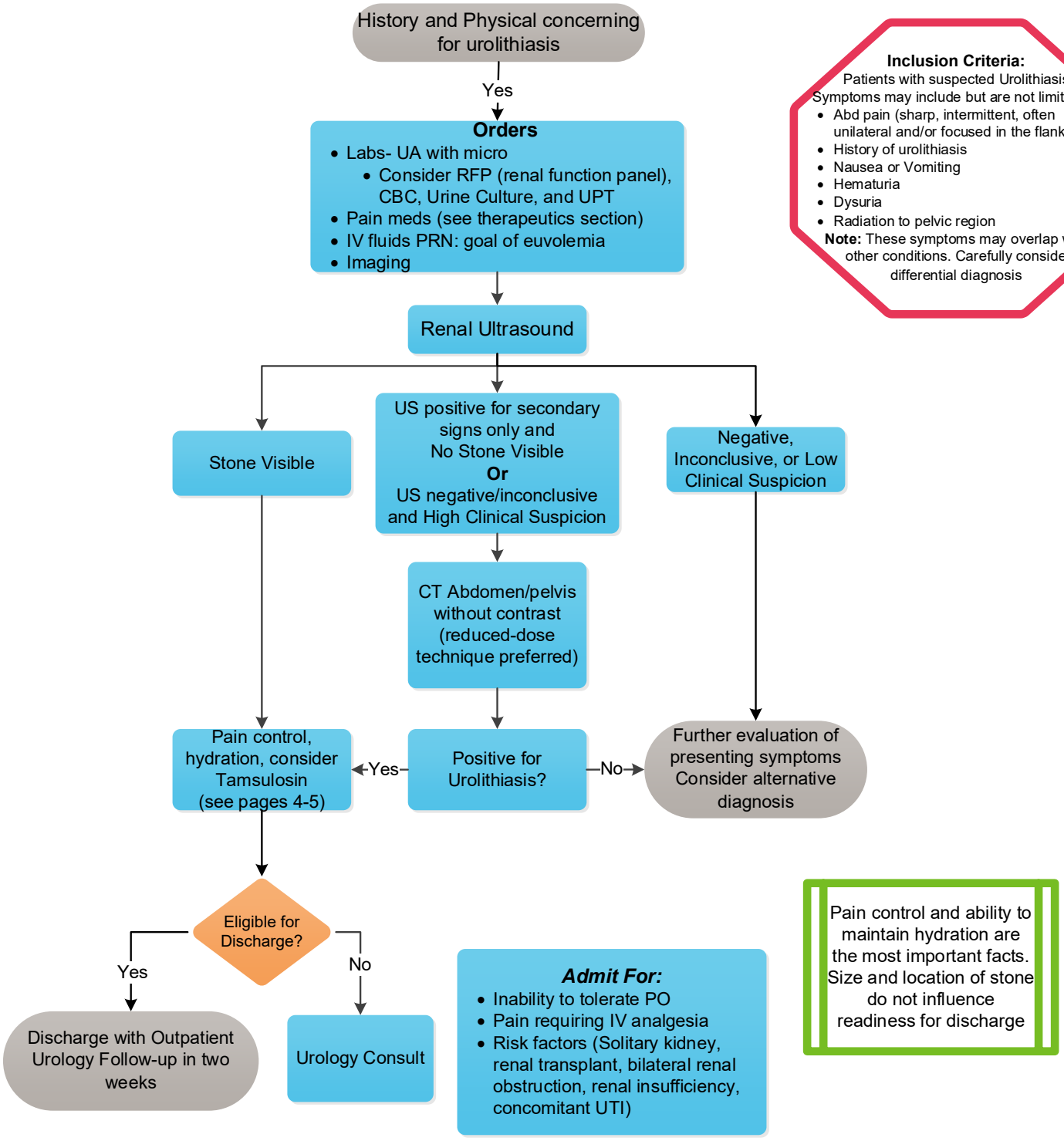
UROLITHIASIS

ALGORITHM



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TARGET POPULATION

Inclusion Criteria

- Patients with suspected Urolithiasis
- Symptoms may include but are not limited to:
  - Abdominal pain (sharp, intermittent, often unilateral and/or focused in the flank or back)
  - History of urolithiasis
  - Nausea or vomiting
  - Hematuria
  - Dysuria
  - Radiation to pelvic region

Note: These symptoms may overlap with other conditions. Carefully consider differential diagnosis.

BACKGROUND | DEFINITIONS

Urolithiasis (including nephrolithiasis/ureterolithiasis) may present with abdominal pain that is sharp, intermittent, often unilateral, and/or focused on the flank or back. A patient with suspected urolithiasis may or may not present with the following:

- History of urolithiasis
- Radiation to the pelvic region
- Hematuria
- Dysuria
- Nausea or vomiting

INITIAL EVALUATION

Triage Assessment

- Review triage information, vital signs
- Assess hydration status, need for pain control, need for IV placement

Complete History & Physical

For a complete history assess the following:

- Abdominal, flank or back, scrotal, penile, or vaginal pain
- Hematuria
- Dysuria
- Urine output
- Nausea or vomiting
- Fever
- Known urinary tract infection
- Any medication use
- Colic in infants

To obtain pertinent past medical history, assess the following

- Nephrolithiasis
- Urological surgeries
- Metabolic disorders, including hypercalciuria or hypocitraturia
- Determine if family history of nephrolithiasis

Physical examination

- Abdominal exam
- CVA tenderness
- GU exam

High Risk

- Family history of stone disease or kidney failure
- Known history of: bone disease, inflammatory bowel disease, cystic fibrosis, gout, deafness, failure to thrive, seizure disorder, immobility, cerebral palsy, spina bifida, nephrectomy, single kidney, nephrocalcinosis
- Urology abnormality: Ureteropelvic junction obstruction, posterior urethral valves, duplex system, bladder exstrophy
- Medication exposure: Furosemide, calcitriol, topiramate, corticosteroids, antiretrovirals, supplement/vitamin use, ketogenic diet, acetazolamide

LABORATORY STUDIES | IMAGING

Laboratory Studies

- Obtain urinalysis with micro, evaluate UTI and hematuria
    - Urinary Catheterization: Straight Catheter Policy
- Send RFP (renal function panel) if:
    - Concern for electrolyte abnormality
    - Renal insufficiency
- Send CBC & urine culture if:
    - Concern for urinary tract infection
- Send hCG for post-menarchal female

Imaging

- Plain radiographs are insufficiently sensitive and specific for urolithiasis evaluation
    - If incidentally found on plain radiographs, follow up with renal ultrasound
- Renal Ultrasound
    - Positive for stone: follow Clinical Management Guideline
    - Negative for stone with secondary findings (hydronephrosis or hydroureter): CT Abdomen/pelvis without contrast (reduced-dose technique preferred)
        - High clinical suspicion: CT Abdomen/pelvis without contrast (reduced-dose technique preferred)
        - Low clinical suspicion: Consider alternative diagnosis

THERAPEUTICS

Analgesia

- **Baseline pain medications** (UPT indicated for females greater than 12 BEFORE NSAIDs are provided)
    - Ketorolac - Can be administered orally, IV, or IM
        - **The maximum combined duration of treatment (for parenteral and oral) is 5 days; do not increase dose or frequency.**
        - **Consider alternative pain management in patients with renal insufficiency.**
        - **Ensure patient is adequately hydrated at time of administration.**
            - **Children greater than (>) 2 years and adolescents less than or equal to (≤) 16 years:** *Oral formulation should only be used as continuation of IV or IM therapy; do not use as initial therapy.*
                - IM, IV: 0.5mg/kg/dose every 6-8 hours; maximum 30mg/dose.
                - Oral: 1mg/kg/dose every 4-6 hours; maximum 10mg/dose.
            - **Adolescents greater than or equal to (≥) 17 years**:
                - Less than (<) 50kg:
                    - IM: 30mg as a single dose or 15mg every 6 hours; maximum daily dose 60mg/day.

- IV: 10mg as a single dose or 10mg every 6 hours; maximum daily dose 60mg/day.
- Oral: Initial: 10mg, then 10mg every 4 to 6 hours; maximum daily dose: 40mg/day.
- Greater than or equal to (≥) 50 kg:
  - IM: 60mg as a single dose or 30mg every 6 hours; maximum daily dose: 120mg/day.
  - IV: 10mg as a single dose or 10mg every 6 hours; maximum daily dose: 120mg/day.
  - Oral: Initial: 20mg, then 10mg every 4 to 6 hours; maximum daily dose: 40mg/day.

- Acetaminophen every 4 hours as needed- refer to CHCO standard dosing (max dose: 650mg)

- **If pain not controlled with baseline pain medications** (see CHCO's Opioid Prescribing Practices Clinical Pathway
  - Add Oxycodone 0.05-0.1mg/kg every 4 hours as needed (max dose: 10mg) **OR**
    - Hydromorphone IV (0.005-0.01mg/kg) if unable to tolerate oral intake (max dose: 2mg)

      OR
    - Intranasal Fentanyl 2mcg/kg x1 dose if no IV access (max dose: 100mcg)
- **Pain Control for discharge**
  - Ibuprofen* every 6 hours as needed- refer to CHCO standard dosing (max dose: 600mg)

    * Preferred medication for outpatient pain associated with urolithiasis.
  - Acetaminophen every 4 hours as needed- refer to CHCO standard dosing (max dose: 650mg)

Medical Expulsive Therapy

- Tamsulosin (Brand: Flomax)
  - Mechanism of Action (MOA): alpha1$_A$-receptor antagonism, smooth muscle relaxation and dilation of distal ureter
  - In the Emergency Department, patient can be given first dose if the right timing (before bed), but can also just be sent home with prescription
    - **Greater than (>) 4 years of age:** 0.4mg PO nightly at bedtime
    - **Less than or equal to (≤) 4 years of age:** 0.2mg PO nightly at bedtime (caregiver to mix capsule contents with 4mL water and administer 2mL for 0.2mg dose and discard remainder of solution)
  - Administration: Give at night, before bed optimally. Available as a 0.4mg capsule that may be swallowed whole or opened and administered in applesauce or mixed with water/juice

IV Fluids

- For clinical dehydration, ongoing losses
  - Normal Saline bolus (10-20mL/kg)
  - Goal of IV hydration is euvolemia
- Not recommended to increase urine output in an effort to facilitate passage of calculus

ADMISSION | DISCHARGE CRITERIA

Admission criteria

- Unable to tolerate oral intake
- Pain requiring IV analgesia
- Concurrent urinary tract infection & signs of obstruction
- Presence of risk factors:
  - Solitary kidney
  - Renal transplant
  - Bilateral renal obstruction
  - Renal insufficiency
- Otherwise, may consider discharge if:
  - Adequate pain control
  - Able to maintain hydration orally
  - If unable to discharge, consult Urology

Discharge with Outpatient Follow-up

- Provide urine strainer to patient, with instructions
- Provide prescription for tamsulosin
  - age greater than (>) 4 years: 0.4mg PO nightly at bedtime
  - age less than or equal to (≤) 4 years: 0.2mg PO nightly at bedtime
- Review importance of hydration
- Provide prescription(s) for pain control, as needed
- Recommend follow-up in 2 weeks in the Urology Clinic
  - Family may call the following business day for an appointment
- Pain Control and ability to maintain hydration are the most important factors.
- Size and location of stone do not influence readiness for discharge.

REFERENCES

1. Tasian GE, et al. Tamsulosin and spontaneous passage of ureteral stones in children: A multi-institutional cohort study. *J Urol* 2014; 192(2): 506-11

2. Mokhless I, et al. Tamsulosin for the management of distal ureteral stones in children: a prospective randomized study. *J Pediatr Urol* 2012; 8(5): 544-8

3. Persaud, A.C., et al., *Pediatric urolithiasis: clinical predictors in the emergency department.* Pediatrics, 2009. 124(3): p. 888-94.

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APPROVED BY

Pharmacy & Therapeutics Committee – July 7, 2022
Clinical Care Guideline and Measures Review Committee – July 25, 2022
Medication Safety Committee –not applicable
Antimicrobial Stewardship Committee –not applicable

MANUAL/DEPARTMENT	Clinical Care Guidelines/Quality
ORIGINATION DATE	November 29, 2016
LAST DATE OF REVIEW OR REVISION	July 25, 2022
COLORADO SPRINGS REVIEWED BY	 Michael DiStefano, MD Chief Medical Officer, Colorado Springs
APPROVED BY	 Lalit Bajaj, MD, MPH Chief Quality, Equity, and Outcomes Officer

REVIEW | REVISION SCHEDULE

Scheduled for full review on date here July 25, 2026

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