Critical Review Form
Prognosis

The utility of renal ultrasonography in the diagnosis of renal colic in emergency department patients. CJEM. 2010 May;12(3):201-6.

Objectives: **"to determine the ability of US [ultrasound] to identify renal colic patients with a low risk of requiring urologic intervention within 90 days of their initial ED [emergency department] visit." (p. 202)**

Methods: **This retrospective chart review was conducted at two academic EDs in Ontario, CA between January 1 and December 31, 2006. All ED patients aged 18 years and older who underwent a renal US for suspected renal colic were included. The study variables were defined *a priori* and a standardized data collection tool was created. Two trained abstractors completed independent chart reviews and data abstraction using the electronic medical record of all patients. US results were categorized as either "normal", "indirect evidence suggestive of ureterolithiasis", "visualized ureteric stone", or "disease unrelated to urolithiasis." Indirect evidence included the presence of hydronephrosis, perinephric fluid, abnormal ureteric jets, or a nonobstructing intrarenal stone. Adverse outcomes included the need for further imaging, hospital admission, or any urologic intervention.**

There were a total of 817 ED-ordered renal USs during the study period. Of these, 352 (43.2%) were normal, 177 (21.7%) were suggestive of ureterolithiasis, 241 (29.5%) showed a ureteric stone, and 47 (5.8%) revealed disease unrelated to urolithiasis. The interrater reliability for US classification was 0.96. The overall mean age was 43.6 and 53.4% were male. A total of 3.7% of patients were admitted to the hospital, and the mean ED length of stay was 5.6 hours.

Guide		Comments
I.	**Are the results valid?**	
A.	**Was the sample of patients representative?** *In other words, how were subjects selected and did they pass through some sort of "filtering" system which could bias your results based on a non-representative sample. Also, were objective criteria used to diagnose the patients with the disorder?*	Yes and no. All adult patients undergoing an ED-ordered renal ultrasound during the study period were included in the study. However, renal US was only available during the daytime hours (0800-1600), and hence patients either presented during the day or had to be observed overnight in order to get an US and hence be included in the study. Additionally, patients undergoing CT as the initial imaging modality for suspected renal colic were not included; this would likely preselect a study population at low risk of serious, alternative diagnoses (e.g. AAA, mesenteric ischemia) and of complicated stone disease.

B.	**Were the patients sufficiently homogeneous with respect to prognostic risk?** *In other words, did all patients share a similar risk from during the study period or was one group expected to begin with a higher morbidity or mortality risk?*	Uncertain. The authors provide very little information regarding patient characteristics, such as pain score, renal function, urinalysis results, and physician perception of the likelihood of ureteral colic as the cause of the patients' symptoms.
C.	**Was follow-up sufficiently complete?** *In other words, were the investigators able to follow-up on subjects as planned or were a significant number lost to follow-up?*	Likely yes. Follow-up consisted of a retrospective chart review of the medical records at two academic EDs associated with the University of Western Ontario. While some patients initially seen in one of these EDs may have had additional imaging or urologic procedures performed at another center, this is somewhat unlikely given that this ED is the main referral center for Southwestern Ontario.
D.	**Were objective and unbiased outcome criteria used?** Investigators should clearly specify and define their target outcomes before the study and whenever possible they should base their criteria on objective measures.	Yes. The authors defined their outcome criteria *a priori* as the need for further imaging, hospital admission, or the need for a urologic intervention. Urologic intervention was predefined as extracorporeal shockwave lithotripsy, ureteric stent placement, or cystoscopic extraction. These outcomes are quite objective.
II.	**What are the results?**	
A.	**How likely are the outcomes over time?**	• Of 352 patients with a "normal" US, 49 (13.9%, 95% CI 10.6-17.9%) underwent CT within 90 days, with 6 resulting in stone identification. Two patients (0.6%, 95% CI 0.16%-2.1%) required a urologic procedure. • Of 177 patients with US classified as "indirect evidence suggestive of ureterolithiasis," 52 (29.4%, 95% CI 23.2-36,5%) underwent CT within 90 days, with 21 (11.9%, 95% CI 7.9-17.5%) having a stone identified that was not previously seen on US. Twelve of these 177 (6.8%, 95% CI 3.9-11.5%) required a urologic procedure. • Of 241 patients classified as "visualized ureteric stone," 44 (18.3%, 95% CI 13.9-23.6%) underwent CT within 90 days, 14 of which did not have a stone visualized. Fifteen (6.2%, 95% CI 3.8-10.0%) required a urologic procedure. • Of 47 patients classified as "disease unrelated to urolithiasis," 15 (31.9%, 95% CI 20.4-46.2%) underwent CT within 90 days.

		*All 95% CI's calculated using http://www.vassarstats.net/prop1.html
B.	**How precise are the estimates of likelihood?** *In other words, what are the confidence intervals for the given outcome likelihoods?*	The study authors did not provide 95% confidence intervals. See calculated confidence intervals above.
III.	**How can I apply the results to patient care?**	
A.	**Were the study patients and their management similar to those in my practice?**	No. While these were patients with suspected renal colic, they represent only a subset of such patients. Of 1085 patients diagnosed with renal colic during the study period, 50 (46.7%) had either a plain film only or no imaging at all ordered. The majority of those who underwent testing (410/570, 71.3%) had US as the initial imaging test. Anecdotally, the vast majority of patients in our institution with suspected renal colic will undergo some form of imaging, and the majority of these undergo CT scan. It is uncertain if the rates of urologic procedure differ at our institution compared to the study institution.
B.	**Was the follow-up sufficiently long?**	Yes. The outcomes were adverse events, subsequent imaging, or urologic procedure within 90 days of the initial ED visit. The vast majority of stones < 5 mm (~90%) will pass within 4 weeks, and a large number of the remainder of stones require intervention (Shriganesh 2012). It seems unlikely that a urologic procedure or repeat imaging would be delayed > 90 days for any stone. It also seems unlikely that any patient would be hospitalized > 90 days following the initial presentation for the same stone.
C.	**Can I use the results in the management of patients in my practice?**	Uncertain. This study demonstrates that patients with either a visualized ureteric stone or indirect evidence of a stone on US are more likely to undergo a urologic procedure than those with a normal US. It remains unclear how to use these results in practice. While these data seem to suggest that US is a reasonable initial imaging modality for some patients with suspected renal colic, there was a large degree of selection bias, as less than half of patients diagnosed with a stone actually underwent US imaging. It remains unclear which patients benefit from this approach. Additionally, the authors did not look at the risk of serious alternative pathology that could be missed

		on US (but may be seen on CT scan).

Limitations:

1. **Important demographic information was not provided (baseline creatinine, UA results, prior history of renal colic, pain scores) limiting our ability to determine which patients to apply the results to (external validity).**

2. **The authors did not report 95% confidence intervals.**

3. **The results can not be applied universally to all patients with suspected renal colic, as less than half of patients diagnosed with renal colic during the study period underwent ultrasound as the initial imaging modality (selection bias).**

4. **The authors did not consider other patient-important outcomes, such serious alternative pathology not diagnosed on ultrasound.**

Bottom Line:

This retrospective chart review demonstrates that patients with either a visualized ureteric stone or indirect evidence of a stone on US are more likely to undergo a urologic procedure than those with a normal US (6.2% and 6.8% vs. 0.6%). It remains unclear how to use these results in practice. While these data seem to suggest that US is a reasonable initial imaging modality for some patients with suspected renal colic, there was a large degree of selection bias, as less than half of patients diagnosed with a stone actually underwent US imaging. It remains unclear which patients benefit from this approach. Additionally, the authors did not look at the risk of serious alternative pathology that could be missed on US (but may be seen on CT scan).