

Major Adverse Kidney Events in Patients Admitted to the Pediatric Intensive Care Unit: A Propensity Score Matched Study

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Background

- Acute Kidney Injury (AKI) occurs in 15-30% of all admissions to the pediatric intensive care unit (PICU)
- AKI is associated with increased rates of mechanical ventilation, prolonged ICU length of stay (LOS), ICU mortality, and post-ICU mortality
- Despite the multitude of studies, there remain questions about association vs. causation and confounding vs. true effect.

Primary Outcome

Major Adverse Kidney Events (MAKE):

- Mortality
- eGFR <60mL/min/1.73²
- Creatinine >200% of baseline
- Dialysis Dependence
- **MAKE30** = MAKE criteria met within 30d

Results

Table 1: Baseline- Complete Cohort			
Variable	Severe AKI (n= 463)	No/Stage 1 AKI (n= 2559)	
Age, yr	8.1 (±5.9)	7.6 (±5.8)	
Male	245 (53%)	1365 (53%)	
Height, cm	119 (±40)*	117 (±37)	
Weight, Kg	22#	26	
Baseline SCr, mg/dL	0.36 (±0.15)#	0.39 (±0.14)	
Admit Sodium, mEq/L	143 (±8)#	141 (±6)	
Admit Platelets, k/L	160 (±120) #	229 (±130)	
Admit Diagnosis:			
-Cardiovascular	30 (7%)	148 (7%)	
-Infectious	92 (21%) #	242 (10%)	
-Renal	33 (8%) #	14 (1%)	
-Respiratory	56 (13%) #	547 (23%)	
-Transplant	29 (7%) #	31 (1%)	
-Oncology	29 (7%)*	259 (11%)	
History of SOT	51 (11%) #	88 (3%)	
History of BMT	5 (1%)*	17 (1%)	
PRISM III Score	10 (5-15) #	3 (0-6)	

Table 4: In-Hospital Characteristics Matched Cohort

	Severe AKI	No/Stage 1 AKI	p-value
Medications			
Amphotericin B	1%	1%	0.653
Antibiotics	87%	90%	0.402
Anti-Virals	25%	28%	0.540
CNI	17%	19%	0.480
Inotropes	4%	3%	0.483
Mechanical Ventilation	61%	66%	0.224
ICU LOS (days)	7.3 (2.9-18.1)	4.0 (2.2-8.9)	<0.001

Table 4: ICU characteristics of complete cohort. Data shown as median (IQR), number (%). CNI, calcineurin inhibitor; LOS, length of stay 00

Propensity Score Methods (PSM) use retrospective databases and match participants by propensity for exposure. PSM comparison cohorts may reduce the risk of confounding

Objectives

To use propensity score matching to study the association between severe AKI (>KDIGO stage 2) and outcomes.

Methods



Table 1: Baseline characteristics, complete cohort. Data reported as mean (+ SD), median (IQR), or number (%). SCr, creatinine; SOT, Solid Organ Transplant; BMT, Bone Marrow Transplant. [#] p-value < 0.001; * p < 0.05

Table 2: In-Hospital Characteristics Complete Cohort

	Severe AKI	No/Stage 1 AKI	p-value
Medications			
Amphotericin B	2%	1%	0.229
Antibiotics	86%	84%	0.445
Anti-Virals	27%	10%	<0.001
CNI	16%	4%	<0.001
Inotropes	7%	2%	<0.001
Mechanical Ventilation	56%	40%	<0.001
ICU LOS (days)	6.5 (2.4-15.1)	3.1 (1.8-7.2)	<0.001

Complete Cohort MAKE30

* p<0.05



Figure 1: Patients with MAKE30 in full cohort * p<0.05 Only patients with complete data included



Table 5: Logistic Regression Models for MAKE30			
	Full Cohort Unadjusted	Full Cohort Adjusted*	PSM Cohort
	OR (95%CI)	OR (95%CI)	OR (95%CI)
No/Stage 1 AKI	1.0 ref	1.0 ref	1.0 ref

- AKI Stage calculated on PICU days 1-7
- Propensity scores for the development of severe AKI generated using following variables
 - Age, sex, race, PRISM3, history of BMT, history of SOT, diagnoses (cardiovascular, oncology, injury, respiratory, transplant related, infectious), amphotericin B, anti-viral use, other nephrotoxic medications, mechanical ventilation, admission sodium and platelets
- Patients with severe AKI were matched to control patients no/stage 1 AKI using 1:1, nearest neighbor

Table 2: ICU characteristics of complete cohort. Data shown as median (IQR), number (%). CNI, calcineurin inhibitor; LOS, length of stay

Table 3: Baseline- Propensity Matched Cohort			
Variable	Severe AKI (n= 247)	No/Stage 1 AKI (n=247)	
Age, yr	8.2 (±5.8)	8.1 (±6.1)	
Male sex	135 (55%)	132 (53%)	
Height, cm	121 (±39)	119 (±39)	
Weight, Kg	26 (12-56)	24 (11-52)	
Baseline Scr, mg/dL	0.35 (±0.16)*	0.40 (±0.18)	
Admit Sodium, mEq/L	142 (±7)	142 (±7)	
Admit Platelets, k/L	162 (±121)	174 (±120)	
Admit Diagnosis:			
-Cardiovascular	20 (8%)	20 (8%)	
-Infectious	57 (23%)	47 (19%)	
-Renal	7 (3%)	8 (3%)	
-Respiratory	36 (15%)	41 (17%)	
-Transplant	18 (7%)	20 (8%)	
-Oncology	24 (10%)	16 (6%)	
History of SOT	33 (13%)	41 (17%)	
History of BMT	4 (2%)	2 (1%)	

Severe AKI	4.82	2.60	2.49
	(3.36-6.90)	(1.71-3.95)	(1.42-4.38)

Table 5: Association between AKI and MAKE30 using logistic regression. *Adjusted for Age, Sex, Race/Ethnicity, PRISM3 score, History of BMT/SOT, specific admission diagnosis categories (cardiovascular, oncology, injury/poisoning, renal, transplant), medications (amphotericin B, anti-viral, calcineurin inhibitor, inotropes

Conclusions

- **Propensity score matching reduces** covariate imbalance between patients with severe AKI and no/stage 1 AKI
- After matching, in-hospital risk factors and exposures were similar between the cohorts. Despite matching, patients with severe AKI have ICUS LOS twice as long as those with no/Stage 1 AKI.
- Severe AKI has a significant association with MAKE30, which persists after propensity score matching [OR (95%CI) 2.49 (1.4-4.4)]

References

1. Kaddourah A, Basu RK, Bagshaw SM, Goldstein SL; AWARE Investigators.



association between AKI status and

MAKE30 in propensity matched cohorts.



Table 3: Characteristics of matched cohort. Data reported as mean (+ SD), median (IQR), or number (%). SCr, creatinine; SOT, Solid Organ

Transplant; BMT, Bone Marrow Transplant. * p-value = 0.001

