

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

A clinical guideline

For use in:	Radiology Department (CT)
By:	CT Radiographers; Consultant Radiologists; Radiology Registrars
For:	Adult patients requiring intravenous contrast media for CT examinations
Division responsible for document:	DCSS
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Compliance links: <i>(is there any NICE related to guidance)</i>	National Institute for Health and Care Excellence (2013) CG169: Prevention, detection and management of acute kidney injury up to the point of renal replacement therapy. NICE, London.
If Yes – does the strategy/policy deviate from the recommendations of NICE? If so, why?	No

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Version and Document Control:

Version Number	Date of Update	Change Description	Author
6	20/05/2020	Time from eGFR test and outpatient CT amended from 3 months to 6 months. Several changes aimed at streamlining process for outpatients and ensuring that outpatients are not sent away unnecessarily. References updated	Dr James MacKay, Rachael Forton, Dr Paul Malcolm

This is a Controlled Document

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Section	Title	Page
1	Quick reference guide and flowcharts	3
2	Preamble	4
3	Rationale and Background	5
4	Guidelines – Outpatients	6
5	Guidelines – Inpatients	7
6	Clinical Audit Standards	8
7	Development and Consultation	8
8	Distribution List	9
9	References	9

Glossary	
CIN	Contrast Induced Nephrotoxicity. Transient or permanent decline in renal function following administration of IVCM (see below)
eGFR	Estimated glomerular filtration rate. An equation derived from the MDRD (Modification of Diet in Renal Disease) study using serum creatinine, modified according to age and sex
IVCM	Iodinated intravenous contrast media. Used to improve contrast resolution in a number of angiographic, CT, fluoroscopic and plain radiographic examinations
PACS	Picture Archiving and Communication System. A method for storing radiological studies

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1. Quick reference guide

Renal function & contrast: **inpatients**

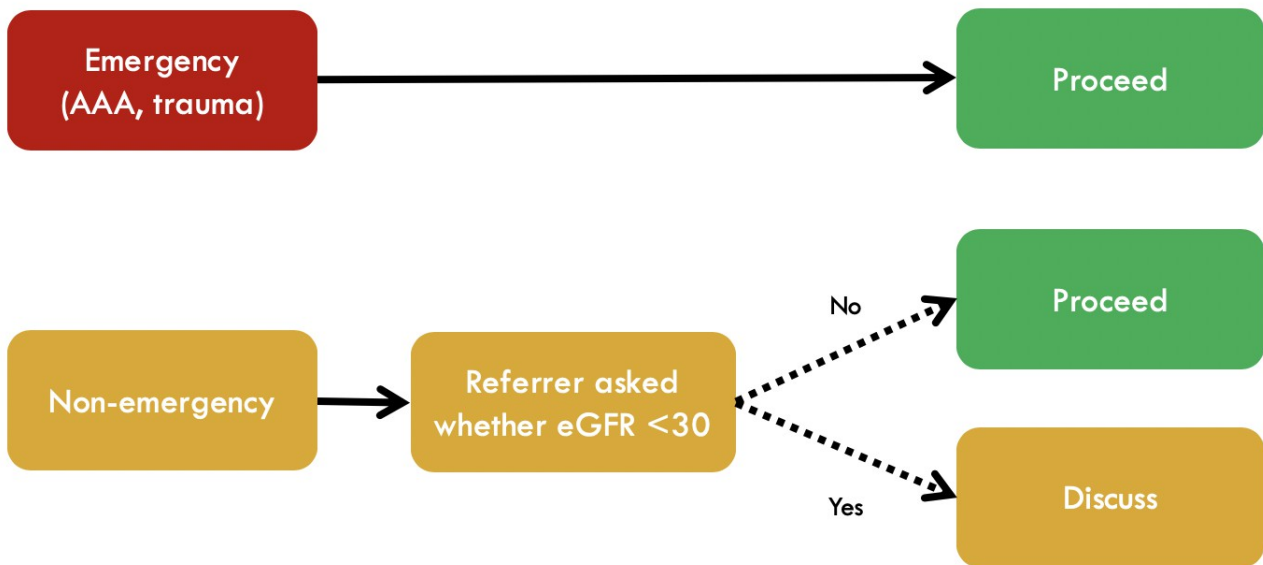


Figure 1 – Inpatient flow chart

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

Renal function & contrast: outpatients

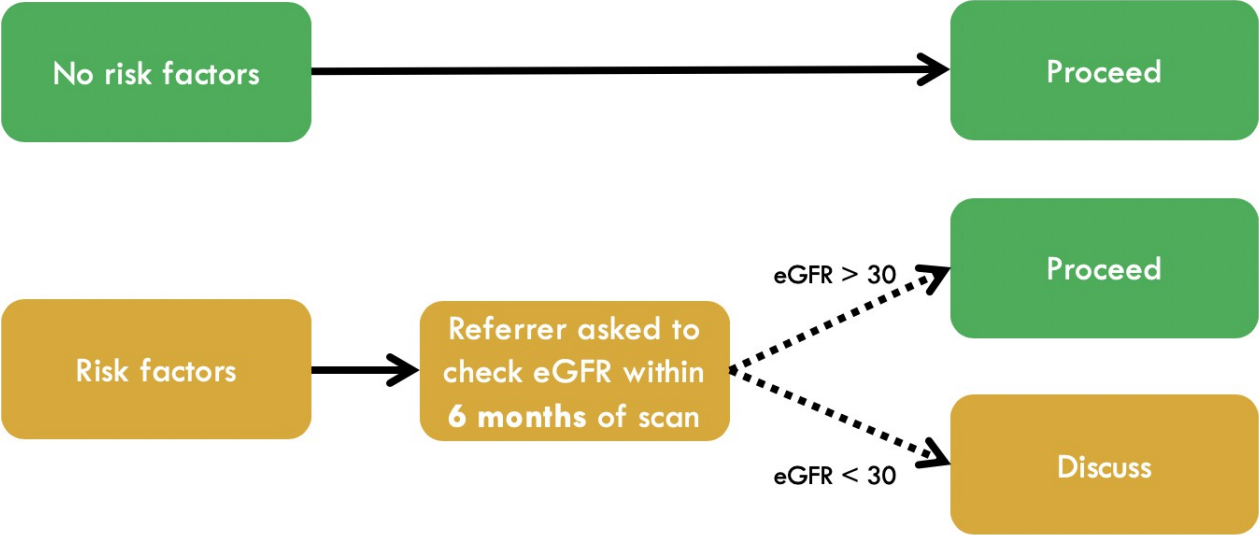


Figure 2 – Outpatient flow chart

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2. Preamble

The National Institute for Health and Care Excellence (NICE) released new guidance in August 2013 on the prevention, detection and management of acute kidney injury (CG169). This did not specify a threshold for the time period prior to a scan in which it was acceptable to check eGFR. Rather, it focussed on assessing risk and taking steps to minimise this.

The guidance is summarised below:

Before offering iodinated contrast agents to adults for emergency or non-emergency imaging, assess their risk of acute kidney injury. Be aware that increased risk is associated with:

Chronic kidney disease (adults with an eGFR less than 40 mL/min/1.73 m² are at particular risk)

Diabetes but only with chronic kidney disease (adults with an eGFR less than 40 mL/min/1.73 m² are at particular risk)

Heart failure

Renal transplant

Age 75 years or over

Hypovolaemia

Increasing volume of contrast agent

Intra-arterial administration of contrast agent

~~Ensure that risk assessment does not delay emergency imaging.~~

Two important papers on CIN were published in *Radiology*, also in 2013. McDonald et al demonstrated that rates of acute kidney injury (AKI) following CT were independent of whether or not IVCM had been administered in a large cohort (>5000 patients) which included both inpatients and outpatients. Another study by Davenport et al suggested that IVCM was a risk factor for AKI in inpatients, but that this risk was mostly concentrated in those with eGFR <30 mL/min/1.73 m² and confined entirely to those with eGFR <45 mL/min/1.73 m².

The overall trend is towards a view of IVCM as more often a coincident rather causal phenomenon in AKI. This update reflects this trend, as well as new NICE, Royal College of Radiologists (RCR) and trust guidance.

Key updates throughout the document have been highlighted in **bold type**.

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

3. Rationale and Background

Aim:

To minimise the risk of contrast induced nephrotoxicity (CIN) following the administration of intravenous contrast media (IVCM) in CT examinations.

Background:

- CIN is a rare, but potentially serious complication of the administration of IVCM.
- CIN does not have a universally agreed definition; however it is generally defined as between a 25 – 50% increase in serum creatinine 48-72h post exposure to IVCM. In severe cases it has been linked to the development of irreversible severe renal failure leading to dialysis dependence and possibly death.
- There is a lack of good data on the prevalence of CIN due to a lack of controlled trials carried out in the appropriate setting (i.e. IV cf. IA administration)
- However, there is evidence that the IV administration of contrast media can still cause serious harm in high risk patients, particularly those with chronic kidney disease (CKD) or diabetes mellitus.
- For the purposes of practicality, we have defined at risk patients as those with eGFR < 60 mL/min/1.73m². Other risk factors include diabetes, heart failure, renal transplants, age >75 years, increasing volume of contrast, intra-arterial contrast and hypovolaemia.
- Patients with very poor renal function (eGFR < 30 mL/min/1.73m²) are at highest risk, especially if they are diabetic.
- Multiple interventions have been suggested to reduce the risk of CIN, however there is no consensus. There is agreement that the principal strategy should be avoiding exposure of patients at high risk of CIN to IVCM.
- Ensuring adequate hydration before and after the examination is also generally agreed to help reduce risk of CIN. This may require IV administration of fluids in particularly high risk patients.
- The administration of IVCM enhances the diagnostic quality of many CT examinations. In most cases, it should be presumed that the risk of non-diagnostic examination outweighs any risk of CIN.

This guideline is intended to operate alongside, but not supersede protocol RADCT 14 (Administration of Contrast Media in CT) and Trust guideline on Acute Kidney Injury [Trustdocs ID No: 1345](#).

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

4. Guidelines – Outpatients

- All patients should have a recorded eGFR prior to CT examinations involving IVCM.
- Patients without risk factors for CIN (as assessed by the referrer) do not require an up-to-date eGFR measurement.
- **Radiographers/assistants/clerical staff are not required to check renal function prior to CT with IVCM if the referrer has stated that there are no risk factors.**
- **All patients with risk factors for CIN (as assessed by the referrer) should have an up-to-date eGFR performed within 6 months of their examination.**
- At the time of ICE request, the referrer will be asked if there are risk factors for contrast induced nephropathy. For a full discussion of these risk factors they will be referred to the excellent Trust guideline on Acute Kidney Injury [Trustdocs ID No: 1345](#).
 - If the clinician answers **"Yes"**
 - The following is displayed:

"Please check eGFR within 6 months of scan. Please see trust guideline on Acute Kidney Injury for strategies to prevent CIN"

- This text includes a hyperlink taking the user to the trust guideline on AKI.
 - If the clinician answers **"No"**
 - The following is displayed:

"If eGFR never checked previously, please check within 6 months of scan"

Prevention of CIN - Outpatients

If NO risk factors present (RIS - [Radiology Contrast Induced Nephropathy] No)

- Proceed with examination as per standard CT protocol (see 'CT Protocols'). No specific additional action required. **No pre-procedure eGFR check required.**

If risk factors present (RIS - [Radiology Contrast Induced Nephropathy] Yes)

- Up-to-date eGFR desirable at time of examination (within preceding **6 months**).
- In certain circumstances where no recent eGFR is available, if the examination will clearly be of limited diagnostic use without the use of IVCM (e.g. CT angiography), the scan may proceed with the use of IVCM at radiographer and radiologist discretion.
- If up-to-date eGFR available, and eGFR is $>30\text{mL}/\text{min}/1.73\text{m}^2$, proceed with examination as per standard CT protocol.

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

- If up-to-date eGFR is available, and eGFR $<30\text{mL}/\text{min}/1.73\text{m}^2$, then this should be discussed between radiographer and radiologists. Consideration should be given to the risks of losing valuable diagnostic information vs. small risk of CIN, especially in patients with stable low eGFR. In certain circumstances, the benefits of administering IVCM to patients with eGFR $<30\text{mL}/\text{min}/1.73\text{m}^2$ will outweigh the risks.

In such cases the referrer may also wish to take appropriate preventative action, including stopping nephrotoxins where clinically possible, consideration of pre-hydration and appropriate post-scan monitoring of urea and electrolyte levels.

If NO risk factors present, but no prior eGFR available

- eGFR **desirable** at time of examination
- In certain circumstances, the benefits of administering IVCM to patients with no previous eGFR may outweigh the risks (e.g. a CT examination which would be of limited use without IVCM in a young patient with no renal risk factors). The examination can proceed with the use of IVCM at the discretion of the radiographer and radiologist.

5. Guidelines – Inpatients

An up-to-date eGFR is desirable for all inpatients undergoing CT examinations with the administration of IVCM. This should be achievable in all but the most urgent situations (e.g. polytrauma). In such urgent circumstances the benefit of administering IVCM will generally outweigh the risk of CIN and it is acceptable to proceed without knowledge of the patient's eGFR.

- At the time of ICE request, the referrer will be asked if most recent eGFR is $< 30\text{ mL}/\text{min}/1.73\text{ m}^2$ or if there is significant acute kidney injury (AKI).
 - If the answer is no, the request is processed and we proceed as for outpatients without risk factors for CIN
 - If the answer is yes, the following message is displayed to the referrer:

"The administration of IV contrast in this setting may carry a risk of contrast induced nephropathy. Please discuss with Radiology as to whether contrast is indicated (x6966)"

In this setting, IVCM will only be administered following discussion with the Radiology department. Clinicians will be directed to the Trust guideline on Acute Kidney Injury, particularly the following section which summarises the guidance on preventing CIN:

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

Preventing Contrast Induced Nephropathy (CIN)

CIN may be caused by iodinated contrast

Risk factors include:

CKD stage 3+ (eGFR <60mL/min/1.73m²), diabetics, heart failure, renal transplant, age >75 years, increasing vol. of contrast, intra-arterial contrast, hypovolaemia

Clinicians should consider if the test is necessary, could it be deferred, and is there an alternative imaging modality?

High risk patients or those with an acute illness should be volume expanded with 0.9% sodium chloride to euvolaemia prior to the procedure, and if eGFR <40mL/min/1.73m², ACEi/ARBs withheld for 48hrs post procedure.

If high risk or acutely ill patients have a contraindication to pre-hydration, please discuss with senior member of nephrology team prior to procedure

6. Clinical Audit Standards

The following will be audited on an annual basis:

- Time taken from most recent measurement of eGFR to CT scan in outpatients attending for CT with IVCM with risk factors for CIN.

Target: 100% to have had eGFR measurement within preceding 6 months.

- Number of outpatients per month attending for CT with IVCM with no prior measurement of eGFR.

Target: 0 patients to attend without prior eGFR measurement available.

- CT scanner downtime whilst radiographers/radiologists discuss whether or not to give IVCM in patients with no available eGFR or without documented discussion with radiology.

Target: 0 mins CT scanner downtime.

7. Development and Consultation Process

This document has been prepared using national and international guidance as well as the latest peer-reviewed evidence. It was conceived within the NNIPS 4 programme which promotes excellence in quality improvement projects.

The authors prepared the protocol on behalf of the Clinical Director and service managers of Radiology who have agreed the final content.

During development, it was circulated to Consultant Radiologists, Consultant Nephrologists, Radiology SpRs, CT Radiographers, PACS room and Radiology departmental administrative staff.

Guideline for the Administration of IV Contrast Media in Patients at Risk of Contrast Induced Nephrotoxicity (CIN)

The content has also been presented at the Radiology Clinical Governance Meeting and to the organisers of the NNIPS project.

This version has been endorsed by the Clinical Guidelines Assessment Panel (CGAP)

8. Distribution List

- All Consultant and junior medical staff
- All Norfolk and local area General Practitioners
- Radiology Consultants
- Radiology SpRs
- Radiographers

9. References

National Institute for Health and Care Excellence (2013) CG169: Prevention, detection and management of acute kidney injury up to the point of renal replacement therapy. NICE, London.

The Royal Australian and New Zealand College of Radiologists (2018) Iodinated Contrast Media Guideline. RANZCR, Sydney.

<https://www.ranzcr.com/college/document-library/ranzcr-iodinated-contrast-guidelines>

Davenport, M. S. *et al.* (2020) Use of Intravenous Iodinated Contrast Media in Patients with Kidney Disease: Consensus Statements from the American College of Radiology and the National Kidney Foundation. *Radiology*, 294, 660 – 668..