

Provincial Clinical Knowledge Topic

Renal Colic, Adult – Emergency

V 1.0

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Revision History

Version	Date of Revision	Description of Revision	Revised By
1.0	September 2018	Version 1 of topic completed	see Acknowledgments

Important Information Before you Begin

The recommendations contained in this knowledge topic have been provincially adjudicated and are based on best practice and available evidence. Clinicians applying these recommendations should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care. This knowledge topic will be reviewed periodically and updated as best practice evidence and practice change.

The information in this topic strives to adhere to Institute for Safe Medication Practices (ISMP) safety standards and align with Quality and Safety initiatives and accreditation requirements such as the Required Organizational Practices. Some examples of these initiatives or groups are: Health Quality Council Alberta (HQCA), Choosing Wisely campaign, Safer Healthcare Now campaign etc.

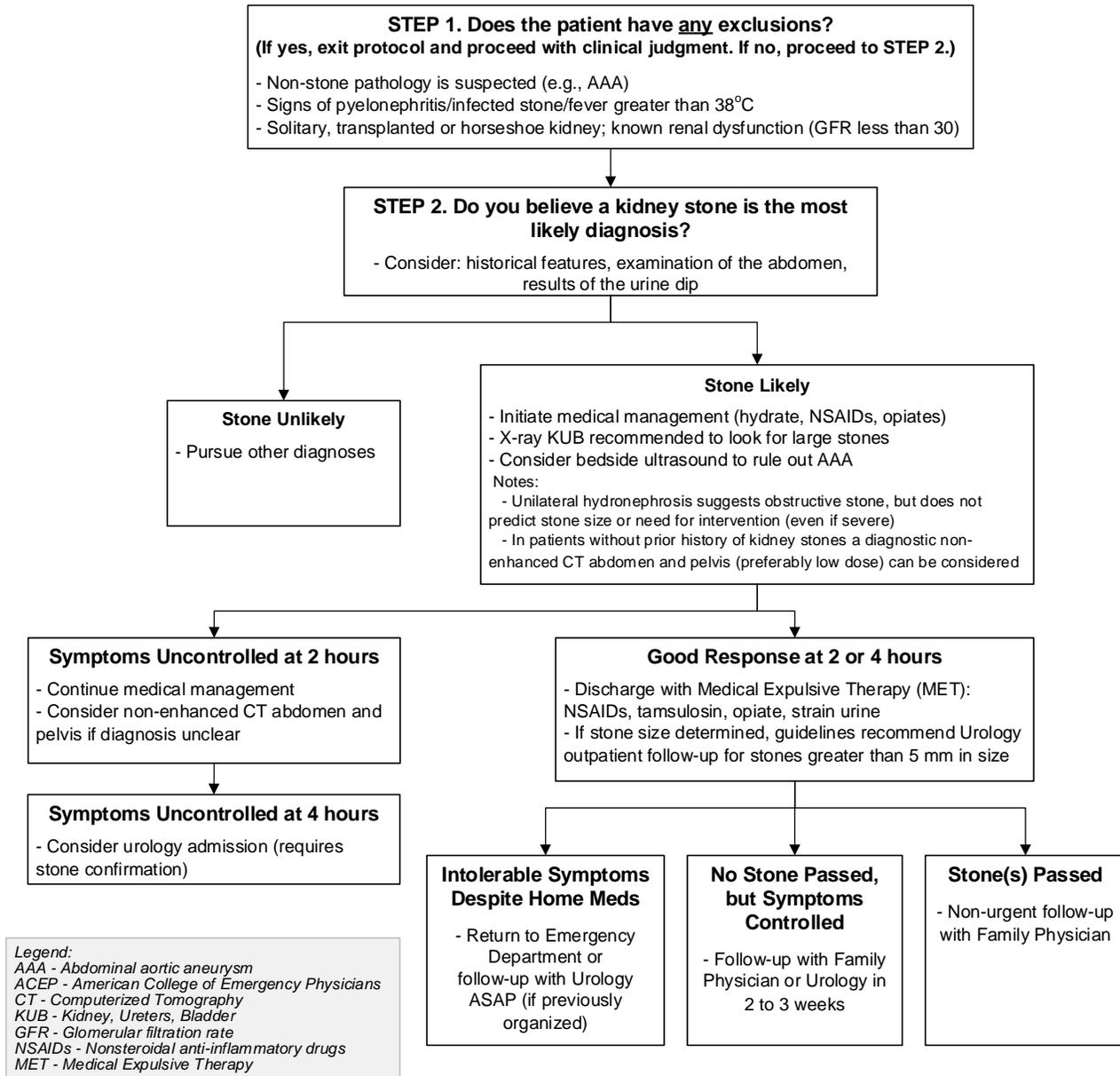
Goals of Management

1. Identify patients whose clinical picture is consistent with renal colic and rule out emergent diagnoses which may mimic renal colic (e.g. - ruptured abdominal aortic aneurysm [AAA])
2. Identify patients with clinical features suggestive of severe sepsis/septic shock and arrange emergent urological and/or interventional radiology consultation while initiating supportive care and antibiotic therapy
3. Identify patients warranting consultation with urology for urgent/emergent stone removal (i.e. - stones larger than 10 mm, solitary kidney, transplanted kidney, or septic stone)
4. Initiate appropriate analgesic and antiemetic therapy for renal colic
5. Limit diagnostic imaging when appropriate (see [Decision Making](#))
6. Provide appropriate disposition instructions and follow-up plans for patients who will be managed as outpatients

Decision Making

Figure 1: Renal Colic Clinical Pathway

ACEP Choosing Wisely recommendation: Avoid CT in otherwise healthy patients under age 50 with prior kidney stones and symptoms compatible with uncomplicated renal colic.



Exclusion Criteria:

- 1) Non-stone pathology is suspected (e.g., appendicitis, abdominal aortic aneurysm [AAA], ovarian torsion, etc.)
 - 2) Evidence of infected urine or fever of greater than 38°C
 - 3) Solitary, transplanted, or horseshoe kidney
 - 4) Known renal dysfunction (GFR less than 30)
- (***Protocol is most relevant to 1st ED visit for suspected stone episode)

Adapted from: Calgary Multidisciplinary Renal Colic Pathway – Calgary Zone Renal Colic Protocol Version 7 (Mar 8, 2016)

Imaging and Clinical Decision Making in Renal Colic

(see [Figure 1](#) for pathway and [Appendix A](#) for Frequently Asked Questions)

1. Non-enhanced computed tomography of the abdomen and pelvis is the most sensitive and specific imaging modality for the diagnosis of ureteral stones. As such, it is generally considered the 'definitive' diagnostic test for ureteral stones. However, the decision of whether to perform CT imaging should be based on a combination of clinical factors. Patients with suspected ureteral stones and clinical indications for emergent/urgent stone removal should be considered for emergent/urgent CT imaging; all other patients may be suitable for delayed or alternative imaging modalities, depending on the clinical circumstances (see [Figure 1](#))
2. In pregnant patients with suspected renal colic, ultrasound (US) of kidneys, ureters, bladder (US KUB) should be the initial diagnostic test due to a lack of ionizing radiation. This strategy must recognize that US will miss some ureteral stones. If a definitive test to rule out ureteral stones is still required based on the clinical picture after a negative/non-diagnostic US then consultation with radiology and urology should be entertained.
3. Consider X-ray or US of kidneys, ureters and bladder as the initial diagnostic imaging test for recurrent stone presenters, since these patients may accrue a large amount of ionizing radiation exposure over their lifetimes if CT scanning is used routinely.
4. In patients with a transplanted kidney, obstructing renal stones often present as painless acute renal failure. Standard imaging modalities (XR, US, CT) will likely suffer from reduced sensitivity for renal stones compared to populations with normal anatomy and consideration for a nuclear medicine renal scan may be warranted. Early consultation with the renal transplant specialist on call would be advised to help guide investigation and management of these cases.

CT Notes:

- Avoid CT in otherwise healthy patients less than age 50 with prior kidney stones and symptoms compatible with uncomplicated renal colic.
- Complicated renal colic includes: infection, renal dysfunction, solitary/horseshoe/transplanted kidney; imaging should be strongly considered in these patients.
- According to Calgary multidisciplinary research data, CT use is associated with long ED length of stay (LOS) and possibly with higher admission and intervention rates, but not with better patient outcomes. Overuse of CT in low risk patients may increase unnecessary radiation exposure.

X-Ray Notes:

- X-ray has poor sensitivity for small stones (which pass spontaneously) but is ~80% sensitive for stones larger than 5 mm that may require intervention.
- X-Ray KUB is a Urology basis in following stone progress in follow-up (i.e. Urology uses KUB X-ray to re-assess stones previously seen on X-ray – usually for larger stones).
- If no stone is seen on plain film, the likelihood of a stone requiring intervention is significantly diminished.

Ultrasound Notes:

- For ED physicians appropriately trained in its use, point of care ultrasound (POCUS) may be of use in evaluating patients with suspected renal colic. The primary value of POCUS is to aid in ruling out abdominal aortic aneurysm (AAA), for which it is highly sensitive. Moderate to severe hydronephrosis seen on POCUS may help to support the diagnosis of renal colic but POCUS is not adequately sensitive or specific to definitively rule in or out the presence of ureteral stones.
- Formal ultrasound (US) may be a reasonable initial investigation for acute flank pain and it is the recommended first line investigation for pregnant patients due to a lack of ionizing radiation. However, US remains less sensitive than CT for the presence of ureteral stones and a negative ultrasound does not necessarily rule out their presence.
- Hydronephrosis (on POCUS or formal ultrasound) does not imply the patient requires CT or intervention. Data shows that most stones causing hydronephrosis are less than 5 mm.
- Physiologic hydronephrosis of pregnancy occurs in greater than 80% of pregnant women, is more common on the right than the left, and is generally seen at the beginning of the second trimester

Treatment

1. All patients with ureteral stones and an indication for emergent/urgent intervention (septic/infected stone, solitary kidney, advancing renal dysfunction suspected to be due to renal stones) should be discussed with the urologist on call to determine the optimal course of management.
2. The preferred first-line analgesics in the management of symptomatic ureteral stones are non-steroidal anti-inflammatory drugs (NSAIDs) for those patients who lack any contraindications to their use. Opiates may be considered in patients whose pain is uncontrolled by NSAIDs or in those with contraindications to NSAID use.
3. For all stones less than 7 mm in diameter and distal stones less than 10 mm, consider a trial of spontaneous passage with tamsulosin (Flomax) and analgesia for 3 to 4 weeks, along with outpatient Urology referral for stones greater than 5 mm. Tamsulosin is likely most effective in larger stones (4-5 mm or greater) and its use in patients with smaller stones should balance the potential costs and risks of this therapy against the small probability of significant clinical benefit. Duration of therapy should be until stone is expelled or 4 weeks, whichever comes first.
4. For proximal or middle ureteric stones greater than 7 mm and distal stones greater than or equal to 10 mm, consult Urology for consideration of intervention.
5. Distal stones are more likely to pass than proximal stones, and the rate of spontaneous passage decreases to about 50% for stones greater than 5 mm.
6. Ureteral stones of any size which fail to pass after conservative management for 3-4 weeks warrant consultation with urology for consideration of intervention.
7. It is recommended that all first-time stone presenters strain their urine and have a stone analysis; this may help towards directed stone prevention therapy and recommendations for prevention of recurrence.

Renal Colic Adult Emergency Department Order Set

Order Set Keywords: nephrolithiasis, renal or ureteral stones, kidney stones

Goals of Care Designation

Conversations leading to the ordering of a Goals of Care Designation (GCD), should take place as early as possible in a patient's course of care. The Goals of Care Designation is created, or the previous GCD is affirmed or changed resulting from this conversation with the patient or, where appropriate, the Alternate Decision-Maker.

Complete the Goals of Care Designation (GCD) Order Set within your electronic system, or if using paper process, complete the Provincial Goals of Care Designation (GCD) paper form (<http://www.albertahealthservices.ca/frm-103547.pdf>)

Laboratory Investigations

Hematology

- Complete Blood Count (CBC) with differential

Chemistry

- Electrolytes (Na, K, Cl, CO₂)
- Creatinine
- Glucose Random
- Urea
- Beta HCG

Urine Tests

- Urine Dipstick Testing - POCT
- Urinalysis Random
- Urine C&S
- Pregnancy Test, Urine (POCT if available)

Diagnostic Investigations

X-ray KUB has good sensitivity (~80%) for stones greater than 5 mm that are most likely to need intervention (see [Decision Making](#))

- X-Ray KUB (Kidney, Ureter, Bladder, 1 Projection)

US is the preferred first-line test in pregnant patients and should be considered in recurrent renal colic patients as an alternative to CT (see [Decision Making](#))

- US Kidneys, Ureters, Bladder (KUB)

Overuse of CT in low risk patients increases radiation exposure and may drive high rates of intervention; (see [Decision Making](#))

- CT Non-enhanced abdomen and pelvis

Intravenous Therapy

Intravenous fluids are not required in every patient consider oral hydration where appropriate.

- Intravenous Cannula – Insert: Initiate IV
- IV Peripheral Saline Flush/Lock: Saline Lock

IV Bolus or Rapid Infusion

- 0.9% NaCl infusion _____ mL as fast as possible
- Other: _____ (specify fluid) _____ mL IV as fast as possible

Maintenance IV Solutions

- 0.9% NaCl infusion at _____ mL/hour
- D5W - 0.9% NaCl infusion at _____ mL/hour
- D5W - 0.45% NaCl infusion at _____ mL/hour
- Other: _____ (specify fluid) at _____ mL/hour

Medications

Non-opiate Analgesia

NSAIDs are considered the first line analgesic for renal colic patients without contraindications to their use.

Oral

Suggest 200 mg for mild to moderate pain, 400 mg for moderate to severe pain

- ibuprofen 400 mg PO once
- ibuprofen 200 to 400 mg PO every 6 hours PRN for pain (maximum 1200 mg/day)
- ibuprofen _____ mg PO _____ (frequency) (maximum 1200 mg/day)

Suggest 325 mg to 650 mg for mild to moderate pain, 975 mg to 1000 mg for moderate to severe pain

- acetaminophen 975 mg OR 1000 mg PO once
- acetaminophen 325 mg to 1000 mg PO every 4 hours PRN for pain (maximum 3000 mg/day)
- acetaminophen _____ mg PO _____ (frequency) (maximum 3000 mg/day)

Parenteral

Recommend restricting ketorolac use to actively vomiting or nauseated patients and using lowest effective dose

- ketorolac 10 mg IV/IM once
- ketorolac 10 mg IV/IM every 6 hours PRN for pain
- ketorolac _____ mg IV/IM _____ (frequency)

Opiate Analgesia

For “susceptible patients” defined as elderly, frail, low body mass, systemically unwell, or on medications known to cause sedation or lower blood pressure we recommend decreasing narcotic dosing by 50%. Total daily doses should be monitored in opioid naïve patients.

- Notify physician or nurse practitioner for reassessment if pain not controlled after administration of maximum prescribed dosage.

Recommend avoiding the simultaneous use of more than one opiate analgesic

Oral

Maximum dosage of acetaminophen from all sources not to exceed 3000 mg per day

- acetaminophen 325 mg/caffeine 15 mg/codeine 30 mg 2 tabs PO once
- acetaminophen 325 mg/caffeine 15 mg/codeine 30 mg 1 to 2 tabs PO every 4 hours PRN for pain
- acetaminophen 325 mg/caffeine 15 mg/codeine 30 mg _____ tabs PO every _____ hours PRN for pain
- oxyCODONE 5 mg/acetaminophen 325 mg 2 tabs PO once
- oxyCODONE 5 mg/acetaminophen 325 mg 1 to 2 tabs PO every 4 hours PRN for pain
- oxyCODONE 5 mg/acetaminophen 325 mg _____ tabs PO every _____ hours PRN for pain

Suggest 1 mg for moderate pain and 2 mg for severe pain

- HYDROmorphine 1 mg PO once
- HYDROmorphine 1 to 2 mg PO every 4 hours PRN for pain
- HYDROmorphine _____ mg PO every _____ hours PRN for pain

Parenteral

Suggest 0.5 mg for moderate pain and 1 mg for severe pain

- HYDROmorphine 1 mg IV once
- HYDROmorphine 0.5 to 1 mg IV every 10 minutes PRN for pain (maximum 3 mg total)
- HYDROmorphine _____ mg IV every _____ minutes PRN for pain

Suggest 2.5 mg for moderate pain and 5 mg for severe pain

- morphine 5 mg IV once
- morphine 2.5 to 5 mg IV every 10 minutes PRN for pain (maximum 15 mg total)
- morphine _____ mg IV every _____ minutes PRN for pain

Suggest 25 mcg for moderate pain and 50 mcg for severe pain

- fentaNYL 50 micrograms IV once
- fentaNYL 25 to 50 micrograms IV every 5 minutes PRN for pain (maximum 200 micrograms total)
- fentaNYL _____ micrograms IV every _____ minutes PRN for pain

Antiemetics

Avoid dimenhyDRINATE in patients 65 years of age or older due to increased risk of side effects including delirium. Suggest 25 mg for mild/moderate nausea, 50 mg for moderate/severe nausea.

- dimenhyDRINATE 50 mg IV/PO once
- dimenhyDRINATE 25 to 50 mg IV/PO every 4 hours PRN for nausea/vomiting

Oral administration or slow infusion via IVPB are preferred for metoclopramide to reduce the risk of akathisia. Suggest 5 mg for mild/moderate nausea or if CrCl less than 40 mL/min; 10 mg for moderate/severe nausea, and CrCl over 40 mL/min.

- metoclopramide 10 mg IV/PO once
- metoclopramide 5 to 10 mg IV/PO every 6 hours PRN for nausea/vomiting

Avoid ondansetron in patients with prolonged QTc interval.

- ondansetron 8 mg PO once
- ondansetron 8 mg PO every 8 hours PRN for nausea/vomiting
- ondansetron _____ mg PO every 8 hours PRN for nausea/vomiting

4 mg starting dose recommended for IV ondansetron. 8 mg IV reserved for chemotherapy induced nausea/vomiting.

- ondansetron 4 mg IV once
- ondansetron 4 mg IV every 8 hours PRN for nausea/vomiting
- ondansetron _____ mg IV every 8 hours PRN for nausea/vomiting

Due to high cost, should only be used for patients with difficulty swallowing tablets or capsules or for patients actively vomiting without established IV access.

- ondansetron DISINTEGRATING tab 8 mg PO once
- ondansetron DISINTEGRATING tab 4 mg PO every 8 hours PRN for nausea/vomiting
- ondansetron DISINTEGRATING tab 8 mg PO every 8 hours PRN for nausea/vomiting

Alpha-Adrenergic Receptor Blockade

For all stones less than 7 mm in diameter, consider trial of spontaneous passage with tamsulosin (Flomax)

- tamsulosin CR 0.4 mg PO daily

Suspected Infected Stone or Urinary Tract Infection (UTI)

If patient has suspected infected stone or symptoms of UTI (acute dysuria, or temperature greater than 38°C or 1.1°C above baseline on 2 consecutive occasions 4 to 6 hours apart)

PLUS one or more of the following:

- *new or increased urinary frequency, urgency, or incontinence, new flank or suprapubic pain or tenderness, or gross hematuria), consider starting antibiotic therapy and re-assess when urine culture results are available.*

Review patient's previous urine culture and susceptibility results if available (preferred).

- Culture-directed therapy: _____

OR

If empiric therapy is required (Ciprofloxacin is not recommended for empiric therapy due to high rate of resistance in E. coli):

- gentamicin (5 to 7 mg/kg) _____ mg IV every 24 hours. *If renal impairment and/or extreme of weight, refer to Bugs and Drugs for dosing guidance - consider pharmacy consult if therapy to extend past 48 hours.*

OR

- cefTRIAxone 1 g IV every 24 hours

Patient Care

Diet / Nutrition

- NPO
- NPO – May Have Sips, May Take Meds
- Clear Fluids
- Regular Diet
- Other Diet : _____

Monitoring

- Vital Signs (respiratory rate, pulse, blood pressure, temperature, oxygen saturation)
 - as per Assessment and Reassessment of Patient Practice Support Document as found on AHS internal web
 - every _____ hour(s)
 - every _____ minute(s)
- Continuous cardiac monitoring

Other

- Strain Urine for renal stones
- Foley Catheter – Insert

Consultations

- Consult Urology
- Consult _____

Admission/Transfer/Discharge Planning

1. Considerations for admission
 - Sepsis
 - Complicated renal colic
 - Stones greater than or equal to 10 mm diameter
 - Uncontrolled symptoms after 4 hours of medical management
2. Considerations for discharge
 - Mild or no residual pain and nausea and tolerating PO fluids and/or meds well
 - Adequate hydration, looks well
 - Stable vital signs, afebrile
 - Ambulatory and comfortable with discharge
 - Glomerular filtration rate (GFR) greater than 60 mL/min
3. Outpatient follow-up
 - Follow-up with outpatient Urology if stone larger than 5 mm or if symptoms become intolerable
 - Follow-up with Primary Care Physician in 2-3 weeks if no stone passed but symptoms controlled for repeat assessment and urinalysis
 - Non-urgent follow-up with Primary Care Physician if stone passes
4. Patient and Caregiver education/discharge instructions
 - Discharge with Medical Expulsive Therapy (Tamsulosin CR) for 4 weeks
 - a. Maintain fluid intake;
 - b. NSAIDs if no contraindications
 - c. Potent opioid for breakthrough pain
 - d. Alpha-blockade is recommended daily
 - Strain urine until stone is passed; first-time presenters should retrieve stone for laboratory analysis
 - Return to ED immediately if fever develops or if new or progressing symptoms
 - Ensure patient receives education package and urine strainer to take home
 - a. [Appendix B: I was diagnosed with a kidney stone](#)
 - b. [Kidney Stones and your Diet](#)

Rural Considerations

1. Access to diagnostic imaging (particularly CT) may influence timing of imaging in patients lacking indications for urgent/emergent stone removal
2. Accessibility of specialty consultation may influence disposition planning and timing of definitive management

References

1. Dion M, Ankawi G, Chew B, et al. CUA guideline on the evaluation and medical management of the kidney stone patient – 2016 update. *Can Urol Assoc J.* 2016;10(11-12):E347-58.
2. Ordon M, Andonian S, Blew B, et al. CUA Guideline: Management of ureteral calculi. *Can Urol Assoc J.* 2015 Nov-Dec; 9(11-12): E837–E851.
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12. Calgary Multidisciplinary Renal Colic Pathway – Calgary Zone Renal Colic Protocol Version 7 (Mar 8, 2016).

Clinical Questions

Clinical Question #1: In patients with a newly diagnosed ureteral stone, which criteria should be used to select patients for observation and a trial of spontaneous passage versus urological intervention?

Clinical Statement #1: In patients with newly diagnosed ureteral stones less than 10 mm in whom urgent stone removal is not indicated (no infectious symptoms, intolerable pain, threat to renal function, solitary/horseshoe kidney, transplanted kidney), observation with periodic evaluation is the recommended initial treatment for all distal stones less than 10 mm and proximal or middle ureteric stones less than 7 mm, and patients should be offered medical expulsive therapy (tamsulosin) and analgesia (NSAIDs and opioids) for 3-4 weeks. Consult Urology for early outpatient referral for all stones greater than or equal to 5 mm (within 2 weeks), and immediate urological referral for intervention on proximal or middle stones greater than or equal to 7 mm.

Quality of Evidence: Moderate

Strength of Statement: Strong

References:

1. Assimos D, Krambeck A, Miller NL, et al. Surgical Management of Stones: American Urological Association/Endourological Society Guideline, PART I. *J Urol*. 2016 Oct;196(4):1153-60. doi: 10.1016/j.juro.2016.05.090.
2. Calgary Multidisciplinary Renal Colic Pathway – Calgary Zone Renal Colic Protocol Version 7 (Mar 8, 2016).

Clinical Question #2: In pregnant patients with suspected renal colic and no previous history of stone/flank pain with known renal calculous disease, what is the most appropriate and effective imaging modality for diagnosis and management of ureteral calculous disease?

Clinical Statement #2: In pregnant patients with flank pain, abdominal ultrasound of Kidneys-Ureters-Bladder (U/S KUB) is the most appropriate initial diagnostic imaging study of choice, due to no radiation risk, and ability to pick up clinically significant stones, obstruction, and hydronephrosis

Quality of Evidence: Weak

Strength of Statement: Moderate

References:

1. Dion M, Ankawi G, Chew B, et al. CUA guideline on the evaluation and medical management of the kidney stone patient – 2016 update. *Can Urol Assoc J*. 2016;10(11-12):E347-58.
2. Fulgham PF, Assimos DG, Pearle MS, Preminger GM. Clinical effectiveness protocols for imaging in the management of ureteral calculous disease: AUA technology assessment. *J Urol*. 2013 Apr;189(4):1203-13. doi:10.1016/j.juro.2012.10.031.

Clinical Question #3: What is the appropriate duration of observation in patients with renal colic being managed conservatively?

Clinical Statement #3: In most patients, if observation with or without MET does not result in successful stone passage or resolution of symptoms after 3-4 weeks, and/or the patient/clinician decide to intervene sooner based on a shared decision making approach, clinicians should offer definitive (urological) stone removal.

Quality of Evidence: Weak

Strength of Statement: Moderate

References:

1. Assimos D, Krambexk A, Miller NL, et al. Surgical Management of Stones: American Urological Association/Endourological Society Guideline, PART I. *J Urol.* 2016 Oct;196(4):1153-60. doi: 10.1016/j.juro.2016.05.090.

Clinical Question #4: In patients with known previous renal stones and flank pain/symptoms consistent with a recurrent stone, what is the preferred imaging modality?

Clinical Statement #4: For a patient with a history of radiopaque stones, KUB X-ray +/- U/S KUB are a viable option for diagnosis and management of stones. Consider starting with KUB X-ray as this may likely visualize stones ≥ 7 mm.

Quality of Evidence: Weak

Strength of Statement: Moderate

References:

1. Assimos D, Krambexk A, Miller NL, et al. Surgical Management of Stones: American Urological Association/Endourological Society Guideline, PART I. *J Urol.* 2016 Oct;196(4):1153-60. doi: 10.1016/j.juro.2016.05.090.

Clinical Question #5: In patients with suspected renal colic, what is the most sensitive and specific imaging modality for diagnosis of ureteral calculous disease?

Clinical Statement #5: Non-enhanced CT abdomen and pelvis is the most sensitive and specific imaging modality for the diagnosis of ureteral stones. Multiple clinical factors should be used to determine initial need for CT vs. other imaging modalities (i.e. - KUB X-ray or U/S KUB). See '**Clinical Decision Making**' section and **Figure 1** of the Renal Colic Knowledge Document for additional details.

Quality of Evidence: Strong

Strength of Statement: Strong

References:

1. Fulgham PF, Assimos DG, Pearle MS, Preminger GM. Clinical effectiveness protocols for imaging in the management of ureteral calculous disease: AUA technology assessment. *J Urol.* 2013 Apr;189(4):1203-13. doi:10.1016/j.juro.2012.10.031.
2. Calgary Multidisciplinary Renal Colic Pathway – Calgary Zone Renal Colic Protocol Version 7 (Mar 8, 2016).

Clinical Question #6: What is the appropriate acute ED management for presentations of acute renal colic with no indications for urgent/emergent urological intervention?

Clinical Statement #6: Appropriate analgesia and anti-emetics must be provided for patients with symptomatic renal colic and no indication for urgent/emergent Urological intervention. NSAIDs (PO, IM, or IV) are the mainstay of analgesic treatment for renal colic. They are at least as effective as opioids. Combination/adjunctive therapy with a potent PO or IV opioid (i.e. morphine/hydromorphone/fentanyl) and/or PO Acetaminophen may provide better analgesia than NSAIDs alone. Also consider giving the first dose of MET with alpha-blockers (i.e. Tamsulosin CR 0.4mg PO) in the ED for stones <10 mm to help facilitate stone passage.

Quality of Evidence: Moderate

Strength of Statement: Moderate

References:

1. Fulgham PF, Assimios DG, Pearle MS, Preminger GM. Clinical effectiveness protocols for imaging in the management of ureteral calculous disease: AUA technology assessment. *J Urol.* 2013 Apr;189(4):1203-13. doi:10.1016/j.juro.2012.10.031.
2. Curhan GC, Aronson MD, Preminger GM. Diagnosis and acute management of suspected nephrolithiasis in adults. UpToDate. <https://www.uptodate.com/contents/diagnosis-and-acute-management-of-suspected-nephrolithiasis-in-adults> Accessed April 20th, 2017.

Appendix A: Renal Colic Pathway Frequently Asked Questions for Clinicians

1. Why do we need a pathway? I think our current practice is just fine.

Use of CT for renal colic has been identified by ACEP's Choosing Wisely campaign as an over utilized test.

Overuse of CT in low risk patients increases radiation exposure and likely drives high rates of intervention. Patients with recurrent renal colic are likely to have many CT's in their lifetime leading to increased cancer risk.

2. What if I miss a stone that needed intervention?

The patient will most likely re-present to the ED with recurrent pain. American / European Urological Society guidelines recommend a trial of spontaneous stone passage for stones less than 10 mm. Long term morbidity is unlikely if spontaneous stone passage fails.

3. Why does the protocol recommend X-ray KUB?

X-ray KUB has good sensitivity (~80%) for stones greater than 5 mm, which are most likely to need intervention.

4. How is bedside ultrasound used in this protocol?

Unilateral hydronephrosis on the symptomatic side can be useful to rule-in the diagnosis, especially for small stones not seen on X-ray KUB. It can also be used to rule out AAA. Hydronephrosis, even severe, has not been shown to be a good predictor of need for surgical intervention.

5. What discharge instructions are we supposed to give patients?

General Instructions:

- **Medical expulsive therapy (MET):** Maintain fluid intake; NSAIDs if no contraindications; potent opioid for breakthrough pain; Alpha-blockade (e.g. tamsulosin) is recommended.
- Strain urine until stone is passed.

Follow-up Plan:

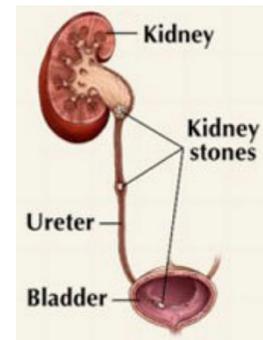
- **Stone passed:** Non-urgent GP follow-up.
- **No clear evidence of stone passage, but symptoms resolved/controlled:** Follow-up with GP in 2-3 weeks for repeat evaluation and urinalysis.
- **Intolerable symptoms at home despite MET:** Follow-up with GP or urology ASAP.
- **Fever, new or rapidly progressive severe symptoms:** Return to ED immediately.

Appendix B: Patient Education

I was Diagnosed with a Kidney Stone

What is a kidney stone? Kidney stones form when minerals like calcium form crystals in the urine. Most of these are tiny and we pass them through our system without even knowing about them. Stones become a problem when they get larger and move down into the ureter (the tube that connects the kidney to the bladder). Stones moving through the ureter can cause pain the back, the side or groin. The pain is often severe and comes in waves. Stones also cause nausea or vomiting, blood in the urine, and difficulty urinating. The good news is that the pain can be treated with medications and most kidney stones will pass through on their own.

How do doctors diagnose kidney stones? Kidney stones cause specific symptoms, so doctors often diagnose them by talking to me, examining me, and testing my urine. X-rays show larger kidney stones, but may not show small ones. Ultrasound tests may show the stone, or signs of kidney swelling, but stones are sometimes too small to see with an ultrasound. CT scans are the best test, but these scans expose patients to large amounts of radiation—more than 10 times as much as an x-ray. Too much radiation increases your future cancer risk, so doctors only do CT scans if there is evidence of a large stone, concern about another possible diagnosis like appendicitis, pain that isn't getting better with treatment, or kidney complications. If you don't have any of these danger signs, no special tests or scans may be needed to diagnose my stone. The doctor may suggest a CT scan or ultrasound to be done in 2 weeks if the stone doesn't pass.



I had these tests in the hospital (check all that apply):

- An x-ray A CT scan An ultrasound by the emergency doctor.
 An ultrasound in the Radiology Department No special tests

What are the treatments for kidney stones? Most stones pass in the urine without treatment. Experts agree that most patients with a kidney stone should have a period of observation to see if the stone will pass on its own. During this period, the doctor will prescribe medicines to relieve pain and to make it easier for the stone to pass. If the stone doesn't pass in 2-3 weeks, or if the pain becomes too severe, you can be rechecked to see if other tests or treatments are needed.

Possible treatments include surgery to remove the stone, or lithotripsy (where an ultrasound machine is used to break the stone into smaller pieces that are easier to pass). These treatments can have side effects like pain, infection or complications of surgery, so they are not used if the stone will pass by itself.

What should I do now? You may have more episodes of pain, bloody urine and difficulty urinating for several days (or even weeks). You should drink lots of fluids to help flush the stone through, and strain my urine so you can tell when you pass the stone. If you catch the stone, you will take it to your doctor, who can analyze what it is made of, to guide future treatment.

What medicine do I need? The doctor may prescribe a medicine to relax (open up) the ureter so the stone can pass easier. The most common one is Flomax (tamsulosin), which is taken as a single pill each day. Simple painkillers like Tylenol (acetaminophen) are helpful but not usually enough to control kidney stone pain. Anti-inflammatories like Advil (ibuprofen) or Aleve (naproxen) are the best pain medicines for kidney stones, but need to be taken in an adequate dose. The doctor might prescribe a stronger anti-inflammatory like Indocid (indomethacin) or Voltaren (diclofenac). Because kidney stones sometimes cause episodes of severe pain, the doctor may also prescribe a narcotic pain-killer like morphine or oxycodone. No single pain killer blocks all the different pain receptors in your body, so it is usually a good idea to take a combination of painkillers. For example you should take regular doses of Tylenol and an anti- inflammatory for basic pain relief—and use the strong painkiller only when you need to.

Medicine	Type	Each dose is:	How often?
Flomax (tamsulosin)	Alpha-blocker (relaxes ureter)	0.4 mg (1 tablet)	Once a day
Tylenol (acetaminophen)	Simple pain killer	1000 mg (2 extra-strength tablets)	3 or 4 times in 24 hours
Advil (ibuprofen)	Anti-inflammatory	600 mg (3 x 200 mg tablets)	3 or 4 times in 24 hours
Aleve (naproxen)	Anti-inflammatory	220 to 440 mg (1 or 2 tablets)	2-3 times daily, up to 4 tablets in 24 hours
<u>Other anti-inflammatories:</u> The doctor may prescribe Voltaren (diclofenac) or Indocid (indomethacin). These are taken as directed by prescription but usually 75-150 mg in 24 hours.			
<u>Narcotic drugs,</u> like morphine, oxycodone or hydromorphone are to be taken (carefully) as directed.			
<i>*These are “usual” doses. You may need a different dose based on size and medical conditions. Do not take more than the recommended dose of painkiller.</i>			

What other care do I need? Make a recheck appointment with your family doctor 3 or 4 days after your hospital visit. Your doctor can help with many ongoing symptoms, problems or questions.

What if I get worse? If your pain worsens or you feel more unwell, you can speak to your family doctor or call Healthlink at 8-1-1. If your symptoms continue more than 2 weeks and the stone hasn't passed, your doctor may arrange an ultrasound or CT scan, or refer you to the emergency department or urologist. If the doctors think your stone might need surgery or lithotripsy, they will refer you to a urologist. Anytime you have severe pain or nausea that cannot be controlled by medicines, or if you develop a fever more than 38°C (101°F) you should return to the emergency department for further treatment. It is a good idea to have a follow-up ultrasound 2-6 weeks after a stone episode to make sure there is no ongoing kidney swelling.

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