Evaluation of Intravenous Ketorolac-Associated Nephrotoxicity in Pediatric Patients During Hospital Stay

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Background

- Ketorolac is preferred for post-operative pain management in pediatric patients due to the adverse effects associated with opioids, such as sedation and respiratory depression[1]
- Administering ketorolac with multiple nephrotoxic agents may put patients at risk of an acute kidney injury (AKI)[2,3]
- Studies have reported AKI incidence rates in the pediatric intensive care unit (PICU) ranging from 8% to 30%[2]

Objectives

- To assess the AKI incidence in pediatric patients who received intravenous (IV) ketorolac alongside nephrotoxic medications and identify potential areas for pharmacist intervention in standard of care.

Methods

Study Design: IRB-approved retrospective chart review

Renal function: assessed using Kidney Disease: Improving Global Outcomes (KDIGO) AKI criteria based on serum creatinine (SCr) and urine output (UO)

Data Analysis: descriptive statistics

Table 1: Eligibility Criteria

Inclusion	Exclusion
Patients aged 21 years and below who received IV ketorolac at Doernbecher Children's Hospital with concomitant nephrotoxic agents between January 1 to December 31, 2022	Patients who have chronic kidney disease, have had renal transplant or required renal replacement therapy

Mild	1.5-1.9x baseline or increase in SCr value of 0.3 mg/dL within 48 hrs or UO < 0.5 ml/kg/h for 6-12 hrs
Moderate	2-2.9x baseline or UO < 0.5 ml/kg/h for ≥ 12 hrs
Severe	3x baseline or increase in SCr value of 4.0 mg/dL or UO < 0.3 ml/kg/h for ≥ 24 hrs or anuria for 12 hrs

Figure 1: KDIGO AKI Criteria[4]

Results

Table 2: Demographic Information

Variable	Total N= 200	Mild AKI N=5	Moderate AKI N=0	Severe AKI N=4	Total AKI N=9
Female	92 (46%)	3 (60%)	0	2 (50%)	5 (55.6%)
Age (years)	10.2	8.8	0	18.3	13
Race					
White	160 (80%)	3 (60%)	0	4 (100%)	7 (77.8%)
Black	4 (2%)	0	0	0	0
Asian	3 (1.5%)	0	0	0	0
Other	8 (4%)	2 (40%)	0	0	2 (22.2%)
Ethnicity					
Hispanic	45 (22.5%)	3 (60%)	0	2 (50%)	5 (55.6%)
Non-Hispanic	136 (68%)	2 (40%)	0	2 (50%)	4 (44.4%)
Unknown	19 (9.5%)	0	0	0	0
History of Present Illness					
Appendicitis	33 (16.5%)	0	0	0	0
Fracture	27 (13.5%)	0	0	0	0
Choledocholithiasis	7 (3.5%)	0	0	0	0
Pneumonia	6 (3%)	0	0	0	0
Urinary tract infection	2 (1%)	1 (20%)	0	0	1 (11.1%)
Pancreatitis	6 (3%)	1 (20%)	0	0	1 (11.1%)
Acute headache	4 (2%)	1 (20%)	0	0	1 (11.1%)
Respiratory distress	8 (4%)	1 (20%)	0	1 (25%)	1 (11.1%)
Testicular pain	1 (0.5%)	1 (20%)	0	0	1 (11.1%)
Cystic Fibrosis Exacerbation	3 (1.5%)	0	0	3 (75%)	3 (33.3%)

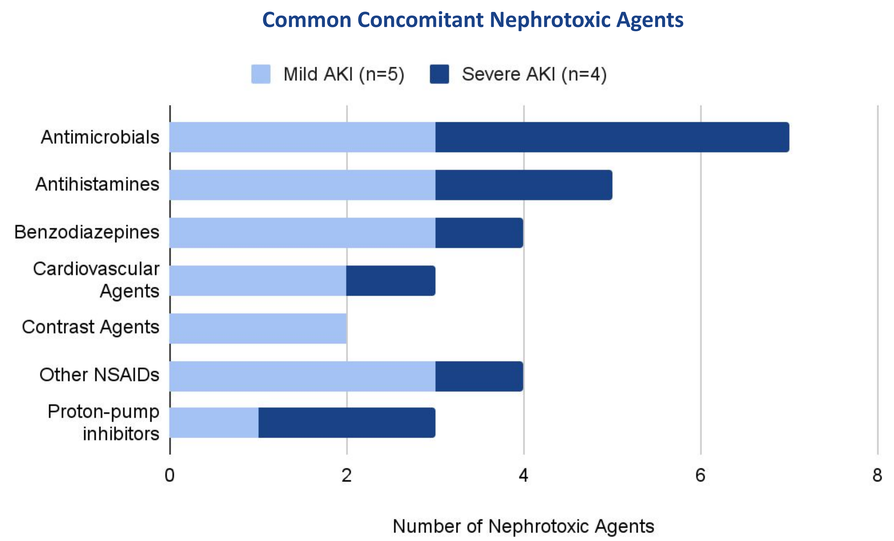

Figure 2: Concomitant nephrotoxic agents administered with IV ketorolac in patients with mild (n=5) and severe (n=4) AKIs.

Results (Cont.)

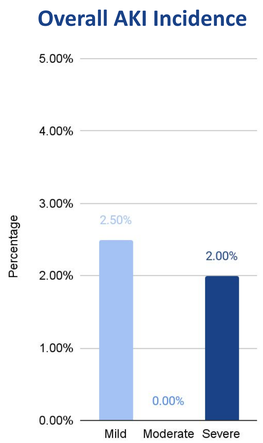

Figure 3: Overall AKI incidence

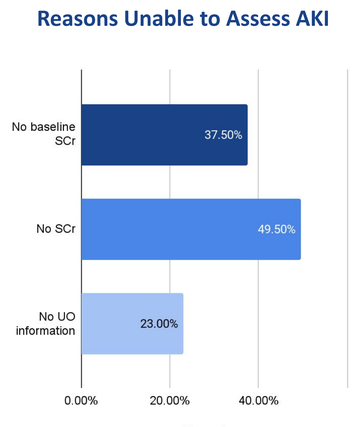

Figure 4: Reasons unable to assess AKI

Conclusion

Drug-induced AKI such as ketorolac administration with concomitant nephrotoxic agents could be prevented with increased monitoring of renal function and medication review

Monitoring could be improved by routinely ordering SCr labs and enforcing strict I/O's in order to have more accurate renal function assessment

Continued research is needed to help identify which agents are more likely to exacerbate an AKI

References

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