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Abstract

Background: Recognizing the optimal time to discontinue continuous kidney replacement therapy (CKRT) is necessary to advance patient recovery and mitigate complications. The aim of this study was to identify predictors of successful CKRT cessation in pediatric patients.

Methods: All patients requiring CKRT between January 2010 and March 2021 were evaluated. Patients on peritoneal or hemodialysis, who transferred between institutions, or who did not trial off CKRT were excluded. Successful discontinuation was defined as remaining off CKRT for at least seven days. Demographics, admission diagnoses, PRISM III scores, and reasons for CKRT initiation were obtained. Clinical and biochemical variables were evaluated at CKRT initiation and discontinuation and in the 12-hour period following discontinuation. Comparisons were conducted using Wilcoxon rank sum and Fisher's Exact tests for continuous and categorical variables, respectively. A logistic regression model was fitted to identify significant factors.

Results: Ninety-nine patients underwent a trial off CKRT. Admission and initiation characteristics of the success and failure groups were similar. Patients who required reinitiation (n=26) had longer ICU lengths of stay (27.2 vs 44.5 days, p=0.046) and higher in-hospital mortality (15.1% vs 46.2%, p=0.002). Urine output greater than 0.5mL/kg/hr irrespective of diuretic administration in the 6-hour period before CKRT discontinuation was a significant predictor (AUC 0.72, 95% CI 0.60-0.84, p=0.0009).

Conclusions: Determining predictors of sustained CKRT discontinuation is critical. Urine output greater than 0.5mL/kg/hr in this pediatric cohort predicted successful discontinuation. Future studies are needed to validate this threshold in disease- and age-specific cohorts and evaluate additional biomarkers of kidney injury.

Introduction

Acute kidney injury (AKI) affects 27% of hospitalized children. Severe AKI (KDIGO stages 2-3) affects 12%. 1.5% of patients require CRRT for AKI, which is associated with mortality 42% (39-45%) and OR 3.38 (95% CI 1.74-6.54)

CRRT re-initiation is also associated with increased mortality

No guidelines exist in adult or pediatric literature regarding optimal timing for CRRT discontinuation

Methods and Materials

Retrospective single-center cohort study

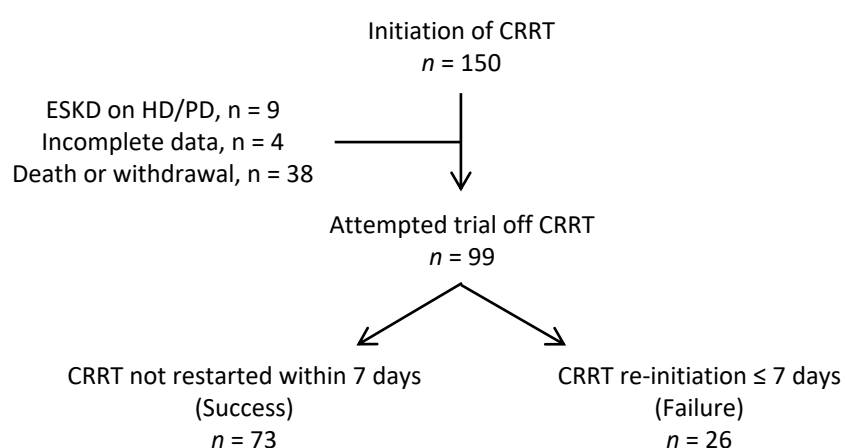
Exclusion Criteria: patients with ESKD on HD/PD; incomplete data; and patients who never had trial off CRRT due to death or withdrawal of life-sustaining therapies

Success defined as remaining off CRRT for >7 days

Baseline demographic data, PRISM III scores, admission diagnoses, reasons for CRRT initiation were obtained

Hemodynamic, biochemical and physiologic data obtained at multiple time points during CRRT course; at initiation, in the 6h and 24h periods prior to discontinuation; and in the 6h and 12h periods after discontinuation

Figure 1. Case selection for study inclusion



Results

There were no differences in hemodynamic parameters between success and failure groups

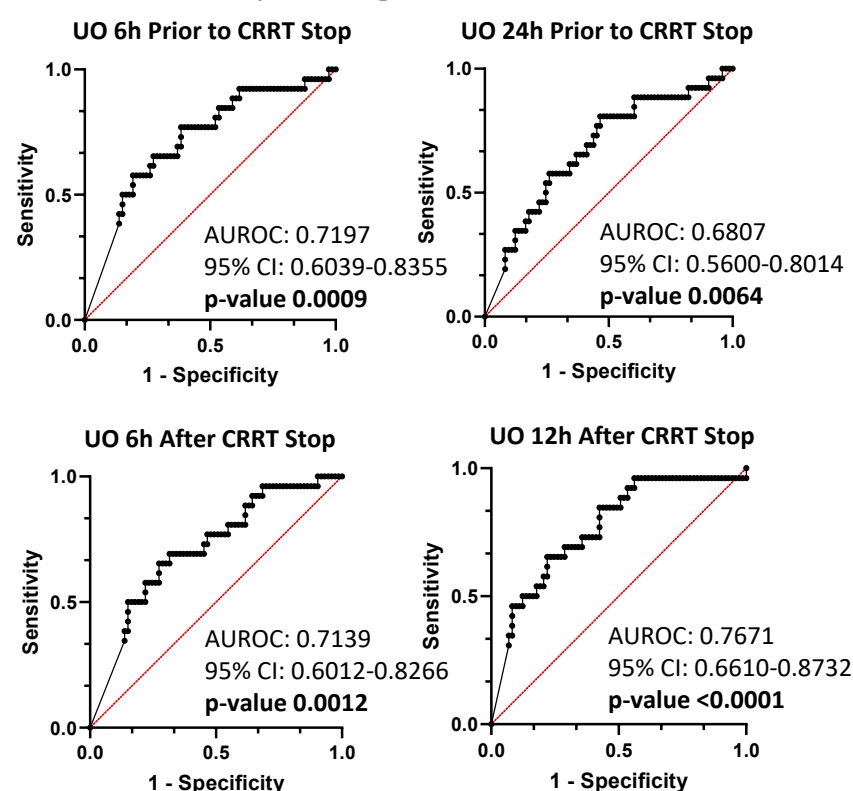
- VIS, mean arterial pressures
- Mechanical ventilation requirement

%FO at CRRT initiation was 12.3% (p=0.712)

- %FO at CRRT discontinuation was 9.1% (8.8 v 11.5%, p=0.443)
- Change in %FO during the CRRT course was -1.34% (-2.8 vs -0.6%, p=0.443)
- Diuretic use was similar between the groups

Multivariable analysis demonstrated a trend towards significance for pre-existing cardiac disease and 6h UO prior to CRRT discontinuation (OR 1.366, 95%CI 1.002, 2.134, p=0.104)

Figure 2. ROC for Urine Output during CRRT Course



	Success n = 73	Failure n = 26	p-value
ICU LOS (days) [†]	27.2 (12.9-53.8)	44.5 (29.7-67.9)	0.046*
Hospital LOS (days) [†]	38.0 (24.0-75.0)	49.0 (37.0-81.8)	0.246
Mortality, n (%)	11 (15.1)	12 (46.2)	0.002**
PD/HD use			
After CRRT, n (%)	32 (43.8)	9 (34.6)	0.490
Discharged on HD/PD, n (%)	4 (12.5)	2 (22.2)	0.326

[†]median (IQR)

Conclusions

First pediatric study to evaluate factors associated with CRRT discontinuation

UO 0.5mL/kg/hr in the 6h prior to CRRT discontinuation was predictive of successful weaning from CRRT. UO in the 6h after CRRT discontinuation can also guide decisions, especially during planned circuit changes

CRRT reinitiation is associated with increased mortality and ICU length of stay

Nest steps: assessing kidney biomarkers, e.g. NGAL and cystatin C, and specific patient populations, e.g. septic AKI, post-CPB AKI

