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In Response to "Sensitivity of Emergency Bedside Ultrasound to Detect Hydronephrosis in Patients with Computed Tomography-proven Stones"

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Riddell J, Case A, Wopat R, et al. Sensitivity of Emergency Bedside Ultrasound to Detect Hydronephrosis in Patients with Computed Tomography-proven Stones. *West J Emerg Med*. 2014;15(1):96-100.

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To the Editor:

We read with great interest the article by Riddell et al. (1) and we believe the study addresses a very important clinical question; however; we have some remarks and questions below.

In Tables 2 and 3, we noticed there were 103 patients with ultrasound (US) evidence of hydronephrosis or stone; but in Table 4, total number of patients with bedside US evidence adds up to 99. Besides that, in Table 1 the number of patients with bedside US evidence of Stone is given to be 98. We could not find information about the missing patients and discrepancy in the number of total patients neither in the results nor discussion, and we feel further clarification is needed.

We also had some questions about the methodology of the study. It is stated that two investigators reviewing charts were blinded to the study hypothesis; however, there is no information regarding whether the emergency physicians performing the ultrasound examination were blinded to computed tomography (CT) results. Similarly, inter-rater reliability was stated to be 100% based on screening of a random sample of study records. We think interrater reliability of the chart reviews is important; however, this is a bit confusing since there is no information given about interobserver variability of the ultrasound examination. We feel including data from the literature about interobserver variability of ultrasound, or evaluating the variability of the performers in another set of patients, would help to give a better sense of real inter-observer variability.

From the perspective of a radiologist, technical details of devices, probes used for ultrasound and protocols used for CT are crucial for external validity, thus including this information would be beneficial.

A result of the study was that, for stones of size >=6 mm, a sensitivity of 100% was reported. Since this is expected to be an SnNout study, we believe this result is very valuable. Also, a sensitivity of 100% was reported for cases with 3 or more stones. However, we think some clarification could be very beneficial regarding how many cases with stones >=6 mm had 3 or more stones, or vice versa.

We think the clarification to our questions above would contribute to the literature in the clinical usefulness of the issue addressed in the study.

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In Reply:

We thank the authors of the letter for their insightful comments.

There were 98 patients with bedside US evidence of hydronephrosis and 11 patients with evidence of a stone. Only one patient with US evidence of stone had no hydronephrosis. The total number of patients with emergency department (ED) bedside US evidence of stone was 99. This correct number is consistent with Table 4.

The value for Table 1 "bedside US evidence of stone" should also be 99. The "Overall positive finding (hydronephrosis or stone) column in Table 2 should be 99, not 103. This changes the overall sensitivity to 79.2% (95% CI), rather than the 82.4% as published originally, which is consistent with the previously reported sensitivities cited in our paper.

Table 2. Sensitivity of ultrasound in all patients.

N = 125	Ultrasound (US) hydronephrosis	US stone	Overall positive finding (hydronephrosis or stone)
ED bedside US evidence	98	11	99
Sensitivty	78.4%	8.8%	79.2%
95% CI	70.0-85.1%	4.7-15.6%	70.8-85.7%

ED, emergency department; *CI,* confidence interval

The emergency physicians performing the ultrasounds were not formally blinded to the computed tomography (CT) results. However, it is common practice in our emergency department to perform the bedside ultrasound prior to ordering a CT. Though possible that a resident went back and did an US after viewing the CT result, it is unlikely to occur in a busy ED.

Testing of inter-rater agreement is one of the methodologic standards in emergency medicine chart reviews.[1] Our reviewers re-abstracted a sample of charts, blinded to the information obtained by the first reviewer. There were no discrepancies.

Lack of inter-observer variability of the US examination is a limitation. If there were significant interobserver variability, it could have biased the results of the study. There is little in the existing renal ultrasound literature regarding interobserver variability. One study of urologists interobserver agreement was excellent for the grade assessment of hydronephrosis by conventional sonography ($\kappa = 0.82$; $p<0.001$).[2] Goertz and Lotterman studied ED resident and attending physicians performing US and found there was very good interobserver agreement between the degree of hydronephrosis as determined by the performing emergency physician and QA review with $\kappa = 0.847$ (95% confidence interval, 0.777-0.918).[3] A study published in September showed a difference in sensitivity of renal ultrasound performed by emergency medicine residents and fellowship-trained emergency physicians for the detection of hydronephrosis. The authors did not report a kappa statistic for interobserver agreement.[4]

US examinations were performed in the ED with a SonoSite MicroMaxx ultrasound machine with a C60e 2 to 5-MHz curvilinear or P17 1 to 5-MHz phased array ultrasound probe (SonoSite, Bothell, Wash). The CT stone examinations were performed on a single-source 64-detector CT scanner (Aquilion CFX; Toshiba, Tustin, Calif), using the following parameters: 120kVp, 100-500mAs (using dose modulation depending on the size of the patient), gantry revolution speed of 0.5 second, pitch factor of 0.844, beam collimation of 64 x 0.5mm, variable field of view (depending on the size of the patient), standard body kernel. This data is reconstructed into 3mm thick sections in the transverse, coronal and sagittal planes.

Sensitivity was 100% for stones ≥ 6mm when combined with hematuria. Of the 60 patients with stones ≥ 6mm, 7 had 3 or more stones. Put another way, 7 of the 8 cases with 3 or more stones had a stone ≥ 6mm.

We thank the authors for their comments and hope this additional explanation helps readers place this retrospective study in its proper context. It was our hope that it would spur further prospective studies. Many of our questions have since been addressed with publication of the initial results of the STONE trial, a prospective multi-centered study of ED patients with suspected renal colic.[5]

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