UROLITHIASIS
ALGORITHM

Inclusion Criteria:
Patients with suspected Urolithiasis
Symptoms may include but are not limited to:
• Abd pain (sharp, intermittent, often unilateral and/or focused in the flank)
• Hx of nephrolithiasis
• Nausea or Vomiting
• Hematuria
• Dysuria
• Radiation to pelvic region

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

Orders
• Labs- UA, consider RFP, CBC, Urine Culture, and UPT
• Pain meds (see therapeutics chart)
• IV fluids
• Imaging

Assessment, History and Physical

Renal Ultrasound

US positive for secondary signs only and No Stone Visible
Or
US negative/inconclusive and High Clinical Suspicion

Stone Visible

Low dose CT without contrast

Pain control, hydration, consider Tamsulosin

Positive for Urolithiasis?

Further evaluation of presenting symptoms
Consider alternative diagnosis

Not recommended to increase urine output to facilitate passage of stone

Eligible for Discharge?

Yes
Discharge with Outpatient Urology Follow-up

No

Admit For:
• Inability to tolerate PO
• Pain requiring IV analgesia
• Risk factors (Solitary kidney, renal transplant, bilateral renal obstruction, renal insufficiency, concomitant UTI)

No

Urology Consult

Yes

Negative, Inconclusive, or Low Clinical Suspicion
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)
  - History of nephrolithiasis
  - Nausea or Vomiting
  - Hematuria
  - Dysuria
  - Radiation to pelvic region

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

BACKGROUND | DEFINITIONS

Urolithiasis may present with abdominal pain that is sharp, intermittent, often unilateral, and/or focused in the flank. 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, scrotal, penile, or vaginal pain
- Hematuria
- Dysuria
- Urine output
- Nausea or vomiting
- Fever
- Known urinary tract infection
- Colic in infants

To obtain pertinent past 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 extrophy
- Medication exposure: Furosemide, calcitriol, topiramate, corticosteroids, antiretrovirals, supplement/vitamin use, ketogenic diet, acetazolamide
LABORATORY STUDIES | IMAGING

Laboratory Studies
- Obtain urinalysis
- Send RFP if:
  - Concern for electrolyte abnormality
  - Renal insufficiency
- Send CBC & urine culture if:
  - Concern for urinary tract infection
- Send hCG if (female) patient to undergo CT scan

Imaging
- Renal Ultrasound
  - Positive for stone: follow Clinical Management Guideline
  - Negative for stone with secondary findings (hydronephrosis or hydroureter): Low dose CT without contrast
  - Negative for stone without secondary findings
    - High clinical suspicion: Low dose CT without contrast
    - Low clinical suspicion: Consider alternative diagnosis

THERAPEUTICS

Analgesia (using Visual Analog Pain Scale 1-10)
- Oral for Pain Scores 1-4
  - Ibuprofen every 6 hours as needed- refer to CHCO standard dosing *Preferred (max dose: 600mg)
  - Acetaminophen every 4 hours as needed- refer to CHCO standard dosing (max dose: 650mg)
- Oral for Pain Scores 5-7 or not relieved by other PO medications
  - Oxycodone 0.1-0.15mg/kg every 4 hours as needed (max dose: 10mg)
- IV for Pain Scores 5-7 or not tolerating PO
  - Ketorolac 0.5mg/kg every 6 hours as needed (max dose: 30mg, max duration: 48hrs)
    - Consider alternative pain management in patients with renal insufficiency
    - Ensure patient is adequately hydrated at time of administration
- IV for Pain Scores 8-10 or not relieved by ketorolac
  - Morphine 0.05-0.1mg/kg every 2 hours as needed (max dose: 4mg)
- Intranasal for Pain Scores 8-10 with no IV access
  - Fentanyl 1-2mcg/kg x1 dose (max dose: 100mcg)

Medical Expulsive Therapy
- Tamsulosin (Brand: Flomax)
  - MOA: alpha1A-receptor antagonism, smooth muscle relaxation and dilation of distal ureter
  - In the Emergency Department, patient can be given first dose if formulary and given in the right timing (before bed), but can also just be sent home with prescription
Dosing:
- 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)
- 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
- Urinary tract infection
- 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

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
REFERENCES


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