

A Pragmatic Approach to Imaging After Ureteroscopy: Lessons From the Michigan Urological Surgery Improvement Collaborative Statewide Collaborative

WHERE ARE THE GUIDELINES?

Ureteroscopy is one of the most commonly performed procedures in urology, yet there is no formal guidance regarding its most critical follow-up decision: immediate postoperative imaging. In this setting, postoperative imaging refers specifically to studies obtained in the early period after ureteroscopy to evaluate the stone-free rate and to identify complications such as hydronephrosis or obstruction. This should be distinguished from long-term surveillance imaging, which is recommended for all stone-forming patients to monitor recurrence, irrespective of procedural outcome or individual risk profile.

Current AUA guidelines on the surgical management of stones do not address postoperative imaging after ureteroscopy directly.¹ Although the guidelines recommend follow-up imaging, they provide no guidance regarding optimal timing or preferred modality. The European Association of Urology takes a similar approach, noting that imaging at approximately 4 weeks may be beneficial to allow residual fragments to pass, but stopping short of a formal recommendation. Like the AUA, the European Association of Urology also remains vague on modality choice and leaves this decision to surgeon discretion.² Finally, although the AUA has issued a more prescriptive Technology Assessment on imaging strategies for ureteral calculi after surgical or medical management, this document does not extend to renal stone treatment and adopts a fairly conservative stance, recommending imaging even after presumed complete solitary stone extraction, without offering a pathway for omission in low-risk patients.³

As a result, urologists are left to rely on personal preference or local practice patterns. These factors can lead to both overuse and underuse of postoperative imaging. This ambiguity has created wide variability in postoperative imaging utilization and highlights a pressing need for more pragmatic, data-informed approaches.

IMAGING AFTER URETEROSCOPY: WHAT MUSIC DATA REVEAL ABOUT PRACTICE VARIATION

The ambiguity surrounding postoperative imaging recommendations has resulted in significant variability in clinical practice within the state of Michigan. This variation was recently characterized through an analysis of the Michigan Urological Surgery Improvement Collaborative's Reducing Operative Complications from Kidney Stones (MUSIC ROCKS) initiative. Among 2850 patients who underwent ureteroscopy for stone disease, only 47.6% received any form of postoperative imaging within 60 days. Among patients who received imaging, the most common modality was abdominal x-ray (AXR; 55.0%), followed by ultrasound (US; 21.9%), and noncontrast computed tomography (NCCT; 11.1%).⁴ National trends mirror these findings, with roughly 55% of patients lacking imaging within 3 months postoperatively and 39% remaining not imaged at 1 year.⁵

Overall, more than half of patients do not undergo routine imaging postoperatively. These practice patterns may reflect uncertainty regarding which patients truly require imaging, reinforcing the need to balance clinical benefit, radiation exposure, and health care resource utilization.

IMAGING MODALITIES IN CONTEXT

Postoperative imaging options each have advantages and limitations. AXR is convenient and widely available but detects only radio-opaque stones and demonstrates poor sensitivity for fragments < 5 mm.⁶ US avoids radiation and reliably identifies hydronephrosis, but may overestimate stone size and generate incidental findings that necessitate follow-up CT.⁷ NCCT remains the gold standard, with sensitivities > 90% and near-perfect specificity even using low-dose or ultra-low-dose protocols with radiation comparable with a single AXR.⁸ For this

reason, NCCT has been endorsed as the reference standard for reporting stone-free status in clinical trials and publications. However, in routine practice, its cost, residual radiation exposure, and potential to reveal incidental findings limit universal adoption.

Understanding these trade-offs is essential when designing targeted imaging strategies informed by patient-specific risk and procedural factors.

POSTOPERATIVE HYDRONEPHROSIS IN A STATEWIDE COLLABORATIVE

To quantify risk of new postoperative hydronephrosis, we analyzed patients without preoperative hydronephrosis who underwent follow-up imaging at 29- to 60-day postureteroscopy.⁹ Among 1066 identified patients, 36 (3.4%) developed non-transient postoperative hydronephrosis of whom only 7 (0.7%) were asymptomatic, traditionally referred to as “silent.” In a subsequent cohort of patients, irrespective of preoperative hydronephrosis status, we identified predictors of postoperative hydronephrosis which included preoperative hydronephrosis, larger stones, female sex, and renal stone location.¹⁰ The highest-risk subgroup, women with renal stones and preoperative hydronephrosis, had a predicted probability of nearly 30% for postoperative hydronephrosis with a 20 mm stone.¹⁰

These findings indicate that although postoperative hydronephrosis is not uncommon, clinically silent and persistent cases are exceptionally rare, and risk can be effectively stratified using patient and stone characteristics. This evidence provides a foundation for a goal-directed imaging strategy, balancing detection of clinically significant complications with avoidance of unnecessary studies.

FRAMING IMAGING DECISIONS AROUND CLINICAL QUESTIONS: A PRAGMATIC APPROACH

In the absence of uniform, evidence-based guidelines, MUSIC has proposed a goal-directed imaging strategy (Figure) that aligns imaging choice with the specific clinical context and patient risk profile. Rather than imaging all patients indiscriminately or not imaging at all, the focus shifts to identifying what clinical questions need answers and selecting the most efficient imaging modality to address them.

Is the Patient at Risk for Obstruction?

Patients with preoperative hydronephrosis or larger stones (>10 mm) are at higher risk of persistent or new hydronephrosis.¹⁰ Formal US is an effective first-line assessment for obstruction, while point-of-care ultrasound may provide rapid bedside evaluation for urologists with expertise. If obstruction is suspected

  Goal Directed Approach for Imaging after Ureteroscopy	
Assessment Goal	Recommended Approach
Post-operative Hydronephrosis	*Order Renal Ultrasound; Consider point-of-care
Stone-Free	Order KUB; Strongly Recommend Low-dose CT
Post-operative Hydronephrosis and Stone-Free	Order Low-dose CT
* Ultrasound is not reliable for assessment of residual stones In low-risk patients, (no pre-op hydro, ureteral stone; no pre-op hydro, renal stone ≤10mm) post-op imaging may not be necessary	
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Figure. Goal-directed approach for imaging after ureteroscopy for stones adopted by the Michigan Urological Surgery Improvement Collaborative (MUSIC). hydro indicates hydronephrosis; KUB, kidney, ureters, bladder x-ray; ROCKS, Reducing Operative Complications from Kidney Stones.

or confirmed, follow-up NCCT can offer definitive assessment.

Are We Confident the Patient Is Stone-Free?

Assessment of stone-free rate is critical for patients with large stone burden, complex anatomy, or difficult intraoperative courses. Although AXR remains widely available, low-dose NCCT is preferred for its higher sensitivity and specificity, reliably detecting residual fragments that may warrant retreatment.

Do We Need to Rule Out Both Obstruction and Residual Fragments?

Patients at risk for both complications benefit most from a single, comprehensive imaging study. Low-dose NCCT detects residual stones and hydronephrosis simultaneously, minimizing missed findings and reducing the need for multiple modalities. This approach is particularly valuable in patients with larger stones, complex anatomy, or atypical recovery.

CAN WE SAFELY OMIT IMAGING IN THIS PATIENT?

Robust evidence to guide this question is lacking. Our data show that patients without preoperative hydronephrosis and with small (<10 mm), nonobstructing stones have a low risk of postoperative complications. Most events in this low-risk group are symptomatic, with asymptomatic cases being exceptionally rare (<1%).¹⁰ In select patients, immediate imaging may be safely deferred, with routine long-term surveillance resumed at 1 year. This approach could potentially reduce patient anxiety, avoid unnecessary follow-up from incidental findings, and optimize health care resource use. Notably, this strategy may already reflect current practice, with up to 50 percent of patients in Michigan not imaged postoperatively.

GUIDANCE TODAY, BETTER TOOLS TOMORROW

Postoperative imaging after ureteroscopy remains a practice area characterized by variability and limited

evidence. The goal-directed framework presented here provides a pragmatic starting point, balancing clinical benefit, patient safety, and resource stewardship.

Future efforts should focus on predictive modeling to further refine risk stratification for obstruction and residual stones. Such tools could enable more precise, individualized imaging protocols and ultimately inform the development of robust, evidence-based guidelines. By combining real-world data, clinical judgment, and patient-centered considerations, urologists can make more informed postoperative imaging decisions, improving both outcomes and efficiency.

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