)	25.0 (21.5 - 28.0)	<0.001
Albumin (g/dL)	2.8 (2.5 - 3.2)	2.9 (2.5 - 3.3)	0.1
Urine sodium (mmol/L)	50.5 (21.0 - 75.0)	54.0 (33.0 - 92.5)	0.7
Urine potassium (mmol/L)	62.0 (42.0 - 81.0)	36.5 (25.0 - 46.0)	0.01
Urine osmolality (mOsm/kg)	531.0 (440.0 - 636.0)	465.3 (340.0 - 645.0)	0.04
<b>Medications, n (%)</b>			
Thiazide diuretics	1 (0.8)	39 (12)	<0.001
Loop diuretics	35 (29)	167 (51)	<0.001

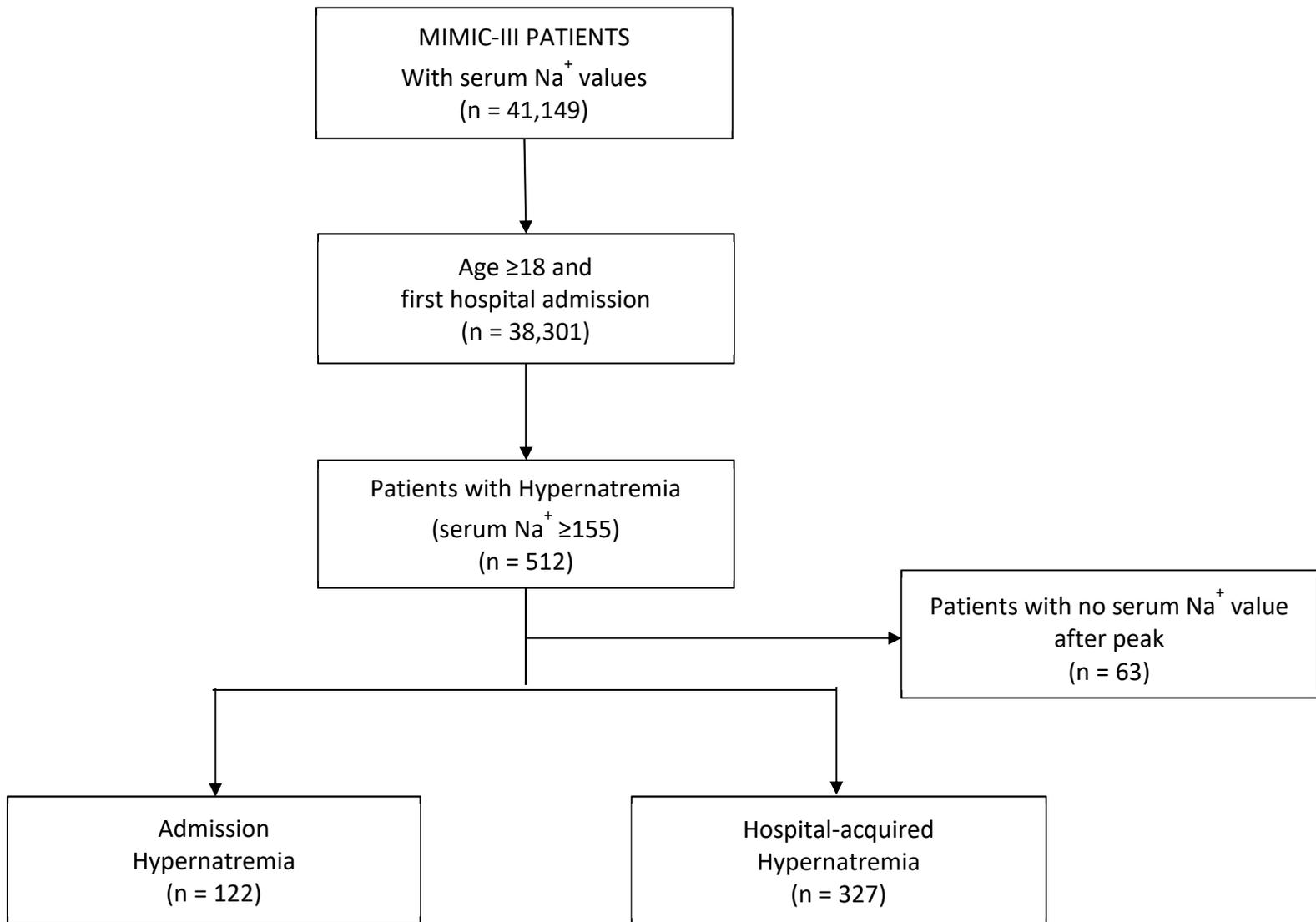
**Supplemental Table 3. Distribution of the sodium level, difference, and correction time of adults admitted to ICU with hyponatremia at admission versus hospital-acquired.**

	Admission Hyponatremia	Hospital-Acquired Hyponatremia	P
<b>Total, n (%)</b>	122 (27.2)	327 (72.8)	
<b>Serum sodium (mmol/L), Mean (SD)</b>			
at peak	163.0 (159.0 - 168.0)	158.0 (156.0 - 161.0)	<0.0001
at 24 hours	155.0 (150.0 - 158.5)	152.0 (148.0 - 155.0)	<0.0001
after correction or last available	144.0 (143.0 - 145.0)	145.0 (143.0 - 148.0)	0.3
<b>Serum sodium difference (mmol/L), Median (IQR)</b>			
at 24 hours	8.0 (4.5 - 12.0)	6.0 (3.0 - 10.0)	0.0004
at correction or last available	19.0 (14.0 - 25.0)	13.0 (11.0 - 16.0)	<0.0001
<b>Serum sodium time difference (hours), Median (IQR)</b>			
at 24 hours	19.2 (15.7 - 21.6)	17.0 (11.2 - 21.1)	0.002
at correction or last available	54.0 (33.1 - 81.1)	37.7 (15.7 - 71.5)	0.005
<b>Rate of sodium correction (mmol/L/hr), Median (IQR)</b>			
at 0 - 24 hours	0.5 (0.3 - 0.7)	0.4 (0.2 - 0.7)	0.05
Peak to normal level or last available	0.3 (0.2 - 0.5)	0.3 (0.2 - 0.6)	0.1

**Supplemental Table 4. Mortality rates of adults admitted to ICU with hypernatremia at admission and patients with hospital-acquired hypernatremia by slower versus rapid correction rate.**

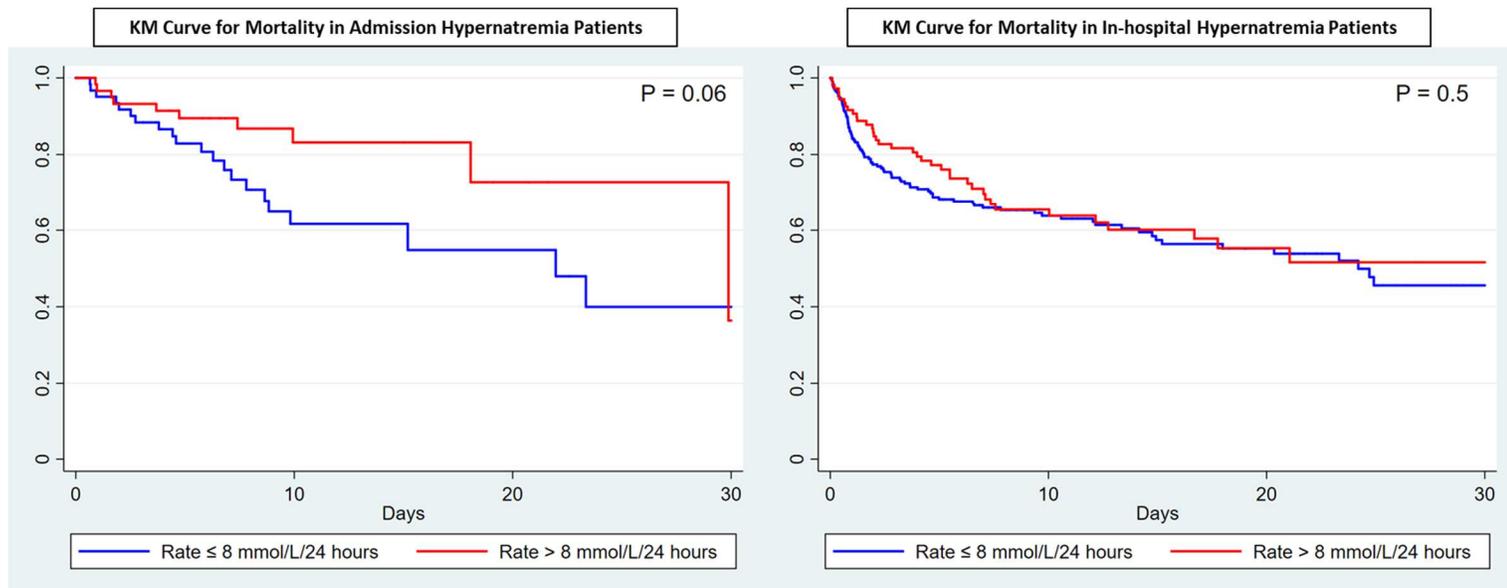
	Mortality in Admission hypernatremia (n=122)			Mortality in Hospital-acquired hypernatremia (n=327)		
	≤0.5 mmol/L/hour	>0.5 mmol/L/hour	p- value	≤0.5 mmol/L/hour	>0.5 mmol/L/hour	p- value
<b>Gender, n (%)</b>						
Male	17 (35)	2 (25)	0.7	56 (38)	27 (41)	0.7
Female	8 (19)	6 (25)	0.8	34 (45)	18 (50)	0.8
<b>Age categories by median level, n (%)</b>						
≤69 years	6 (33)	2 (22)	0.7	65 (46)	37 (55)	0.3
>69 years	19 (26)	6 (26)	1.0	25 (29)	8 (23)	0.5
<b>Duration of hypernatremia, n (%)</b>						
≤48 hours (n=199)	N/A			58 (51)	36 (42)	0.3
>48 hours (n=128)	N/A			36 (31)	5 (38)	0.7

Supplemental Figure 1. Selection of patients with hypernatremia from the MIMIC-III database.

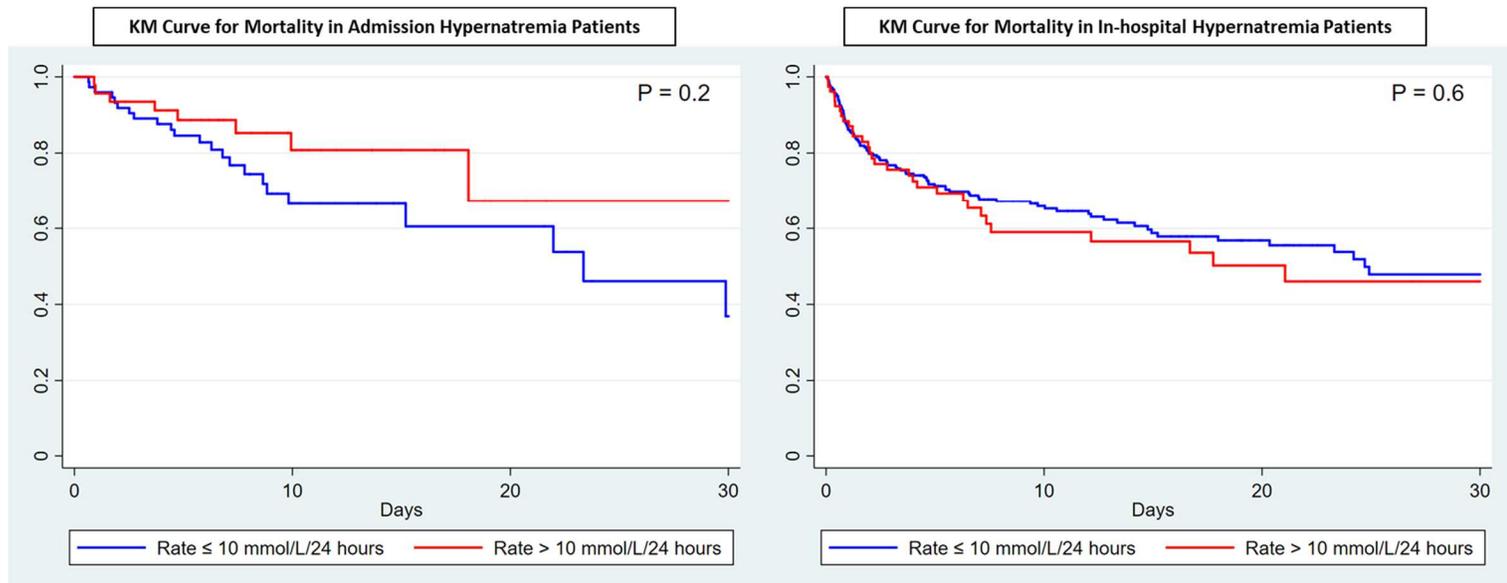


Supplemental Figure 2. Thirty-day survival patterns by rapid versus slow correction rate in admission and hospital-acquired hypernatremia groups.

Supplemental Figure 2A.



Supplemental Figure 2B.



Supplemental Figure 2C.

