

# Diuretic exposure in critically ill pediatric patients who progress to Continuous Renal Replacement Therapy

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## BACKGROUND

- Fluid overload (FO) is common among critically ill children and associated with prolonged mechanical ventilation (MV), longer ICU stays, need for continuous renal replacement therapy (CRRT), and higher risk of mortality.
- Optimal management of FO remains unclear.
- Current literature is lacking in recommended diuretic administration (agent, dose, route, frequency) to critically ill children with FO.
- The relationship between diuretic exposure and progression to CRRT is not well documented in this patient population.
- This is the largest study to date with individual level data regarding diuretic exposure in critically ill children with FO that progress to CRRT.**

## OBJECTIVE

To describe and characterize diuretic exposure in children with FO who progress to CRRT.

## METHODS

- Design:** Single center retrospective cohort study of patients admitted to a general pediatric ICU in a large academic children's hospital.
- Inclusion criteria:** Patients who received CRRT for a primary indication of FO as determined by comparison to admission weight, MV dependence, oliguria and/or clinical exam.
- Exclusion criteria:** Patients on chronic dialysis at baseline.
- Data collection:** Charts were manually reviewed for all variables.
- Exposure:** Diuretic exposure was calculated as mg/kg/day for each class
- Outcomes:** Time to CRRT, percent FO at CRRT initiation, total hospital length of stay, and mortality.
- Data analysis:** Clinical outcomes were compared between groups of patients above and below the median loop diuretic dose, as modeled in furosemide equivalents, using Wilcoxon rank-sum or Pearson's chi-squared tests as appropriate.

Table 1. Study Population Characteristics among 50 critically ill pediatric patients who received CRRT, reported as N (percent).

Sex	
Female	25 (50%)
Race	
Black/African American	13 (26%)
White	21 (42%)
Other/Unknown	16 (32%)
Age (years), median (IQR)	4.9 (1, 15.5)
Admission Diagnosis	
GI/Hepatic	4 (8%)
Hematology/Oncology	19 (38%)
Infectious Disease/Sepsis	10 (20%)
Lymphatic	1 (2%)
Metabolic Disease	1 (2%)
Renal Disease/Failure	2 (4%)
Respiratory Illness	13 (26%)
Presence of AKI upon ICU Admission	34 (68%)
>10% Fluid Overload upon ICU Admission	23 (46%)
Diuretics Administered during ICU Stay	
<b>Loop diuretics</b>	43 (100%)
Cumulative dose, median (IQR), mg/kg/day*	2.17 (0.86, 5.43)
<b>Thiazide diuretics</b>	13 (30%)
Cumulative dose, median (IQR), mg/kg/day	5.33 (4, 7.67)
<b>Metolazone</b>	5 (12%)
Cumulative dose, median (IQR), mg/kg/day	0.1 (0.1, 0.2)
Mechanical ventilation status	50 (100%)
Underwent Extracorporeal Membrane Oxygenation (ECMO)	11 (22%)

- Fifty patients (age 0-20 years) were included, of which 100% were on MV prior to CRRT.
- Forty-three (96%) received a diuretic prior to CRRT; of these, all received a loop diuretic, one-third received a thiazide, and 12% received metolazone.

## RESULTS

- Patients with  $\leq 2$  mg/kg/day of loop diuretic exposure during ICU stay had significantly fewer days to initiation of CRRT than those with  $>2$  mg/kg/day loop diuretic exposure (median 2 vs 5 days,  $p=0.006$ ).
- There was no difference between loop diuretic exposure across groups in terms of percent FO at CRRT initiation, hospital length of stay, or mortality.

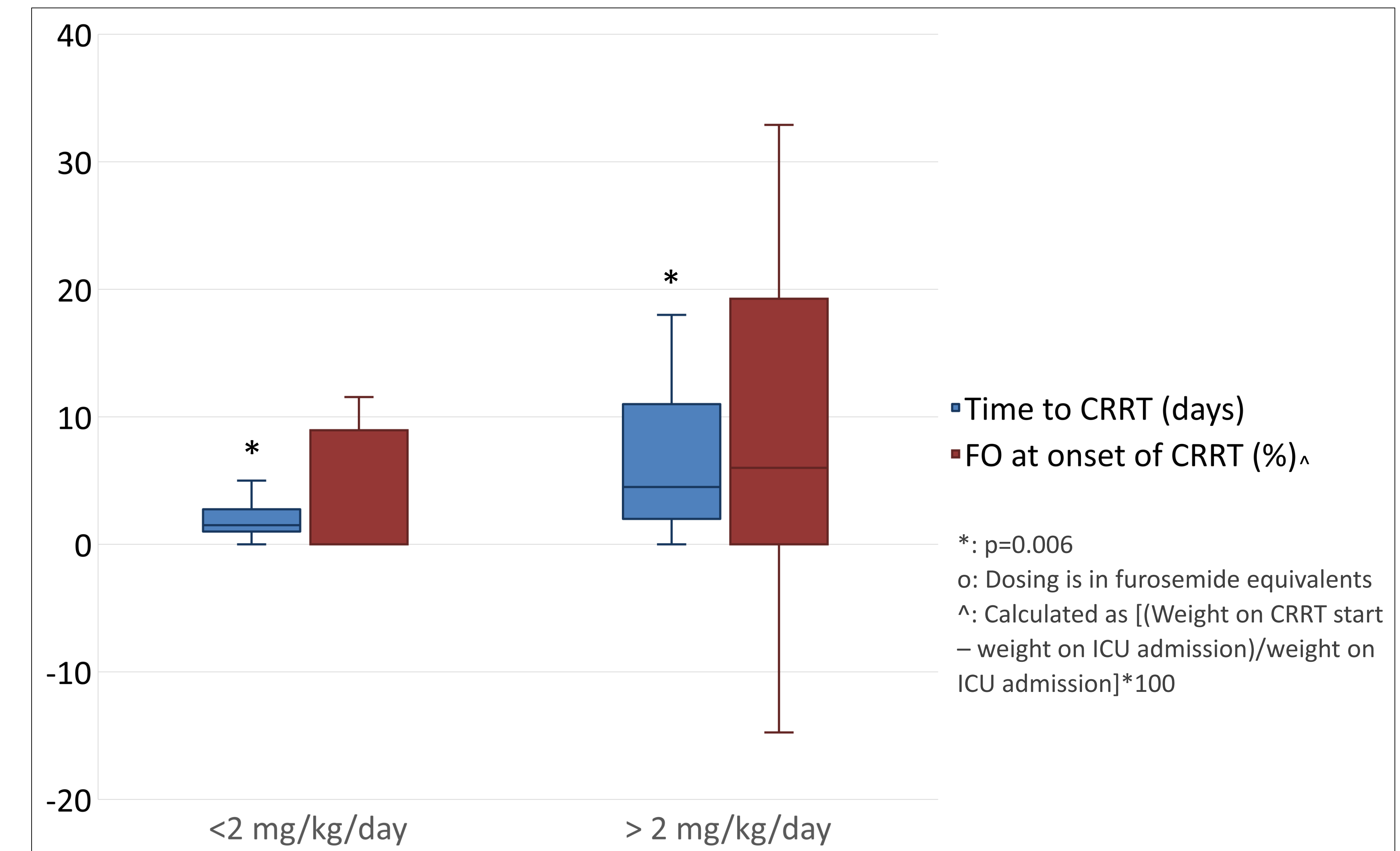


Figure 1. Comparison of time to CRRT and % of FO at onset of CRRT by cumulative loop diuretic exposure among critically ill children in the ICU.

## CONCLUSION

This the largest descriptive analysis of diuretic use in pediatric patients requiring CRRT to date

- Diuretic exposure is variable in critically ill children, and **more diuretic use may be associated with delayed initiation of CRRT**
- Multicenter, prospective studies are necessary to determine optimal timing and dosing of diuretic therapy to mitigate adverse outcomes associated with fluid overload.