Nephrotoxic-associated AKI in children

Acute kidney injury in pediatric cancer patients

- 52.6% of pediatric cancer patients developed AKI.
- 22.6% of cancer survivors had long-term renal impairment.

Park PG, Hong CR, Kang E, et al. Acute Kidney Injury in Pediatric Cancer Patients. The Journal of Pediatrics, 2019;208:243-250.e3. doi: 10.1016/j.jpeds.2018.12.023

Drug-induced acute kidney injury in children

- Up to 25% of AKI cases in the PICU are believed to be the result of pharmacotherapy with cancer chemotherapeutics among the most common offenders.
- Drugs and/or drug classes, which are known to cause AKI in children, include cancer chemotherapeutics, non-steroidal anti-inflammatory drugs and antimicrobials.

Faught LN, Greff MJ, Rieder MJ, Koren G. Drug-induced acute kidney injury in children. Br J Clin Pharmacol. 2015;80(4):901–909. doi:10.1111/bcp.12554

Nonsteroidal anti-inflammatory drugs are an important cause of acute kidney injury in children

- 6.6% of children receiving NSAIDs developed AKI even though 75% received doses in the recommended range.
- During 11.5 years of study, a minimum total of $375,293 was spent at our institution on the care of patients with NSAID-associated AKI; markedly underrepresented as billing data from specialists was not available.

Misurac JM, Knoderer CA, Leiser JD, Nailescu C et al. Nonsteroidal Anti-Inflammatory Drugs Are an Important Cause of Acute Kidney Injury in Children. The Journal of Pediatrics, 2013;162(6):1153-1159.e1 DOI: https://doi.org/10.1016/j.jpeds.2012.11.069

Nephrotoxicity as a cause of acute kidney injury in children

- Nephrotoxic drugs account for about 16% of all AKIs.
- Children with AKI caused by nephrotoxic agents have a significant risk for chronic renal injury.

Patzer L. Nephrotoxicity as a cause of acute kidney injury in children. Pediatr Nephrol. 2008;23:2159-2173 https://doi.org/10.1007/s00467-007-0721-x

Acute kidney injury associated with high nephrotoxic medication exposure leads to chronic kidney disease after 6 months

- Six months after NTMx-AKI, 70% of patients had evidence of residual kidney damage.
- CKD, hypertension, and proteinuria were more common in the AKI cohort than in controls.
- [The authors] suggest systematic comprehensive follow-up in children after NTMx-AKI.

Menon S, Kirkendall ES, Nguyen H, Goldstein S. Acute Kidney Injury Associated with High Nephrotoxic Medication Exposure Leads to Chronic Kidney Disease after 6 Months. The Journal of Pediatrics, 2014;165(3):522-527.e2 DOI: https://doi.org/10.1016/j.jpeds.2014.04.058

Urine biomarkers of acute kidney injury in noncritically ill, hospitalized children treated with chemotherapy

- Conclusion: Urine NGAL and IL-18 show promise as early AKI diagnostic tests in children treated with ifosfamide and may have a potential role in drug toxicity monitoring.

Sterling M, Al-Ismaili Z, McMahon KR, et al. Urine biomarkers of acute kidney injury in noncritically ill, hospitalized children treated with chemotherapy. Pediatr Blood Cancer. 2017; 64:e26538. https://doi.org/10.1002/pbc.26538

Urinary neutrophil gelatinase associated lipocalin as a biomarker in ifosfamide induced chronic renal failure

- The 24-hour urine NGAL cut-off level for demonstrating CRF was found to be 1.065 ng/mL/24 hours. The sensitivity and specificity for this cut-off value were 83% and 77%, respectively.
- Conclusion: Elevated NGAL levels may be a good option in determining CRF.

Kesik V, Demirkaya E, Buyukpamukçu M, Urinary neutrophil gelatinase associated lipocalin as a biomarker in ifosfamide induced chronic renal failure. Eur Rev Med Pharmacol Sci 2015;19(24):4851-4857

Detection of early renal injury in children with solid tumors undergoing chemotherapy by urinary neutrophil gelatinase-associated lipocalin

- Among critically ill cancer patients (CICPs), 12-49% experience ARF and 9-32% require renal replacement therapy during their time at an intensive care unit (ICU).
- uNGAL was highly predictive with an AUC of 0.847.
- Depending only on the creatinine level for detecting AKI will markedly delay the diagnosis.

Almalky MA, Hasan SA, Hassan TH, et al. Detection of early renal injury in children with solid tumors undergoing chemotherapy by urinary neutrophil gelatinase-associated lipocalin. Mol Clin Oncol. 2015;3(6):1341–1346. doi:10.3892/mco.2015.631