

Cumulative Fluid Balance is a risk factor for AKI development and non-recovery

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Background

Acute kidney injury (AKI) is associated with high mortality. The risk increases with severity of AKI. Our aim was to identify risk factors for development and subsequent progression of AKI in critically ill patients.

Results

1. The incidence of new AKI in 7 days was 33% (AKI I 42%, AKI II 35%, AKI III 23%). Multivariate analysis revealed cumulative fluid balance as independent risk factors for development of AKI.
2. Among patients who developed AKI in ICU, 69% had full renal recovery, 8% partial recovery and 23% had no recovery of renal function by day 7.
3. AKI patients without renal recovery in 7 days had significantly higher hospital mortality (60%).
4. Independent risk factors for non-recovery of renal function were CKD, mechanical ventilation, diuretic use and extreme fluid balance before and after first day of AKI.

Methods

We analysed 2525 patients without end-stage renal disease who were admitted to the ICU in a tertiary care centre between January 2014 to December 2016 and did not have AKI on admission. We identified risk factors for development and non-recovery of AKI as defined by the KDIGO criteria

Table 1 Multivariate analysis for acute kidney injury non-recovery

Variables	MVR (variables pre-AKI) ¹			MVR (variables post-onset of AKI) ²		
	P-value	OR	95% CI for OR	P-value	OR	95% CI for OR
AKI stage	-	-	-	<0.01	-	-
AKI stage 2	-	-	-	0.21	0.63	0.31-1.28
AKI stage 3	-	-	-	0.02	2.24	1.16- 4.31
SOFA score on admission to ICU	0.26	1.05	0.96 -1.15	-	-	-
SOFA score on day of AKI / day 3	-	-	-	0.09	1.10	0.99- 1.22
Lowest MAP on day of AKI	-	-	-	0.36	0.99	0.96- 1.02
Chronic kidney disease	0.02	2.01	1.12 -3.58	0.01	2.82	1.37- 5.78
Reason for admission: Respiratory	0.09	1.52	0.94 -2.45	-	-	-
Mechanical ventilation	0.01	2.29	1.24 -4.26	<0.01	4.34	2.05- 9.15
Norepinephrine	0.56	1.21	0.64 -2.30	0.16	0.56	0.25-1.26
Vancomycin	0.83	1.10	0.48 -2.48	0.39	1.40	0.65- 3.01
Diuretic	0.01	1.89	1.20 - 2.97	-	-	-
Aminoglycosides	0.63	1.13	0.69 -1.83	-	-	-

Figure 1 Estimated predicted probability of non-recovery by fluid balance

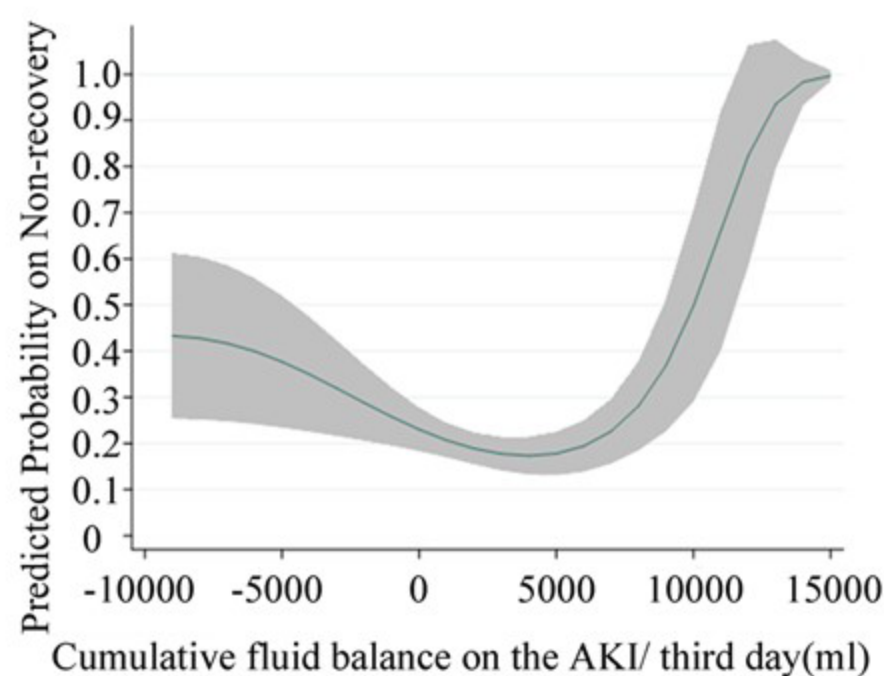
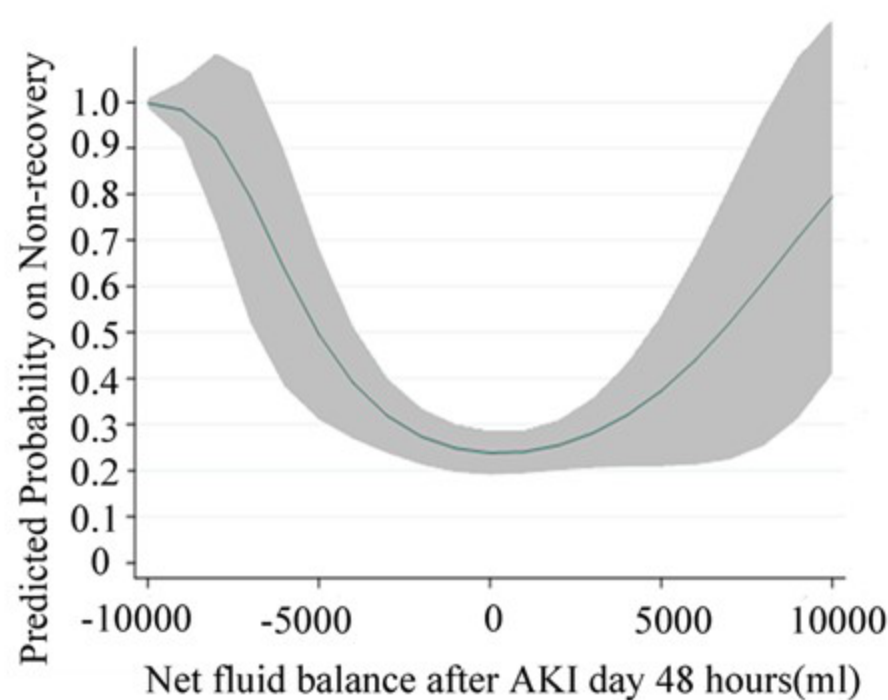


Figure 2 Estimated predicted probability of non-recovery by 48h cumulative fluid balance



Conclusions

1. Acquired AKI is common and mortality is highest in those who do not recover renal function.
2. Cumulative fluid accumulation is a strong risk factor for AKI development and progression.