

RENAL CALCULI PATHWAY

EXECUTIVE SUMMARY

Physician Owner(s): Claudia Berrondo, MD

Primary Objective

Nephrolithiasis is responsible for 1 in 1000 to 1 in 7600 pediatric hospital admissions annually throughout the United States. Seventy-five percent of children with nephrolithiasis have an identifiable predisposition to stone formation.¹⁶ Delayed identification and treatment significantly impact patient outcomes and can be reduced with appropriate screening and medical treatment. The intention of this pathway is to standardize patient evaluation for suspected renal calculi, expedite appropriate radiographic and urinary studies, treat pain appropriately, judiciously consult appropriate subspecialty services (Urology and Nephrology) and perform follow-ups with patients in a timely manner.

Recommendations

Inclusion criteria

Patients presenting to Urgent Care, Children's Physicians, Emergency Department, and Inpatient Clinical settings. Patients are greater than or equal to one year of age, symptomatic/chief complaint of urinary tract infection (UTI), flank pain, nausea or vomiting, and high suspicion of renal calculi.

Exclusion criteria

Patients under one year of age, with low suspicion for renal calculi or concern for septic shock.

Radiographic Imaging

Non contrast CT has been shown to be the most sensitive and specific imaging study in evaluation of urolithiasis, though utilizes ionizing radiation which should be used sparingly, particularly in the more radiosensitive pediatric population. Ultrasound has a high specificity (97.1%) and positive predictive value (92.3%) for detection of renal calculi, therefore if a renal stone is identified by ultrasound confirmatory CT may not be necessary, making ultrasound a useful first line imaging study in evaluation of suspected urolithiasis in the pediatric population.²³ Both the American Urological Association and European Society of Pediatric Radiology (ESPR) have recommended ultrasound as the first line study for suspected renal calculus in children.^{11, 22}

Urinalysis with microscopic

Urinalysis with microscopic supports diagnosis for renal calculi and should be performed in any child in whom renal calculi is suspected. Microhematuria is the most common abnormality found in 60-95% of patients.² Microhematuria is common in patients with confirmed nephrolithiasis (84%).¹⁹ It is important that a standard urinalysis is not ordered but rather urinalysis with microscopic as it can identify true hematuria and can be used to identify crystal type according to the distinctive crystal structure of renal calculi.^{2, 16}

Initial Management of Nephrolithiasis

Pain Control: First line pain management includes oral acetaminophen or intramuscular or intravenous ketorolac. Nonsteroidal anti-inflammatory drugs (NSAIDs) are used to control pain with renal calculi. NSAIDs reduce glomerular filtration, which in turn reduces pressure in pelvic area and reduces stretch receptors stimulation.⁹ NSAIDs directly impact the inhibiting prostaglandin synthesis¹⁵ which reduces ureteric edema and inflammation, leading to better ureteral drainage.⁹ NSAIDs have the advantage of decreasing ureteral smooth muscle tone, resulting in relaxation (ureteral spasm).⁹ In a systematic review, NSAIDs were found to be equivalent to opioids or

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paracetamol in the relief of renal colic with fewer side effects and fewer requirements for rescue analgesia.²¹ The second line of pain medication includes intranasal fentanyl and intravascular morphine. A combination of both NSAIDS and opioids can be superior to either agent alone.^(24, 13, 18, 25)

Anti-emetics

Ondansetron is the recommended first line anti-emetic given lack of proven superior efficacy of other anti-emetic agents.^{1,3} Ondansetron has also been shown to be effective for the prevention/treatment of nausea in children.⁸

Tamsulosin

“Tamsulosin has been shown to be effective in facilitating expulsion of ureteral stones (<10mm) as medical therapy alone or as an adjunct to shock wave lithotripsy and ureteroscopy.”¹⁷ Tamsulosin increases the odds of spontaneous passage of ureteral stones in children.^{26,28} Tamsulosin should only be used in pediatric patients greater than 2 years of age and only patients with ureteral renal calculi.^{5, 12, 14}

Rationale

A Renal Calculi pathway will standardize patient evaluation for suspected renal calculi by expediting radiographic and urinary studies, which medications are used for first and second line to treat pain appropriately, judiciously consult appropriate subspecialty services (Urology and Nephrology) to assess criteria for admission and patient disposition. By implementing this pathway workflow and care delivery will be streamlined and will reduce number of Computed Tomography (CT) scans, decrease the amount of opioids administered, increase appropriate lab orders for urinalysis, and initiate follow up in the Urology, Nephrology or Stone Clinics.¹⁰

Metrics

1. Increase percentage of encounters with follow up to Urology, Nephrology, or Kidney Stone Clinic in 2-4 weeks after discharge to 50% by December 2023. (Outcome Metric)
2. Decrease percentage of encounters receiving opioids (fentanyl, morphine, hydrocodone, oxycodone, oxymorphone, hydromorphone, hydrocodone with acetaminophen, oxycodone with acetaminophen) for pain control for initial management of pain related to renal calculi to 25% by December 2023. (Outcome Metric)
3. Increase percentage of confirmed renal calculi encounters that have Urinalysis with Microscopic of renal calculi to 80% by December 2023. (Process Metric)
4. *Maintain percentage of encounters with renal bladder US for initial imaging of renal calculi at ***% by *** 2023. (Process Metric)*
5. Monitor LOS (minutes) in the ED from time provider signs up for patient to discharge or admission. (Balancing Metric)
6. Monitor median pain scores. (Balancing Metric)

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Team Members

Project Champion: Claudia Berrondo, MD

Team Members

- Anja Zann, MD (Urology)
- Melissa St. Germain, M.D. (VP Children's Physicians & Urgent Care Medical Director)
- Angela Beavers, MD (Radiology)
- Melissa Muff-Luett, MD (Nephrology)
- Jennifer Wang, DO (Medical Director Emergency Medicine)
- Drew Sankey, PharmD (Clinical Pharmacy Manager)
- Natalie Shafer APRN-NP (Pediatric Hospital Medicine)
- Heidi Killefer, MD (Interim Division Chief Urgent Care)
- Kelsey Spackler, DNP, APRN-NP, CPNP-AC/PC (Supervisor, Clinical Effectiveness)
- Abby Vipond, MSN, APRN, FNP-C (Clinical Effectiveness Project Manager)

Evidence

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