

Nutritional Status and Cardiac Surgery Associated Acute Kidney Injury and Impact on Patient Outcomes

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BACKGROUND

Congenital heart disease (CHD) is one of the most common developmental anomalies⁽¹⁾. Poor growth and failure to thrive is a known consequence for many children with congenital heart disease⁽²⁻³⁾. Acute kidney injury (AKI) is associated with both energy and protein underfeeding in critically ill children⁽⁴⁾. The severity of AKI is directly associated with increased time to achieve adequate energy and protein administration. Malnutrition in children with congenital heart disease who have undergone cardiac surgery is associated with increased mortality⁽⁵⁻⁶⁾. Acute kidney injury, alone, is associated with increased morbidity and mortality in critically ill children⁽⁷⁾.

PURPOSE

To establish whether children who are malnourished prior to surgery and older than 1 month of age have an increased likelihood for developing cardiac surgery associated acute kidney injury (CSA-AKI) within the first 2 days of cardiac surgery for congenital heart disease (CHD), as well as worse outcomes.

METHODS

- Retrospective study of children undergoing surgery for CHD between 01/12 and 12/14.
- Complexity was according to Society of Thoracic Surgeons-European Association for Cardio-Thoracic Surgery (STAT) Category.
- AKI on postoperative day 2 was according to KDIGO criteria.
- Malnutrition (MN) was according to WHO and CDC weight-for-age (WFA) z-score < -1.

N = 735

Age, yrs.	1.16 (0.38-4.87)	CICU LOS, days	3 (2-6)
Male/Female, n	422/323	Hospital LOS, days	8 (5-12)
Weight, kg	9 (5.63-17.88)	STAT category, n(%)	
Prevalence of malnutrition, n (%)	483 (47.35)	1	195 (26.53)
Creatinine on admission, mg/dl	0.4 (0.32-0.49)	2	344 (46.8)
Prevalence of CSA-AKI, n (%)	125 (17.41)	3	120 (16.33)
Mechanical Ventilation, hrs.	23.46 (8.18-36.97)	4	74 (10.07)
		5	2 (0.27)
		Mortality, n (%)	11 (1.50)

Fig 1: Demographics

N = 125

Prevalence of CSA-AKI, n(%)	125 (17.41)	Hospital LOS, days	8 (6.0-14.0)
Stage, n(%)		CICU LOS, days	4 (3.0-7.0)
1	76(60.8)	Mechanical Ventilation, hrs	16.73 (6.98-32.28)
2	36(28.8)	CPB time, min	177.5 (119.0-242.0)
3	13(10.4)	Mortality, n(%)	1 (0.8)

Fig 2: Cardiac Surgery Associated Acute Kidney Injury. CSA-AKI: Acute Kidney Injury by Kidney Disease Improving Global Outcomes (KDIGO) staging system; MV: mechanical ventilation; CICU: cardiac intensive care unit; LOS: length of stay; CPB: cardiopulmonary bypass time.

	OR	95% CI	P value
WFA MAL	0.94	0.60 – 1.48	0.7836
Age < 1 yr	2.20	1.37 – 3.52	0.0010
STAT High vs Low	0.83	0.38 – 1.83	0.6462
CBP time	1.01	1.00 – 1.01	< 0.0001
MV Hrs	0.99	0.99 – 1.00	0.1650

Fig 3: Univariate Analysis of CSA-AKI

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Fig. 4: Multivariate Analysis of CSA-AKI

RESULTS

- Malnutrition was common on admission for congenital heart disease surgery.
- Almost 1 in 5 patients develops Cardiac Surgery Associated AKI after surgery.
- By post-operative day 5, the majority of patients exhibited renal recovery.
- Regardless of the presence of malnutrition or acute kidney injury, the overall mortality remained low.

CONCLUSION

Malnutrition was common early after surgery for CHD and while approximately 20 percent of patients developed CSA-AKI, the majority of patients had renal recovery by post-operative day 5.

REFERENCES