NATIONAL CLINICAL GUIDELINES

THE DIAGNOSIS & MANAGEMENT OF UROLITHIASIS

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المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

وزارة الصحـــــة العامـــــة
Ministry of Public Health
State of Qatar • دولـــة قطـــر

Version History

Version	Status	Date	Editor	Description
1.0	Final	14th December 2016	Guidelines Team	Final version for publication.
2.0	Final	7th November 2019	Guidelines Team	Updated version for publication.

Citation

Suggested citation style:

Ministry of Public Health Qatar. National Clinical Guideline: The Diagnosis and Management of Urolithiasis (2019).

Abbreviations

The abbreviations used in this guideline are as follows:

CT	Computed tomography scanning
ESWL	Extracorporeal shock wave lithotripsy
HU	Hounsfield Unit
LUTS	Lower urinary tract symptoms
MET	Medical expulsive therapy
NCCT	Non-contrast-enhanced computed tomography scan
NSAID	Non-steroidal anti-inflammatory drug
PNL	Percutaneous nephrolithotomy
URS	Ureteroscopy
UTI	Urinary tract infection

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1 Information about this Guideline

1.1 Objective and Purpose of the Guideline

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.

1.2 Scope of the Guideline

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.

1.3 Editorial Approach

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.

The editorial methodology, used to develop this guideline, 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 healthcare professionals, subject matter experts and patient representatives, from across Qatar.
- Independent review of the guideline by the National Clinical Guidelines & Pathways Committee, appointed by the MOPH, from amongst stakeholder organisations across Qatar.

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

1.4 Sources of Evidence

The professional literature 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 member of the Editorial Team 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.
3. Address an aspect of specific importance to the guideline in question.

Further information about the literature search and appraisal process is included in the appendix.

1.5 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 A (RGA):** Evidence demonstrates at least moderate certainty of a net benefit from the recommendation.
- **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 C (RGC):** 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.

1.6 Guideline Development Group Members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the National Clinical Guidelines & Pathways Committee. The GDG members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

Guideline Development Group Members		
Name	**Title**	**Organisation**
Dr Ammar Abduljabbar Al Ani	Consultant Urologist	Hamad Medical Corp
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[1] Dr Ahmed Babiker attended the MOPH in his capacity as a Clinical Pharmacist and advisor on the availability of medications in Qatar.

1.7 National Clinical Guidelines & Pathways Committee Members

The following table lists members of the National Clinical Guidelines & Pathways Committee (NCGPC), appointed by the MOPH. The NCGPC members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

National Clinical Guidelines & Pathways Committee (NCGPC) Members		
Name	**Title**	**Organisation**
Ms Huda Amer Al-Katheeri	Chair of the NCGPC, Director of Strategic Planning & Performance Department	Ministry of Public Health
Shk Dr Mohammed Hamad J. Al Thani	Co-Chair of NCGPC, Director of Public Health	Ministry of Public Health
Prof Anthony Akobeng	Chair Clinical Practice Guidelines Committee	Sidra Medicine
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Dr Chris Kenny	Executive Director Clinical and Service Development, Office of the Chief Medical Officer	Hamad Medical Corporation
Dr Egon Toft	VP and Dean of College of Medicine	College of Medicine, Qatar University

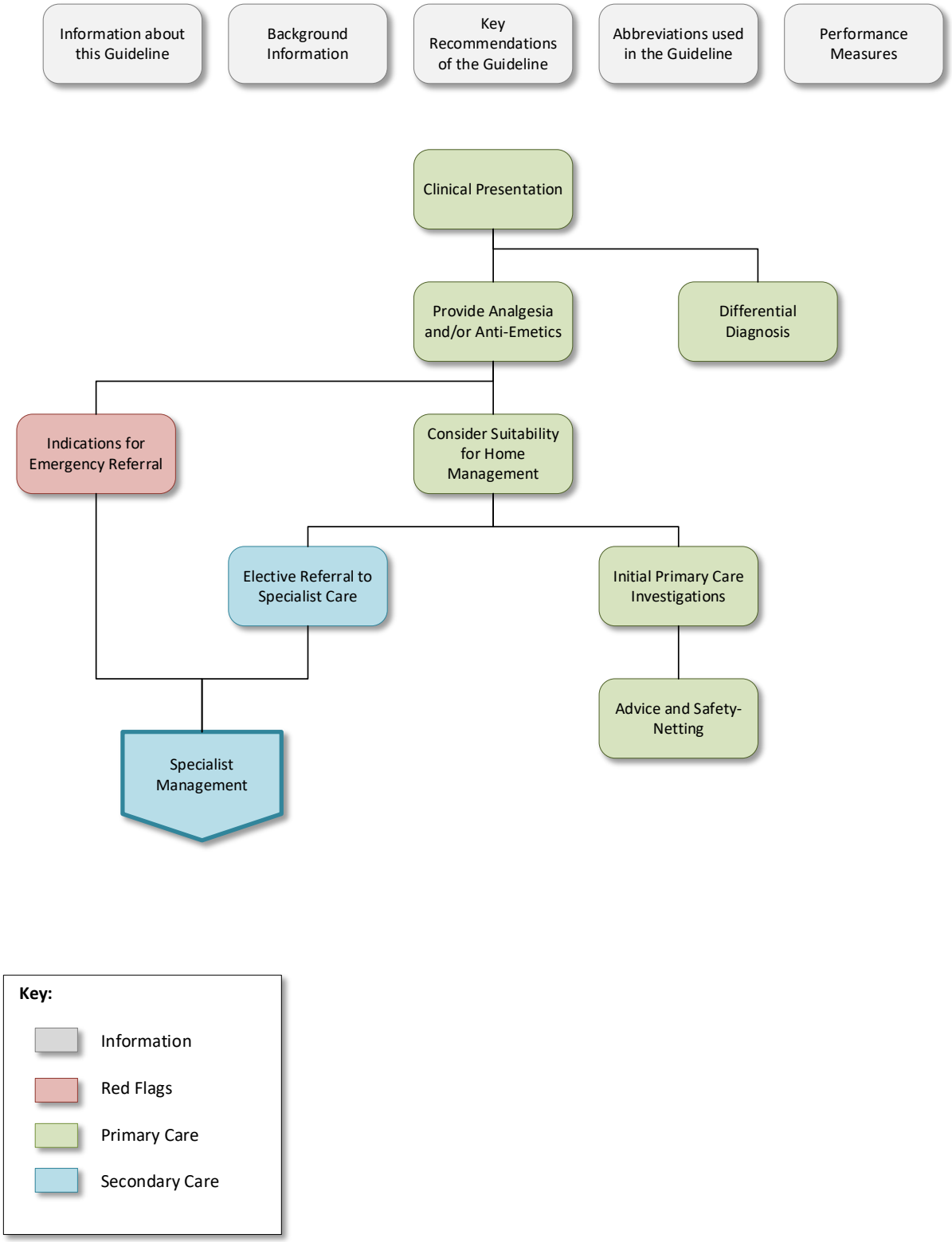
1.8 Responsibilities of Healthcare Professionals

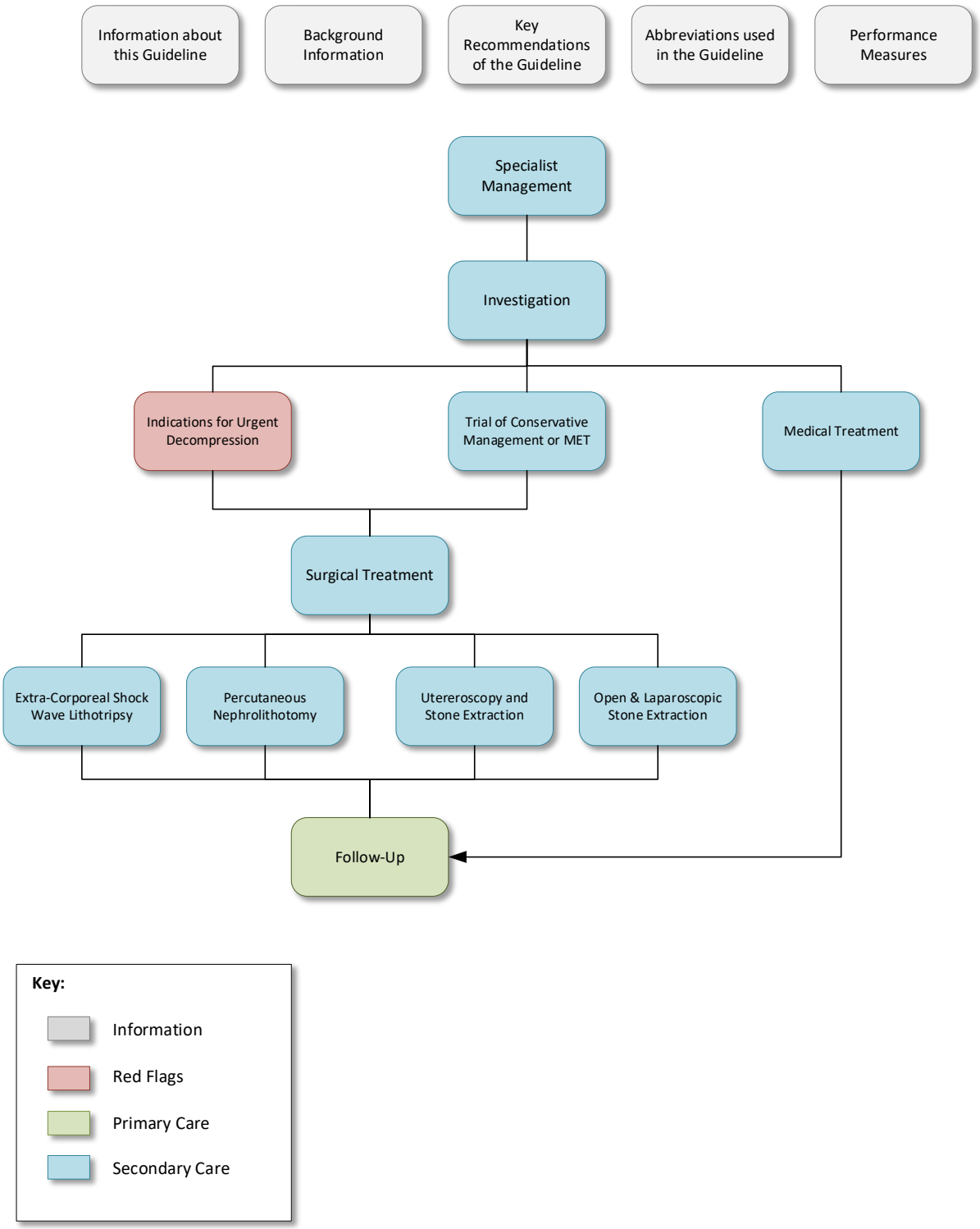
This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising 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 caregivers and should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

2 Urolithiasis Management Pathway

Click on a box below to see the relevant page of the Pathway.

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3 Key Recommendations of the Guideline

The key recommendations of this guideline are:

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, a non-steroidal anti-inflammatory drug (NSAID) should be the first drug of choice for pain relief [1–3][**L1, RGA**].
- Urine tests, 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 Specialist Care:

- See *Section 7.4* 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 *Section 7.5*).

Imaging in Specialist Care:

- Unless contraindicated, a non-contrast-enhanced CT (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 [1,2] [**L3, RGA**].
- NB: Do not delay pain relief or any other emergency measures for imaging assessments [1,2].

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 [3,4] (see *Section 8.2*).

Conservative Management:

- Can be offered to newly diagnosed patients with [1,2]:
  - 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 [1,2] [**L1, RGA**].

Surgical Treatment:

- Options for definitive treatment include the following (see *Section 8.4*) [5]:
  - Extracorporeal shock wave lithotripsy.

- Percutaneous nephrolithotomy.
- Ureteroscopy and stone extraction.
- Open or laparoscopic surgery.

Medical Treatment:

- Alkalinisation of urine is an option for [1,2,6]:
  - 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 [1,2,6]:
  - Are followed up periodically to monitor the course of their disease.
  - Are evaluated for metabolic risk factors.
  - Have stone prevention strategies in place.

4 Background Information

4.1 Definition

Urolithiasis is defined as [7]:

- The presence of calculi in the urinary tract system.

Renal/ureteric colic is defined as [7]:

- 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 [7]:

- Septicaemia resulting from a urinary tract infection (including from obstruction of infected urine).

4.2 Incidence and Prevalence

Stone incidence depends on geographical, climatic, ethnic, dietary, and genetic factors [1,2]:

- 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) [8].
- 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 [8].

Recurrence [1,2]:

- 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.

4.3 Classification and Aetiology

Urinary stones can be classified according to [1,2]:

- Size – stratified into those measuring:
    - <5 mm.
    - 5-10 mm.
    - 10-20 mm.
    - >20 mm.
- Anatomical position, e.g.:
    - Upper, middle, or lower calyx.
    - Renal pelvis.
    - Upper, middle, or distal ureter.
    - Bladder.
- Radiographic characteristics.
- Aetiology of formation.
- Composition.

Stones can be classified into those caused by [1,2]:

- 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 [1,2,5]:

- Calcium oxalate, phosphate, or both [1,2,9] – typically 70-80% of stones [5]:
  - Calcium oxalate stones are associated with [1,2]:
    - 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 [1,2]:
    - Hypercalciuria.
    - Elevated serum calcium
    - Hyperparathyroidism.
    - Renal tubular acidosis.
    - Urinary tract infections (UTI).
- Magnesium ammonium phosphate (*Struvite stones*) – 2-15% [1,2]:
  - Associated with UTI caused by urea-splitting organisms e.g.:
    - *Proteus spp.*
- Uric acid – approximately 10% of stones [1,2]:
  - 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% [1,2]:
  - Result from cystinuria, a genetic disorder.
- Other substances (e.g. xanthine) – 1% [1,2].

4.4 Higher Risk Groups

Risk factors for stone formation include:

- Age and gender [9,10]:
  - 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.
  - Peak age in men is 30 years; the peak ages in women are 35 years and 55 years.
- Low urine output (<1L/day) caused by [9,11]:
  - Excessive losses; and/or

    - Low fluid intake.
- Urinary pH strongly influences the formation of various types of stones, e.g. [1,2]:
    - 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 [11].
- Certain medications, e.g. [1,2,12]:
    - Calcium supplements.
    - Vitamin D & C.
    - Diuretics.
    - Protease inhibitors, e.g. indinavir.
- Certain medical conditions e.g. [1,2,11]:
    - Recurrent UTI.
    - Gout.
    - Metabolic syndrome.
    - Obesity.
    - Bariatric surgery.
    - Hyperparathyroidism.
    - Gastrointestinal causes e.g.:
        - Crohn's disease.
        - Malabsorptive conditions.
- Anatomical abnormalities of the urinary tract [1,2].

5 Presentation

Urolithiasis:

- May be symptomatic or asymptomatic [1,2].
    - Asymptomatic stones may be found as incidental findings when patients have investigations for other reasons, e.g. ultrasound [13].
- The main symptom is renal/ureteric colic.
- Pain may be accompanied by [11]:
    - Nausea.
    - Vomiting.
    - Haematuria.
    - Lower urinary tract symptoms (LUTS).
    - Constitutional symptoms e.g. fever, malaise.

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

6 Differential Diagnosis

The differential diagnosis of urolithiasis includes [11,13,14]:

- 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.

7 Initial Management

7.1 Provide Analgesia and/or Anti-Emetics

Analgesia:

- Where possible, unless there are contraindications, a non-steroidal anti-inflammatory drug (NSAID) should be the first drug of choice [1–3] [**L1, RGA**]:
- If an NSAID is not suitable, consider an opiate, if available, such as [1,2] [**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 [11]:
- Considerations for prescribing diclofenac [15]:
    - Is contraindicated in patients with:
        - Asthma.
        - 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 [15]:
        - Hypertension.
        - Diabetes.
        - Hyperlipidaemia.
        - Smoking.

If necessary, administer a parenteral anti-emetic for the relief of severe nausea and/or vomiting e.g. metoclopramide hydrochloride [3,4,11].

7.2 Consider Suitability for Home Management

Consider the patient's suitability for home management if [16]:

- 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.

Offer advice to the patient:

- Advise adequate fluid intake to maintain lightly-coloured urine [1,2,11].
- Avoid excessive fluid intake during an acute attack of renal colic.
- Seek urgent medical assistance if [16] [**L2**]:
    - They develop fever or rigors.
    - The pain worsens.
    - They have a rapid recurrence of severe pain.

7.3 Initial Investigations

In patients deemed suitable for home management, undertake the following initial investigations in an outpatient setting [**R-GDG**]:

- Urine tests [1–3]:
  - Urinalysis by dipstick or microscopy.
- Blood tests [1–3]:
  - Complete blood count [1,2,4][**L1, RGA**].
  - Urea, electrolytes and creatinine.
- Imaging [1,2]:
  - Urinary tract ultrasound.
    - Ultrasound is preferred unless CT scanning is readily available [**R-GDG**].

7.4 Indications for Referral to the Emergency Department

Refer the patient to the Emergency Department, if the patient has renal colic and any of the following [1,2,11,14,16]:

- 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 are not possible.
- Oliguric or anuric.
- Bladder or urethral stones on imaging with or without acute urinary retention.
- Elevated creatinine and/or leucocytosis.
- 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.

7.5 Elective Referral to Specialist Care

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.

8 Specialist Management of Urolithiasis

8.1 Investigation

Undertake the following investigations:

- Urine tests [1,2]:
  - Urinalysis by dipstick or microscopy.
  - Urine culture and sensitivity.
- Blood tests [1–4] [**L1, RGA**]:
  - Complete blood count.
  - Urea, electrolytes and creatinine.
  - Coagulation profile, if intervention is planned.
  - Blood culture if infection is suspected, patient is clinically unwell or has fever.
- Imaging [1,2]:
  - Non-contrast-enhanced CT (NCCT) (unless contraindicated):
    - NB: Do not delay pain relief or the above tests for imaging assessments [1,2].
    - If stone removal is planned *and* renal collecting system anatomy needs to be assessed, then a contrast study is recommended [1,2] [**L3, RGA**].

NB: Urinary tract ultrasound:

- Ultrasound is preferred as the initial imaging test in the Emergency Department setting unless CT scanning is readily available [**R-GDG**].

8.2 Indications for 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 [3,4]:

- Decompress the renal collecting system, if the patient has [1–4]:
  - Sepsis or an infected obstructed kidney [1,2] [**L1, RGA**]:
    - The obstructed kidney with signs of UTI is a urological emergency.
    - Delay definitive treatment of the stone until the infection is cleared following a complete course of antimicrobial therapy.
  - A single functioning kidney or bilateral obstruction.
  - Intractable pain.
- Urgently decompress the collecting system using [1,2] [**L1, RGA**]:
  - Percutaneous drainage; or
  - Ureteral stenting.

Following urgent decompression [1,2] [**L2, RGA**]:

- Send both urine and blood samples for culture and sensitivity testing.
- Initiate antibiotics immediately, if not already started.

8.3 Trial of Conservative Management or Medical Expulsive Therapy

Conservative management [1,2]:

- Can be offered to newly diagnosed patients with:
  - Stones ≤10 mm; and

- In whom pain can be adequately managed; and
- Adequate renal functional reserve; and
- No evidence of sepsis; and
- No other indications for urgent stone removal are present; and
- Adequate compliance with the treatment plan and access to healthcare is available.

Consider medical expulsive therapy (MET):

- MET should be offered to facilitate ureteral stone passage if conservative management is preferred [1,2] [**L1, RGA1**].
- For MET [1,2]:
  - Alpha blockers are recommended (mostly for distal ureteral stones > 5mm) [1,2] [**L1, RGA**].
  - Patients should be followed up once within 2 weeks to monitor for stone position and hydronephrosis [1,2] [**L3, RGA**].
  - Discontinue treatment if complications develop, e.g. [1,2]:
    - Infection.
    - Refractory pain.
    - Deterioration of renal function.
- NB: Patients should be counselled about the risks of MET, including drug side effects [1,2].

8.4 Surgical Treatment

Stone removal [1,2,17]:

- Active removal of renal stones should be considered if there is evidence of:
  - Stone growth.
  - Related infection.
  - Acute or chronic pain.
  - de novo obstruction.

- A variety of techniques are available, depending on:
  - The number of stones.
  - The size of the stones.
  - The stone site and type.

- These techniques include:
  - Extracorporeal shockwave lithotripsy.
  - Percutaneous nephrolithotomy.
  - Ureteroscopic techniques.
  - Open or laparoscopic surgery.

8.4.1 Extracorporeal Shock Wave Lithotripsy

Extracorporeal shock wave lithotripsy (ESWL) [1,2]:

- May be an option for stones ≤20 mm in the renal pelvis and upper or middle calices.
- Is unlikely to be successful, in the following:
  - For renal stones >15 mm in diameter at the lower renal pole.
  - For ureteral stones >10mm in diameter.
  - Shockwave-resistant stones e.g.:

        - Stones with density >1,000 HU.
        - Cystine stones.
- Contraindications include [1,2]:
    - UTI.
    - Pregnancy.
    - Lower ureteric stones in women of child-bearing age.
    - Bleeding diathesis.
    - Arterial aneurysm in the vicinity of the stone.
    - Severe skeletal malformations.
    - Morbid obesity.
    - Anatomical obstruction distal to the stone.

To facilitate clearance after ESWL, MET may be useful [1,2].

8.4.2 Percutaneous Nephrolithotomy

Percutaneous nephrolithotomy (PNL) [1,2,18]:

- Is the preferred treatment for removal of:
    - Renal stones >20 mm in diameter.
    - Ureteral stones that:
        - Cannot be accessed via a retrograde approach; or
        - Are not amenable to ESWL.
- Is an effective and durable treatment for calyceal diverticular stones.
- May be considered for stone size <20 mm especially in the unavailability of flexible URS or abnormal anatomy such re-implanted ureter. [**R-GDG**]
- Contraindications [1,2]:
    - UTI.
    - Anticoagulant therapy.
    - Potential malignant kidney tumour.
    - Pregnancy.
- Consider placing a nephrostomy tube or ureteric stent at the end of the PNL procedure [1,2].

8.4.3 Ureteroscopy and Stone Extraction

Consider Ureteroscopy (URS) (semi-rigid or flexible) [1,2]:

- For the removal of larger renal stones (>20 mm) if PNL is not possible [1,2] [**L2, RGA**].
    - However, there may be a higher risk that a follow-up procedure and placement of a ureteral stent may be needed.
- For the removal of ureteric stones.
- Failure of conservative treatment with MET.
- For patients with an uncorrected bleeding disorder or on continued antithrombotic therapy:
    - URS may be an alternative option, as it is associated with less morbidity than ESWL or PNL.

NB: There are no specific contraindications to URS other than UTI.

Stenting in URS [1,2]:

- In uncomplicated URS, routine stenting may not be necessary.
- Ureteral stents should be inserted in patients who are at increased risk of complications.
- An alpha-blocker can reduce the rate of stent-related symptoms.
- In all patients, perioperative antibiotic prophylaxis is recommended.

8.1.4 Open and Laparoscopic Surgical Stone Extraction

Open or laparoscopic surgery may be considered in rare cases in which ESWL, URS and PNL have failed or are unlikely to be successful [1,2] [**L2**].

8.5 Medical Treatment

Alkalinisation of urine is an option for [1,2,6]:

- Treatment of uric acid stones.
- Prevention of cystine stones.

Works by alkalinisation of urine using alkaline citrate or sodium bicarbonate. For information on the stone composition and type, consider the following prior to chemolysis [1,2,6]:

- Stone analysis.
- Urinary pH measurement.
- Radiographic characteristics.

NB: Alkalinisation of urine cannot be used for Struvite stones.

8.6 Follow-Up

Consider stone analysis in all patients in whom a stone is collected [**R-GDG**].

Ensure patients with recurrent stone formation [1,2,6]:

- Are followed up periodically to monitor the course of their disease.
- Are evaluated for metabolic risk factors.
- Have stone prevention strategies in place.

9 Key Considerations for Patient Preferences

Patient preferences refer to patient perspectives, beliefs, expectations, and goals for health and life, and to the steps employed by individuals in assessing the potential benefits, harms, costs, and limitations of the management options in relation to one another. Patients may have preferences when it comes to defining their problems, identifying the range of management options and selecting or ranking the outcomes used to compare these options.

It is important for healthcare professionals to develop an understanding of the patient as an individual and the unique way in which each person experiences a condition and its impact on their life.

The following recommendations are therefore made for physicians and other healthcare professionals regarding general principles of patient care in Qatar:

- **Respect Patients:** Treat patients with respect, kindness, dignity, courtesy and honesty. Ensure that the environment is conducive to discussion and that the patient's privacy is respected, particularly when discussing sensitive, personal issues. Ask the patient how they wish to be addressed and ensure that their choice is respected and used.

- **Maintain Confidentiality:** Respect the patient's right to confidentiality and avoid disclosing or sharing patients' information without their informed consent. In this context, students and anyone not directly involved in the delivery of care should first be introduced to the patient before starting consultations or meetings, and let the patient decide if they want them to stay.

- **Clarify Third-Party Involvement:** Clarify with the patient at the first point of contact whether and how they like their partner, family members or carers to be involved in key decisions about their care or management and review this regularly. If the patient agrees, share information with their partner, family members or carers.

- **Obtain Informed Consent:** Obtain and document informed consent from patients, in accordance with MOPH policy and guidance.

- **Encourage Shared Decision Making:** Ensure that patients are involved in decision making about their own care, or their dependent's care, and that factors that could impact the patient's participation in their own consultation and care including physical or learning disabilities, sight, speech or hearing impairments and problems with understanding, reading or speaking English are addressed.

- **Disclose Medical Errors:** Disclose errors when they occur and show empathy to patients.

- **Ensure Effective Communication:** Explore ways to improve communication including using pictures, symbols or involving an interpreter or family members. Avoid using medical jargon. Use words the patient will understand and confirm understanding by asking questions.

- **Ensure Continuity of Care:** Provide clear and timely sharing of patient information between healthcare professionals especially at the point of any transitions in care.

10 Performance Measures

A list of performance measures is given in the table below. Healthcare organisations are encouraged to monitor service performance using the indicator definitions below [19].

Number	Numerator	Denominator
U01	Number of patients who are diagnosed with urolithiasis who have initial pain relief using an NSAID.	Total number of patients diagnosed with urolithiasis.
U02	Number of urolithiasis patients who had inappropriate referral to the Emergency Department.	Total number of patients with urolithiasis who were referred to the Emergency Department.
U03	Number of patients with urolithiasis who had inappropriate referral to urology specialist.	Total number of patients with urolithiasis who were referred to a urologist.

Table 10.1: Performance measures.

11 References

1. Türk C, Knoll T, Petrik A, et al. EAU Guidelines on Urolithiasis. 2015.
2. Türk C, Neisius A, Petrik A, et al. EAU Guidelines on Urolithiasis. 2017.
3. Tsiotras A, Smith RD, Pearce I, O'Flynn K, Wiseman O. British Association of Urological Surgeons standards for management of acute ureteric colic. *J Clin Urol*. 2018;11(1):58-61. doi:10.1177/2051415817740492
4. British Association of Urological Surgeons. Guidelines for acute management of first presentation of renal/ureteric lithiasis (excluding pregnancy). 2012.
5. Miller NL, Lingeman JE. Management of kidney stones. *BMJ*. 2007;334(7591):468-472. doi:10.1136/bmj.39113.480185.80
6. Frassetto L, Kohlstadt I. Treatment and prevention of kidney stones: an update. *Am Fam Physician*. 2011;84(11):1234-1242.
7. Stedman TL. *Stedman's Medical Dictionary*. 28th ed. Philadelphia: Lippincott Williams & Wilkins; 2006.
8. Robertson WG. Stone formation in the Middle Eastern Gulf States: A review. *Arab J Urol*. 2012;10(3):265-272. doi:10.1016/j.aju.2012.04.003
9. Parmar MS. Kidney stones. *BMJ*. 2004;328(7453):1420-1424. doi:10.1136/bmj.328.7453.1420
10. Pearle MS, Goldfarb DS, Assimos DG, et al. Medical management of kidney stones: AUA guideline. *J Urol*. 2014;192(2):316-324. doi:10.1016/j.juro.2014.05.006
11. Best Practice Advocacy Centre New Zealand. Managing patients with renal colic in primary care: Know when to hold them. 2014.
12. Thomas M. Clinical diagnosis of kidney stones. *Nephrology*. 2007;12(s1):S1-S3. doi:10.1111/j.1440-1797.2006.00721.x
13. Portis AJ. Diagnosis and Initial Management of Kidney Stones. *Am Fam Physician*. 2001;63(7):10.
14. Stewart A, Joyce A. Modern management of renal colic. *Trends Urol Gynaecol Sex Health*. 2008;13(3):14-17. doi:10.1002/tre.68
15. Diclofenac: new contraindications and warnings. GOV.UK. https://www.gov.uk/drug-safety-update/diclofenac-new-contraindications-and-warnings. Accessed September 16, 2019.
16. Wright PJ, English PJ, Hungin APS, Marsden SNE. Managing acute renal colic across the primary-secondary care interface: a pathway of care based on evidence and consensus. *BMJ*. 2002;325(7377):1408-1412. doi:10.1136/bmj.325.7377.1408
17. National Institute for Health and Care Excellence (NICE). Laparoscopic nephrolithotomy and pyelolithotomy. Interventional procedure guidance 212. 2012.
18. Turna B, Raza A, Moussa S, Smith G, Tolley DA. Management of calyceal diverticular stones with extracorporeal shock wave lithotripsy and percutaneous nephrolithotomy: long-term outcome. *BJU Int*. 2007;100(1):151-156. doi:10.1111/j.1464-410X.2007.06911.x
19. Champagne F, Dhami S. WHO Recommendations and Implementation Plan to Optimize and Institutionalize the National Clinical Guidelines for Qatar Project. 2017.

Appendix: Detailed Description of the Literature Search

A systematic search for existing literature on urolithiasis was performed in the period September 10th – September 22nd, 2019.

All existing references were evaluated and where necessary and applicable, the latest version of the specific manuscript was used to update the guideline and replace the older reference. The search for clinical practice guidelines on urolithiasis diagnosis and/or management was performed in the *PubMed* database and websites of relevant organisations and societies including the *UK NICE*, the *European Association of Urology,* the *American Urological Association*, and the *British Association of Urological Surgeons*. The present guideline is primarily based on EAU and BAUS guidelines and is supplemented with other relevant studies.

Peer-reviewed scientific publications were found in PubMed and via *Google Scholar* Internet search engine. Non-peer reviewed studies were identified in *bioRxiv*. Books were checked on *Amazon* and via *Google* and *Google Scholar* search engines.

The included publications were identified using the terms “urolithiasis” and specified with the following terms in combinations:

guideline, epidemiology, definition, prevalence, risk factors, screening, diagnosis, differential diagnosis, symptoms, management, investigation, treatment, referral, specialist, emergency, pharmacological therapy, anti-emetic, NSAID, alpha-blockers, conservative, expulsive therapy, decompression, surgery, extracorporeal shock, lithotripsy, nephrolithotomy, ureteroscopy, laparoscopy, follow-up.

Figure A.1 on the next page demonstrates graphically the results of the search and application of exclusion criteria.

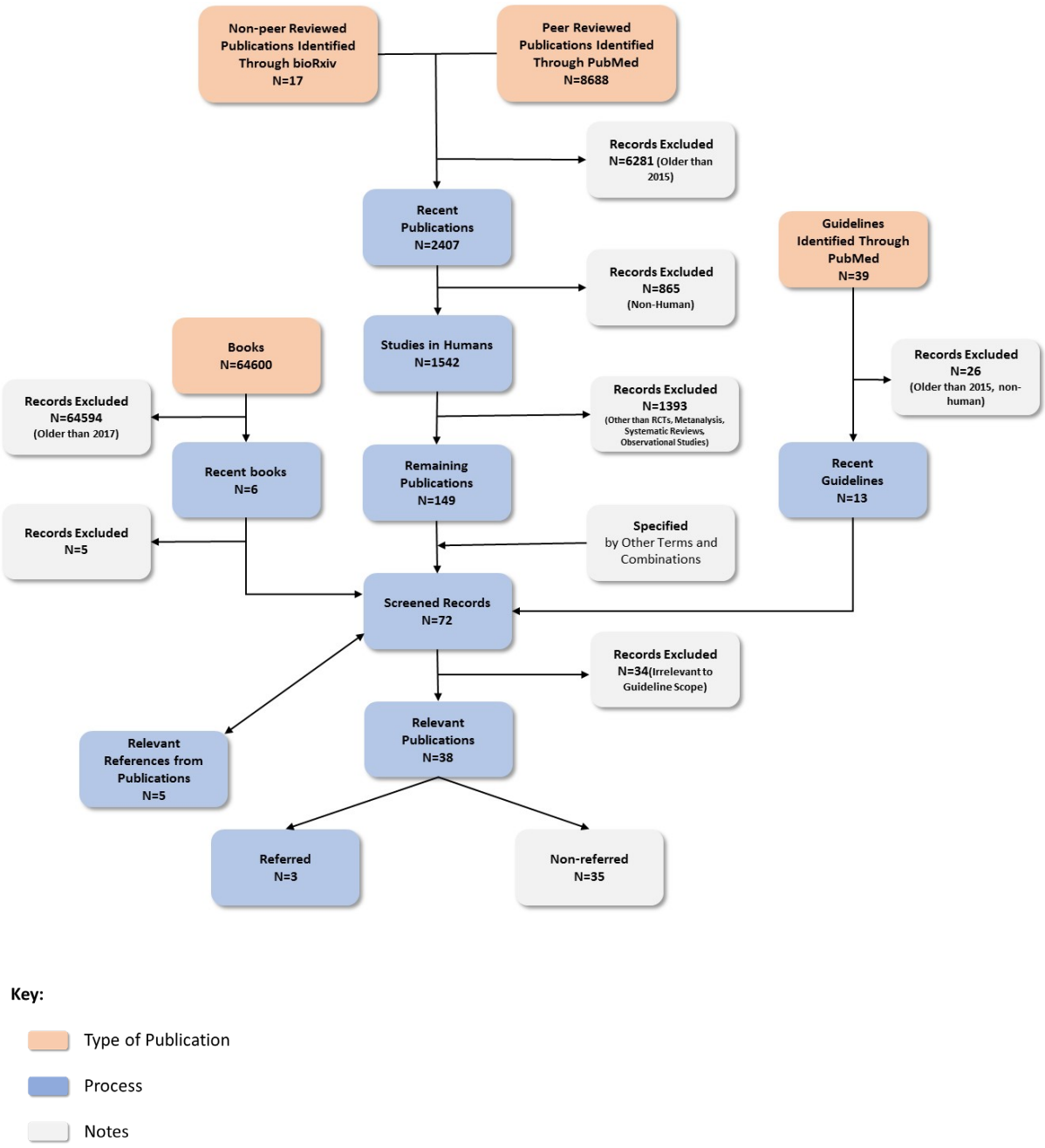

Fig A.1: Literature search results and application of exclusion criteria.

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