UROLITHIASIS

ALGORITHM

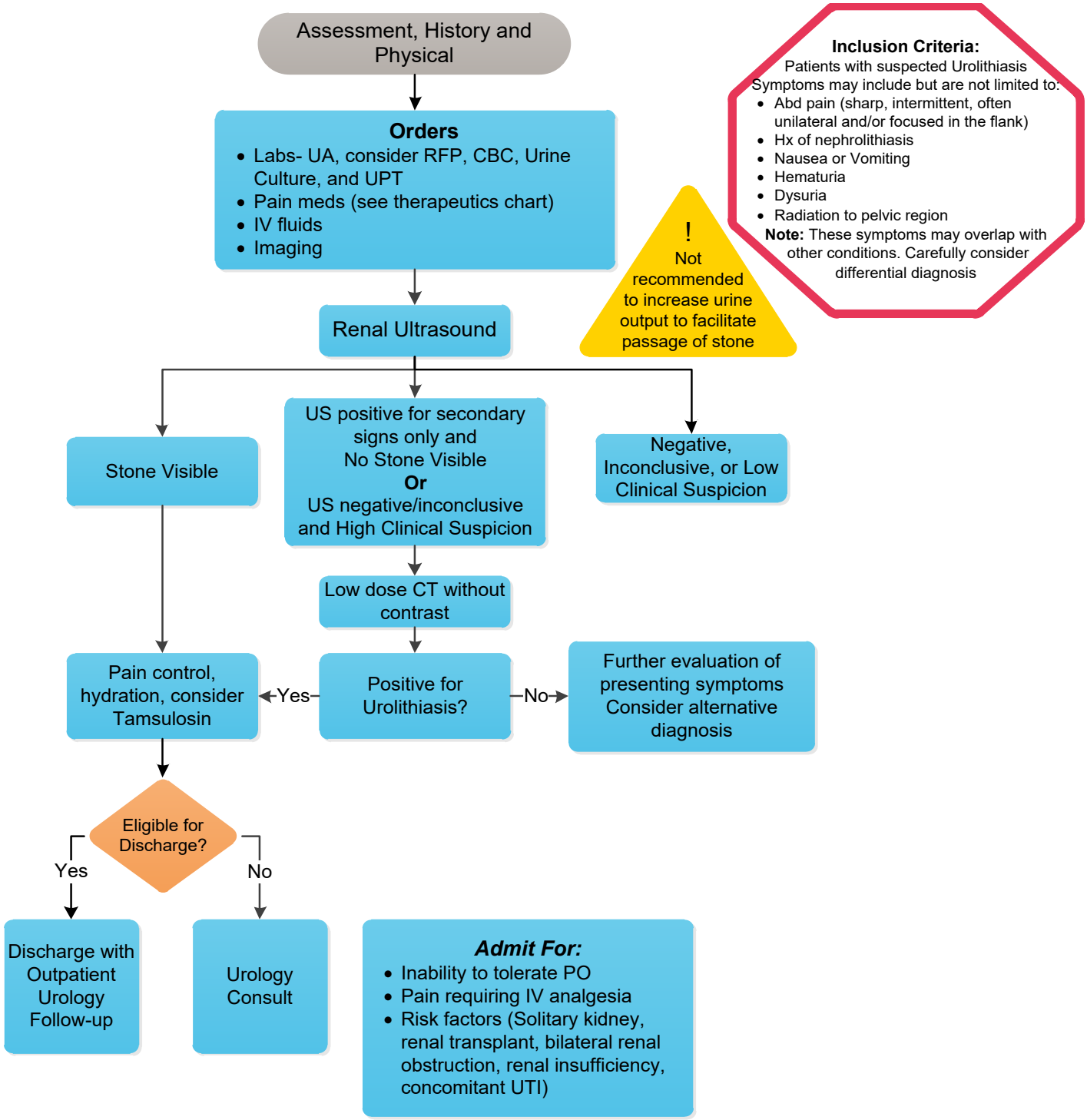

TABLE OF CONTENTS

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: alpha1$_A$-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

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.

CLINICAL IMPROVEMENT TEAM MEMBERS

Jeffrey B Campbell, MD | Urology
Brian Caldwell MD |Urology
John Strain, MD | Radiology
Sarah Mellion, MD | Emergency Medicine
Michelle Zapapas, PharmD
Kaylee Wickstrom, PI Specialist

APPROVED BY

Pharmacy & Therapeutics Committee – November 3, 2016
Clinical Care Guideline and Measures Review Committee – November 29, 2016
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	November 29, 2016
APPROVED BY	 Lalit Bajaj, MD, MPH Medical Director, Clinical Effectiveness

REVIEW | REVISION SCHEDULE

Scheduled for full review on date here November 29, 2020

Discrimination is Against the Law. Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex. Children's Hospital Colorado does not exclude people or treat them differently because of race, color, national origin, age, disability, or sex.

Children's Hospital Colorado provides free aids and services to people with disabilities to communicate effectively with us, such as: Qualified sign language interpreters, written information in other formats (large print, audio, accessible electronic formats, other formats). Children's Hospital Colorado provides free language services to people whose primary language is not English, such as: Qualified interpreters, information written in other languages.

If you need these services, contact the Medical Interpreters Department at 720.777.9800.

If you believe that Children's Hospital Colorado has failed to provide these services or discriminated in another way on the basis of race, color, national origin, age, disability, or sex, you can file a grievance with: Corporate Compliance Officer, 13123 E 16th Avenue, B450, Aurora, Colorado 80045, Phone: 720.777.1234, Fax: 720.777.7257, corporate.compliance@childrenscolorado.org. You can file a grievance in person or by mail, fax, or email. If you need help filing a grievance, the Corporate Compliance Officer is available to help you.

You can also file a civil rights complaint with the U.S. Department of Health and Human Services, Office for Civil Rights, electronically through the Office for Civil Rights Complaint Portal, available at ocrportal.hhs.gov/ocr/portal/lobby.jsf, or by mail or phone at: U.S. Department of Health and Human Services 200 Independence Avenue, SW Room 509F, HHH Building Washington, D.C. 20201 1-800-368-1019, 800-537-7697 (TDD) Complaint forms are available at www.hhs.gov/ocr/office/file/index.html.

Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex.

ATENCIÓN: si habla español, tiene a su disposición servicios gratuitos de asistencia lingüística. Llame al 1-720-777-9800.

CHÚ Ý: Nếu bạn nói Tiếng Việt, có các dịch vụ hỗ trợ ngôn ngữ miễn phí dành cho bạn. Gọi số 1-720-777-9800.

주의: 한국어를 사용하시는 경우, 언어 지원 서비스를 무료로 이용하실 수 있습니다. 1-720-777-9800 번으로 전화해 주십시오

注意：如果您使用繁體中文，您可以免費獲得語言援助服務。請致電1-720-777-9800。

ВНИМАНИЕ: Если вы говорите на русском языке, то вам доступны бесплатные услуги перевода. Звоните 1-720-777-9800.

ማስታወሻ: የሚናገሩት ቋንቋ አማርኛ ከሆነ የትርጉም እርዳታ ድርጅቶች፣ በነጻ ሊያግዝዎት ተዘጋጀተዋል፡ ወደ ሚከተለው ቁጥር ይደውሉ 1-720-777-9800 (መስማት ለተሳናቸው.

ملحوظة: إذا كنت تتحدث اذكر اللغة، فإن خدمات المساعدة اللغوية تتوافر لك بالمجان. اتصل برقم 1-720-777-9800 (رقم

ACHTUNG: Wenn Sie Deutsch sprechen, stehen Ihnen kostenlos sprachliche Hilfsdienstleistungen zur Verfügung. Rufnummer: 1-720-777-9800.

ATTENTION : Si vous parlez français, des services d'aide linguistique vous sont proposés gratuitement. Appelez le 1-720-777-9800.

ध्यान दनु होस्तपाइले नेपाल बोल्नहन्छ भन तपाइको निम्त भाषा सहायता सवाहरू नःशल्क रूपमा उपलब्ध छ । फोन गनु होसर् 1-720-777-9800 ।

PAUNAWA: Kung nagsasalita ka ng Tagalog, maaari kang gumamit ng mga serbisyo ng tulong sa wika nang walang bayad. Tumawag sa 1-720-777-9800.

注意事項：日本語を話される場合、無料の言語支援をご利用いただけます。1-720-777-9800 まで、お電話にてご連絡ください。

Ntị: Ọ bụrụ na asụ Ibo, asụsụ aka ọasụ n'efu, defu, aka. Call 1-720-777-9800.