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ENDOUROLOGY
Guideline of guidelines

Guideline of guidelines for kidney and bladder stones

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ABSTRACT

Urological organizations publish detailed evidence-based guidelines to support the urologists in the management of urolithiasis. Our objective was to provide clear guidance on the management of urolithiasis, compare the American Urological Association (AUA) and European Association of Urologists (EAU) guidelines, and present an algorithm for different clinical scenarios. The latest AUA and EAU guidelines on urolithiasis were evaluated for the level of evidence and grade of recommendation. All recommendations on management of urolithiasis (surgical and medical management) were reviewed and included. Both the organizations provide guidance for initial patient assessment, imaging requirements, and therapeutic options, including surgical intervention and medical therapy. In addition, these guidelines provide advice for managing specific patient groups, including pediatric patients and pregnant patients. Although there is a general concordance between both the groups, differences exist particularly for recommended modality of surgical intervention depending on stone location and size. Although both the guidelines were broadly similar, we also highlighted the variations in the level of evidence and grade of recommendation. Although these guidelines provide a valuable evidence-based framework to support the management of urinary tract stones, their implementation must be tailored to individual patient needs and available resources.

Keywords: Bladder stones; guideline; lithotripsy; nephrolithotomy; percutaneous; ureteroscopy; urolithiasis.

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Introduction

Urinary tract stones are common, with a global prevalence of approximately 14%, which varies depending on age, sex, and ethnicity.[1,2] The majority are found in the upper urinary tract and 5% are found within the bladder.[3] They present a significant clinical and economic workload to the healthcare systems.[4,5] Many professional institutions have developed extensive guidelines to aid the clinicians in the assessment, diagnosis, and management of urolithiasis. The American Urology Association (AUA) and the European Association of Urology (EAU) have both published separate guidelines for the management of stone disease.

The AUA has published separate guidelines for surgical and medical management of the upper tract stone disease, most recently updated in 2016 and 2019, respectively.[6,7] There are separate EAU guidelines for upper tract stones and bladder stones, both of which received a minor update in 2020.[8,9] Both the guidelines evaluate the strength of evidence using different methods (Appendix 1). The AUA assesses the level of evidence alphabetically and uses specific nomenclature to demonstrate the strength of recommendation. The EAU recommendations are classified as "strong" or "weak" using the modified grading of recommendations assessment, development, and evaluation system[10,11] and the key elements considered by the panel to form the basis of the strength of recommendation.

Although guidelines are a valuable tool for the clinicians, they are not without issue because they are only periodically updated despite new evidence being published continuously. Therefore, caution should be exercised when interpreting the guidelines, particularly for complex cases.

Primary Assessment

Presentation

Urolithiasis may present with loin pain, fever, nausea, and vomiting or with an incidental finding. Urgent investigation is required in

those with features suggestive of infection or solitary kidney (EAU: Strong recommendation). Bladder stones present differently with lower urinary tract symptoms (LUTS) predominantly, but hematuria and suprapubic pain may also be present.

Initial Investigations

Renal and ureteric stones

In the presentation of acute flank pain, noncontrast computed tomography (NCCT) is the most sensitive and specific mode of imaging to confirm the diagnosis of upper urinary tract stones (EAU: Strong recommendation). However, the EAU recommends ultrasound (US) to be used initially, if available, because it is inexpensive and radiation-free. If the urinary tract anatomy needs assessment before stone removal, contrast imaging should be performed (EAU: Strong recommendation).

The AUA recommends NCCT before performing percutaneous nephrolithotripsy (PCNL) (AUA: Strong recommendation), and it could identify the candidate's suitability for shockwave lithotripsy (SWL) versus ureteroscopy (URS) (AUA: Conditional recommendation). If significant renal function impairment is suspected, functional imaging, e.g. diethylene-triamine-pentaacetate or mercaptoacetyltriglycine could be used to assess the renal function (AUA: Conditional recommendation).

In pregnancy, US is the recommended first-line imaging modality with magnetic resonance imaging being the second-line, and low-dose NCCT as the last resort (EAU: Strong recommendation).

US is also the preferred choice of imaging in children to limit the exposure to ionizing radiation. However, because of the low sensitivity of US,[12,13] a kidney-ureter-bladder (KUB) X-ray or low-dose NCCT may be necessary if the US is inadequate (EAU: Strong recommendation). The AUA recommends obtaining NCCT imaging in children before PCNL (AUA: Strong recommendation).

In addition to imaging, basic biochemical profiling of the blood and urine should be performed on patients presenting as an emergency (Table 1).

Main Points:

- The American Urology Association (AUA) and the European Association of Urologists (EAU) both publish evidence-based guidelines on the surgical and medical management of upper urinary tract stones. Only the EAU produces guidelines for bladder stones.
- Both groups provide recommendations of varying strength according to their assessment of the level of evidence available.
- The AUA and EAU guidance is broadly similar with the main differences existing between choice of surgical management depending on upper urinary tract stone size and location.

Bladder stones

US imaging of the bladder is the first-line recommendation in both adults and children presenting with symptoms suggestive of bladder stones. If clinical concern persists despite negative US findings, an NCCT or cystoscopy, which have higher sensitivity than US, should be performed in adults (EAU: Strong recommendation). The KUB X-ray may be useful in adults with confirmed bladder stones to plan treatment and follow-up (EAU: Weak recommendation). No specific second-line investigation for children is advised because of limited evidence. Investigations to determine the underlying cause of the bladder stone should include physical examination, uroflowmetry, urine dip and pH, stone analysis, and serum biochemistry as for upper urinary tract stones.

Management

Ureteric stone

Emergency management

An infected, obstructed renal system is a urological emergency and prompt management is required. Both ureteric stenting and

Table 1. Summary of the recommended hematological, biochemical, and urine analysis

	Tests to be performed
Blood	**Hematology**
	Red blood cells
	White cells
	Hemoglobin
	Hematocrit
	Platelets
	Biochemistry
	(Ionized) calcium
	Creatinine
	CRP
	Potassium
	Sodium
	Uric acid
	Coagulation
Urine	**Urine dip**
	Nitrites
	pH
	Red cells
	White cells
	Following urine dip if infection is suspected
	Urine microscopy and/or culture

CRP: C-reactive protein

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percutaneous nephrostomy are deemed to be equally effective at achieving decompression, and definitive treatment should be postponed until sepsis has resolved (EAU/AUA: Strong recommendation). The EAU strongly recommends immediate initiation of antibiotic therapy, acquiring a urine sample at decompression, and amending antibiotic therapy once sensitivities are available.

Renal colic

The EAU strongly recommends managing the acute renal colic with nonsteroidal anti-inflammatory drugs (NSAIDs) and paracetamol in the absence of contraindication, with weak evidence supporting the second-line use of opioids. NSAIDs are also beneficial for reducing the recurrent episodes of renal colic in those managed expectantly.[8] If the colic is refractory to medical management, decompression of the renal system or stone removal are indicated (EAU: Strong recommendation).

Uncomplicated ureteric stones may be managed conservatively (AUA/EAU: Strong recommendation). The AUA applies this to stones ≤10 mm, but the EAU is less specific, stating that "small" stones may be observed with a suggestion that small implies a size of <6 mm, because meta-analysis has shown that rates of spontaneous passage of stones reduced with increasing stone size.[14]

The AUA advocates the use of medical expulsive therapy (MET) in the form of alpha-blockers (tamsulosin) for uncomplicated distal ureteric stones ≤10 mm (Strong recommendation). The EAU differs by suggesting that alpha-blockers should be used only in distal ureteric stones >5 mm because a large randomized controlled trial demonstrated no benefit in using alpha-blockers for distal ureteric stones of <5 mm (Strong recommendation).[15]

The AUA guidelines state that definitive stone management is indicated if conservative management, with or without MET, has been unsuccessful after a period of 4–6 weeks (Moderate recommendation). However, it should be noted that the EAU does not place a timeframe on conservative management.

Reimaging is appropriate before treatment if there has been a change in symptoms because this may reflect stone migration or passage and alter management (AUA: Clinical principle). SWL or URS are the most common treatment modalities used for definitive management of ureteric stones. The patients should be informed that SWL is associated with less morbidity and a lower complication rate than URS; however, SWL has a lower stone-free rate (SFR) after a single procedure than URS (AUA/EAU: Strong recommendation), although there is no statistical difference in SFR at 3 months between URS and SWL.[16] URS is recommended as the first-line treatment for ureteric stones >10 mm, with the exception of the AUA stating equivalence between SWL and URS for proximal ureteric stones >10 mm (Figure 1). The EAU guidelines recommend that distal or proximal ureteric stones <10 mm can be managed with either SWL or URS as first-line treatment, whereas the AUA recommend preferential use of URS over SWL for distal/mid ureteric stones (AUA: Strong recommendation). URS is preferred in morbidly obese patients owing to the increased SFR (EAU: Strong recommendation).

Renal stones

Asymptomatic renal stones may be managed conservatively with active surveillance, with both organizations acknowledging a lack of high-quality evidence to support this (AUA: Conditional recommendation). The EAU states that the stones <15 mm may be conservatively managed.[8] If conservative management is chosen, regular surveillance (initially 6 months, then annually) with imaging should be performed to evaluate the symptoms and assess the stone growth (EAU: Strong recommendation). Active management is indicated for new symptoms, increasing stone size for stones >5 mm, infection, or lifestyle reasons, including occupation or patient choice (EAU: Weak recommendation).

Both the institutions recommend PCNL as the preferential treatment modality for all renal stones >20 mm owing to the increased SFR and reduced need for a second procedure (AUA/EAU: Strong recommendation). Staged URS or SWL may be offered as the second-line treatment if PCNL is not appropriate (EAU: Strong recommendation). Both SWL and URS are recommended as first-line treatments for non-lower pole stones ≤20 mm (AUA: Strong recommendation), with the EAU also including PCNL as another option for stones sized 10–20 mm.[8] The guidance on lower pole stones varies slightly with both associations advocating the use of URS or SWL as the first-line treatment for stones <10 mm. However, the AUA states that SWL should not be offered as the first-line therapy for lower pole stones >10 mm, whereas the EAU lists SWL as the first-line treatment alongside URS and PCNL in the absence of unfavorable factors for SWL (AUA/EAU: Strong recommendation).

Unfavorable factors for SWL include long skin-to-stone distance, long calyx, steep infundibular-pelvic angle, narrow infundibulum, or shockwave-resistant stones (calcium oxalate monohydrate, brushite, or cystine).[8] In the rare circumstances that SWL or endourological surgery is unsuccessful or not possible, laparoscopic or open surgery can be offered for stone removal (AUA/EAU: Strong recommendation).

Bladder stones

Transurethral cystolithotripsy offers the same SFR as open suprapubic cystolithotripsy, with shorter length of hospital stay and low rates of major complications or further unplanned procedures.[9] If transurethral cystolithotripsy is not possible, percutaneous cystolithotripsy should be considered because this also has a shorter length of hospital stay than an open proce-

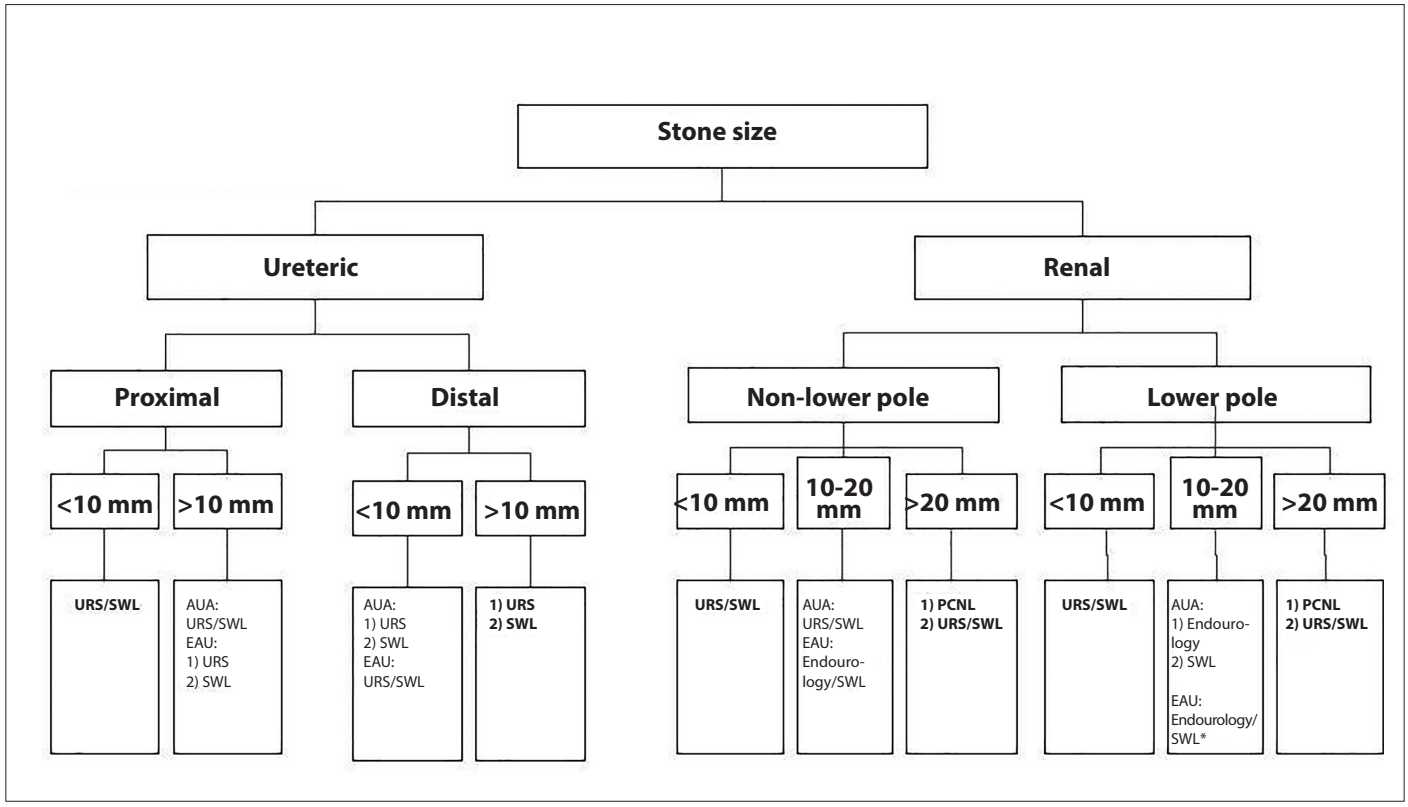

Figure 1. Flowchart demonstrating the recommended management according to the stone size and location
Endourology=URS+PCNL. *=If favourable factors for SWL as discussed in text
Bold Text=denotes recommendation from both AUA and EAU. URS: ureteroscopy; SWL: shockwave lithotripsy; PCNL: percutaneous nephrolithotripsy

dure (EAU: Strong recommendation). The operation duration is shorter when using a nephroscope rather than a cystoscope (EAU: Weak recommendation). If indicated, surgery for bladder outflow obstruction should be performed simultaneously with bladder stone surgery (EAU: Strong recommendation). SWL is less invasive than other therapeutic options; however, SFR is lower and can be considered alongside laparoscopic or open surgery if endoscopic treatment is not possible (EAU: Weak recommendation).

Treatment specific considerations

Numerous factors need to be considered before selecting the treatment modality, including patient preference and comorbidity, former stone analysis, and imaging findings, including Hounsfield unit on NCCT (EAU: Strong recommendation).

SWL

The AUA strongly recommends against pre-stenting for SWL. Although the risk of steinstrasse is greater in patients without stents, there is no difference in SFR and an increased risk of developing LUTS secondary to the stent.[17] The EAU provides technical advice, which includes advocating the use of ultrasound gel as a coupling agent, incremental increases in power to limit the renal injury, an optimum frequency of 1–1.5 Hz, and careful imaging control to optimize SWL outcomes (EAU: Strong recommendation). Both the groups support the use of antibiotics in the presence of urinary tract infection, with the EAU extending this to those who have been pre-stented (AUA: Clinical principle, EAU: Strong recommendation). The AUA and EAU endorse the off-label use of alpha-blockers after SWL to promote stone fragment expulsion and increase SFR (AUA: Moderate recommendation). However, SWL should not be used in the presence of anatomical or functional obstruction of the collecting system distal to the stone because of the reduced potential for fragment clearance (AUA: Strong recommendation).

Ureteroscopy

The routine placement of a ureteric stent preoperatively is not necessary, although the EAU guidelines note that it improves the outcomes for renal stones in particular (AUA: Strong recommendation).[18] Despite being relatively common practice, both the AUA and EAU advise against postoperative ureteric stenting in uncomplicated cases because this is associated with increased morbidity without an improvement in SFR (AUA/EAU: Strong recommendation).[19] In situations where a stent is placed, MET may facilitate stone fragment expulsion and provide relief from the stent-related symptoms (AUA: Moderate recommendation, EAU: Strong recommendation). URS is the preferred interven-

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tion in cases where antithrombotic therapy must be continued because it is associated with less morbidity than SWL or PCNL (EAU: Strong recommendation).

The AUA and EAU recommend using a safety wire whenever possible, although the AUA states that a ureteric access sheath (UAS) can provide the same function if it reaches the renal pelvis (AUA: Expert opinion). There are no formal recommendations regarding the use of UAS in either guidelines, with the EAU stating that their use depends on the urologist's preference.[8] UAS has advantages in prolonged procedures by reducing the intrarenal pressures, and it can facilitate multiple passages to the renal pelvis in cases of large stone burden; however, it may increase the risk of ureteric mucosal injuries.[20,21] The EAU advocates the use of Holmium-YAG laser lithotripsy for URS because it is effective in all the stone types, and they state that bilateral URS can be considered but may have an increased risk of minor complications.[22] According to both the associations, antibiotic prophylaxis should be used for all the endoscopic stone treatments, including PCNL (AUA: Clinical principle, EAU: Strong recommendation).

PCNL

The EAU discusses patient positioning for PCNL, concluding that both prone and supine positioning are equally safe with no difference in operative time.[8] The AUA recommends preoperative CT before PCNL; the EAU broadens the imaging requirement to include US or intraoperative fluoroscopy (AUA/EAU: Strong recommendation). The AUA recommends flexible nephroscopy as a routine component of standard PCNL because this is associated with increased SFR of 92.5% compared with 70% for rigid nephroscopy alone (AUA: Strong recommendation).[23] The use of smaller instruments (miniaturized PCNL) is associated with reduced blood loss but increased operative time.[24] The EAU guidelines state that nephrostomy placement for uncomplicated PCNL is not required because it is associated with reduced postoperative pain and shorter length of hospital stay; however, it is optional in the AUA guidelines (AUA: Conditional recommendation, EAU: Strong recommendation).

Specific patient groups

Pregnancy

Conservative management of stones during pregnancy is preferred in uncomplicated cases with well-controlled symptoms (AUA/EAU: Strong recommendation). In cases where active management is indicated, there should be multidisciplinary decision making between the urology, radiology, anesthetic, and obstetric teams (AUA: Clinical principle).[25]

Management options include temporizing strategies with nephrostomy or ureteric stenting, which may be poorly tolerated or require regular changes owing to the accelerated encrustation during pregnancy. An alternative would be definitive treatment with URS (AUA: Strong recommendation).

Pediatrics

The management of urolithiasis in children is broadly similar to that in adults, with some important differences. The AUA supports conservative management of uncomplicated ureteric stones ≤10 mm with or without off-label use of MET (AUA: Moderate recommendation). The EAU discusses a lack of evidence regarding conservative management; however, asymptomatic, nonstruvite, noncystine stones <7 mm with no anatomical abnormalities may be managed expectantly.[26] The EAU advises that if treatment is indicated, SWL should be offered as the first-line therapy for ureteric stones <10 mm, with URS as an alternative for stones not amenable to SWL (EAU: Strong recommendation). The AUA suggests that if conservative management fails or is inappropriate, either URS or SWL are the options (AUA: Strong recommendation). Renal stones <20 mm can be managed with SWL or URS (AUA: Moderate recommendation, EAU: Strong recommendation).[27] The EAU advises PCNL for renal stones >20 mm, whereas the AUA includes SWL with a ureteric stent or a nephrostomy tube as an alternative (AUA: Expert opinion, EAU: Strong recommendation). Furthermore, the AUA endorses active surveillance of asymptomatic nonobstructing renal stones, although no size criteria are given (AUA: Expert opinion).

Follow-up imaging

After active stone management with endourology or SWL, imaging is required to assess the stone clearance (EAU: Strong recommendation). NCCT has the highest sensitivity of stone fragment detection but increased ionizing radiation exposure compared with X-ray or US. The EAU suggests 4 weeks as an appropriate time for interval imaging while acknowledging the lack of high-quality data.[8] Consequently, they leave the timing of imaging and decision to treat the stone fragments to the discretion of the clinician.[28] The AUA recommends that if residual fragments are present, the patient should be offered endoscopic intervention (AUA: Moderate recommendation). In addition, they specifically state that if SWL was unsuccessful in the first attempt, the follow-up procedure should be endourological, although cases of partial fragmentation may be considered for further SWL (AUA: Moderate recommendation).

Secondary prevention

All patients with a new diagnosis of urolithiasis should undergo screening to include medical and dietary history, urinalysis, and serum biochemistry with parathyroid hormone if serum calcium level is elevated (AUA: Clinical principle). Once available, the stone should be sent for analysis to determine its composition (AUA: Clinical principle, EAU: Strong recommendation).

Stone analysis and screening results can be used to classify a patient as having a high risk or low risk for stone formation, with only high-risk patients requiring more detailed metabolic assessment (Table 2) (AUA: Standard). Metabolic urine testing of one or two 24-hour urine collections should include total volume, urinary pH, calcium, oxalate, uric acid, citrate, sodium, potassium, and creatinine with additional tests, such as cystine, when necessary (AUA: Expert opinion). The EAU advises that 2 consecutive 24-hour urine collections be performed.[8]

Ensuring an adequate fluid intake to maintain a daily urine output of >2.5 L is emphasized in both the guidelines (AUA: Standard, EAU: Strong recommendation). Both the organizations provide specific pharmacological and dietary guidance depending on the stone composition and metabolic status (Table 3).

Calcium stones

The AUA suggests that treatment for calcium stones is dependent on urinary levels of calcium, citrate, and uric acid.[29] In the absence of metabolic abnormalities or those who have been appropriately treated, thiazide diuretics and/or potassium citrate are recommended (AUA: Standard).

Uric acid stones

Urinary alkalinization is recommended as the first-line treatment by using alkaline citrates (AUA: Expert opinion). The AUA specifies that allopurinol should not be used as the first-line therapy (AUA: Expert opinion). The EAU recommends allopurinol in the presence of hyperuricosuria (EAU: Strong recommendation).

Cystine stones

Potassium citrate is recommended as the first-line treatment to neutralize the urine alongside increasing fluid intake (AUA: Expert opinion, EAU: Strong recommendation). The AUA specified that in addition to adequate fluid intake, one should limit the sodium and protein intake (AUA: Expert opinion). Refractory cases should be offered cystine-binding thiol drugs, such as tiopronin (AUA: Expert opinion, EAU: Strong recommendation).

Struvite stones

Surgical intervention is the recommended first-line treatment for struvite stones (EAU: Strong recommendation). The AUA recommends the use of acetohydroxamic acid in those who have exhausted all the surgical options (AUA: Option). The EAU strongly recommends the use of antibiotics in the presence of persistent bacteriuria.

Recommendations and areas of future research

The prevalence of urinary tract stones will increase in the future.[30] As more research is carried out and published,[31] the guidelines will help us manage the patients with an evidence-based approach. Although they can help us make these decisions, treatment should be tailored to individual patient needs and available resources. Future studies should adhere to standardized defini-

Table 2. Summary of risk factors for recurrent stone formation

	Examples
General factors	Family history of stone disease
	Solitary kidney
	Obesity
	Recurrent UTIs
Medical conditions	Gastrointestinal diseases affecting absorption (e.g. Crohn's Disease)
	RTA type 1
	Primary cystinuria (type A, B, and AB)
	Cystic fibrosis
	Hyperparathyroidism
	Gout
	PKD
	Type 2 diabetes mellitus
	Sarcoidosis
	Spinal cord injury, neurogenic bladder
Congenital/ Anatomical abnormalities	Medullary sponge kidney
	UPJ obstruction
	Calyceal diverticulum, calyceal cyst
	Ureteral stricture
	Vesico-uretero-renal reflux
	Horseshoe kidney
	Ureterocele
Drug induced	Acetazolamide
	Allopurinol
	Aluminum magnesium hydroxide
	Ascorbic acid
	Calcium
	Furosemide
	Laxatives
	Vitamin D
	Topiramate

UTIs: urinary tract infections; RTA: renal tubular acidosis; PKD: polycystic kidney disease; UPJ: ureteropelvic junction

Table 3. Summary of medical management depending on stone composition

Stone type	Metabolic status	AUA recommended interventions	AUA strength of recommendation	EAU recommended interventions	EAU strength of recommendation
Calcium oxalate	Hypercaluria	Limit sodium and calcium intake	Standard	Thiazide and alkaline citrates	Strong
		Thiazide	Standard		
	Hyperoxaluria	Avoid oxalate-rich foods but	Expert opinion	Oxalate intake restriction	Weak
		maintain normal calcium intake		Enteric - Alkaline citrates	Weak
				Calcium and magnesium	Weak
				Primary-Pyridoxine	Strong
	Hyperuricosuria	Limit non-dairy animal protein	Expert opinion	Avoid excessive intake of animal protein	Strong
		Allopurinol	Standard	Allopurinol (first-line)	Strong
				Febuxostat (second-line)	Strong
	Hypomagnesuria			Magnesium	
	Hypocitraturia	Increase the intake of fruit and vegetables and limit non-dairy animal intake.	Expert opinion	Alkaline citrates and sodium bicarbonate	Strong
		Potassium citrate	Standard		
	Hypernaturia			Restricted salt intake	Strong
Calcium Phosphate	Hypercaluria			Thiazide	Strong
	Acidic urine			L-methionine	Weak
Uric Acid	Alkaline urine	Potassium citrate	Standard	Alkaline citrates	Strong
	Hyperuricouria			Allopurinol	Strong
Cystine		Increase fluid intake	Expert opinion	Increase fluid intake	
		Limit sodium and protein intake		Alkaline citrates	
		Potassium citrate	Standard	Tiopronin (added if above treatments are insufficient)	
		Tiopronin (second-line, if unresponsive to above)	expert opinion		
Struvite		Surgical intervention (first-line)	Option	Surgical intervention (first-line)	Strong
		AHA (second-line)		AHA (second-line)	
	Acidic urine			Ammonium chloride or methionine	Weak
	Persistent bacteriuria			Antibiotics	Strong

AHA: acetohydroxamic acid; AUA: American Urological Association; EAU: European Association of Urologists

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tions, paying attention to the patient's quality of life and the cost of stone prevention and treatment.[32]

In conclusion, both AUA and EAU guidelines offer a detailed, evidence-based framework to guide the urologists in the management of stone diseases. Although some discrepancies exist, particularly regarding the choice of surgical management in specific scenarios, there is generally a consensus between both the groups. However, the guidelines are not applicable to every clinical situation and need to be used in conjunction with the most recently published material and tailored to each individual patient.

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Appendix 1. Table demonstrating the level of evidence and nomenclature used in the AUA and EAU guidelines

AUA Grade	Level of evidence	Further clarifications
A	Well-conducted and highly generalizable RCTs or exceptionally strong observational studies with consistent findings	RCT
B	RCTs with some procedural or generalizability weaknesses or moderately strong observational studies with consistent findings.	
C	RCTs with serious procedural deficiencies.	
AUA nomenclature used in medical management guidelines	Definition and link to level of evidence	
Options	Nondirective statement when the balance between benefits and risk/burden is unclear based on Grade A, B, or C evidence. Decision should be made by the clinician with the patient, taking into consideration the patient's past clinical history, current quality of life, preferences, and values.	
Recommendations	Directive statement guiding whether an action should* or should not** be undertaken based on Grade C evidence.	* Should is defined by benefits outweigh risks/burdens ** Should not is defined by risks/burden outweigh benefit
Standards	Directive statements guiding whether an action should* or should** not be undertaken based on Grade A or B evidence.	
AUA nomenclature used in surgical management guidelines		
Strong recommendations	Directive statement indicating that action should* or should not** be undertaken because there is a significant and substantial change of net benefit or harm. This is mainly based on Grade A or B evidence. Grade C is rarely used.	Grade A: (high certainty) future research unlikely to change confidence Grade B: (moderate certainty) better evidence could change confidence Grade C: (low certainty) better evidence is likely to change confidence
Moderate recommendations	Directive statement indicating an action should* or should not** be undertaken owing to a moderate chance of net benefit or harm. This is can be based on Grade A, B, or C evidence.	
Conditional recommendations	Nondirective statements when evidence shows there is no apparent benefit or harm, and the balance between benefits and risks/burden is unclear. This can be based on Grade A, B, or C evidence.	
AUA nomenclature used in medical and surgical management guidelines		
Clinical principle	Statement about clinical care which is widely agreed upon among clinicians when there may or may not be supporting evidenc in the medical literature.	
Expert opinion	Statement based on the consensus of the panel. This is based on clinical training, experience, knowledge, and judgment when there is no evidence to support.	
EAU	Strong or weak recommendations provided according to the following factors	
	1. Overall quality of evidence supporting the recommendations based on the modified GRADE system	
	2. Magnitude of the effects considering all individual or combined effects	
	3. Certainty of the results considering the precision, consistency, heterogeneity, and other statistical or study related factors	
	4. Balance between desirable and undesirable outcomes	
	5. Impact of patient values and preferences on the intervention	
	6. Certainty of those patients' values and preferences	

GRADE: grading of recommendations assessment, development, and evaluation; RCT: randomized control trial