CT Use Reduction In Ostensive Ureteral Stone (CURIOUS)

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BACKGROUND

Computed tomography (CT) is performed in over 90% of patients diagnosed with ureteral stones, but only 10% of patients presenting to the emergency department (ED) with acute flank pain are hospitalized for a clinically important stone or non-stone diagnosis. We sought to create a highly sensitive clinical decision rule for the prediction of complicated ureteral stone. We hypothesized that the application of this rule to guide imaging decisions could identify patients at sufficiently low risk of this outcome to avoid CT.

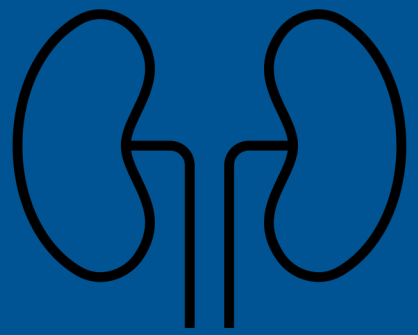
METHODS

DESIGN AND SUBJECTS: Retrospective cohort study. Adults who underwent non-contrast CT for suspected ureteral stone across 21 community-based facilities in an integrated healthcare system in northern California (2016-2020).

DATA COLLECTION: Electronic health record extraction with natural-language processing assisted chart review. Covariates included demographics, comorbidities, history of stone, hydronephrosis, hematuria, and pain presentations.

OUTCOMES: Complicated stone defined as stone resulting in hospitalization or urologic procedure within 60 days.

ANALYSIS: Recursive partition analysis was used to generate a clinical decision rule predicting the outcome. Accuracy was determined using a ROC curve and c-statistic analysis. Performance metrics were measured including sensitivity, specificity, positive predictive value, and negative predictive value.



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RESULTS

Among 4000 patients, 354 (8.9%) had a complicated stone. Our partition model resulted in four terminal nodes with risks ranging from 0.4% to 21.8%. The area under the ROC curve was 0.81 (95% CI 0.80, 0.83). Using a 2% risk cut point, a clinical decision tree including hydronephrosis, hematuria, and a history of prior stones predicted complicated stones with sensitivity 95.5% (95% CI 92.8 – 97.4), specificity 59.9% (95% CI 58.3 – 61.5), positive predictive value 18.8% (95% CI 18.1 – 19.5), and negative predictive value 99.3% (95% CI 98.8 – 99.6).

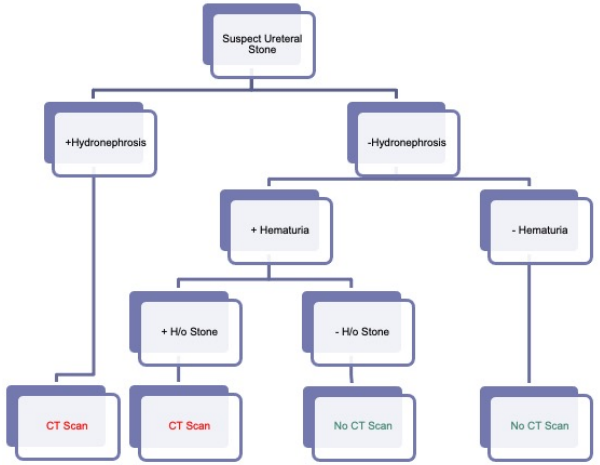

Figure: Clinical decision rule for prediction of complicated stone

CONCLUSION

Application of this complicated stone rule to imaging decisions would have led to 63% fewer CT scans with a miss rate of 0.4%. Application of our decision rule only to patients who underwent CT for suspected ureteral stone. Thus, this rule would not apply to patients who were thought to have ureteral colic but did not receive a CT because ultrasound or history were sufficient for diagnosis. These results could inform future prospective validation studies.

CONTACT INFORMATION

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