

AKI: common in pediatric cardiac surgery

Incidence, risk factors, and outcomes of acute kidney injury after pediatric cardiac surgery: a prospective multicenter study

AKI is common after pediatric cardiac surgery and is associated with prolonged mechanical ventilation and increased hospital stay.

- AKI occurred in 42% of the patients within 3 days after surgery.
- CPB time and age were independently associated with AKI risk.
- A large proportion of patients who developed AKI were exposed to nephrotoxic drugs.

➤ Li S, Krawczeski CD, Zappitelli M, et al. Incidence, risk factors, and outcomes of acute kidney injury after pediatric cardiac surgery: a prospective multicenter study. *Crit Care Med*. 2011;39(6):1493–1499. doi:10.1097/CCM.0b013e31821201d3

Acute kidney injury after pediatric cardiac surgery

- AKI is a common complication of pediatric cardiac surgery and is associated with increased morbidity and mortality.
- Risk factors for AKI after cardiac surgery include younger age, prolonged CPB time, prolonged time on ventilator, pump failure, sepsis and hematological complications.
- sCR is not sensitive for evaluation of postoperative AKI due to a delayed peak until 1–3 days after cardiac surgery.

➤ Yuan S. Acute kidney injury after pediatric cardiac surgery. *Pediatrics & Neonatology*. 2019;60(1):3–11 DOI: <https://doi.org/10.1016/j.pedneo.2018.03.007>

Neutrophil gelatinase-associated lipocalin as a biomarker for acute renal injury after cardiac surgery

Concentrations in urine and serum of NGAL represent sensitive, specific, and highly predictive early biomarkers for acute renal injury after cardiac surgery.

- 28% of children undergoing cardiopulmonary bypass developed AKI.
- uNGAL rose 2 h after cardiopulmonary bypass, whereas diagnosis with serum creatinine was only possible 1–3 days after surgery.
- The amount of NGAL in urine at 2 h after cardiopulmonary bypass was the most powerful independent predictor of acute renal injury.

➤ Mishra J, Dent C, Tarabishi R, et al. Neutrophil gelatinase-associated lipocalin (NGAL) as a biomarker for acute renal injury after cardiac surgery. *The Lancet*. 2005;365(6466):1231–1238. [https://doi.org/10.1016/S0140-6736\(05\)74811-X](https://doi.org/10.1016/S0140-6736(05)74811-X)

Combining functional and tubular damage biomarkers improves diagnostic precision for acute kidney injury after cardiac surgery

- After a given injury, such as cardiopulmonary bypass, profiles created by combining novel tubular damage and functional injury biomarkers allow clinicians to predict acute kidney injury earlier than the use of changes in creatinine, and with more detail.

uNGAL+ pCysC+ SN=69 SP=96 NPV=77

> Basu RK, Wong HR, Krawczeski CD, et al. Combining functional and tubular damage biomarkers improves diagnostic precision for acute kidney injury after cardiac surgery [published correction appears in J Am Coll Cardiol. 2015;65(11):1158-9]. J Am Coll Cardiol. 2014;64(25):2753-2762. doi:10.1016/j.jacc.2014.09.066

Early detection of acute kidney injury after pediatric cardiac surgery

- The diagnostic accuracy of NGAL for the prediction of AKI has remained high. This is particularly applicable to the pediatric cardiac surgery setting.
- The combination of functional biomarkers along with markers of tubular injury offers a greater diagnostic opportunity in pediatric patients following cardiac surgery.
- Clinicians managing pediatric patients that have undergone cardiac surgery should be aware of the long-term implications of AKI. If AKI is diagnosed during the post-operative period, referral to a pediatric nephrologist is strongly advocated for ongoing monitoring and institution of medical therapy when indicated.

> Jefferies JL, Devarajan P. Early detection of acute kidney injury after pediatric cardiac surgery. Prog Pediatr Cardiol. 2016;41:9-16. doi:10.1016/j.ppedcard.2016.01.011

Postoperative biomarkers predict acute kidney injury and poor outcomes after pediatric cardiac surgery

- A simple, noninvasive measurement of urine IL-18 or urine NGAL collected during the first 6 postoperative hours provided risk stratification for severe AKI.
- A postoperative level of urine NGAL of >72 ng/ml distinguished a five-fold increased odds of AKI.

> Parikh CR, Devarajan P, Zappitelli M, et al. Postoperative biomarkers predict acute kidney injury and poor outcomes after pediatric cardiac surgery. J Am Soc Nephrol. 2011;22(9):1737-1747. doi:10.1681/ASN.2010111163