Acute Kidney Injury in Hospitalized Children with Cystic Fibrosis

David Askenazi[1,3] Adam W. Scott[1], LaCrecia J. Britton [1,2], Raymond Lyrene[1,2], Hector Gutierrez[1,2]
[1]University of Alabama School of Medicine, Birmingham, AL
[2]Department of Pediatric Pulmonology, University of Alabama at Birmingham, Birmingham, AL
[3]Department of Pediatric Nephrology, University of Alabama at Birmingham, Birmingham, AL

BACKGROUND

- Intravenous Aminoglycosides (AGs) are routinely used for treatment of cystic fibrosis (CF) related lung infections
- AGs are a significant risk factor for the development of acute kidney injury (AKI).
- In order to address this issue, a clinical protocol was developed in June 2009 in order to reduce the incidence of AKI. This protocol outlined screening parameters and guidelines for evidence-based aminoglycoside therapy.

Hypothesis

We hypothesized that the incidence of AKI in hospitalized children with CF would decrease after the protocol implementation.

METHODS

- Retrospective chart review of hospitalized patients with CF admitted to UAB/Children's of Alabama
  - Pre-Protocol Group
    - Admissions from 6/18/2007 – 7/16/2009
  - Post-Protocol Group
    - Admissions from 8/1/2009 to 4/28/2011
- KDIGO definition were used for AKI diagnosis (Table 1)

Table 1: KDIGO Staging of AKI

Stage	Serum Creatinine Criteria
1	≥ 1.5 – 1.9 times baseline or 0.3 mg/dl increase from baseline
2	≥ 2.0 – 2.9 times baseline
3	≥ 3.0 times baseline increase to ≥ 4.0 mg/dl or RRT

Baseline SCr was defined using previously existing SCr for each patient

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RESULTS

Table 2: Study demographics of hospitalized children with CF

Demographics	Pre-protocol	Post-protocol	p-value
	n = 631	n = 475	
Male: N (%)	329 (52.1)	200 (42.1)	<0.001
Race: N (%)			0.14
Caucasian	594 (94.1)	448 (94.3)	
African-American	32 (5.1)	27 (5.7)	
Hispanic	5 (0.08)	0 (0)	
Admit age: years (SD)	14.5 (4.7)	14.8 (5.2)	0.3
Length of stay: days (SD)	12.2 (4.8)	12.2 (5.9)	0.90
Known Renal Complications:			
CFRD	450 (71.3)	319 (67.2)	0.14
Stones	112 (17.7)	93 (19.6)	0.44
Renal Disease	11 (17.4)	12 (25.3)	0.37
No of SCr/admit: N(SD)	2.1 (2.1)	3.4 (5.4)	<0.001
No. of SCr/day: N(SD)	0.18 (0.17)	0.28 (0.20)	<0.001

Fig 1. percentages of AKI in pre- and post-protocol eras

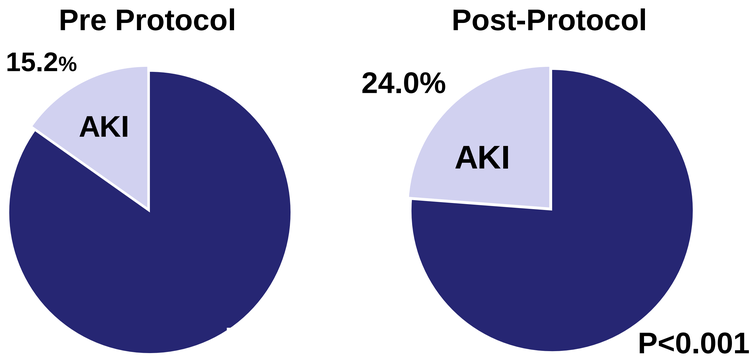
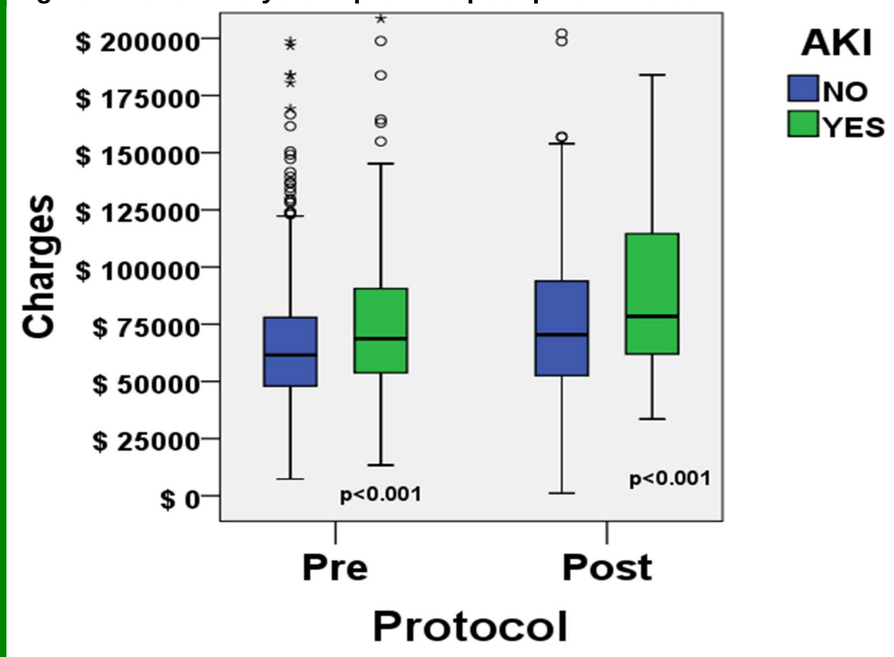


Table 3: Incidence of Acute kidney injury population

	Pre-protocol	Post-protocol	P-VALUE
	n = 631	n = 475	
AKI Stage: N (%)			P< 0.01
No AKI: N (%)	535 (84.8)	362 (76.2)	
Stage 1	70 (11.1)	89 (18.7)	
Stage 2	22 (3.5)	21 (4.4)	
Stage 3	4 (0.6)	3 (0.6)	

Figure 2: Cost analysis of pre- and post-protocol eras



CONCLUSIONS

1. The incidence of AKI in CF patients admitted for pulmonary exacerbations increases from 15 to 24% with higher surveillance.
2. Our data suggest that the incidence of AKI is higher than what is reported in the literature.
3. Cost analysis reveals that children with AKI in the hospital have higher costs in both pre- and post-protocol groups
4. Through increased screening with SCr, CF patients with AKI could be more readily identified which could lead to prevention of severe AKI and less long-term damage.
5. Studies are needed to determine if preventive strategies to reduce AKI can decrease morbidity, and assess the cost-benefit ratio of such screening.

BIBLIOGRAPHY

1. Bockenhauer D, Hug M, Kleta R. Cystic fibrosis, aminoglycoside treatment and acute renal failure: the not so gentle micin. Pediatr Nephrol 2009; 24: 925-928

2. Smith A, Lewis S, Bortenshaw C, Chochara I, McGaw J, Watson A. Case-control study of acute renal failure in patients with cystic fibrosis in the UK. Thorax 2008; 63: 532-535

3. Smyth A, Tan K, Hyman-Taylor P, Mulheran M, Lewis S, Stableforth D, Knox A, for the TOPIC Study Group. Once versus three-times daily regimens of tobramycin treatment for pulmonary exacerbations of cystic fibrosis – the TOPIC study: a randomised controlled trial. Lancet 2005; 365: 573-578