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Risk Factors and Outcomes of Rapid Correction of Severe Hyponatremia

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Supplementary Materials

Supplementary Table 1: Factors associated with sodium correction >10 mEq/L at 24 hours in patients admitted to Geisinger system hospitals with an initial serum sodium <120 mEq/L

Supplemental Table 2: Factors associated with sodium correction >18 mEq/L at 48 hours in patients admitted to Geisinger system hospitals with an initial serum sodium <120 mEq/L

Supplementary Table 3: Factors associated with rapid sodium correction at 24 hours using the difference between baseline and highest recorded sodium value in the first 24 hours in patients admitted to Geisinger system hospitals with an initial serum sodium <120 mEq/L

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Supplementary Table 1: Factors associated with sodium correction >10 mEq/L at 24 hours in patients admitted to Geisinger system hospitals with an initial serum sodium <120 mEq/L

	Unadjusted OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Academic center	0.62 (0.49 – 0.79)**	0.68 (0.51 – 0.91)**	0.70 (0.50 – 0.96)*	0.68 (0.51 – 0.91)*
Female	1.38 (1.09 – 1.74)**	1.58 (1.16 – 2.14)**	1.63 (1.15 – 2.31)**	1.59 (1.17 – 2.15)**
Age (per 1 yr)	0.98 (0.97 – 0.99)**	0.98 (0.97 – 0.99)**	0.98 (0.97 – 1.00)*	0.98 (0.97 – 0.99)**
White	1.45 (0.59 – 3.58)	0.84 (0.28 – 2.58)	0.69 (0.20 – 2.39)	0.82 (0.27 – 2.54)
Schizophrenia	2.52 (1.27 – 5.00)**	2.01 (0.95 – 4.29)	2.13 (0.93 – 4.91)	2.05 (0.96 – 4.37)
Congestive heart failure	0.53 (0.37 – 0.76)**	0.95 (0.63 – 1.45)	1.24 (0.77 – 1.98)	0.98 (0.64 – 1.48)
Charlson comorbidity index	0.83 (0.79 – 0.87)**	0.91 (0.85 – 0.97)**	0.90 (0.84 – 0.97)**	0.91 (0.85 – 0.97)**
Outpatient Na ⁺ < 135	0.48 (0.37 – 0.62)**	0.59 (0.45 – 0.79)**	0.63 (0.45 – 0.87)**	0.60 (0.45 – 0.80)**
Inpatient baseline Na ⁺ at hospitalization	0.88 (0.85 – 0.90)**	0.90 (0.87 – 0.93)**	0.89 (0.86 – 0.93)**	0.90 (0.87 – 0.93)**

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Urine Na ⁺ <30 mEq/L	1.47 (1.12 – 1.92)**		1.60 (1.15 – 2.30)**	
K ⁺ ≥ 5 mEq/L	0.75 (0.53 – 1.05)	1.13 (0.76 – 1.66)	1.08 (0.68 – 1.72)	1.14 (0.77 – 1.68)
K ⁺ < 3.5 mEq/L	1.73 (1.33 – 2.26)**	1.13 (0.81 – 1.58)	1.14 (0.78 – 1.65)	1.05 (0.73 – 1.53)
Loop diuretics (outpatient)	0.28 (0.19 – 0.42)**	0.59 (0.37 – 0.93)	0.55 (0.33 – 0.93)*	0.58 (0.36 – 0.92)
Aldosterone antagonists (outpatient)	0.17 (0.08 – 0.35)**	0.31 (0.14 – 0.70)**	0.36 (0.15 – 0.86)*	0.31 (0.14 – 0.69)**
Hypertonic saline (inpatient)	2.13 (1.55 – 2.93)**			1.14 (0.75 – 1.74)
Electrolyte repletion (inpatient)	1.81 (1.42 – 2.30)**			1.13 (0.81 – 1.58)
Vaptan (inpatient)	0.79 (0.26 – 2.41)			0.96 (0.28 – 3.27)
ICU stay in first 24 hours after admission	1.13 (0.86 – 1.49)			1.29 (0.93 – 1.81)
<p>**Significant at p=0.01; *: Significant at p=0.05</p> <p>Abbreviations: ICU (intensive care unit)</p> <p>Model 1 included all significant unadjusted risk factors of rapid correction except for urine sodium or inpatient treatment factors; Model 2 included Model 1 covariates + urine sodium (< or ≥ 30 mEq/L); Model 3 included Model 1 covariates + inpatient treatment factors.</p>				

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Supplemental Table 2: Factors associated with sodium correction >18 mEq/L at 48 hours in patients admitted to Geisinger system hospitals with an initial serum sodium <120 mEq/L

	Unadjusted OR (95% CI)	Model 1	Model 2	Model 3
Academic center	0.40 (0.28 – 0.58)**	0.39 (0.25 – 0.62)**	0.36 (0.21 – 0.60)**	0.42 (0.26 – 0.67)**
Female	1.22 (0.88 – 1.70)	1.51 (0.96 – 2.38)	1.68 (1.01 – 2.81)*	1.48 (0.94 – 2.36)
Age (per 1 yr)	0.97 (0.96 – 0.99)**	0.97 (0.96 – 0.99)**	0.98 (0.96 – 1.00)	0.97 (0.95 – 0.99)**
White	1.11 (0.33 – 3.74)	1.89 (0.23 – 15.59)	0.91 (0.11 – 7.76)	2.18 (0.26 – 18.45)
Schizophrenia	2.70 (1.18 – 6.17)*	2.36 (0.91 – 6.14)	2.94 (1.10 – 7.91)*	2.06 (0.77 – 5.52)
Congestive heart failure	0.33 (0.18 – 0.63)**	0.59 (0.29 – 1.21)	0.62 (0.28 – 1.39)	0.54 (0.26 – 1.13)
Charlson comorbidity index	0.83 (0.77 – 0.89)**	0.95 (0.86 – 1.05)	0.94 (0.84 – 1.05)	0.95 (0.86 – 1.05)
Outpatient Na ⁺ < 135	0.33 (0.23 – 0.47)**	0.38 (0.25 – 0.58)**	0.43 (0.27 – 0.68)**	0.37 (0.24 – 0.57)**
Inpatient baseline Na ⁺ at hospitalization	0.81 (0.78 – 0.84)**	0.82 (0.78 – 0.85)**	0.82 (0.78 – 0.86)**	0.81 (0.78 – 0.86)**
Urine Na ⁺ <30 mEq/L	1.20 (0.83 – 1.74)		1.21 (0.75 – 1.98)	
K ⁺ ≥ 5 mEq/L	0.81 (0.50 – 1.31)	1.39 (0.77 – 2.51)	1.50 (0.75 – 3.00)	1.44 (0.79 – 2.62)
K ⁺ < 3.5 mEq/L	1.74 (1.21 – 2.51)**	0.98 (0.60 – 1.60)	1.09 (0.64 – 1.86)	1.09 (0.63 – 1.89)

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Loop diuretics (outpatient)	0.34 (0.19 – 0.62)**	0.96 (0.47 – 1.96)	1.02 (0.47 – 2.19)	1.00 (0.48 – 2.08)
Aldosterone antagonists (outpatient)	0.18 (0.06 – 0.56)**	0.29 (0.08 – 1.08)	0.42 (0.11 – 1.59)	0.27 (0.07 – 1.02)
Hypertonic saline (inpatient)	2.72 (1.83 – 4.05)**			1.18 (0.67 – 2.07)
Electrolyte repletion (inpatient)	1.72 (1.24 – 2.40)**			0.88 (0.52 – 1.47)
Vaptan (inpatient)	2.62 (0.93 – 7.38)			3.92 (1.09 – 14.09)*
ICU stay in first 24 hours after admission	0.59 (0.38 – 0.94)*			0.54 (0.31 – 0.96)*
**: Significant at p=0.01; *: Significant at p=0.05 Abbreviations: ICU (intensive care unit)				

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Supplementary Table 3: Factors associated with rapid sodium correction at 24 hours using the difference between baseline and highest recorded sodium value in the first 24 hours in patients admitted to Geisinger system hospitals with an initial serum sodium <120 mEq/L

	Unadjusted OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Academic center	0.92 (0.74 – 1.14)	1.04 (0.79 – 1.36)	0.92 (0.68 – 1.27)	1.03 (0.78 – 1.36)
Female	1.44 (1.15 – 1.80)**	1.77 (1.33 – 2.37)**	1.85 (1.32 – 2.59)**	1.78 (1.33 – 2.39)**
Age (per 1 yr)	0.98 (0.97 – 0.98)**	0.98 (0.97 – 0.99)**	0.98 (0.97 – 0.99)**	0.98 (0.97 – 0.99)**
White	0.92 (0.43 – 1.98)	0.93 (0.32 – 2.69)	0.67 (0.20 – 2.28)	0.82 (0.28 – 2.39)
Schizophrenia	4.53 (2.23 – 9.18)**	3.91 (1.78 – 8.56)**	4.12 (1.69 – 10.06)**	4.03 (1.83 – 8.88)**
Congestive heart failure	0.62 (0.45 – 0.86)**	1.12 (0.77 – 1.65)	1.28 (0.82 – 2.00)	1.17 (0.80 – 1.72)
Charlson comorbidity index	0.84 (0.80 – 0.87)**	0.93 (0.87 – 0.99)*	0.91 (0.85 – 0.98)*	0.93 (0.87 – 0.98)*
Outpatient Na ⁺ < 135	0.45 (0.35 – 0.58)**	0.54 (0.41 – 0.71)**	0.57 (0.42 – 0.79)**	0.54 (0.41 – 0.72)**
Inpatient baseline Na ⁺ at hospitalization	0.88 (0.86 – 0.91)**	0.90 (0.87 – 0.93)**	0.90 (0.87 – 0.93)**	0.90 (0.88 – 0.94)**
Urine Na ⁺ <30 mEq/L	1.47 (1.14 – 1.89)**		1.73 (1.26 – 2.38)**	
K ⁺ ≥ 5 mEq/L	0.82 (0.60 – 1.12)	1.20 (0.83 – 1.73)	1.08 (0.69 – 1.69)	1.23 (0.85 – 1.78)
K ⁺ < 3.5 mEq/L	1.82 (1.41 – 2.35)**	1.27 (0.92 – 1.74)	1.31 (0.91 – 1.89)	0.97 (0.68 – 1.39)

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Loop diuretics (outpatient)	0.30 (0.21 – 0.43)**	0.50 (0.33 – 0.77)**	0.52 (0.32 – 0.85)**	0.49 (0.32 – 0.75)**
Aldosterone antagonists (outpatient)	0.23 (0.13 – 3.01)**	0.43 (0.22 – 0.83)*	0.31 (0.14 – 0.71)**	0.43 (0.22 – 0.84)*
Hypertonic saline (inpatient)	2.21 (1.62 – 3.01)**			1.10 (0.72 – 1.66)
Electrolyte repletion (inpatient)	2.33 (1.85 – 2.93)**			(1.68 (1.22 – 2.30)**
Vaptan (inpatient)	0.81 (0.29 – 2.26)			1.18 (0.37 – 3.70)
ICU stay in first 24 hours after admission	1.23 (0.95 – 1.60)			1.41 (1.03 – 1.94)*
<p>**Significant at p=0.01; *: Significant at p=0.05</p> <p>Abbreviations: ICU (intensive care unit)</p> <p>Model 1 included all significant unadjusted risk factors of rapid correction except for urine sodium or inpatient treatment factors; Model 2 included Model 1 covariates + urine sodium (< or ≥ 30 mEq/L); Model 3 included Model 1 covariates + inpatient treatment factors.</p>				