

## EVALUATING THE ACCURACY OF COMPUTED TOMOGRAPHY OF THE KIDNEYS, URETERS, AND BLADDER INTERPRETATION BY UROLOGY TRAINEES FOR SUSPECTED ACUTE NEPHROLITHIASIS

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### Abstract

**Aim:** This study aims to evaluate the interpretation accuracy of urology trainees in reporting computed tomography of the kidneys, ureters, and bladder (CT-KUB) compared with the formal radiology reports in patients with suspected acute nephrolithiasis.

**Methods:** A sample of 12 consecutive CT-KUB scans for suspected acute nephrolithiasis was prospectively compiled and displayed using a software PACS viewer. 11 urology trainees, with an average of 24 months of urology specialist training, interpreted each scan. A total of 132 urology trainees' reports were compared to the formal radiology reports for agreement in detecting key findings (presence or absence of stone disease), signs of urinary tract obstruction, clinically significant findings, and clinically non-significant findings.

**Results:** There was a high level of agreement between urology trainees and radiologists for detecting key findings (98.4%) and clinically significant abnormalities (72.7%). There was less agreement in detecting all signs of urinary tract obstruction (56.2%) and non-clinically significant findings (36.8%).

**Conclusion:** This study shows that urology trainees can accurately report CT KUB studies for key findings and clinically significant abnormalities. This may improve ongoing acute management and early patient discharge. However, their findings should be verified against formal radiological reports.

**Keywords:** *Urology trainees; reporting CT; CT KUB; helical computed tomography; urolithiasis; ureteric colic; ureteric stones; renal stones; Urology residents; reporting CT KUB*

### INTRODUCTION

Urinary stone disease is a common worldwide healthcare problem, with a lifetime incidence of more than 10% urolithiasis has an important effect on the healthcare system.<sup>1,2</sup> Moreover, over the past few decades, it has been shown that stone disease incidence and prevalence are steadily increasing.<sup>2</sup>

Non-enhanced computed tomography (CT) is a sensitive imaging modality for diagnosing urolithiasis in most patients with suspected ureteric colic

and presenting with flank pain.<sup>3,4</sup> The superior sensitivity and specificity of CT kidneys, ureters, and bladders (KUB) allows urolithiasis to be diagnosed or excluded without the potential risks of contrast agents.<sup>5,6</sup> Furthermore, CTKUB can diagnose different urinary causes of acute flank pain.<sup>6</sup>

CT KUB replaced intravenous urogram (IVU) as a gold standard for investigation of acute ureteric colic.<sup>7</sup> While IVUs were previously performed and reported by urology trainees and consultants,

radiologists report CTKUB. In the case of critical patients presenting with ureteric stones, identifying the key findings of a CTKUB requires the urology trainees to be confident in interpreting its results. The ability of urology trainees to comment on the most critical abnormalities relevant to CTKUB would result in treatment plans being made quicker, which could be vital in some patients, especially when they present after the usual working hours.<sup>7</sup>

Several studies have attempted to quantify the ability of different non-radiology doctors and specialised radiographers to interpret various imaging modalities.<sup>5,8,9</sup> One concluded that emergency physicians could accurately detect clinically significant acute calculous disease and signs of obstruction on CT-KUB.<sup>7</sup> This study aims to test whether urology trainees can achieve similar results.

This study aims to test whether consultant radiologists' CTKUB reports match the reports initiated by 12 urology trainees with variable clinical and urological experiences.

## METHODS

We conducted a study at Royal Blackburn Hospital. Eleven urology trainees (Registrars) reviewed twelve anonymised CT KUB scans resulting in a total of 132 urology freehand text reports. We compared each one of the reports to the standard freehand text of the reporting radiology consultant.

We used OsiriX PACS viewer software, using original PACS images in both axial and coronal views, and each one of the registrars reviewed the 12 scans over 70 minutes and provided a free text report on each scan. Each one of the trainees had five minutes per report.

Then scans were also reported by consultant radiologists with both the urology registrars and the reporting consultant radiologists are blind to different reports.

We subdivided the findings of the scans into the following four categories:

1. **Key abnormalities.** These are the most striking abnormality that accounts for presentation with acute nephrolithiasis.
2. **Signs of obstruction.** These included hydronephrosis, dilated ureter, and perinephric stranding.
3. **Clinically significant findings.** These findings would affect the management plan of acute nephrolithiasis or require future assessment and treatment, such as the presence of a duplex renal system.
4. **Non-clinically significant findings.** These findings will neither affect the course of stone management nor require further investigations or assessment, such as the presence of stable intraosseous lipoma in the right iliac bone.

A complete list of the reported findings of CT scans and their classifications into the four categories is listed in Table 1.

**TABLE 1** The Four Categories of Findings of CT KUB with Examples

Category	Examples
Key Abnormalities	Obstructing ureteric stone, staghorn stone or confirming the absence of urolithiasis.
Signs of Obstruction	Hydronephrosis, dilated ureter, or perinephric stranding.
Clinically Significant Findings	Renal stone, duplex collecting system, or extensive bilateral calcifications consistent with nephrocalcinosis.
Non-clinically Significant Findings	Intrauterine contraception device, stable intraosseous lipoma right iliac bone, or tiny fleck of calcification in the kidney.

The primary outcome is to compare the overall accuracy of urology trainees' reports in reporting key abnormalities and clinically significant findings. The secondary outcome was to compare the same for signs of obstruction and clinically significant findings.

## RESULTS

Eight of the 11 urology registrars were males, and the other three were females. The average time spent in speciality training for the urology registrars was 22 months (ranging from one week to 51 months). The average time since graduation for the participating registrars was eight years and six months (ranging from 6 to 14 years).

Eight of the 12 scans were positive for urolithiasis (66.7%), while the other four were negative for urolithiasis (33.3%).

The study has shown an agreement for key abnormalities (98.4%). The results also demonstrated an understanding of clinically significant abnormalities (72.7%).

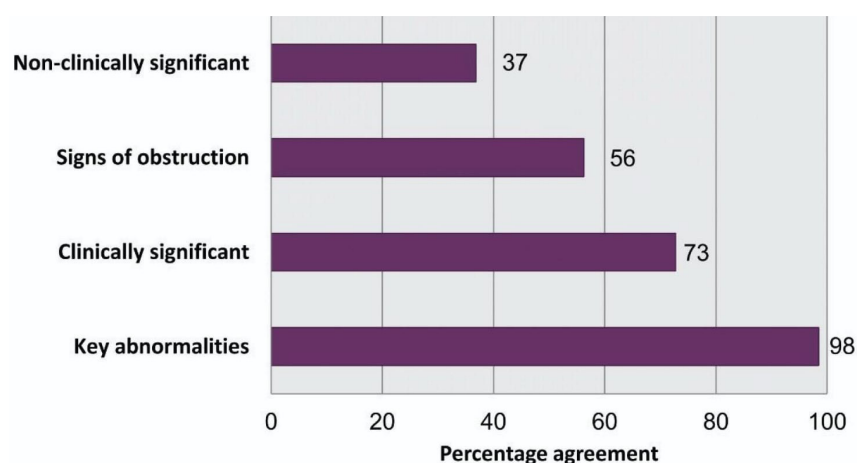
Urology trainees reported all signs of urinary tract obstruction mentioned in radiology consultants about half the time (56.2%). While they reported (36.8%) of the non-clinically significant abnormalities. Results are outlined in Figure 1.

## DISCUSSION

More studies suggest that emergency doctors' reports of CTKUB are also accurate in reporting key abnormalities.<sup>7,9</sup> The ability of urology trainees to report CTKUB completes the loop and provides a competent clinician who can interpret the scan results and start managing patients with the slightest delay possible. Moreover, having urology or radiology registrars preliminarily reporting CT KUB studies would facilitate patients' flow in emergency settings, improve the ongoing management of ureteric colic patients, and encourage early patient discharge.<sup>7,9</sup>

The ability of urology trainees with different urological experiences to identify the key findings and clinically significant abnormalities in CTKUB is likely to positively influence the acute management of ureteric colic patients by using this ability to early start managing the sickest patients.<sup>7</sup> The findings of this study would strengthen the position of urology trainees when acting upon their review of CT scans in emergencies or where there are significant delays in issuing reports for scans in less urgent situations.

However, this study does not suggest that urologists replace radiologists, and CT KUB reports



**FIGURE 1** Results reported by urology trainees of all signs of urinary tract obstruction mentioned in radiology consultation as well as non-clinically significant abnormalities.

should still be validated by a consultant radiologist. Instead, we encourage that urologists' input about CTKUB studies is considered and could provide a safety net to reach the correct conclusion. This process becomes critical when radiology trainees or consultants with less experience in uro-radiology report CTKUBs.

The increasing evidence shows that urologists and emergency doctors can identify the key findings in CT KUB studies,<sup>7</sup> opening questions about whether including more training in uro-radiology in the urology training curriculum would enhance the ability of urologists to interpret urograms and trauma scans. However, there will be a need for further studies to evaluate this.

Finally, we suggest exploring ways to enhance the knowledge and experience of urology trainees in interpreting more specialised uro-radiology scans such as CT urogram, including the relevant training in the urology curriculum, and organising regular collaborative teaching sessions between radiology and urology trainees. The latter suggestion would enhance trainees' learning and help build rapport and enrich these teaching activities.

### LIMITATIONS

Among the limitations of this study is that trainees had five minutes to report each scan, while the time given to consultant radiologists is usually 15 minutes, as provided by the hospital. Moreover, this study could have been improved by double reporting the CTKUB by two consultant urologists instead of one report and increasing the number of scan reports, including a wider variety of findings. However, this would need more resources and is unlikely to have affected the primary outcome of this study.

### CONCLUSION

This study has shown that urology trainees with varying experience can do a focused reporting to CTKUB and correctly identify key clinically significant findings.

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