



IAEM Clinical Guideline 3

## **Emergency Department Management of Renal Colic and Suspected Renal Calculus**

Version 1

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### **DISCLAIMER**

IAEM recognises that patients, their situations, Emergency Departments and staff all vary. These guidelines cannot cover all clinical scenarios. The ultimate responsibility for the interpretation and application of these guidelines, the use of current information and a patient's overall care and wellbeing resides with the treating clinician.



## **GLOSSARY OF TERMS**

AAA: Abdominal Aortic Aneurysm

CRP: C-reactive protein

CT: Computed Tomography

ED: Emergency Department

FBC: Full Blood Count

GRADE: Grade of recommendation

IVP/IVU: Intravenous Pyelography/Intravenous Urography

KUB: X-rays of Kidney, Ureter and Bladder

LOE: Level of Evidence

MET: Medical Expulsive Therapy

NCCT: Low Dose Non Contrast-Enhanced Computed Tomography

NSAIDs: Non-Steroidal Anti-inflammatory Drugs

US: Ultrasound

# Emergency Department Management of Renal Colic and Suspected Renal Calculus

## INTRODUCTION

The average lifetime risk of stone formation has been reported as being in the range of 5-10%. Patients with renal colic usually present with characteristic loin pain +/- vomiting and may have fever. The clinical diagnosis should be supported by an appropriate imaging procedure. This will immediately help to decide if a conservative approach is justified or if another treatment should be considered.

### *Target Audience*

Emergency Medicine, Primary Care, National Ambulance Service, Specialist Services

### *Patient Population*

The index patient is a non-pregnant adult with a unilateral ureteral stone whose contralateral kidney functions normally and whose medical condition, body habitus and anatomy allows for any one of the treatment options to be undertaken.

An adult is defined in this guideline as a person 18 years of age or older.

### *Patient groups specifically excluded from guideline*

Exclude from pathway if:

- pregnant
- history of renal transplant/solitary kidney
- known AAA
- younger than 18 years of age

## AIMS

All adult patients who present to Emergency Departments with clinical features suspicious for renal calculus should be managed according to the best available clinical evidence.

### Assessment

#### *Patient History*

Patients with renal colic usually present with characteristic loin pain +/- radiation to the groin +/- vomiting and may have fever. They usually but not always have haematuria (macroscopic or microscopic). However, 15% of patients with proven stone on imaging will not have haematuria. They may have a previous history of renal calculus.

#### *Physical Examination*

Abdominal examination is usually unremarkable. AAA may present with a similar presentation and should be considered in the appropriate patient age group- especially in males older than 50 years with a first presentation of suspected renal colic.

## INVESTIGATIONS

<b>Urine</b>	<b>GRADE</b>
<i>Dipstick of spot urine sample</i> <ul style="list-style-type: none"> <li>• <i>Red cells</i></li> <li>• <i>White cells</i></li> <li>• <i>Nitrite</i></li> <li>• <i>Urine pH</i></li> </ul>	A
<i>Urine culture or microscopy (if abnormality on dipstick urinalysis)</i>	A
<b>Blood</b>	
<i>Serum blood sample</i> <ul style="list-style-type: none"> <li>• <i>Creatinine</i></li> <li>• <i>Uric acid</i></li> <li>• <i>Ionised calcium</i></li> <li>• <i>Sodium</i></li> <li>• <i>Potassium</i></li> </ul>	A
<i>Full Blood Count</i>  <i>CRP (if febrile)</i>	A
<i>If intervention is likely or planned: Coagulation test (PTT and INR)</i>	A

- *Biochemical Investigations*

All patients should have a urine dipstick for red cells, white cells and nitrites and a urine pH. Urine should be sent for culture if dipstick urinalysis is abnormal.

Serum urea, creatinine, sodium and potassium should be analysed as a measure of renal function.

Serum uric acid and calcium should also be performed if the patient has not had a previous normal result (within 1 year). This might be the only occasion when a patient with hypercalcaemia may be identified.

Patients with fever should also have blood samples for CRP and FBC sent to the laboratory.

If intervention is likely or planned a coagulation test should be considered.

Stone analysis should be performed in certain high risk stone formers. This would include first presentation at a young age, bilateral stones or large stones at presentation. The patient should be

instructed to filter the urine to retrieve a concrement for analysis after discussion with the Urology team.

#### DIAGNOSTIC IMAGING

NCCT has become the standard method for diagnosing acute flank pain. It can identify the presence of the stone, its diameter and density. NCCT should be used to confirm a diagnosis in patients presenting with acute flank pain because it is superior to IVU. The radiation risk can be reduced by using low-dose CT.

CT can demonstrate uric acid and xanthine stones which are radiolucent on plain films. CT also provides a better estimate of stone volume. A further advantage is the ability of CT to detect alternative diagnoses. Indinavir stones cannot be detected on NCCT.

Immediate imaging is recommended with fever, a solitary kidney or when diagnosis is in doubt.

Timing of imaging should be within 24 hours of ED presentation in order to confirm the diagnosis.

## MANAGEMENT (SEE ALGORITHM)

### Acute

- *Pain Relief*

<b>Recommendations</b>	<b>GRADE</b>
<i>In acute stone episodes, pain relief should be initiated immediately</i>	A
<i>Whenever possible, a NSAID should be the first drug of choice</i>	A

The relief of pain is usually the most urgent therapeutic step in patients with an acute stone episode. The recommendation is to start with diclofenac (pr or po) whenever possible and to change to an alternative drug if the pain persists. Compared to NSAIDs, opioids carry a greater likelihood of further analgesia being needed.

### Ongoing management

- *Further pain relief and MET*

<b>Recommendations for analgesia during renal colic</b>	<b>LOE</b>	<b>GRADE</b>
<i>First choice: Start with an NSAID e.g. diclofenac, indomethacin or ibuprofen</i>	1b	A
<i>Second choice: IV opioid</i>	4	C
<i>Use <math>\alpha</math> blockers to reduce recurrent colic</i>	1a	A

Diclofenac is recommended as a method of counteracting recurrent pain after an episode of ureteric colic. Although diclofenac can affect renal function in patients with already reduced renal function, this is not the case in patients with normally functioning kidneys.

Spontaneous stone passage can be expected in up to 80% of patients with stones <4 mm in diameter. For stones with a diameter >7mm, the chance of spontaneous passage is very low. In a patient who has a newly diagnosed ureteral stone <10mm and if stone removal is not indicated, observation with periodic evaluation is an option for initial treatment. Such patients may be offered appropriate medical therapy to facilitate stone passage during the observation period.

Drugs used to expel stones are thought to act by relaxing ureteral smooth muscle through either the inhibition of calcium channel pumps or alpha-1 receptor blockade. For MET, alpha-blockers (e.g. tamsulosin) are recommended. Patients should be counselled about the attendant risks of MET (including associated drug side effects) and should be informed that it is being administered as “off-label” use.

In case of suspected or proven infection, appropriate antibiotic therapy should be administered before intervention.

- *Indications for active stone removal*

Spontaneous stone passage can be expected in up to 80% of patients with stones <4 mm in diameter. For stones with a diameter >8mm, the chance of spontaneous passage is very low.

Active stone removal is generally indicated when:

- stones exceed a diameter of 15 mm
- adequate pain relief cannot be achieved
- stone obstruction is associated with infection
- there is a risk of pyonephrosis or urosepsis
- the patient has a single kidney with obstruction or
- there is bilateral obstruction.

## INDICATIONS FOR HOSPITAL ADMISSION

Hospital admission is required if:

- The patient is in shock, has fever or signs of systemic infection.
- There is pre-existing renal impairment or increased risk of loss of renal function.
- There are bilateral obstructing stones.
- There is no response to appropriate analgesia or abrupt recurrence of severe pain despite appropriate analgesia.
- The patient is dehydrated and cannot take oral fluids due to vomiting.

## LOW RISK PATIENTS

Consider discharge for next day follow-up imaging in patients where:

- Urolithiasis is the likely diagnosis.
- There is no suspicion of AAA.
- There are no signs of sepsis.
- Pain is controlled adequately.
- The patient is able to pass urine.
- Appropriate imaging is available the next day.
- Social circumstances allow for discharge and return the next day.



## PREVENTIVE TREATMENT/ADVICE FOR PATIENTS

### GENERAL ADVICE

<i>Fluid Intake (drinking advice)</i>	<i>Fluid amount:2.5-3L/day</i> <i>Circadian drinking</i> <i>Neutral pH beverages</i> <i>Diuresis:2-2.5L/day</i> <i>Specific gravity of urine&lt;1.010</i>
<i>Nutritional advice for a balanced diet</i>	<i>Balanced diet</i> <i>Rich in vegetable and fibre</i> <i>Normal calcium content:1-1.2g/day</i> <i>Limited NaCl content:4-5g/day</i> <i>Limited animal protein content:0.8-1g/kg/day</i>
<i>Lifestyle advice to normalise general risk factors</i>	<i>BMI 18-25kg/m<sup>2</sup></i> <i>Stress limitation measures</i> <i>Adequate physical activity</i> <i>Balancing of excessive fluid loss</i>

For a normal adult, the 24-hour urine volume should exceed 2000 mls. Although most beverages can be drunk to increase fluid intake and help prevent stone formation, grapefruit has been shown to be associated with an increased risk of stone formation. A mixed balanced diet is recommended with contributions from all nutrient groups but avoiding any excesses, especially animal proteins.

Fruit and vegetable intake should be encouraged because of the beneficial effects of fibre. Oxalate rich foods, such as rhubarb, spinach, cocoa, tea leaves and nuts should be limited or avoided.

The average time to pass a 2-4mm stone is 40 days. There is a 50% risk of one further lifetime recurrence with 10% of stone formers suffering more recurrent disease.

## SPECIAL CONSIDERATIONS

### *Pregnancy*

<b>Recommendations</b>	<b>GRADE</b>
<i>Ultrasound is the method of choice for practical and safe evaluation of pregnant women</i>	A
<i>Conservative management should be the first line treatment for all non-complicated cases of urolithiasis in pregnancy (except those that have clinical indications for intervention)</i>	A

The incidence has been reported to be between 0.026% and 0.53%. When compared to non-pregnant age-matched controls, pregnant women do not have an elevated incidence of urolithiasis. Like the non-pregnant person, 70-80% of the symptomatic stones pass spontaneously.

The evaluation of pregnant patients suspected of having renal colic begins with ultrasonography as ionizing radiation should be limited in this setting. If the US examination is unrevealing and the patient remains severely symptomatic, a limited IVP may be considered.

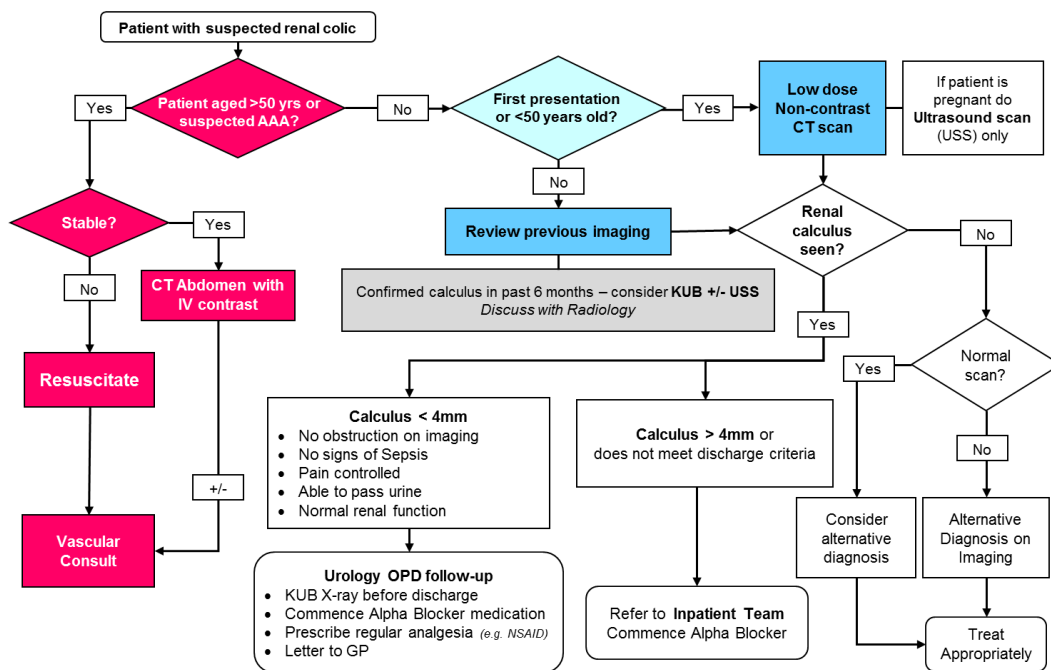
## RISK FACTORS FOR RECURRENT STONE FORMATION

About 50% of all recurrent stone formers have just one recurrence during lifetime. Highly recurrent disease is observed in slightly more than 10% of all stone formers.

Risk factors associated with recurrent stone formation include the following:

- Onset of disease early in life i.e <25 years of age.
- Stones containing brushite (calcium hydrogen phosphate).
- Strong family history of stone formation.
- Only one functioning kidney.
- Diseases associated with stone formation:
  - hyperparathyroidism
  - renal tubular acidosis
  - cystinuria
  - primary hyperoxaluria
  - jejunoileal bypass
  - Crohn's disease
  - intestinal resection;
  - malabsorption syndromes;
  - sarcoidosis.
- Medication associated with stone formation:
  - vitamin D supplements; calcium supplements; acetazolamide; ascorbic acid in megadoses (>4 g/day); sulphonamides; triamterene; indinavir (stones not visible on NCCT).
- Anatomical abnormalities associated with stone formation:
  - medullary sponge kidney, pelvo-ureteral junction obstruction, caliceal diverticulum, caliceal cyst, ureteral stricture, vesico-ureteral reflux, horseshoe kidney, ureterocoele.

## Management of Suspected Renal Colic



Note: Timing of Imaging depends on local policy - guidelines suggest imaging within 24 hours in Low Risk Patients

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