# Opacification of the Renal Collecting System during CT urography (CTU)

**Descriptor:**

This audit assesses adequacy of collecting system opacification during CTU and suggests modifications to CTU protocol if the standard is not met.

**Background:**

CTU provides comprehensive evaluation of the upper and lower urinary tract and has increasingly begun to replace other imaging techniques, especially intravenous urography (IVU). CTU is a high dose investigation (CTDIvol 9-12 mGy – Ref. 1) and it is important therefore to optimise CTU protocol so as to maximise diagnostic information. Currently there is no standard CTU protocol, many suggested protocols have been published [Summarised in Ref. 1]. Failure to achieve opacification of the entire renal collecting system is a significant limitation of CTU and this audit evaluates adequacy of collecting system opacification.

## The Cycle

**The standard:**

No nationally agreed standard. The literature describes various CTU protocols, and assesses opacification in various ways. For this audit, a simple method has been selected based on Ref. 2. The renal collecting system is divided into 4 segments; renal calyces and infundibula (CI), renal pelvis (RP), upper ureter above the level of the iliac crest (UP), and lower ureter below the iliac crest (LU). Right and left renal collecting systems are assessed separately (hence most CTU’s will yield results for two renal collecting systems). Cases with urinary tract reconstruction should not be excluded and the ureter should simply be divided half way down to determine UP and LU. Opacification is assessed on a binary scale as either being satisfactory = 80% opacification, or unsatisfactory = 79% opacification. The number of satisfactorily opacified segments is then summated and converted into an opacification score (OS) expressed as a percentage

**Target:**

Published studies suggest achievable OS for each segment [Ref. 2 – aggregated from published results] are CI 95%, RP 98%, UP 85% and LU 72%.OS for each segment of the renal collecting system;

1. CI = 95%. 2. RP = 98%. 3. UP = 85%. 4. LU = 72%.

A ‘minimum standard’ of 10% lower than the target OS for each renal collecting system segment could be adopted for the first cycle but the target OS should be adopted for later audit cycles.

## Assess local practice

**Indicators:**

Percentage OS for each segment of the renal collecting system.

**Data items to be collected:**

Assess opacification of each renal collecting system segment as either satisfactory or unsatisfactory. Grading of opacification should be performed by an experienced reader if possible.

**Suggested number:**

30 CTU’s (to hopefully ensure results on at least 50 renal collecting systems).

**Suggestions for change if target not met:**

Modification of CTU protocol based on findings and pre-existing technique. Possible modifications include patient position, volume of contrast used, timing of CTU acquisition following injection, number of CTU phases acquired and use of ancillary manoeuvres such as compression bands, IV saline hydration and diuretics [Summarised in Ref. 1].

**Resources:**

Estimated time for image analysis and data collection: 6 hours (5 CTU’s per hour).

Estimated time for data interpretation: 1 hour

**References:**

1. Van Der Molen AJ, Cowan NC, Mueller-Lisse UG et al (2008). CT urography: definition, indications and techniques. A guideline for clinical practice. Eur Radiol 18: 4-17Please note that this paper includes 69 references detailing various aspects on CTU.
2. Kawamoto S, Horton KM, Fishman EK (2006). Opacification of the Collecting System and Ureters on Excretory Phase CT using Oral Water as Contrast Medium. AJR 186: 136-140
3. Washburn, Z., Dillman, J., Cohan, R., Caoili, E. and Ellis, J. (2009). Computed Tomographic Urography Update: An Evolving Urinary Tract Imaging Modality. Seminars in Ultrasound, CT and MRI, 30(4), pp.233-245.

**Editor's comments:**

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**Submitted by:**

Dr Ket Sang Tai, and adapted by Dr Jon Lloyd. Updated by CRAC 2014

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