**Knowledge to Practice: Journal Club**

Is ultrasonography the same as computerized axial tomography when managing patients who report to an emergency department with suspected urolithiasis?

Aubert Lachance-Fortin\*; Xavier Leblanc\*; Samuel Racine†; Audrey Dupuis, MA‡§; Patrick Archambault, MD, MSc¶‖\*\*

From the \*Programme de formation complémentaire en médecine d’urgence (CCMF-MU), Université Laval, Québec City, Québec; †Programme de spécialité en médecine d’urgence, Université Laval, Québec City, Canada; ‡Département d’information et de communication, Université Laval, Québec City, Canada; §Centre intégré de santé et services sociaux de Chaudière-Appalaches, Secteur Alphonse-Desjardins (CHAU de Lévis), Lévis, Québec City, Canada; ¶Département de médecine familiale et médecine d'urgence, Division de soins intensifs, Université Laval, Québec City, Canada; ‖Centre intégré de santé et services sociaux de Chaudière-Appalaches, Secteur Alphonse-Desjardins (CHAU de Lévis), Lévis, Québec City, Canada; and the \*\*Centre de recherche du CHU de Québec, Québec City, Canada.

**Correspondence to:** Patrick M. Archambault; Email:[Patrick.m.archambault@gmail.com](mailto:Patrick.m.archambault@gmail.com)

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**BACKGROUND**

Almost 1 in 10 Canadians will have at least one episode of nephritic colic in their lifetime.1 These patients use considerable resources in the emergency departments in Canada,2 as they do elsewhere.3 In addition, the use of computerized axial tomography (CAT) as an initial diagnostic method when urolithiasis is suspected has greatly increased in recent years.4 Despite having a higher sensitivity than ultrasonography, its increased use does not seem to have led to a significant improvement in patient management.5 Furthermore, use of CAT presents certain undesirable effects, such as irradiation,6-8 a high number of incidental findings,9,10 and higher costs.11 Thus, ultrasonography that is performed both in the emergency department (EDU) and by a radiologist become diagnostic methods that would be interesting to study. The goal of this study was to evaluate the comparative effectiveness of these three investigative methods on the outcomes of patients who are reporting to emergency departments with nephritic colic.

**PATIENT POPULATION**

The patients, aged between 18 and 76, had to have reported to an emergency department for pain in the abdomen or in the side for which the physician requested imagery to confirm the initial hypothesis for diagnosis of urolithiasis.

**SPECIFICATIONS OF THE EXPERIMENT**

This was a practical randomized clinical trial conducted in 15 emergency departments at American universities. The patients were randomly assigned with a ratio of 1:1:1 to one of the three methods of the following imaging: EDU, ultrasonography by a radiologist and CAT. After being assigned to an initial investigation, patient management was left to the discretion of the emergency physician, particularly those dealing with additional investigations. An analysis of the diagnostic precision of the three methods was conducted by applying the standard of visual confirmation of the passing of the lithiasis by the patient or a urologist.

**EVALUATED JUDGEMENT CRITERIA**

The primary judgement criteria that were evaluated in this study were: (1) the cumulative 30-day incidence of significant diagnoses that were missing or delayed, such as a ruptured aneurysm in the abdominal aorta, a ruptured appendix, pneumonia with sepsis, diverticulitis with abscess or sepsis, intestinal ischemia or perforation, renal infarct, nephrolithiasis with abscess, pyelonephritis with urosepsis or bacteremia, ovarian torsion with necrosis, or even an aortic dissection with ischemia; (2) the cumulative dose of irradiation at 6 months; and (3) the total costs (not reported in this study). The secondary judgement criteria were the occurrence of serious events, second visits to emergency, subsequent hospitalizations, and pain, as well as the diagnostic precision of the three methods of imagery.

**Results**

From among 3,100 eligible patients, 2,759 were randomized. In total, 113 patients were lost to follow-up. Thirty days after the randomization, 6 patients (0.7%) in the EDU group, 3 patients (0.3%) in the ultrasonography by radiologist group, and 2 patients (0.3%) in the CAT received a diagnosis of significant pathology (*p*=0.3). Regarding the cumulative dose of irradiation at 6 months, this was lower for the EDU group (10.1 millisieverts (mSv)) and for the ultrasonography by radiologist group (9.3 mSv) as compared to the CAT group (17.2 mSv) (*p* <0.001).

From among the secondary judgement criteria, the occurrence of serious events was comparable in the three groups: 113 for EDU vs. 96 for ultrasonography by radiologist vs. 107 for CAT (*p* =0.5). The authors did not note any difference in reported pain severity. The diagnostic precision of the three methods was also comparable: the sensitivity of the EDU, ultrasonography by radiologist and CAT groups was 85%, 84%, and 86% for detecting urolithiases; the specificity was 50%, 53%, and 53% respectively.

**CRITICAL ANALYSIS**

This analysis was conducted using criteria proposed by the User's Guides to the Medical Literature12 and the CONSORT Checklist.13 Although one of the judgement criteria is the evaluation of the diagnostic precision of the investigation methods, we focused our critique particularly on the effectiveness of diagnostic strategies on patient outcomes. This study shows that patient outcomes, measured by the cumulative incidence of significant diagnoses that were missing or delayed, is similar regardless of which of the imagery methods is used initially. It also shows that the cumulative dose of irradiation was lowest in the two ultrasonography groups (*p*<0.001).

***Are the results of the study valid?***

Despite the fact that this study was randomized, multicentred, and provided for adequate follow‑up, certain aspects of the methodology restricted the internal and external validity of results. The lack of blinding of the clinicians with respect to the diagnostic method could have possibly influenced the performance of clinicians that were interpreting the diagnostic methods and the decision to use additional tests. In addition, the reasons for requesting additional imagery are not described, and the criteria for considering a method for positive imaging were not defined. Nevertheless, 40.7% of patients who received an EDU and 27% of patients who received ultrasonography from a radiologist had additional imaging done. It would also have been interesting to know whether the groups differed in terms of medication usage, particularly those with an impact on renal function. Other elements limited the external validity of the results. Firstly, the selection of patients was conducted only when the three methods were available (essentially day time only). Furthermore, the exclusion criteria were subjective, since they relied on the judgement of clinicians to exclude patients who were potentially at high risk of an alternate serious diagnosis. Given the very tight follow-up for the patients in this study (at 3, 7, 30, 90, and 180 days), the risk of of missing complications could be higher in the real clinical world, where follow-up risks is less stringent. Finally, choosing visual confirmation of the passing of the lithiasis by the patient or the surgeon as a standard could have underestimated the measurement of sensitivity in the various diagnostic methods.

***Are the results useful?***

This study shows that ultrasonography (EDU or ultrasonography by radiologist) as an initial investigation for patients aged 18 to 76 years who reported to an emergency department with suspected nephritic colic can be safe and effective. They led to less irradiation than by CAT. Follow-up should be arranged after being discharged from emergency to avoid missing or delaying diagnoses. In the current Canadian context, where attempts are being made to reduce overdiagnosis and better target over investigations with the Choosing Wisely Canada™ initiative,14 these results may be useful.

***Will the results change my practices?***

Given the described limitations, the results of this study should not change current practice, but it does seem to offer an interesting path for future consideration on how to reduce exposure to irradiation and overdiagnosis. The comparative cost of these different diagnostic strategies remains to be evaluated and understood. In addition, as suggested by the Canadian Agency for Drugs and Technologies in Health,15 it would be desirable to obtain other prospective studies that show the potential advantage of ultrasonographic methods in terms of safety and cost in the Canadian context. Finally, it will also be important to verify the applicability of these results to rural areas, where ultrasonographic resources are not as extensive.16

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