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1 Background information

Quick info:

Objective and purpose of the care map
The purpose of this guideline is to define the appropriate management of urolithiasis in adults. The objective is to reduce inappropriate investigation, prescribing, and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians in primary care and outpatient settings.

Scope
Aspects of care covered within this guideline include:
- Diagnosis and management of urolithiasis in adults (i.e. people over 18 years of age).
- Topics covered include:
  - Stone classification.
  - Investigation.
  - Indications for urgent decompression.
  - Surgical treatment options.
  - Medical treatment options.

Aspects of care not covered within this guideline include:
- Management of urolithiasis in children and adolescents.

Definition
Urolithiasis is defined as [1]:
- The presence of calculi in the urinary tract system.
Renal/ureteric colic is defined as [1]:
- Paroxysmal pain due to abrupt obstruction of the renal pelvis or ureter. Typically caused by impaction or passage of a calculus.
Urosepsis is defined as [1]:
- Septicaemia resulting from a urinary tract infection (including from obstruction of infected urine).

Incidence and prevalence
Stone incidence depends on geographical, climatic, ethnic, dietary, and genetic factors [2]:
- There is a high incidence of kidney stones in the Gulf region due to an adverse combination of dietary (i.e. high animal protein intake) and environmental factors (i.e. hot, dry climate) [3].
- The incidence of uric acid and calcium oxalate stones is comparatively higher in the Gulf than most Western countries with a comparatively lower incidence of calcium phosphate and infection (Struvite) stones [3].

Recurrence [2]:
- Approximately 50% of people who develop recurrent stones have just one lifetime recurrence.
- Highly recurrent disease is observed in approximately 10% of patients.
- Stone type and disease severity determine whether risk of recurrence is low or high.

References:
Please see the care map’s Provenance.

2 Classification and aetiology

Quick info:

Urinary stones can be classified according to [2]:
- Size – stratified into those measuring:
  - <5 mm.
  - 5-10 mm.
  - 10-20 mm.
  - >20 mm.
- Anatomical position, e.g.:
  - Upper, middle, or lower calyx.
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Surgery > Urology > Urolithiasis

- Renal pelvis.
- Upper, middle, or distal ureter.
- Bladder.
- Radiographic characteristics.
- Aetiology of formation.
- Composition.

Stones can be classified into those caused by [2]:
- Infection – *infection stones (Struvite stones)* e.g.:
  - Magnesium ammonium phosphate.
  - Carbonate apatite.
  - Ammonium urate.
- Non-infectious causes – *non-infection stones*, e.g.:
  - Calcium oxalate.
  - Calcium phosphate.
  - Uric acid.
- Adverse drug effects – *drug-induced urinary calculi*.
- Genetic defects, e.g.:
  - Cystine.
  - Xanthine.
  - 2,8-dihydroxyadenine.

Stone classification can also be made by composition [2,4]:
- Calcium oxalate, phosphate, or both [2,5] – typically 70-80% of stones [4]:
  - Calcium oxalate stones are associated with [2]:
    - A small urine volume.
    - Hypercalciuria, hyperoxaluria, hyperuricosuria, high sodium excretion.
    - Hypocitraturia, hypomagnesuria.
    - High animal protein intake.
    - High oxalate intake.
  - Calcium phosphate stones are associated with [2]:
    - Hypercalciuria.
    - Elevated serum calcium.
    - Hyperparathyroidism.
    - Renal tubular acidosis.
    - UTI.
  - Magnesium ammonium phosphate (*Struvite stones*) – 2-15% [2]:
    - Associated with UTI caused by a urea-splitting organisms e.g.:
      - *Proteus spp.*
- Uric acid – approximately 10% of stones [2]:
  - Uric acid stones are associated with hyperuricosuria and acidic urine.
  - Some patients may form mixed stones, e.g. hyperuricosuric calcium oxalate stones.
  - Cystine – 1-2% [2]:
    - Result from cystinuria, a genetic disorder.
    - Other substances (e.g. xanthine) – 1% [2].

Risk factors for stone formation include:
- Age and gender [5,6]:
  - The risk is higher in men than in women.
  - However, some evidence suggests the risk is becoming more equal because of lifestyle factors, such as obesity.


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• Peak age in men is 30 years; the peak ages in women are 35 years and 55 years.
• Low urine output (<1 L/day) caused by [5,7]:
  • Excessive losses; and/or
  • Low fluid intake.
• Urinary pH strongly influences the formation of various types of stones, e.g. [2]:
  • A urine pH of <6.0 increases the risk of uric acid stones.
  • A urine pH of >6.5 increases the risk of calcium phosphate stones.
• Family history [7].
  • Certain medications, e.g. [2,8]:
    • Calcium supplements.
    • Vitamin D & C.
    • Diuretics.
    • Protease inhibitors, e.g. indinavir.
• Certain medical conditions e.g. [2,7]:
  • Recurrent UTI.
  • Gout.
  • Metabolic syndrome.
  • Obesity.
  • Bariatric surgery.
  • Hyperparathyroidism.
  • Gastrointestinal causes e.g.:
    • Crohn's disease.
    • Malabsorptive conditions.
• Anatomical abnormalities of the urinary tract [2].

References:
Please see the care map's Provenance.

3 Updates to this care map

Quick info:
Date of publication: 19-Mar-2017
Please see the care map's Provenance for additional information on references, contributors, and the editorial process.

4 Key recommendations of the care map

Quick info:
The key recommendations of this care map are:

General recommendation:
• It is recommended that a National Guideline for the management of urolithiasis be created for children and adolescent age groups [R-GDG].

Clinical assessment:
• A full clinical assessment should be undertaken in patients presenting with suspected urolithiasis [R-GDG].

Initial management:
• Where possible, and unless there are contraindications, an NSAID should be the first drug of choice for pain relief [2][L1, RGA1].
• Urine tests and blood tests should be performed in an outpatient or Emergency Department setting [R-GDG].
• Ultrasound should be performed as the initial imaging test – unless CT scanning is readily available [R-GDG].

Referral to secondary/specialist care:
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Surgery > Urology > Urolithiasis

• See the 'Indications for referral to the Emergency Department' care point for indications for referral to the Emergency Department.
• Patients not meeting the criteria for emergency referral should be referred to the Urology outpatient clinic (see the 'Elective referral to secondary/specialist care' care point).

Imaging in secondary care:
• Unless contraindicated, a NCCT should be performed in all patients referred to the Emergency Department.
• If stone removal is planned and renal collecting system anatomy needs to be assessed, then a contrast study is recommended [2][L3, RGA1].
• NB: Do not delay pain relief or any other emergency measures for imaging assessments [2].

Urgent decompression:
• Urgent urological referral is required to determine if obstruction needs to be relieved and to determine the method and timing of renal drainage [12] (see the 'Consider urgent decompression' care point in the 'Specialist care' page).

Conservative management:
• Can be offered to newly diagnosed patients with [2]:
  • Stones ≤10 mm; and
  • In whom pain can be adequately managed; and
  • No other indications for urgent stone removal are present; and
  • Adequate compliance with the treatment plan; and
  • Access to healthcare is available.
• Medical expulsive therapy with alpha-blockers should be offered to facilitate ureteral stone passage if conservative management is preferred [2][L1, RGA1].

Surgical treatment:
• Options for definitive treatment include the following (see the 'Surgical treatment' care point in the 'Specialist care' page) [4]:
  • ESWL.
  • PNL.
  • URS and stone extraction.
  • Open or laparoscopic surgery.

Medical treatment:
• Alkalisation of urine is an option for [2,15]:
  • Treatment of uric acid stones.
  • Prevention of cystine stones.

Follow-up:
• Consider stone analysis in all patients in whom a stone is collected [R-GDG].
• Ensure patients with recurrent stone formation [2,15]:
  • Are followed up periodically to monitor the course of their disease.
  • Have their metabolic risk factors identified.
  • Have stone prevention strategies in place.

References:
Please see the care map's Provenance.

5 Abbreviations used in this care map

Quick info:
The abbreviations used in this care map are as follows:

CT
Computed tomography scanning
ESWL
Extracorporeal shock wave lithotripsy
HU


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Urolithiasis presentation

Quick info:
Urolithiasis:
• May be symptomatic or asymptomatic [2].
  • Asymptomatic stones may be found as incidental findings when patients have investigations for other reasons, e.g. ultrasound [9].
• The main symptom is renal/ureteric colic.
• Pain may be accompanied by [7]:
  • Nausea.
  • Vomiting.
  • Haematuria.
  • LUTS.
  • Constitutional symptoms, e.g. fever, malaise.
NB: A full clinical assessment should be undertaken in patients presenting with suspected urolithiasis [R-GDG].

References:
Please see the care map's Provenance.

7 Indications for referral to the Emergency Department

Quick info:
Refer the patient to the Emergency Department, if the patient has renal colic and any of the following [2,7,10,13]:
• Uncontrolled pain despite adequate analgesia.
• Repeated presentations within a short duration.
• Immunosuppression.
• Pregnancy.
• The patient is at increased risk of acute kidney injury, e.g. if:
  • There is a solitary or transplanted kidney.
  • There is pre-existing chronic kidney disease.
  • Bilateral obstructing stones are suspected.
  • Signs of infection.
  • Dehydration and oral fluid intake is not possible.
  • Oliguric or anuric.
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• Bladder or urethral stones on imaging with or without acute urinary retention.
• Elevated creatinine and/or leukocytosis.
• Signs of acute obstruction on imaging.
• Social circumstances do not meet the criteria for home management, e.g.:
  • Telephone contact is not possible.
  • No reliable social support.
• There is uncertainty about the diagnosis and the patient is acutely symptomatic.
• The patient prefers to be admitted.

References:
Please see the care map's Provenance.

9 Differential diagnosis

Quick info:
The differential diagnosis of urolithiasis includes [7,9,10]:
• Upper UTI.
• Upper urinary tract obstruction due to other causes (e.g. renal or ureteral tumour).
• Gynaecological causes, e.g.:
  • Ectopic pregnancy.
  • Ovarian torsion.
• Testicular causes, e.g.:
  • Testicular torsion.
  • Acute epididymitis.
• Gastrointestinal:
  • Appendicitis.
  • Diverticulitis.
  • Biliary colic.
• Other:
  • Musculoskeletal pain.
  • Herpes zoster.
  • Pneumonia or pleurisy.

References:
Please see the care map's Provenance.

11 Provide analgesia and/or anti-emetics

Quick info:
Analgesia:
• Where possible, unless there are contraindications, an NSAID should be the first drug of choice [2][L1, RGA1]:
• If an NSAID is not suitable, consider an opiate, if available, such as [2][L3]:
  • Tramadol.
  • Hydromorphone.
  • NB: avoid pethidine as this is particularly associated with vomiting.
• For less severe pain, or for ongoing relief and an NSAID is not suitable, offer paracetamol [7]:
• Considerations for prescribing diclofenac [11]:
  • Is contraindicated in patients with:
    • Asthma.
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• Congestive heart failure.
• Ischaemic heart disease.
• Peripheral arterial disease.
• Cerebrovascular disease.
• Renal failure.
• Peptic ulcer disease.
• Should only be initiated after careful consideration for patients with significant cardiovascular risk factors, such as [11]:
  • Hypertension.
  • Diabetes.
  • Hyperlipidaemia.
  • Smoking.

If necessary, administer a parenteral anti-emetic for the relief of severe nausea and/or vomiting, e.g. metoclopramide hydrochloride [7,12].

References:
Please see the care map's Provenance.

12 Consider home management

Quick info:
Consider home management if [13]:
• Pain and associated symptoms subside spontaneously or after medication; and
• The patient:
  • Has adequate social support.
  • Can be contacted by telephone.
  • Is willing to stay at home.

References:
Please see the care map's Provenance.

14 Patient can be managed at home

Quick info:
Offer advice to the patient:
• Advise adequate fluid intake to maintain lightly-coloured urine [2,7].
• Avoid excessive fluid intake during an acute attack of renal colic.
• Seek urgent medical assistance if [13][L2]:
  • They develop fever or rigors.
  • The pain worsens.
  • They have a rapid recurrence of severe pain.

References:
Please see the care map's Provenance.

16 Initial investigations

Quick info:
In patients deemed suitable for home management, undertake the following initial investigations in an outpatient setting [R-GDG]:
• Urine tests [2]:
  • Urinalysis by dipstick or microscopy.
• Blood tests [2]:

Please see the care map's Provenance.
Urolithiasis - initial management

17 Follow-up

Quick info:
Consider stone analysis in all patients in whom a stone is collected [R-GDG].
Ensure patients with recurrent stone formation [2,15]:
• Are followed up periodically to monitor the course of their disease.
• Have their metabolic risk factors identified.
• Have stone prevention strategies in place.

References:
Please see the care map's Provenance.

18 Initial Investigations

Quick info:
In patients not deemed suitable for home management, undertake the following initial investigations in the Emergency Department, otherwise conduct the tests in an outpatient setting [R-GDG]:
• Urine tests [2]:
  • Urinalysis by dipstick or microscopy.
• Blood tests [2]:
  • Complete blood count [2,12][L1, RGA1].
  • Urea, electrolytes, and creatinine.
• Imaging [2]:
  • Urinary tract ultrasound.
  • Ultrasound is preferred unless CT scanning is readily available [R-GDG].

References:
Please see the care map's Provenance.

19 Elective referral to secondary/specialist care

Quick info:
For patients who do not meet the criteria for emergency referral:
• Refer to a urology outpatient clinic, if any of the following apply [R-GDG]:
  • Signs of obstruction on imaging but with:
    • Normal renal function; and
    • Controlled symptoms.
  • Confirmed non-obstructing renal stone on imaging.
  • Uncertainty about the diagnosis at follow-up.

References:
Please see the care map's Provenance.
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Provenance Certificate

Overview

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

This care map was approved on 19 Mar 2017.

For information on changes in the last update, see the information point entitled 'Updates to this care map' on each page of the care map.

Editorial approach

This care map has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The care map will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this care map, has involved the following critical steps:

- Extensive literature search for well reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising physicians and subject matter experts from across provider organisations in Qatar.
- Independent review of the guideline by the Clinical Governance body appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Explicit review of the care map by patient groups was not undertaken.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

Sources of evidence

The professional literature published in the English language has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a clinical editor and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals (i.e. journals that are read and cited most often within their field).
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3. Address an aspect of specific importance to the guideline in question.

Where included, the 'goal length of stay' stated within this guideline is supported by and validated through utilisation analysis of various international health insurance databases. The purpose of database analysis is to confirm the reasonability and clinical appropriateness of the goal, as an achievable benchmark for optimal duration of inpatient admission.

Evidence grading and recommendations

Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.

In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A1 (RGA1):** Evidence demonstrates at least moderate certainty of at least moderate net benefit.
- **Recommendation Grade A2 (RGA2):** Evidence demonstrates a net benefit, but of less than moderate certainty, and may consist of a consensus opinion of experts, case studies, and common standard care.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C1 (RGC1):** Evidence demonstrates a lack of net benefit; additional research is recommended.
- **Recommendation Grade C2 (RGC2):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.
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References


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Guideline Development Group members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

<table>
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Responsibilities of healthcare professionals

This care map has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient’s care.

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Healthcare Quality Management and Patient Safety Department of the MOPH:

- Ms Huda Amer Al-Katheeri, Acting Director & Project Executive.
- Dr Alanoud Saleh Alfehaidi, Guideline & Standardisation Specialist.
- Dr Ilham Omer Siddig, Guideline & Standardisation Specialist.
- Ms Maricel Balagtas Garcia, Guideline Standardisation Coordinator.
- Dr Rasmeh Ali Salameh Al Huneiti, Research Training & Education Specialist.
- Mr Mohammad Jaran, Risk Management Coordinator.
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Hearst Health International:

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