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The Association of Early Net Ultrafiltration Rate and 90-Day Mortality in Patients Receiving Continuous Renal Replacement Therapy

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Objectives : Early net ultrafiltration (NUF) rate may be associated with mortality in patients receiving continuous renal replacement therapy (CRRT). In this study, we aimed to tested whether early NUF rates and other factors were association with increased mortality.
Methods : We performed a single-center, retrospective, observational study in West China Hospital of Sichuan University (shown in figure 1). We defined the early (initial 24 h) NUF rate as the amount of fluid removal per hour adjusted by the patients' weight.Using Generalized Additive Model to evaluate the relationship between NUF and mortality (shown in figure 2). Using log-rank test to find cut off point in Kaplan-Meier survival curve in early NUF. We took it as a classified variable (low rate: ≤1.2ml/kg/h and high rate: >1.2 ml/kg/h). The association between 90-day mortality and the NUF rate and other factors was analyzed by cox regression.
Results : A total of 684 patients were included in our study. The median NUF rate was 1.04 (interquartile range 0.59–1.75) ml/kg/h and the 90-day mortality was 70.1%. Our results fined that the relationship between early NUF rate (24h) and mortality in critically ill patients receiving CRRT was not "U" (shown in figure 2). Compared with the early low NUF rate, the early high NUF rate (adjusted hazard ratio 1.24, 95% CI 1.04–1.48, p = 0.018) was associated with higher 90-day mortality(shown in figure 3 and table 2). Moreover, we found an increase trend in the 90-day mortality when patients with fluid overload >3000ml(adjusted hazard ratio 1.54, 95% CI 1.19-2, p = 0.001), Age> 65(adjusted hazard ratio1.84 95% CI 1.51-2.24, p <0.001), using vasopressor(adjusted hazard ratio 2.24, 95% CI 1.77-2.84, p < 0.001,shown in table 2).
Conclusions : Compared with NUF rates≤1.2ml/kg/h in the first 24h during CRRT, NUF > rates 1.2ml/kg/h, fluid overload>3000ml,Age> 65 and using vasopressor were associated with higher 90-day mortality.

图片 1.png

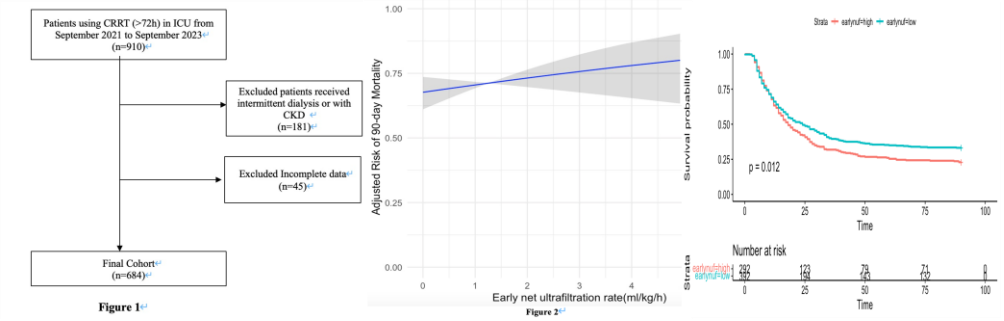

Figure 1

Figure 2

图片 1.png

	Low NUF（≤1.2ml/kg/h） N =391	High NUF（>1.2ml/kg/h） N =294	P value
Age(years)	55 [41.5, 70.00]	58 [48, 69.00]	0.076
Male gender (%)	304 (77.7)	204 (69.6)	0.021
BMI (kg/m^2)	24.97 [22.16, 27.69]	23.03 [20.20, 25.92]	<0.001
Weight (kg)	70.00 [60.00, 80.00]	65.00 [54.00, 74.00]	<0.001
Admission diagnosis – surgical (%)			0.031
Cardiothoracic	56 (14.4)	28 (9.6)	
Trauma	36 (9.2)	25 (8.6)	
Admission diagnosis – medical (%)			
Renal diseases	21 (5.4)	24 (8.2)	
Cardiovascular diseases	33 (8.5)	22 (7.5)	
Sepsis	104 (26.7)	61 (20.9)	
Respiratory diseases	26 (6.7)	34 (11.6)	
Digestive diseases	109 (27.9)	89 (30.5)	
Neurological disorders	5 (1.3)	9 (3.1)	
Fluid Overload	1453.78[540.12, 2342.80]	1022.25 [362.00, 2117.00]	0.012
Pao2/Fio2	227.73 [147.84, 313.88]	219.00 [151.11, 312.12]	0.642
SOFA	16.00 [15.00, 19.00]	17.00 [15.00, 19.00]	0.687
APACHE II	19.50 [11.00, 26.25]	19.00 [11.00, 26.00]	0.55
Vasopressor (%)	282 (72.1)	203 (69.3)	0.469
Ventilation (%)	389（99.5）	292（99.3）	0.987
ICU mortality (%)	262 (67.0)	225 (76.8)	0.007
Systolic blood pressure（mmHg）	123.00 [110.00, 140.00]	127.00 [113.00, 143.00]	0.041
Mean arterial pressure（mmHg）	84.67 [75.67, 95.33]	85.67[77, 96.33]	0.376
Laboratory data before CRRT			
Creatinine (μmol/L)	256 [165.50, 379.50]	263.00 [170.00, 403.00]	0.284
Lactic acid（mmol/L）	2.30 [1.50, 4.20]	1.90 [1.30, 2.90]	<0.001
Platelet (*10^9/L)	98.00 [54.50, 158.50]	81.00 [46.00, 144.00]	0.011
Bilirubin(μmol/L)	22.20 [11.70, 49.45]	20.60 [11.30, 54.10]	0.653

Table1

	Univariable model		**Multivariable model**	
Variables	**HR (95%CI)**	**P value**	**HR (95%CI)**	**P value**
High NUF (>1.2ml/kg/h)	1.24 (1.04 - 1.48)	0.018	1.25(1.04-1.51)	0.0185
Age above 65(years)	2.05(1.71-2.45)	<0.001	1.84(1.51-2.24)	<0.001
Male gender	0.93(0.76-1.14)	0.475	1.06(0.85-1.33)	0.5998
Fluid overload (<1000ml)	1(reference)		1(reference)	
(1000-3000ml)	1.43(1.175-1.75)	<0.001	1.16(0.95-1.43)	0.1497
(>3000ml)	1.63(1.27-2.1)	<0.001	1.54(1.19-2)	0.0010
Need of vasopressor	2.48(1.98-3.1)	<0.001	2.24(1.77-2.84)	<0.001
Weight (kg)	0.99(0.20-0.74)	<0.001	0.99(0.98-1)	0.0221
Sepsis	1.48(1.21-1.81)	<0.001	1.11(0.97-1.28)	0.13
Lactic acid	1(0.99-1.08)	0.75	1.01(0.99-1.02)	0.3310

Table2