Impact of a Clinical Pathway for Acute Nephrolithiasis in a Pediatric Emergency Department

Dima Raskolnikov MD, Tony Chen MD, Paul A. Merguerian MD, Russell T. Migita MD, Surabhi B. Vora MD, Jonathan S. Ellison MD
Development of a Pediatric Nephrolithiasis Pathway

Overall Aim: Streamline and standardize care for children presenting to SCH ED with suspected or proven nephrolithiasis

Specific Aim: Reduce CT utilization in ED
Inclusion Criteria
- 1 year or older
- Symptomatic/chief complaint of UTI
- Flank pain, nausea or vomiting and
- High suspicion of Nephrolithiasis

Exclusion Criteria
- Less than 1 year
- Low suspicion of Nephrolithiasis
- Concern for septic shock (use septic shock pathway)

UA Concern for Infection:
Consider UTI Pathway
- Nitrites OR
- Leukocytes esterase OR
- Microscopy shows bacteria OR
- ≥ 10 WBC/HPF

Presenting Symptoms
- Pain (47-80%)
- Gross Hematuria (32-55%)
- Nausea/vomiting

Clinical Predictors for Nephrolithiasis
- Personal history of nephrolithiasis
- > 5 RBC per HPF on microscopic urinalysis
- History of nausea/vomiting
- Flank pain on physical exam

US First Line Imaging
- Abdominal ultrasound or renal bladder ultrasound
- CT (not required)
- If ultrasound not diagnostic/clinical suspicion high discuss with urology prior to CT scan
- IV Fluids: 20mL/kg, NS, 1L maximum
- NPO

Pain Medications
- Ketorolac
- Morphine

Anti-emetics
- Ondansetron

Urinalysis
- Reflex culture
Contact Urology to determine appropriateness of low-dose CT scan

**Ultrasound**

- **Indeterminate**
  - Ultrasound
  - Negative: Consider other diagnosis
  - Off Pathway

- **UA negative for infection**
  - **Reassessment**
    - Pain Management (oxycodeone, ibuprofen and acetaminophen)
    - Tamsulosin (only over 2 years of age) if ureteral calculus
    - Maintenance IV Fluids
    - Trial PO (Clear liquids)

- **UA positive for infection**
  - **Suspected Infection**
    - Urology consultation
    - Antibiotics
    - Labs: CBC with diff; BUN; creatinine; lytes; blood culture if concern for obstructed stone & sepsis (Use septic shock pathway)

Urology consultation to determine need for admission and plan of care (if not already consulted)

**Indications for consult:** suspected infection; inability to tolerate PO; poor pain control; return to the ED
# Nephrolithiasis Plan, ED Nephrolithiasis (Planned Pending)

## Ordersets
- **DO NOT USE** this plan for **ASYMPTOMATIC** children.
- CLICK LEFTMOST ICON to review Nephrolithiasis pathway.
- Last modified: 12/07/2016  
  Clinical Owner: Russ Migita MD and Jonathan Ellis
- **INCLUSION CRITERIA**: Symptomatic children 1 year OR OLDER with high suspicion.
- **EXCLUSION CRITERIA**: Using pathway for children **YOUNGER THAN 1** year.
- Follow Nephrolithiasis Pathway
- For patients meeting **Exclusion Criteria**, uncheck **Follow Pathway** order above.

## Laboratory
- Microscopic with Urinalysis
- Urine Culture

## Medications
- **NOTE**: Evidence suggests ketorlac + morphine is the most efficacious pain.
- IV ketorlac for children **OLDER THAN 6** months:
- ketorlac
- IV morphine for children **6 months OR OLDER**:
- morphine
- IV ondansetron:
- ondansetron

## Continuous Infusions
- Includes all orders relating to peripheral IVs (place, access, lock, etc) and meds.
- **Peripheral IV Plan**
- **Peripheral IV**
- **NS**: (NS BOLUS -)
- **NS IV TKO ED ONLY**

## Radiology
- **US Renal Sonoqram Complete**

## Nutrition
- For dietary restrictions, order modified diet
- NPO
METHODS

Pathway implemented Oct 2015

Pre-Pathway: Jan 2013 – Oct 2015


Outcome Metrics:
- ED LOS
- CT utilization
- Admission Rates

Balance Metrics:
- Readmission Rates

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# Results

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Results

**CT Scan Rate**

- Pre-Pathway: 21.2%
- Post-Pathway: 3.2%
- p = 0.01

**ED Admission Rate**

- Pre-Pathway: 41.0%
- Post-Pathway: 24.4%
- p = 0.03

**ED Length of Stay**

- Pre-Pathway: 359.3 minutes
- Post-Pathway: 305.0 minutes
- p = 0.02

**30-Day Readmission Rate**

- Pre-Pathway: 14.3%
- Post-Pathway: 9.7%
- p = 0.73
Continuous Process Improvement = Continual Appraisal of Outcomes

Figure 1: CT utilization pre and post-pathway initiation.

- Red line: total utilization across time period
- Yellow box: +/- 2 SDs above 0, across time period
Lessons Learned & Next Steps

Implementing change for a diagnostic test:
1) Combined ED and Urology champions
2) Education and awareness for initial improvement
3) Orderset/Pathway to maintain optimal outcomes
4) Guidance to providers for indeterminate results
5) Favorable culture for reducing CT scans

Next steps:
1) Regional expansion
ACKNOWLEDGEMENTS

CSW Nephrolithiasis Team:

Urology, Owner
Urology, Owner
Urology, Stakeholder
Emergency Department, MD
Emergency Department, CNS
Clinical Pharmacy
Pharmacy Informatics
Surgical Unit, CNS
Urology Clinic Nurse

Jonathon Ellison, MD
Paul Merguerian, MD, MS, FAAP
Thomas Lendvay, MD
Russ Migita, MD
Sara Fenstermacher, RN
Eric Harvey, PharmD, MBA
Rebecca Ford, PharmD
Kristine Lorenzo, RN
Andrea Bakke, RN

Clinical Effectiveness Team:

Consultant
Project Manager
CE Analyst
CIS Informatician

Sara Vora, MD
Jennifer Magin, MBA
Holly Clifton, MPH
Mike Leu, MD, MS, MHS
Carlos Villavicencio, MD, MMI
Heather Marshall
Sue Groshong, MLIS
Asa Herrman

CIS Analyst
Librarian
Program Coordinator

Executive Approval:

Sr. VP, Chief Medical Officer
Sr. VP, Chief Nursing Officer
Surgeon-in-Chief

Mark Del Beccaro, MD
Susan Heath, RN, MN, NEA-BC
Bob Sawin, MD

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