Chronic Kidney Disease (CKD) Development Five Years Following Acute Kidney Injury (AKI) in Children

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Background

- Survivors of acute kidney injury (AKI) are at risk for chronic kidney disease (CKD), but most studies assessing the AKI-CKD link are limited by retrospective design, reliance on a convenience sample of patients with relevant testing available and/or use of administrative coding data.
- As part of our study, "A Predictive Model for Development of Chronic Kidney Disease Following Acute Kidney Injury in the Pediatric Population (AKI2CKD)", we follow children prospectively for up to 5 years after AKI at our center.
- It is unclear how long AKI survivors should be followed if they have do not have CKD at different time intervals.

Aim

- Our aim was to determine the risk of CKD development for patients without evidence of CKD by 6 months following an AKI event.
  - We defined CKD as GFR < 90 mL/min/1.73m^2

Methods

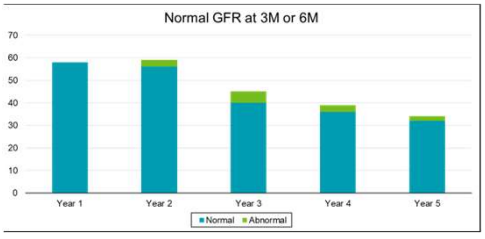
- Hospitalized patients with serum creatinine (SCr) based severe AKI, defined as KDIGO Stage 2-3 for ≥ 48 hours, were prospectively enrolled in this study.
- SCr and Cystatin-C (CysC) were collected at all follow up visits to estimate GFR (eGFR). For this analysis, the lower eGFR between the two was used.
- Patients included in analysis had sufficient data at 3M or 6M and were evaluated for follow-up. Patients without follow-up past one-year were excluded.
- Pearson chi-square or Fisher's exact tests were used for all categorical data, with p-value <0.05 considered significant

Results

- Data from 118 patients with severe AKI episode from between 2011 and 2018 were analyzed.
- Of these, 118 had follow up data at the first year, 105 at the second year, 83 at the third year, 75 at the fourth year, and 62 at the fifth year.
- 49/118 had CKD and 69/118 did **not** have CKD at the 3M or 6M follow up

Patients without CKD at 3/6M

- **Only two of the 69 patients without CKD at 3/6M went on to develop CKD subsequently by their last visit.**
  - Both of these patients had a comorbidity, one with a Wilms tumor and the other had received a heart transplant complicated by PTLD.

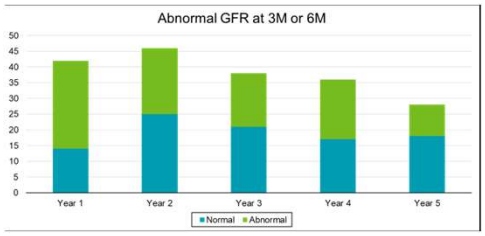


- The graph above displays the number of patients who had a normal GFR at 3/6M and evaluable eGFR data at follow-up visits
  - Blue represents patients with normal GFR (GFR ≥ 90 ml/min/1.73m^2) at follow-up visits, whereas green patients represent those who developed evidence of CKD at those visits.

Results Continued

Patients with eGFR < 90 ml/min/1.73m^2 at 3/6M

- Twenty-two (22) of the 49 patients with CKD at 3/6M had CKD that persisted to their last follow-up visit.



- The graph above displays the number of patients who had an abnormal GFR at 3/6M and had evaluable eGFR data at follow-up visits.
  - Blue represents patients with normal GFR (GFR ≥ 90 ml/min/1.73m^2) at follow-up visits, whereas green patients represent those who had persistent evidence of CKD at those visits.

All Patients

Stage of CKD	# Patients at Last Visit
2	5
3	10
4	5
5	4

- At their last study visit, 24 patients had CKD, including the two who did not have evidence of CKD at 3/6M
- Of the 4 patients with CKD Stage 5 at the last visit, 2 had received transplants and 2 were receiving dialysis.

- An eGFR ≥ 90 mL/min/1.73m^2 at 3/6M has a strong negative predictive value to function as a screening tool for the development of CKD within 5 years

Statistic	Value	95% CI
Sensitivity	91.7%	73.0-98.9%
Specificity	71.3%	61.0-80.1%
Pos. Pred. Value	44.9%	36.7-53.4%
Neg. Pred. Value	97.1%	89.8-99.2%

Conclusion

- Patients without CKD Stage 2 within the first year post-sAKI are at very low risk of CKD development.
- We suggest CKD surveillance may be safely discontinued after one year in the absence of CKD presence or primary kidney disease.

Further Directions

- As seen in this abstract, a few patients who did not show incidence of CKD within the first-year post sAKI developed CKD within five years. These patients at risk of CKD development but without CKD incidence in the first year need to be identified.
- A full CKD assessment, including urine protein, microalbumin, and blood pressure measurements, should be assessed to ensure all patients at risk of developing CKD and are identified and seen for follow up.

References

1. Goldstein, S.L. and P. Devarajan, Acute kidney injury in childhood: should we be worried about progression to CKD? Pediatr Nephrol, 2011. 26(4): p. 509-22.
2. Chawla, L.S., et al., Acute kidney injury and chronic kidney disease as interconnected syndromes. N Engl J Med, 2014. 371(1): p..
3. Flynn, J.T., et al., Clinical Practice G58-66uideline for Screening and Management of High Blood Pressure in Children and Adolescents. Pediatrics, 2017. 140(3).