



Managing patients with  
**renal colic in primary care:**  
**Know when to hold them**

*Approximately one in ten people will be affected by renal colic at some stage in their life. Patients with red flags should be referred for emergency treatment immediately. However, patients with an uncomplicated presentation of renal colic can often be managed in primary care, following prompt referral for imaging to confirm the diagnosis (same-day if possible). Non-steroidal anti-inflammatory drugs (NSAIDs) are generally preferred over morphine for pain management in patients with renal colic. Most urinary stones will pass spontaneously, however, alpha-blockers are now recommended to accelerate their passage.*

## Assessing renal colic

Renal colic is generally caused by stones in the upper urinary tract (urolithiasis) obstructing the flow of urine; a more clinically accurate term for the condition is therefore ureteric colic.<sup>2</sup> The blockage in the ureter causes an increase in tension in the urinary tract wall, stimulating the synthesis of prostaglandins, causing vasodilatation. This leads to a diuresis which further increases pressure within the kidney. Prostaglandins also cause smooth muscle spasm of the ureter resulting in the waves of pain (colic) felt by the patient. Occasionally renal colic will occur due to a cause other than urinary stones, such as blood clots that may develop with upper urinary tract bleeding, sloughed renal papilla (e.g. due to sickle cell disease, diabetes, long-term use of analgesics) or lymphadenopathy.<sup>3</sup>

Individual urinary stones are aggregations of crystals in a non-crystalline protein matrix.<sup>3</sup> Eighty percent of urinary stones are reported to contain calcium, frequently in the form of calcium oxalate.<sup>3</sup> Calcium phosphate and urate are also found in urinary stones in decreasing frequency, although urate may be more prevalent in patients who are obese.<sup>3</sup> Bacteria can also cause the formation of calculi, referred to as infection stones, which contain magnesium ammonium phosphate and may be large and branched; these are also known as staghorn calculi.<sup>3</sup>

The pain of renal colic develops suddenly and is often described by patients as “the worst pain they have ever felt”.<sup>4</sup> Despite this severe presentation, the majority of urinary stones pass spontaneously.<sup>4</sup> Therefore many patients with renal colic can

be managed in primary care with a watchful waiting approach if there are no red flags present (see over page), their pain can be controlled and a prompt referral for imaging is arranged.<sup>3</sup>

## Which patients are most likely to develop urinary stones?

It is estimated that 12% of males and 6% of females will experience an episode of renal colic at some stage in their life, with incidence peaking between age 40 and 60 years for males, and in the late 20’s for females.<sup>3</sup>

Urinary stones are more likely to occur in patients who have:<sup>3</sup>

- Chronic dehydration resulting in concentrated urine production, e.g. less than one litre of urine production per day
- A family history of urinary stones; the risk is increased 2.5 times
- An abnormality of the urinary tract
- Obesity
- Hyperparathyroidism
- Gout
- Idiopathic hypercalciuria
- Exposure to a hot environment, e.g. hot working conditions, causing dehydration

Between 30 – 40% of people will experience recurrent renal colic within five years of their first episode.<sup>3</sup>

## Diagnosing renal colic

Patients with renal colic classically present with sudden and severe loin pain that occurs in waves of intensity and may be accompanied by nausea and vomiting. Some patients may be symptom-free between these episodes. This description helps to distinguish renal colic from some other conditions causing abdominal pain (see differential diagnosis below). The site of the pain is generally not useful for predicting the location of the stone within the renal tract, however, new onset lower urinary tract symptoms are consistent with a stone migrating distally.<sup>2</sup> If the stone is located at the vesico-ureteric junction patients may experience straining when urinating, with painful and frequent passage of small volumes of urine (strangury), due to the stone irritating the detrusor muscle.<sup>3</sup>

### Examining the patient

Patients with renal colic typically appear restless and unable to find a comfortable position. Classical renal colic pain is located in the costovertebral angle, lateral to the sacrospinus muscle and beneath the 12<sup>th</sup> rib.<sup>3</sup> The pain may radiate to the flank, groin, testes or labia majora.<sup>3</sup>

Acute kidney injury is a concern in patients with renal colic. It is important to be aware of a previous nephrectomy or any other cause of renal impairment which would increase the significance of further renal injury and lower the threshold for referral to the emergency department (see "Red Flags").

Assess for signs and symptoms of infection. Another concern in patients with renal colic is the development of pyonephrosis (infection of the renal system above an obstructing stone). If this occurs then the patient can develop life-threatening sepsis.

Diagnostic uncertainty is an indication for referral to hospital as renal colic can be difficult to differentiate from a number of other conditions, including:<sup>3,5</sup>

- Biliary colic and cholecystitis
- Aortic and iliac aneurysms – particularly in older patients with left-side pain, hypertension or atherosclerosis
- Appendicitis, diverticulitis and peritonitis. N.B. These patients are less likely to appear restless and generally prefer to lie still.
- Gynaecological causes, e.g. endometriosis, ovarian torsion and ectopic pregnancy
- Testicular torsion

## Investigating suspected renal colic

The following investigations should be performed or requested to detect haematuria, rule-out infection, assess kidney function and assess for the presence of an underlying metabolic condition, such as gout, hyperparathyroidism or renal tubular acidosis:<sup>2,3,5</sup>

- Urine dipstick
- Midstream urine culture
- Full blood count
- Serum creatinine
- Electrolytes
- Serum urate
- Serum calcium
- Serum phosphate

Approximately 90% of patients with urinary stones will return a positive test for haematuria on urine dipstick, therefore a negative result is a reason to reconsider the diagnosis.<sup>3</sup> A midstream urine sample should be sent for microscopy to assess for the presence of dysmorphic red blood cells and urinary casts to exclude other causes such as glomerular injury.<sup>2</sup> Patients with reduced kidney function, e.g. creatinine > 160 mmol/L, who are at immediate risk of acute kidney injury (AKI) should be referred to the emergency department.

N.B. the patient's white blood cell count may be elevated in the absence of infection.<sup>2</sup> Serum urate levels may also fluctuate due to acute inflammation.<sup>3</sup>

 **Red flags that over-ride requests for testing and require immediate referral** of the patient to the emergency department include:<sup>3,5</sup>

- Fever or other features, e.g. rigors, consistent with systemic infection which can lead to life-threatening sepsis
- Suspected bilateral obstructing stones
- Known clinically significant renal impairment
- The presence of only one kidney
- Pregnancy (see: "Renal colic during pregnancy", Page 13)

**Non-contrast computed tomography (CT) urogram is the gold standard for diagnostic confirmation** of renal colic.<sup>3</sup> If CT urogram is not available then a kidney-bladder ultrasound

in combination with an x-ray can achieve detection rates for urinary stones that approach those of CT urogram.<sup>3</sup> Ultrasound is the preferred imaging technique for patients who are unable to be x-rayed, e.g. a female who is pregnant, and is also useful for identifying urate stones which cannot be detected with standard x-ray.<sup>2,3</sup> Patients should have a full bladder when the ultrasound is performed to identify stones at the vesico-ureteric junction.<sup>3</sup> Stones in other regions of the ureter may not be seen, however, dilatation will suggest where the obstruction is located.

## Management of renal colic in primary care

In a patient suspected of having renal colic initial management will generally include:

1. Acute pain control with either a non-steroidal anti-inflammatory drug (NSAIDs or morphine (see below)
2. Laboratory testing, e.g. serum creatinine and full blood count (see previous page)
3. Prompt referral (same-day if possible) for CT urogram or kidney-bladder ultrasound and x-ray (see below)
4. Prescribe an analgesic for ongoing pain management
5. Prescribe an alpha-blocker to accelerate stone passage (see below)
6. Consult with the patient the following day to discuss treatment and referral options

**NSAIDs are the first-line treatment** for renal colic pain because they have been shown to achieve greater reductions in pain scores, have a longer duration of action and result in a reduced need for additional analgesia in the short-term, compared with patients treated with opioid analgesics.<sup>3</sup> The increased efficacy of NSAIDs may be partially explained by the fact that prostaglandin production is part of the pathophysiological process of renal colic. In addition, treatment with NSAIDs has the advantage of circumventing any concerns about drug-seeking behaviour (see: "Identifying drug-seeking behaviour", Page 16).

**Opioid analgesics can be prescribed in addition to, or as an alternative, to NSAIDs** for patients with renal colic who are at risk of NSAID-induced adverse effects, e.g. in patients with chronic renal impairment, who are dehydrated or have a history of peptic ulcers.<sup>3,5</sup>

N.B. Pethidine is no longer used for the treatment of renal colic because it is no more effective than morphine and is associated with an increased rate of adverse effects such as vomiting.<sup>3</sup>

Pethidine is also best avoided in people with impaired renal function as it has a toxic metabolite which can accumulate.

The patient's general health, e.g. the presence of co-morbidities, age and their preference, as well as any history of successful renal colic pain management should be taken into account when considering the most appropriate analgesic regimen.



## Diclofenac is often the first choice NSAID for renal colic

Diclofenac is used for the treatment of renal colic because:<sup>4</sup>

1. It is the NSAID with the strongest evidence of effectiveness in the management of renal colic
2. It is available in immediate and modified release oral, injectable and suppository formulations
3. Both injectable and suppository formulations are available fully subsidised on a Practitioner's Supply Order (PSO)

Diclofenac injectable preparation is indicated for the immediate relief of renal colic pain. It must be administered by deep intragluteal injection in the upper outer quadrant to minimise the risk of abscess formation.<sup>6</sup> The recommended dose is:

- Diclofenac 75 mg (3 mL) injection, IM, repeated once (may be given 30 minutes later if required, in the opposite side)
- May also be combined with oral diclofenac to a maximum of 150 mg, daily, for a maximum of two days<sup>5</sup>

Oral or rectal diclofenac, 75 – 150 mg, daily, can be prescribed for ongoing pain management.<sup>6</sup> Some clinicians recommend NSAID suppositories as the best analgesia for out-of-hospital care for renal colic pain.<sup>2</sup>

 Ten diclofenac 50 mg suppositories, and five 75 mg injections are available fully subsidised on a PSO for general practices to have available for acute administration.<sup>6</sup>

Diclofenac may not always be the most appropriate NSAID for treating the pain of renal colic, e.g. if the patient is unable to tolerate diclofenac or has an increased cardiovascular risk. Diclofenac is contraindicated in patients who have had a myocardial infarction in the previous 12 months.<sup>6</sup> Other NSAIDs, e.g. ibuprofen or naproxen, should provide effective pain management for patients with renal colic in these situations.

 For further information see: "Non-steroidal anti-inflammatory drugs (NSAIDs): making safer treatment choices", BPJ 55 (Oct, 2013).

## Morphine is an alternative to NSAIDs

Morphine 5 – 10 mg, IM, is an alternative treatment to NSAIDs for acute pain management in patients with renal colic and is preferred over NSAIDs in women who are pregnant (see: "Renal colic during pregnancy", opposite). The concomitant administration of an antiemetic may be considered for the prevention or control of nausea and vomiting.<sup>5</sup>

Once the patient's pain has been controlled, short-term use of oral morphine, 5 – 10 mg, every four hours, adjusted according to response, can be appropriate for patients managed in the community who are unable to tolerate oral NSAIDs.<sup>6</sup>

## Additional pain management options

Paracetamol and a weak opioid, e.g. codeine or tramadol, can be prescribed for ongoing pain management if NSAIDs are not appropriate once any nausea and vomiting has passed.<sup>5</sup> Applying warmth to the lateral abdomen and lower back, e.g. with a wheat bag or hot-water bottle, may provide useful pain relief for patients with renal colic.<sup>3</sup>

## How much fluid should patients drink?

In general, patients should drink sufficient fluid to reduce the risk of developing AKI, especially if they are taking NSAIDs.<sup>3</sup> Advising patients to maintain a lightly coloured urine is a "rule of thumb" for achieving this.<sup>5</sup> Patients who are dehydrated may benefit from intravenous fluids, if the practice has the resources to provide this treatment. However, there is no evidence that increasing hydration assists in pain control or stone movement once the ureter has become obstructed.<sup>3</sup> Excessive fluid intake will increase urine output pressure causing hydronephrosis (distension of the ureter and kidney) which is likely to worsen the patient's pain.<sup>7</sup>

## Alpha-receptor blockers (medical expulsive treatment)

Alpha-receptor blockers, e.g. doxazosin and terazosin, or calcium channel blockers, e.g. nifedipine, can accelerate the passage of urinary stones by relaxing smooth muscle without preventing peristalsis.<sup>3, 8</sup> Alpha-blockers are also thought to reduce pain episodes and the need for analgesia.<sup>3</sup> An alpha-blocker should be prescribed as an off-label indication when patients with renal colic are first seen. Several local guidelines in New Zealand, e.g. Canterbury HealthPathways, recommend doxazosin, 1 – 4 mg, at night, for four weeks or until the stone passes. A lower dose may be more appropriate in older patients or patients who are hypotensive.<sup>6</sup> Doxazosin

is contraindicated in patients with a history of postural hypotension or micturition syncope.<sup>6</sup>

### Interpreting the results of the computer tomography urogram

Patients with renal colic who have not been referred to hospital should be asked to attend a follow-up consultation as soon as is feasible to discuss their imaging and tests results, to confirm pain is being managed and to discuss referral options. The CT urogram is critical when assessing the likelihood of the patient's stone passing without the need for surgery; which will also determine whether they should continue to be managed in secondary care.

#### Which stones are most likely to pass without surgery?

The smaller the stone and the more distal its location the more likely it will pass spontaneously.<sup>3</sup> The presence of anatomical abnormalities in the ureter may also influence the likelihood of stone passage occurring. The average reported time for a

stone 2 – 4 mm in diameter to pass is approximately 13 days and approximately 22 days for a stone 6 – 8 mm in diameter.<sup>3</sup> Over half of stones causing symptoms in patients presenting to an emergency department can be expected to be found at the ureterovesical junction and approximately one-quarter in the proximal ureter.<sup>3</sup> Spontaneous passage is reported to occur in 79% of patients with urinary stones located at the ureterovesical junction and in 48% of patients with stones located in the proximal ureter.<sup>11</sup>

#### When should patients be referred to an Urologist?

**In general, if there is a single stone less than 4 mm on CT urogram the patient can be managed in the community** if they are able to cope at home and have social support. Follow-up radiology will often not be required as it is likely that the stone will pass without the need for surgery, however, the location of the stone will also influence this. The patient should be monitored for signs of infection and advised to

## Renal colic during pregnancy

The incidence of renal colic is not thought to be increased in women who are pregnant.<sup>1</sup> However, the composition of urinary stones in women who are pregnant may be different, e.g. often containing calcium phosphate.<sup>1</sup> Complications if renal colic does occur during pregnancy include: premature rupture of membranes, pre-term labour and delivery, pregnancy loss, mild pre-eclampsia and infection. All pregnant women with suspected renal colic should therefore be referred to an Urologist or Obstetrician.<sup>1</sup> The possibility of ectopic pregnancy should be excluded during the history and examination. Renal and bladder ultrasound is the investigation of choice in women who are pregnant, but interpretation of imaging may be complicated if the stone is not readily visible due to hydronephrosis, which occurs naturally in up to 90% of pregnant women.<sup>1</sup> Transvaginal ultrasonography, simple radiography and intravenous urography are investigations that may also be used if necessary.<sup>1</sup>

The majority of urinary stones in women who are pregnant will pass spontaneously, so management

is generally watchful waiting with appropriate pain management. Of the stones that do not pass during pregnancy, many will pass after delivery; usually within the first month.<sup>1</sup> Non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided during the first and third trimester of pregnancy due to potentially teratogenic adverse effects early in pregnancy and an increased risk of miscarriage or premature closure of the ductus arteriosus later in pregnancy.<sup>1</sup> Short-term oral morphine can be used if required for ongoing pain.<sup>6, 12</sup> There is no evidence of alpha-blockers causing teratogenicity.<sup>6</sup> Urinary stone passage may be accelerated by the off-label use of doxazosin if the potential benefits of an early stone passage, which will reduce the need for analgesia, outweighs any risks.<sup>1, 6</sup>

If the urinary stone does not pass or if there are signs of infection, then management depends on the clinical situation, e.g. the stage of pregnancy. Temporary drainage of the ureter with delayed stone treatment, urgent or definitive stone treatment via ureteroscopy, may be considered.<sup>1</sup>

contact the practice once they have passed the urinary stone. Untreated obstruction of the ureter can lead to a permanent loss of renal function and it can be expected that urological follow up will be advised if the patient has not passed a stone after two to three weeks.

 A practical tip for patients with smaller stones is to ask the patient to sieve their urine, e.g. through pantyhose fabric, to confirm passage of the stone and to aid retrieval for analysis if required.

**Patients with a stone larger than 4 mm on CT urogram, with a stone in the kidney or multiple urinary stones should be discussed with an Urologist** who will generally arrange for follow-up radiology.

Stones greater than 6 mm in diameter have a low likelihood of spontaneous passage and these patients should be immediately discussed with an Urologist to ensure the patient is prioritised appropriately.<sup>2</sup>

### Surgical treatment of urinary stones

The size of the urinary stone, its position and the general health of the patient will determine which technique is the most appropriate for the removal of stones that require surgery.<sup>2</sup> People with certain occupations, e.g. airline pilots, require complete removal of any urinary stones before they are able to return to full duties.<sup>2</sup>

**Uretero pyeloscopic laser lithotripsy** uses laser pulses to break up ureteric and smaller renal stones. This has high stone-clearance rates but may cause:<sup>2</sup>

- Infection in at least 5% of patients
- Haematuria, which will be problematic in < 1% of patients
- Postoperative pain
- Rarely, significant ureteric injury

Urinary tract infection is the only specific contraindication for this technique, and patients are able to continue to take antithrombotic medicines.<sup>2</sup>

**Shock wave lithotripsy** is the least invasive but also least effective method for removing urinary stones. It is not commonly used to treat urinary stones in the ureter, but may occasionally be used to treat those in the upper ureter. The technique is generally indicated for renal stones in patients who are not troubled by pain or for patients with stones that are inaccessible via retrograde or percutaneous routes.<sup>2</sup> Shock

wave lithotripsy is less effective for stones greater than 10 – 20 mm in diameter.<sup>2</sup> The adverse effects of shock wave lithotripsy include:<sup>2</sup>

- Significant pain due to stone fragment passage, experienced by 15% of patients
- Haematuria is to be expected, but is problematic in less than 1% of patients
- Rarely perinephric haematoma can occur

This technique is contraindicated in patients who: are pregnant, have an active UTI, are taking antithrombotic medicines, have an aortic aneurysm or with drainage abnormalities of the kidney.<sup>2</sup>

**Percutaneous nephrolithotripsy** is generally performed on renal stones larger than 20 mm and particularly staghorn calculi.<sup>2</sup> This has an increased risk of bleeding and sepsis, compared with laser treatment, and the patient may require further treatment to remove remaining fragments.<sup>2</sup> Patients may require several nights in hospital following this procedure.<sup>2</sup>

**Open surgery** is performed rarely for patients with urinary stones that have not passed and requires an extended period in hospital and an approximate six week convalescence.<sup>2</sup>

### Preventing stone reoccurrence

Patients can take several steps to reduce the likelihood of future urinary stone formation including:<sup>2</sup>

- Increasing water intake to dilute urine output
- Reducing salt intake
- Maintaining a healthy diet
- Avoiding fructose-containing soft drinks due to their association with increased urate levels

An analysis of stone content can guide dietary and medical interventions for urinary stone prevention. This may be useful for patients with a history of recurrent urinary stones.

Patients with stones containing calcium oxalate can be advised to reduce their salt and oxalate intake.<sup>2</sup> Examples of foods rich in oxalate include: tea, chocolate, spinach, beetroot, rhubarb, peanuts, cola and supplementary vitamin C (most of which is converted to oxalate).<sup>2</sup> Patients should maintain a normal dietary calcium intake of 700 – 1000 mg per day. Potassium citrate is subsidised under Special Authority for patients who

have had recurrent calcium oxalate urinary stones and who have had more than two episodes of urinary stones in the previous two years.<sup>6</sup>

For patients with urate stones, reducing dietary purines by eating less purine-rich meat (e.g. red meat and offal) and seafood (e.g. shellfish and oily fish) is an effective way to decrease urate production.<sup>13</sup> A urinary pH of 6.0 – 6.5 can increase the solubility of urate.

Allopurinol is indicated for the prophylaxis and treatment of patients with either urate or calcium oxalate renal stones.<sup>6</sup> Treatment with allopurinol is recommended if urinary stones reoccur despite lifestyle modifications and adjustment of urinary pH.<sup>13</sup> For patients without renal impairment allopurinol is initiated at 100 mg, once daily, and increased by 100 mg, every four weeks until a target serum urate of < 0.36 mmol/L is achieved.<sup>6</sup> Lower doses of allopurinol are recommended for patients with estimated glomerular filtration rates < 60 mL/min/1.73 m<sup>2</sup> (see NZF for details).

If a patient is suspected of having a renal tract abnormality that may predispose them to stone formation or if a patient passes a urinary stone that when analysed has an unusual composition, e.g. marked cystine content, then further investigations and treatment should be discussed with an Urologist.

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## Identifying drug-seeking behaviour

More than one in 30 New Zealanders reported using an opiate for recreational purposes at some stage in their life in the 2007/2008 alcohol and drug use survey.<sup>9</sup> The most common type of opiates used were analgesics such as morphine and oxycodone.<sup>9</sup> As opioids are a known treatment for renal colic this condition can be mimicked by drug-seekers wanting to misuse or on-sell opioids. Therefore in some situations the possibility that a patient's symptoms are fictitious may need to be excluded. Some general features of the patient encounter that increase the suspicion of drug-seeking behaviour include:<sup>10</sup>

- Presenting near closing time without an appointment
- Reporting a recent move into the area, making validation with their previous practitioner difficult
- Obsessive and impatient behaviour, often demanding immediate appointments but not attending follow-up consultations
- An unusual degree of knowledge about analgesics or an insistence on a specific opioid
- An unwillingness to trial non-pharmacological methods of pain relief
- Effuse gratitude when prescribed an opioid

Clinicians who suspect that a patient is seeking an opioid for reasons other than legitimate pain relief should document the discussion and diagnosis. During the history and examination and before any treatment is prescribed consider:

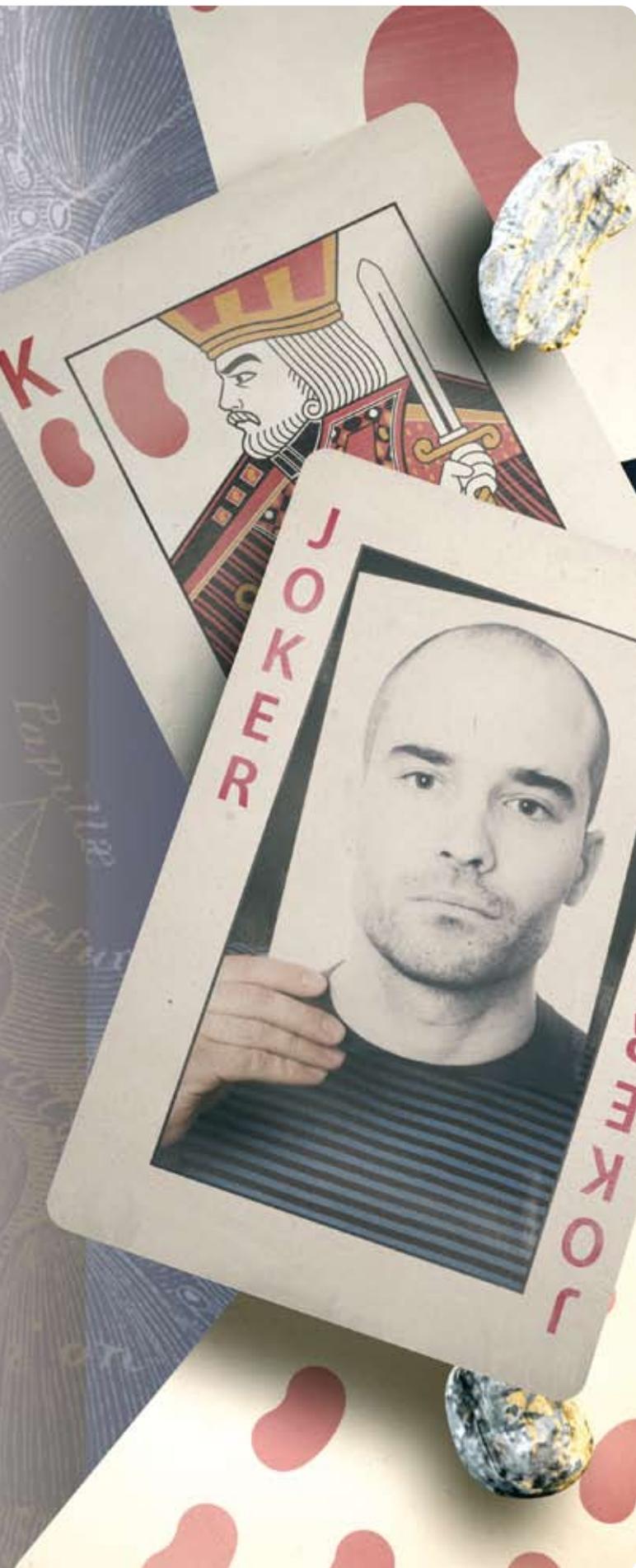
- Asking unexpected questions when taking the patient's history to counteract any scripted responses the patient has prepared
- Including questions about substance-use, alcohol and previous prescription medicine use during the patient's history
- Assessing whether the symptoms are consistent with the natural history of the condition; in the case of renal colic pain will usually be spasmodic

- Using distraction techniques during the physical examination, e.g. firmly palpating a non-affected area while only gently palpating the affected area, when looking for consistency in the patient's posture, movement and examination findings. Asking non-medical questions while palpating the patient's abdomen is another distraction technique.
- Seeking a second opinion from a colleague

Patients who are fabricating their condition will be highly attuned to clinical indecisiveness and a firm and evidence-based clinical opinion is the best way to discourage drug-seekers.<sup>10</sup> When prescribing an analgesic consider:

- Refusing to prescribe an opioid by providing a calm and clear explanation why an opioid is not the most appropriate first-line treatment for acute pain in patients with renal colic
- Ask to see some identification, it is less likely a drug-seeker will be prepared to provide this and if they do this will be useful if they are reported to the police
- Write the exact amount of medicine prescribed until the next consultation in words if it is decided that an opioid is the appropriate treatment
- Prescribe for a limited time, e.g. for two or three days
- Provide supervised daily dosing

When there is a strong suspicion that a patient is a drug-seeker other practice members should be alerted in case the patient displays threatening behaviour. Other staff members may also be able to point out inconsistencies in the patient's behaviour, e.g. did they appear distressed or in pain on the phone or in the waiting room? Drug seekers will often use more than one doctor or be known by local Pharmacists and phone calls to colleagues once the patient has left the practice may confirm that a patient has a history of drug-seeking behaviour.



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