

Epidemiology of Acute Kidney Injury in Neonatal Cardiac Surgery: A Report from the NEPHRON Collaborative



¹Katja M Gist, ²David S Cooper, ³David Selewski, ⁴Santiago Borasino, ⁴David Askenazi, ⁴Kristal M Hock, ²Jeffrey A Alten on behalf of the NEPHRON Collaborative ¹University of Colorado Denver, Anschutz Medical Campus, Department of Pediatrics, Division of Pediatric Cardiology, Children's Hospital Colorado, ²University of Cincinnati School of Medicine, Cincinnati Children's Hospital Medical Center, Department of Pediatrics, Section of Cardiology, Cincinnati OH, ³Medical University of South Carolina, Department of Pediatrics, Section of Pediatric Nephrology, Charleston, SC, ⁴University of Alabama at Birmingham, Children's of Alabama, Department of Pediatrics, Section of Pediatric Cardiology and Nephrology.

BACKGROUND

NEPHRON is a multi-center collaborative created to better understand cardiac surgery associated AKI (CS-AKI).
The purpose of the study was to describe the following among

neonates who undergo cardiac surgery:

- Epidemiology
- Outcomes
- Center Variation

METHODS

DATA
•2240 neonates were included (Table 1)
•CS-AKI occurred in 1207 (54%) (Table 2)
•312 (26%) met both Cr and UOP criteria
•412 (35%) met only Cr criteria
•462 (38%) met only UOP criteria
•CS-AKI peaked on post-operative day (POD) 1, with 9.3% having AKI on POD 6 (Figure
1)
 •KDIGO stage 3 was most commonly defined by oligo-anuria (65%) compared to Cr
only criteria (35%)
•No stage of CS-AKI impacted duration of mechanical ventilation or hospital length of
stay
•After controlling for institutional practice variation, no patient or treatment level

•22 Center study of neonates (≤30 days) who underwent cardiac surgery utilizing a CS-AKI module combined with the Pediatric Cardiac Critical Care Consortium (PC4) dataset.

•Consecutive retrospective subjects were screened for enrollment starting in August 2017

•Exclusion criteria: pre-operative AKI, required extracorporeal membrane oxygenation and required reoperation.

•AKI was defined by modified KDIGO serum creatinine (Cr) or urine output criteria

•Primary outcome: mortality

•Multinomial regression was used to determine CS-AKI predictors. Associations among CS-AKI stages and outcomes were assessed with multivariable logistic or linear regression. variables were independently associated with development of CS-AKI

Table 1. Cohort Demographics

Characteristic	Overall (N=2240)		
Median age at surgery, days	7 (5, 11)		
Prematurity, n (%)	291 (13)		
Single ventricle, n (%)	559 (25)		
STAT category, n (%)			
1	83 (3.7)		
2	307 (13.7)		
3	285 (12.7)		
4	1158 (51.7)		
5	403 (18)		
Mortality, n (%)	91 (4.1)		

CS-AKI incidence varied by as much as 3-fold across the 22 centers (27-86%). Severity also varied significantly

Only KDIGO stage 3 was associated with mortality (OR 2.4; 95% CI: 1.3-4.6) In multivariable analysis, <u>use of CPB (but not duration)</u> was independently associated with CS-AKI (OR 1.5, 95% CI: 1.0-2.3)



Figure 1. CS-AKI prevalence and AKI stage by operative day

Table 2. Frequency of AKI

Characteristic	Overall (N=2240)	CPB (N=1657)	No CPB (N=583)
Any CS-AKI, n (%)	1207 (53.9)	983 (59.3)	224 (38.4)
KDIGO Stage, n (%)			
1	702 (31.3)	569 (34.3)	133 (22.8)



CONCLUSIONS

•CS-AKI varies widely across centers and occurs in >50% of neonates undergoing cardiac surgery

•CS-AKI did not impact outcomes, with the exception of stage 3 on mortality



•Further NEPHRON analyses will explore CS-AKI risk factors and understand

the impact of oligo-anuria on outcomes

•Further analyses will also explore optimization of definitions.