

## 777 - Intravenous fluid bolus volume and resolution of acute kidney injury in children with diabetic ketoacidosis

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### Presenter(s)



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**Background:** Acute kidney injury (AKI) occurs in 30-64% of children hospitalized for diabetic ketoacidosis (DKA) and is thought to result from hypoperfusion, though recent evidence suggests that ischemia with reperfusion injury may contribute.

**Objective:** To determine whether resolution of AKI is hastened by low versus high IV fluid bolus volumes among children with type 1 diabetes who present with DKA.

**Design/Methods:** We conducted an observational retrospective cohort study between January 1, 2012 – March 1, 2020 among children and young adults  $\leq 21$  years with type 1 diabetes who presented to our tertiary care emergency department (ED) with DKA. DKA was defined as having: 1) venous pH  $< 7.3$  or bicarbonate  $< 15$  mmol/L, 2) positive urine or serum ketones, and 3) glucose  $> 200$  mg/dL. AKI was defined by the Kidney Disease/Improving Global Outcomes creatinine criteria. The Schwartz estimating equation was used to calculate an expected baseline creatinine, assuming a glomerular filtration rate (GFR) of  $120 \text{ mL/min/1.73m}^2$ . IV fluid bolus volume with 0.9% normal saline was categorized as low ( $< 15 \text{ mL/kg}$ ) and high ( $\geq 15 \text{ mL/kg}$ ) because, although a high proportion of patients received volumes at  $10 \text{ mL/kg}$  and  $20 \text{ mL/kg}$ , some received amounts between these values. Generalized additive mixed models were used to model trends of creatinine ratios: the observed creatinine divided by the expected baseline creatinine. Trends over time were flexibly modelled with thin plate regression splines. Estimated mean creatinine ratios and differences of low versus high bolus volumes were assessed at the time of bolus, and 12, 24, 36, 48 hours thereafter.

**Results:** We identified 884 encounters with DKA, of which 768 with 3,247 total creatinine measurements were included after applying exclusion criteria (Figure 1). In total, 179 (23.3%) encounters had AKI at ED presentation. Demographics and presenting laboratory values were similar when comparing patients who received low versus high IV fluid bolus volumes (Table 1), as was the proportion of encounters with AKI on presentation ( $p=0.6562$ ). The average trend (Figure 2) and mean difference (Table 2) in creatinine ratios were similar among patients with AKI who received low compared to high IV fluid bolus volumes.

**Conclusion(s):** IV fluid bolus volume was not associated with resolution of AKI in our cohort of children with DKA.

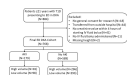


Figure 1. Flow chart.

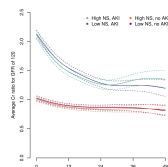


Figure 2. Average creatinine ratio for patients receiving low versus high IV fluid bolus volumes.

Characteristic	Low bolus volume (n=605)	High bolus volume (n=179)	p-value
Age (years)	10.5 (SD 3.2)	10.8 (SD 3.1)	0.85
Sex (male)	305 (50.4%)	95 (53.1%)	0.78
Weight (kg)	32.5 (SD 12.1)	33.1 (SD 12.3)	0.92
Height (cm)	145.2 (SD 18.5)	146.1 (SD 18.7)	0.89
Time to ED (min)	120 (SD 45)	118 (SD 44)	0.91
Time to treatment (min)	15 (SD 10)	16 (SD 11)	0.93
Initial glucose (mg/dL)	250 (SD 50)	248 (SD 48)	0.95
Initial pH	7.25 (SD 0.05)	7.26 (SD 0.05)	0.94
Initial bicarbonate (mmol/L)	14.5 (SD 2.5)	14.6 (SD 2.6)	0.96
Initial ketones (mmol/L)	3.5 (SD 1.5)	3.6 (SD 1.6)	0.97
Initial creatinine (mg/dL)	0.5 (SD 0.2)	0.5 (SD 0.2)	0.98
Initial anion gap (mmol/L)	18.5 (SD 2.5)	18.6 (SD 2.6)	0.99
Time to resolution of AKI (min)	120 (SD 45)	118 (SD 44)	0.91
Time to discharge (min)	150 (SD 50)	148 (SD 49)	0.92

Table 1. Characteristics of children with DKA by IV fluid bolus volume.

Time point	Low bolus volume (n=605)	High bolus volume (n=179)	p-value
At presentation	1.0 (SD 0.2)	1.0 (SD 0.2)	0.95
12 hours	0.9 (SD 0.2)	0.9 (SD 0.2)	0.96
24 hours	0.8 (SD 0.2)	0.8 (SD 0.2)	0.97
36 hours	0.7 (SD 0.2)	0.7 (SD 0.2)	0.98
48 hours	0.6 (SD 0.2)	0.6 (SD 0.2)	0.99

Table 2. Mean differences in creatinine ratios by AKI status at presentation.

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