

# How to treat kidney stone less than 2 cm

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SIU SESSION

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19<sup>e</sup>

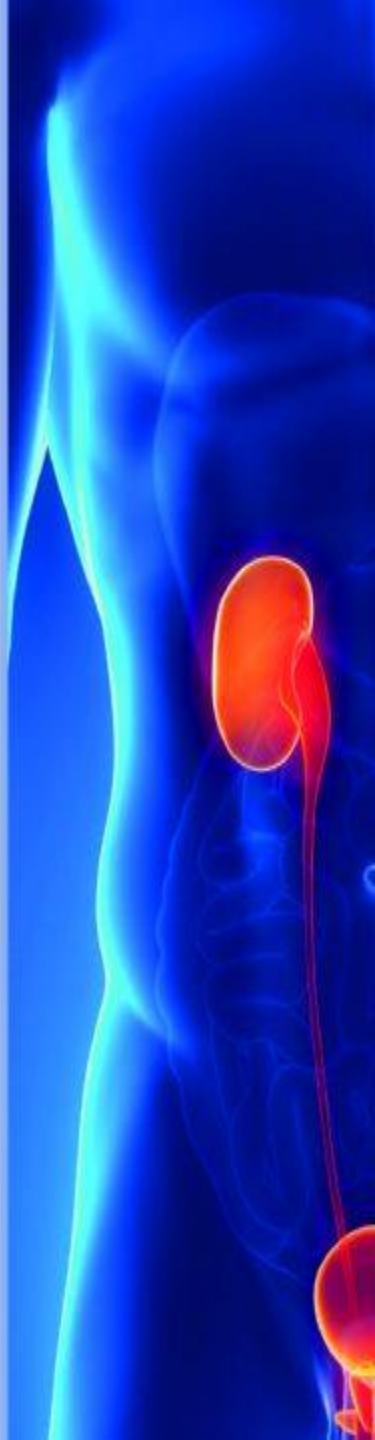
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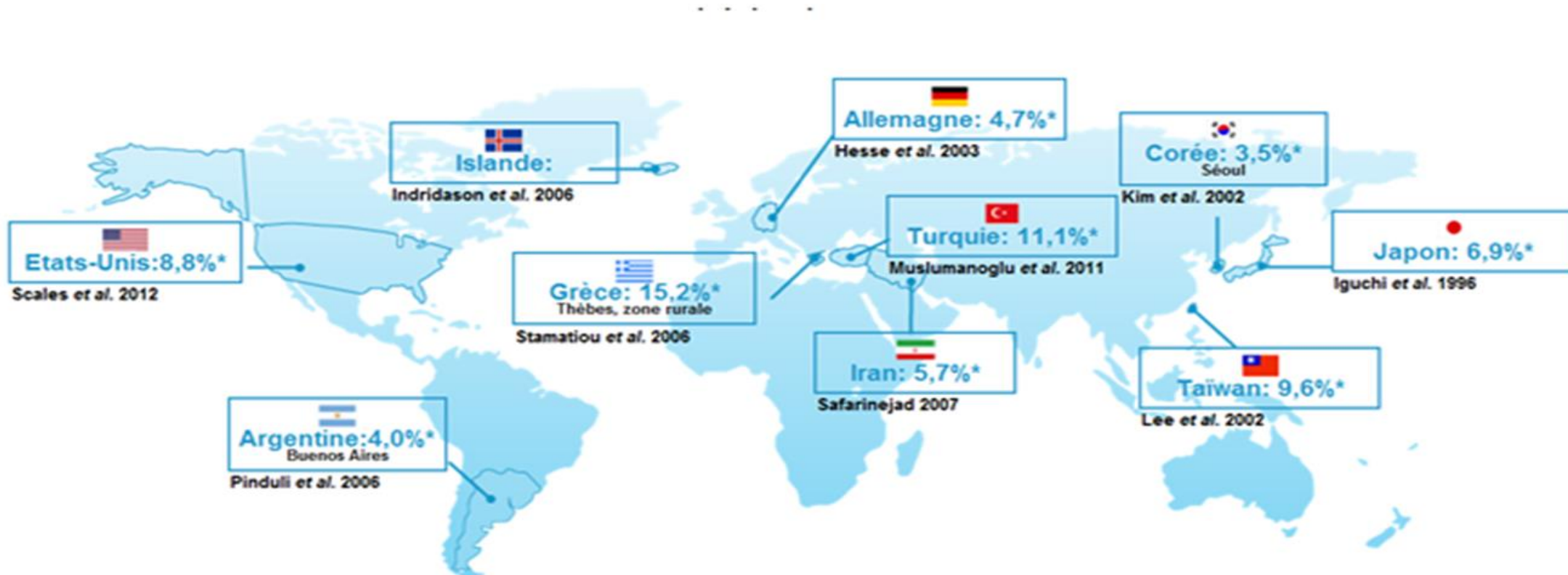
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No disclosure

# Urolithiasis : worldwide disease



*Hesse et al. 2003 ; Iguchi et al. 1996 ; Indridason et al. 2006 ; Kim et al. 2002 ;*

*Lee et al. 2002 ; Muslumanoglu et al. 2011 ; Pinduli et al. 2006 ; Safarinejad 2007 ; Scales, Jr. et al. 2012 ; Stamatiou et al. 2006.*



# Urolithiasis : Costly condition

Health Services Research

Economic burden

## Cost-effectiveness of Retrograde Intrarenal Surgery, Standard and Mini Percutaneous Nephrolithotomy, and Shock Wave Lithotripsy for the Management of 1-2cm Renal Stones

Kevin M. Wymer, Vidit Sharma, Tristan Juvet, Dane E. Klett, Bijan J. Borah, Kevin Koo, Marcelino Rivera, Deepak Agarwal, Mitchell R. Humphreys, and Aaron M. Potretzke  
<https://doi.org/10.1016/j.urology.2021.06.030>

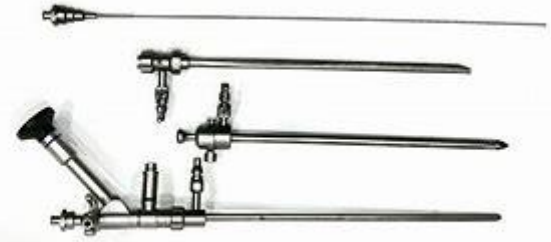
Technic	Cost (\$)
PCNL	9,374
RIRS	4,549
SWL	3,384
Mini-PCNL	9,374

COST =

- ✓ Primary procedure
- ✓ Convalescence,
- ✓ Complications
- ✓ Repeat procedures,
- ✓ Others.



# Large aramamentarium

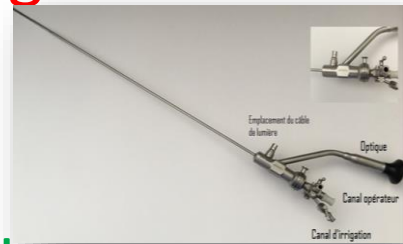


- RIRS PCNL, and SWL are all options for surgical stone management.



- Treatment :depending upon stone location and patient characteristics

- Kidney stone (>2cm) PCNL= the gold standard (**invasiveness** with **higher** rates of both minor and major operative **complications**).



- Kidney stone ( $\leq 2$ cm) SWL and RIRS = the gold standard because **high stone-free rate (SFR)** for smaller stones and **less risk of complication**.



# What is said?

GREY ZONE

## Management of 1-2 cm renal stones

**Aneesh Srivastava, Saurabh S. Chipde**

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- ✓ **Informed patient risk/benefit**
- ✓ **Individualized treatment**

## CONCLUSIONS

There are various minimally invasive modalities like SWL, PCNL, and RIRS for the treatment of 1-2 cm renal stones. Selection of the treatment depends upon various stone-related, patient-related, and renal anatomical factors. Patients should be informed about various modalities, their chances of stone clearance, and morbidity of the procedure. Treatment should be individualized according to site of stone and available expertise. We suggest the following algorithm for the management of these calculi.

# What is said?

World Journal of Urology (2022) 40:553–562  
<https://doi.org/10.1007/s00345-021-03860-w>

ORIGINAL ARTICLE



## Super-mini percutaneous nephrolithotomy (SMP) vs retrograde intrarenal surgery (RIRS) in the management of renal calculi $\leq 2$ cm: a propensity matched study

Sunil Bhaskara Pillai<sup>1</sup> · Arun Chawla<sup>1</sup> · Jean de la Rosette<sup>2</sup> · Pilar Laguna<sup>2</sup> · Rajsekhar Guddeti<sup>1</sup> · Suraj Jayadeva Reddy<sup>1</sup> · Ravindra Sabnis<sup>3</sup> · Arvind Ganpule<sup>3</sup> · Mahesh Desai<sup>3</sup> · Aditya Parikh<sup>3</sup>

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### Conclusion

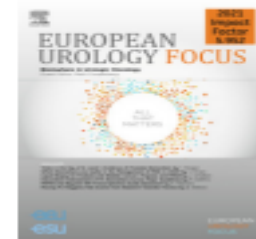
SMP provides early stone-free rates as compared or better to RIRS in a single session combined with reduced morbidity, in the management of renal calculus of size less than 2 cm. Although SMP is associated with more early post-operative pain, it has significantly lower operative times, complication rates and a shorter hospital stay.

**SMP HIGHER SFR LESS CPC**

**Table 3** Comparison studies of PNL versus RIRS

Study	Design	Stone	Modality	Cases—N	Stone size (mm)	Months follow-up	SFR (%)	SFR definition	
Zhang [29]	RCT	LPS 1-2 cm	UMP FURS SWL	60 60 60		3	98 92 73	Fragment < 3 mm	16.67 8.33 6.67
Zeng [18]	RCT	LPS 1-2 cm	RIRS SMP	80 80	14.3 ± 3.4 15.0 ± 2.9	3	86.8 97.4	Fragment < 3 mm	7 7
Kandemir [30]	RCT	LPS $\leq 1.5$ cm	RIRS PNL-4.85Fr	30 30	11.5 10.6	3	86.7 83.3	No residual stone	16.7 20
Bozzini [31]	RCT	LPS < 2 cm	SWL RIRS PNL	194 207 181	13.8 ± 3.1 14.8 ± 2.7 15.2 ± 3.3	3	61.8 82.1 87.3	Asymptomatic fragment < 3 mm	6.7 14.5 19.3
Fayad [32]	RCT	LPS < 2 cm	RIRS PNL-16Fr	60 60	14.1 ± 3.0 14.7 ± 3.0	3	84.3 92.7	Fragment < 2 mm	3.3 5
Akbulut [33]	CCT-R	LPS < 2 cm	PNL-18Fr RIRS	31 63	137.4–62.5 mm <sup>2</sup> 137.7–40.9 mm <sup>2</sup>	1	90.3 85.7	Asymptomatic frag- ment < 3 mm	29 8
Ozgor [34]	CCT-R	1–2 cm	PNL18-20Fr RIRS	56 56	19.5 ± 3.9 18.3 ± 3.2	1–3	80.4 76.7	Frag- ment < 2 mm	30.3 5.3
Demirbas [35]	RCT	1–2.5 cm	PNL-14Fr RIRS	30 43	185.86– 88.29mm <sup>2</sup>	1	80 74.4	Fragment < 3 mm	23.3 13.9
Kumar [36]	RCT	LPS 1–2 cm	PNL-18Fr RIRS SWL	41 42 43	13.3 ± 1.3 13.1 ± 1.1 13.2 ± 1.2	3	95.1 86.1 73.8	Frag- ment < 4 mm	24.3 9.3 7.1
Lee [37]	RCT	> 1 cm	PNL-18Fr RIRS	35 33	39.1 ± 30.7 28.9 ± 17.5	3	85.7 97	Frag- ment < 2 mm	25.7 27
Schoenthaler [38]	CCT-R-(match)	1–2 cm	PNL-14Fr RIRS	30 30	15.1 14.4	–	84 87	–	7 7
Ramon de Fata [39]	CCT	1–3 cm	PNL-4.85Fr RIRS	8 12	1.9 cm <sup>2</sup> 1.3 cm <sup>2</sup>	–	87.5 91.7	–	12.5 8.3
Kirac [40]	CCT-R	< 1.5 cm	PNL $\leq 20$ Fr RIRS	37 36	1.05 ± 0.22 1.02 ± 0.29	1–3	89 88.9	Fragment < 3 mm	18.9 16.7
Pan [41]	CCT-R	2–3 cm	PNL-18Fr RIRS	59 56	22.37 ± 2.7 22.28 ± 2.6	1	96.6 71.4	Frag- ment < 2 mm	11.9 16.1
Kruck [42]	CCT-R		PNL-18Fr RIRS SWL	172 108 202	12.6 ± 9.5 6.8 ± 6.9 7.5 ± 5.1	3	79.6 77.8 58.4	No stones	11.5 8.3 5
Ozturk [43]	CCT-R	1–2 cm	PNL RIRS SWL	144 38 221	1.74 ± 0.15 1.73 ± 0.15 1.70 ± 0.16	–	93.7 73.7 –	–	13.2 5.3 3.2
Sabnis [26]	RCT	< 1.5 cm	PNL-4.85Fr RIRS	35 35	1.1 1.04	3	97.1 94.3	No residual stone	28.6 14.3
Resorlu [44]	CCT-R	1–2 cm	PNL RIRS SWL	140 46 251	17.3 ± 3.6 15.6 ± 3.4 14.9 ± 2.9	3	91.4 87 66.5	Fragment < 3 mm	22.1 10.9 7.6
Aboutaleb [45]	CCT-R	1–2 cm	PNL RIRS SWL	19 13 24	1.73 ± 0.33 1.45 ± 0.32 1.56 ± 0.43	–	89.5 84.6 –	–	31.6 46.2 41.7
Bozkurt [46]	CCT-R	1.5–2 cm	PNL RIRS	42 37	1.70 ± 0.12 1.65 ± 0.69	2	92.9 89.2	Fragment < 3 mm	16.7 18.9
Kuo [47]	RCT	LP < 2.5 cm	PNL RIRS	15 13		3	66.7 45.6	–	6.7 0

CCT-R case-control trial retrospective



✓ SFR  
 ✓ CPC  
 ✓ RETREATMENT

Stone Disease

# Flexible Ureterorenoscopy Versus Shockwave Lithotripsy for Kidney Stones $\leq 2$ cm: A Randomized Controlled Trial

Table 2 – SFR results at 1 mo, 6 mo, and 1 yr

✓ 1ST MONTH

Parameter	RIRS	SWL	p value
<b>1 mo</b>			
Patients (n)	70	68	
SFR-4, n (%)	49 (70.0)	31 (45.6)	<b>0.004</b>
SFR-0, n (%)	35 (50.0)	18 (26.5)	<b>0.004</b>
<b>6 mo</b>			
Patients (n)	69	66	
SFR-4, n (%)	55 (79.7)	42 (63.6)	<b>0.038</b>
SFR-0, n (%)	41 (59.4)	27 (40.9)	<b>0.032</b>
<b>1 yr</b>			
Patients (n)	68	64	
SFR-4, n (%)	51 (75.0)	43 (67.2)	0.322
SFR-0, n (%)	38 (55.9)	31 (48.4)	0.392

SFR = stone-free rate; SFR-4 = presence of fragments up to 4 mm evaluated on kidney, ureter, and bladder ultrasound and X-ray [9]; SFR-0 = complete absence of any fragments on kidney, ureter, and bladder ultrasound and X-ray [9]; RIRS = retrograde intrarenal surgery via flexible ureterorenoscopy; SWL = shockwave lithotripsy.

Table 3 – Rates of complications and further treatments

Parameter	Patients, n (%)		p value
	RIRS (n = 70)	SWL (n = 68)	
<b>Complications</b>			
Overall	4 (5.7)	8 (11.8)	0.207
6–10-mm stones	2 (6.1)	0 (0.0)	0.134
11–20-mm stones	2 (5.4)	8 (25.0)	<b>0.021</b>
<b>Complications by Clavien-Dindo grade</b>			
No complications	66 (94.3)	60 (88.2)	
Grade I (analgesia for flank pain)	0 (0.0)	2 (2.9)	
Grade II (antibiotics for urinary tract infection)	3 (4.3)	2 (2.9)	
Grade IIIa (stenting/URS under SA for obstructing fragments)	1 (1.4)	4 (5.9)	
Grade $\geq$ IIIb	0 (0.0)	0 (0.0)	
<b>Further treatments</b>			
Overall	14 (20.0)	18 (26.5)	0.368
6–10-mm stones	8 (11.4)	5 (7.3)	0.627
11–20-mm stones	8 (21.6)	13 (19.1)	0.087

RIRS = retrograde intrarenal surgery via flexible ureterorenoscopy; SA = spinal anesthesia; SWL = shockwave lithotripsy; URS = ureteroscopy.

# What is said?

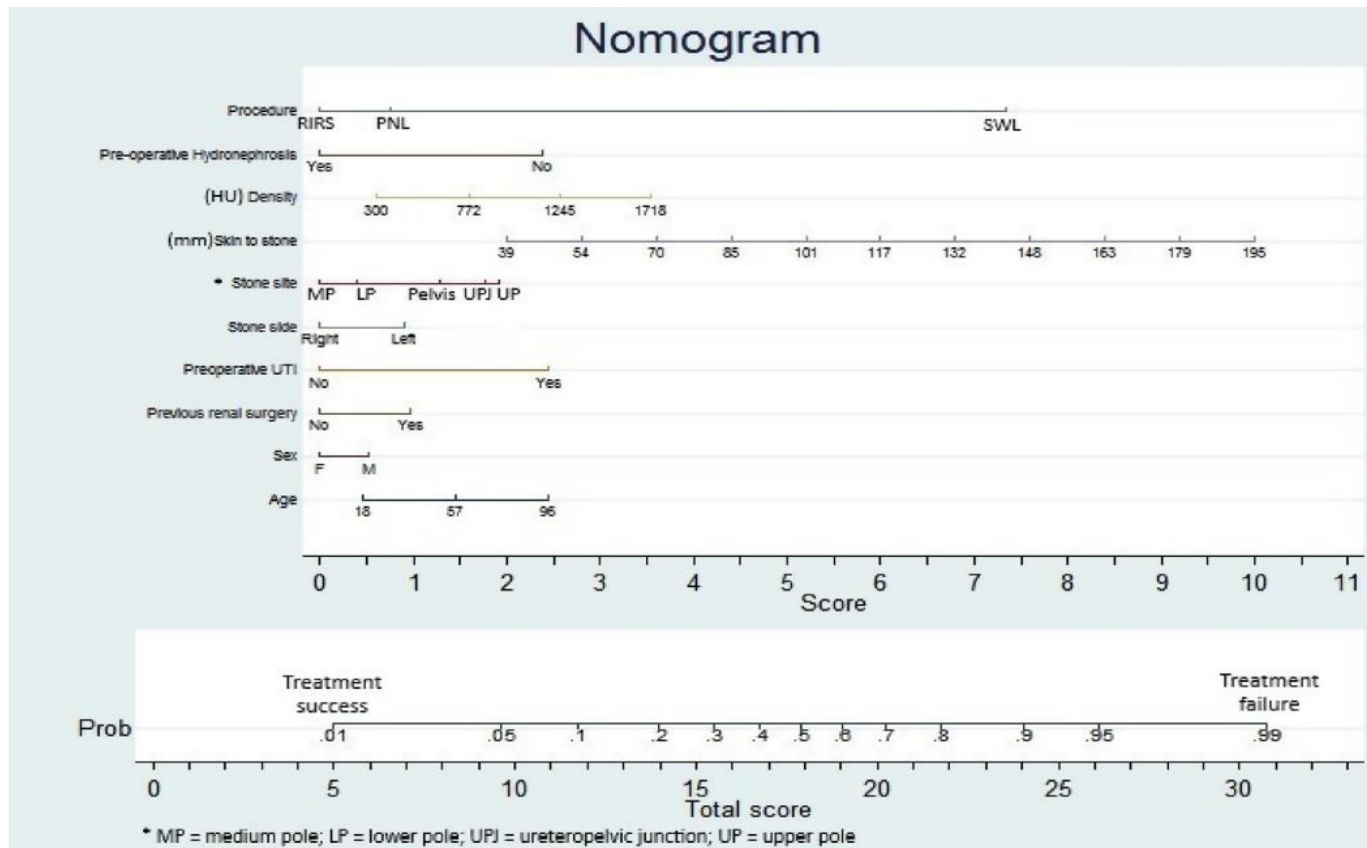


## Initial Experience and Evaluation of a Nomogram for Outcome Prediction in Management of Medium-sized (1–2 cm) Kidney Stones

### 5. Conclusions

Counseling of the patient before stone treatment plays a key role in the well-being of the patient, and its accuracy concerning the estimated SFR is crucial. This nomogram can give an accurate prediction of the need for reintervention after each treatment option for solitary kidney stones between 1 and 2 cm.

There are no existing scoring systems currently usable for this purpose; however, external validation of the current nomogram is needed to determine its reproducibility and validity.



# Cost-effectiveness of Retrograde Intrarenal Surgery, Standard and Mini Percutaneous Nephrolithotomy, and Shock Wave Lithotripsy for the Management of 1-2cm Renal Stones

Kevin M. Wymer, Vidit Sharma, Tristan Juvet, Dane E. Klett, Bijan J. Borah, Kevin Koo, Marcelino Rivera, Deepak Agarwal, Mitchell R. Humphreys, and Aaron M. Potretzke

## What is said?

- ✓ Cost-effectiveness analysis were based on 2 recently published meta-analyses comparing PCNL, mini-PCNL, RIRS, and SWL.
- ✓ A total of 35 studies



**Table 3.** Baseline cost-effectiveness analysis results.

Index Patient 1 (1-2cm lower pole stone)

	3-y Cost	Effectiveness (QALY)	ICER (\$/QALY) versus RIRS	NMB (\$)	Cost-Effective?
RIRS	5,930	2.946	Reference	288,713	Yes
PCNL	10,290	2.951	946,464	284,814	No
Mini-PCNL	10,109	2.953	624,075	285,203	No
SWL	10,916	2.943	DOMINATED	283,384	No
Index Patient 2 (1-2cm non-lower pole stone)					
RIRS	5,187	2.951	Reference	289,950	Yes
PCNL	9,782	2.949	DOMINATED	285,160	No
SWL	10,287	2.951	DOMINATED	284,843	No

Outputs for the base-case analyses for index patients 1 and 2. For both index patients, RIRS was most cost-effective.

### CONCLUSION

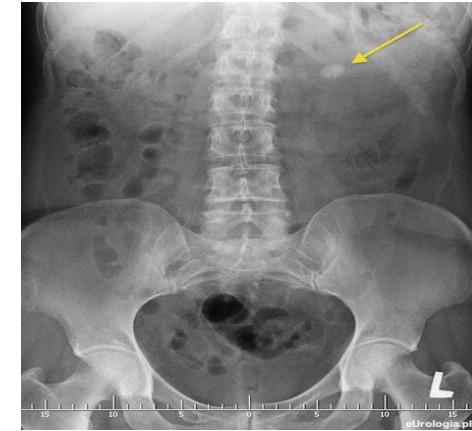
Using a Markov decision analytic model, we found that **RIRS is the most cost-effective surgical intervention for renal stones 1-2cm in size, regardless of stone location.** This is dependent upon a relatively high SFR, low major complication rate, and moderate cost. Although percutaneous treatment approaches offer higher QALYs relative to RIRS, particularly for lower pole stones, cost reductions are necessary for these approaches to become cost-effective.



**WHAT GUIDELINES SAY ABOUT THIS ?**

# Surgical Management of Stones: AUA/Endourology Society Guideline

- 21. In symptomatic patients with non-lower pole **renal stone burden  $\leq 20$  mm**, clinicians may offer **SWL or URS**. **Strong Recommendation**; *Evidence Level Grade B*

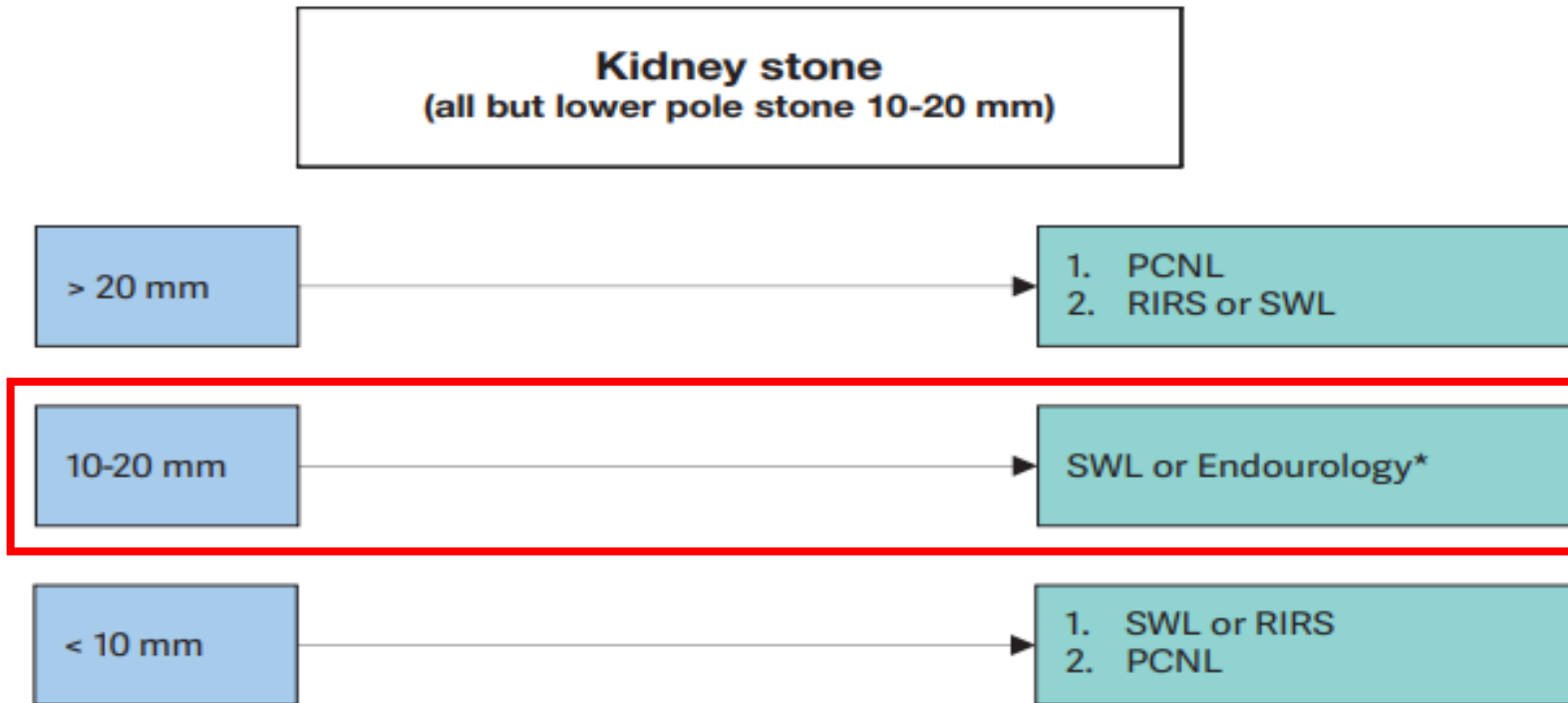


- 31. Clinicians **should not offer SWL** as first-line therapy to patients with **>10mm lower pole stones**. **Strong Recommendation**; *Evidence Level Grade B*



- 32. Clinicians should inform patients with **lower pole stones >10 mm** in size that **PCNL** has a **higher stone-free rate but greater morbidity**. (Index patient 10). **Strong Recommendation**; *Evidence Level Grade B*

# Management of Urolithiasis: EAU Guidelines



2024

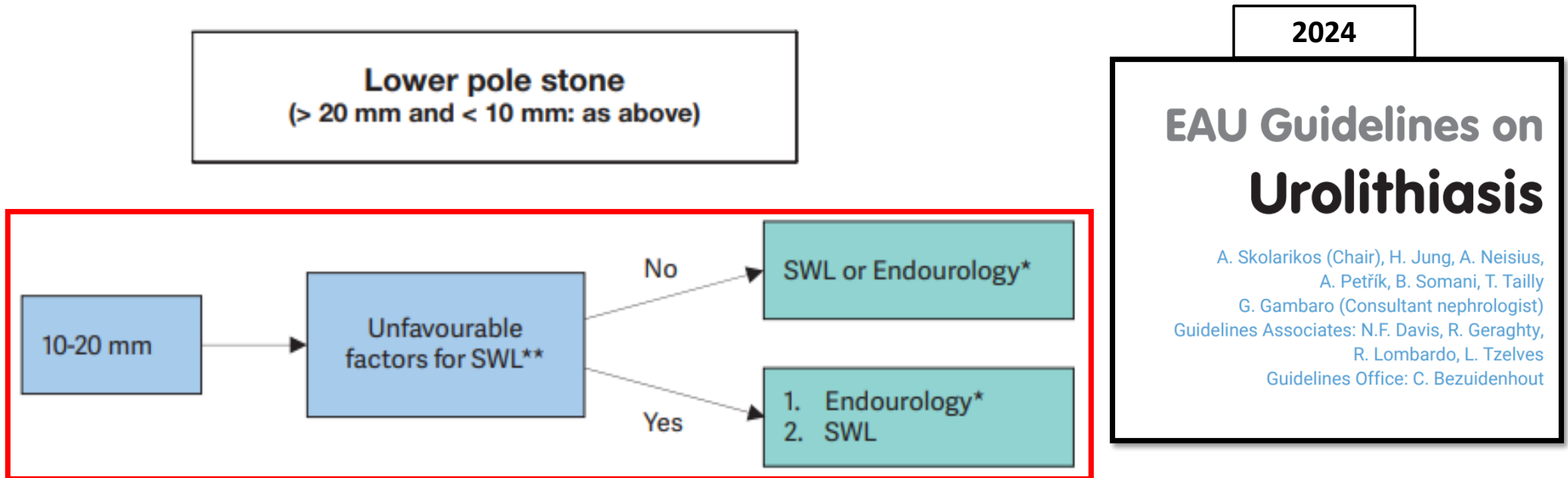
## EAU Guidelines on Urolithiasis

A. Skolarikos (Chair), H. Jung, A. Neisius,  
A. Petřík, B. Somani, T. Tailly  
G. Gambaro (Consultant nephrologist)  
Guidelines Associates: N.F. Davis, R. Geraghty,  
R. Lombardo, L. Tzelves  
Guidelines Office: C. Bezuidenhout

*\*The term 'Endourology' encompasses all PCNL and URS interventions.*

*PCNL = percutaneous nephrolithotomy; RIRS = retrograde intrarenal surgery; SWL = shock wave lithotripsy; URS = ureteroscopy*

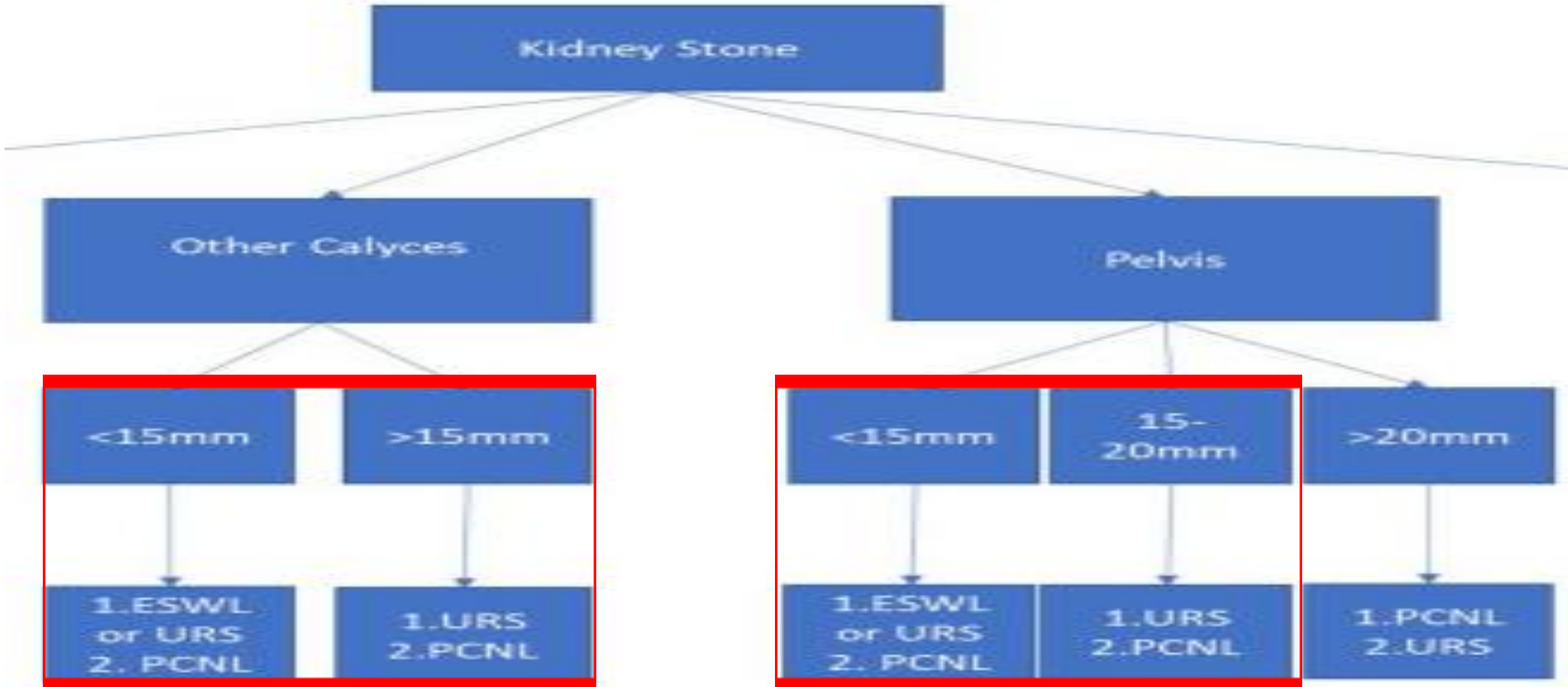
# Management of Urolithiasis: EAU Guideline



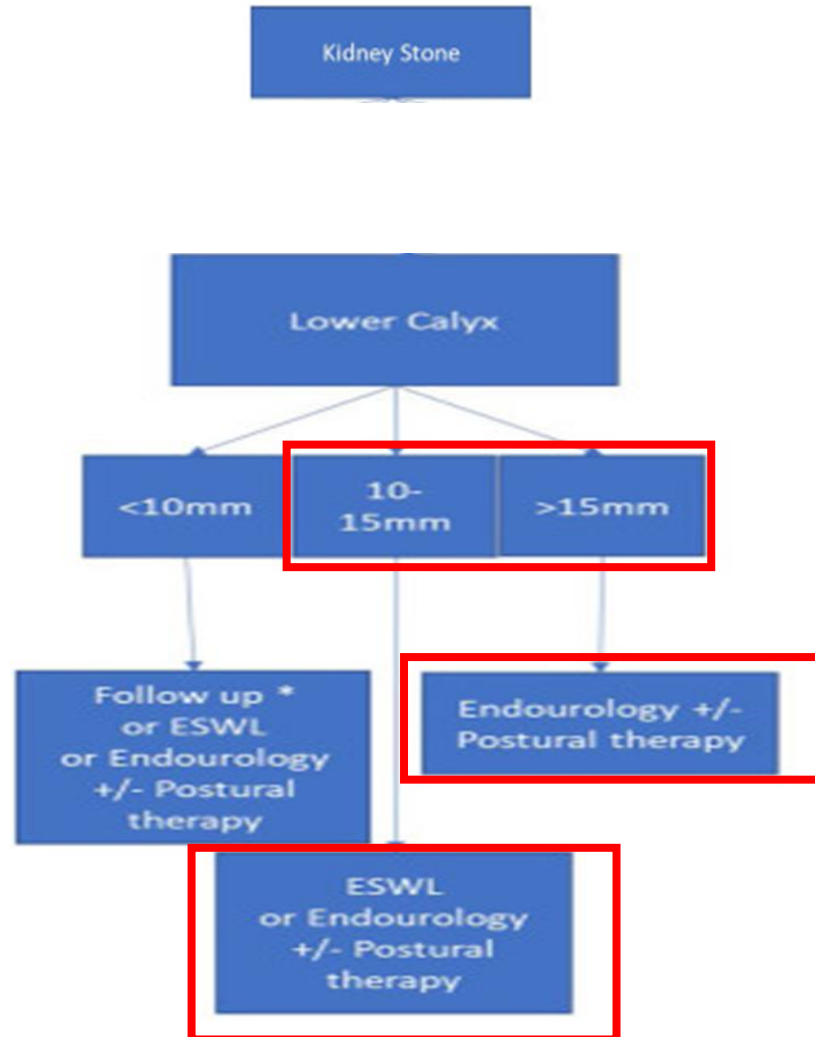
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# French Association of Urology : Guidelines of surgical management of urolithiasis



# French Association of Urology : Guidelines of surgical management of urolithiasis



# Summary of guidelines



EAU and AUA recommendations based on renal stone size and location.

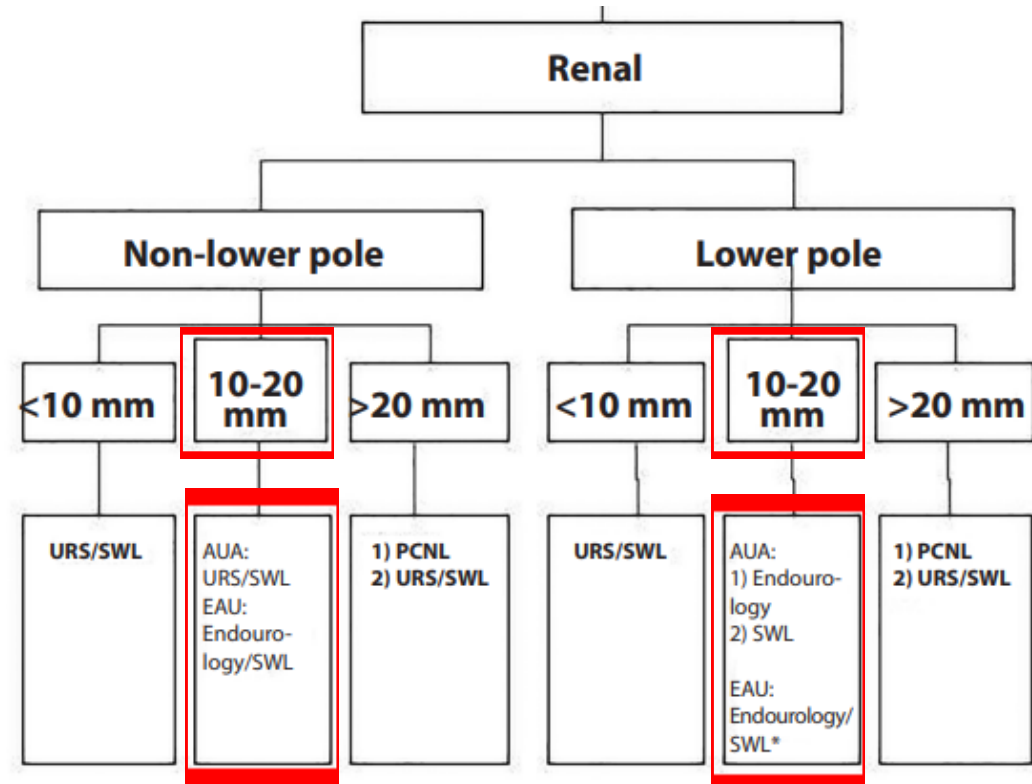
Anatomical Location in Collecting System	Stone Size	Type of Intervention (EAU)	Type of Intervention (AUA)
Upper/middle calyces/renal pelvis	<10 mm	1. SWL or URS (first line) 2. PCNL (second line)	SWL or URS
	10–20 mm	PCNL/URS or SWL	SWL or URS
	>20 mm	1. PCNL (first line) 2. URS or SWL (second line)	1. PCNL (first line) 2. URS or SWL (second line)
Lower pole	<10 mm	1. SWL or URS (first line) 2. PCNL (second line)	SWL or URS
	10–20 mm	<ul style="list-style-type: none"> <li>SWL or URS/PCNL (favourable factors for SWL)</li> <li>PCNL/URS as first line, SWL as second line (unfavourable factors for SWL)</li> </ul>	1. PCNL/URS (first line) 2. SWL (second line)
	>20 mm	1. PCNL (first line) 2. URS or SWL (second line)	1. PCNL (first line) 2. URS or SWL (second line)
	>20 mm	1. PCNL (first line) 2. URS or SWL (second line)	1. PCNL (first line) 2. URS or SWL (second line)

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► J Clin Med. 2024 Feb 16;13(4):1114. doi: [10.3390/jcm13041114](https://doi.org/10.3390/jcm13041114)

## al Guidelines for Kidney Stones: Overview and Comprehensive





## CONCLUSION

- The choice of technique is multifactorial and is based on the advantages and limitations of each, but also on the clinical context (e.g., morbid obesity, general health status, coagulation disorders, pregnancy), and the availability of the technic.
- The challenge is finding a balance between the least invasive procedure and the objective of achieving the stone-free status.
- Counselling patient is the main condition to succeed the treatment.

A serene sunset scene with a bright orange sun low on the horizon. The sky transitions from a deep orange near the sun to a dark blue at the top. In the foreground, a wooden dock extends from the bottom center towards the water. To the right, a dark canoe is on the water, with its reflection visible. The background shows a silhouette of a forested hill on the left and bare tree branches on the right.

Primum non nocere.  
First do no harm.

**Thank you for your attention!**

