Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust

Please Note: This policy is currently under review.

Prevention of Contrast Induced Acute Kidney Injury Guidelines in Adults (CI-AKI)

This procedural document supersedes: PAT/T 48 v.3 - Guidelines for Prevention of Contrast Induced Nephropathy (CIN)

Did you print this document yourself?

The Trust discourages the retention of hard copies of policies and can only guarantee that the policy on the Trust website is the most up-to-date version. **If, for exceptional reasons, you need to print a policy off, it is only valid for 24 hours.**

Executive Sponsor(s):	Ray Cuschieri – Deputy Medical Director (Clinical Standards)
Author/reviewer: (this version)	Julie Kay – DRI Pharmacist Jas Sawhney – Medical Imaging Consultant Ian Stott – Renal Consultant Wendy Lee – Deputy Head Medical Imaging Rina George – Gastro Surgical Team Consultant
Date revised:	March 2020
Approved by:	Patient Safety Review Group/Policy Approval and Compliance Group
Date of approval:	11 March 2020
Date issued:	14 June 2021 – **Implementation date 28 June 2021**
Next review date:	March 2023
Target audience:	Trust Wide

Amendment Form

Please record brief details of the changes made alongside the next version number. If the procedural document has been reviewed **without change**, this information will still need to be recorded although the version number will remain the same.

Version	Date	Brief Summary of Changes	Author
Version 4	14 June 2021	• Major changes have been made throughout and it is recommended that you read this document in full. • Title change. • Adoption of South Yorkshire and Bassetlaw Integrated Care system guidance on Prevention of Contrast induced kidney injury • Emergency imaging procedures for life/limb threatening conditions should not be delayed waiting for Estimated glomerular filtration rate (eGFR) results, in this situation the benefit of early diagnosis and treatment outweighs the risk of the contrast. • No need for routine checking of baseline eGFR in stable patients unless >65yrs, pre-existing kidney disease (including those with renal transplants or eGFR <60ml/min) or patient is diabetic • Stable patients with risk factors stratified as low risk eGFR >30ml/min –proceed Medium risk eGFR 15-30ml/min-oral hydration High risk eGFR < 15ml/min iv hydration • Acutely unwell patients will all have baseline eGFR checked and be given iv hydration (unless benefit outweighs risk) unless life/limb threatening emergency • Change of terminology from Contrast Induced Nephropathy (CIN) to Contrast Induced Acute Kidney Injury (CI-AKI)	Julie Kay Jas Sawhney Ian Stott Wendy Lee Rina George

Version 3	4 May 2018	• Major changes have been made throughout and it is recommended that you read this document in full • Use of eGFR rather than creatinine for assessment of CIN risk • Ensuring eGFR known prior to requesting scan so informed decision can be made as to risk and benefit of particular scan and where this is not the case mechanisms are in place to ensure clinical review of those deemed high risk prior to the scan. • Ensure details of risk/benefit in relation to those with renal impairment documented on request/referral	Julie Kay Jas Sawhney Ian Stott Wendy Lee
Version 2	July 2012	• Major changes have been made throughout and it is recommended that you read this document in full. • Paragraph 2 removal of Administration of N-Acetylcysteine (NAC) is believed to reduce this complication although not proven. As this drug is relatively inexpensive, most clinicians administer this drug for prevention of CIN. • Replaced with: Due to lack of evidence and the logistical problems associated with prescribing an unlicensed medicine, the administration of N-Acetylcysteine is no longer recommended although the decision for this remains with the referring clinician. • References updated • **Appendix 1** updated • **Appendix 2** added	Dr M Arkanath
Version 1	February 2010	This is a new procedural document, please read in full.	Dr M Arkanath

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Prevention and Monitoring Algorithm

Intravascular iodinated contrast media should be given to any patient regardless of renal function status if the perceived diagnostic benefit to the patient justifies this administration. Emergency studies should NOT be delayed to assess the risk of contrast-induced AKI

Well / Stable Patient?

Yes

No

Is baseline / recent (within 3 months) serum creatinine required? *

No → Proceed

Yes

Risk Stratify as follows:

Low Risk: eGFR >30 ml/min/1.73m²
Proceed with the Study

Medium Risk: eGFR 15-30 ml/min/1.73m²

- Discuss CI-AKI risk with patient (Informed Consent by the patient to be recorded on ICE requesting form)
- Follow trust guideline on Stopping Metformin
- Oral Hydration**
- Check Kidney Function 48-72 hours post Contrast

High Risk: eGFR < 15 ml/min/1.73m²

- Discuss CI-AKI risk with patient (Informed Consent by the patient to be recorded on ICE requesting form)
- If patient takes metformin it should be stopped indefinitely
- IV hydration ***
- Check Kidney Function 48-72 hours post Contrast

Acutely unwell patients (e.g. sepsis, hypovolaemia)

- Must have a baseline serum creatinine (within 7 days)
- Manage AKI (see appendix 1) if AKI alert on ICE
- Discuss CI-AKI risk with patient if possible (Informed Consent by the patient to be recorded on ICE requesting form)
- Withhold Metformin
- IV hydration***
- Monitor Urea & Electrolytes daily for the first 72 hours
- For Stage 3 AKI consult the on call Renal team but this should NOT delay obtaining an urgent scan

* Baseline / recent serum creatinine (and eGFR) is required for patients with:

- Age > 65
- Pre-existing chronic kidney disease
- Diabetes

**Oral Hydration: At least 1 litre of water (can be mixed with cordial) in the 4 hours before the appointment time and a further 1 litre in the 4 hours following the scan

***IV hydration: 0.9% Sodium Chloride 0.9% 500 ml pre & 500 ml post-contrast, however modify according to volume status. Sodium bicarbonate 1.26% or 1.4% can be used as alternative.

1. INTRODUCTION

Intravascular administration of radiographic contrast media may result in contrast induced acute kidney injury (CI-AKI). This is usually self-limiting but may require a period of dialysis. The incidence of CI-AKI is greatest in patients with a decreased Estimated glomerular filtration rate (eGFR) (<30ml/min/1.73^2), in diabetic nephropathy with renal insufficiency, or in advanced heart failure etc. The risk is further increased by dehydration or concurrent exposure to other nephrotoxins, but reduced by limiting the volume of contrast and the use of low osmolar non-ionic contrast medium.

Prevention of this complication is achieved by adequate hydration prior to and/or during the procedure. Due to lack of evidence the administration of N-Acetylcysteine is no longer recommended although the decision for this remains with the referring clinician.

The Trust has adopted the guidance from the South Yorkshire and Bassetlaw Integrated Care system. The full guidance can be found in section 5.

2. PURPOSE

The purpose of this document is to provide clear instruction on the correct operational procedure for at risk patients receiving intravascular contrast medium.

It is the responsibility of the referring team, prior to referral for radiological investigations requiring contrast, to assess their patients' risk factors for developing CI-AKI. The referring team must also ensure baseline eGFRs are ordered when appropriate, hydration prescribed where required and drug therapy adjusted in line with the guidance.

The clinical team also has ongoing responsibility for monitoring urea and electrolytes in those patients at risk in line with the guidance.

The exception to this is when the benefit of very early imaging outweighs the risk of delaying the procedure. Emergency imaging procedures requiring contrast media in life or limb threatening situations eg acute stroke, acute bleeding, trauma should not be delayed in order to obtain renal function tests. Where this is the case the referrer must ensure a senior doctor is involved in this decision and document this in the clinical records and on the referral form.

3. DUTIES AND RESPONSIBILITIES

Consultant medical staff are responsible for ensuring that their junior staff (including locum staff) read and understand this guidance and adhere to it at all times.

4. GENERAL PRINCIPLES

The risk of CI-AKI should be assessed for individual patients as although presence of renal impairment is often the major determinant, other factors can increase the risk greatly. Patients in the at risk group include:

Diabetes
Multiple myeloma
Malignancy
Heart failure
Sepsis
Volume depleted states – GI bleed, diarrhoea and vomiting, diuretics
Age>65years
Patient receiving nephrotoxic agents eg aminoglycosides, NSAIDs, amphotericin
Patients needing scans requiring intra-arterial administration of contrast
CKD eGFR <60ml/min/1.73²
Multiple administrations of contrast media within a few days

Consider putting **at risk** patients on the hydration protocol despite normal renal function.

- The algorithm (please see front of policy) to decide which patients need their renal function checking and may subsequently need hydration is based on if the patient is well/stable.
  In general most outpatients will be classed as stable and most inpatients classed as unstable, however this should be reviewed by the requesting clinician at the time the request is made. If a patient is requiring repeated administration of contrast within a short period of time there is no need for additional monitoring of their renal function, if they are well/stable, (repeat readings should be obtained as noted in the algorithm for patients who are acutely unwell or in a medium or high risk category). It is the clinical teams' responsibility to ensure repeat renal function tests are ordered and reviewed where indicated.

- It is important to include all the appropriate information on the referral form to allow the imaging team to approve the request. In patients that are acutely unwell, or if the patient is at moderate or high risk of contrast induced AKI, it is important to document that the benefit of the test outweighs any risk. For patients at the very highest risk eGFR<15ml/min or AKI 2 or higher discuss the possibility of alternative imaging modalities with the radiologist and document this on the referral proforma. Advice should also be sought in this patient group where appropriate from the renal team. If intravenous hydration is required indicate this on the request form together with assurances that this will be organised to commence prior to the scan.

- Use caution when using the guideline in patients with fluid overload. Should your patient fall in the high risk category, but be unsuitable for the usual hydration regime, the need for a contrast scan should be reviewed with the consultant in charge of the patient/ radiologist/renal team as appropriate. If a contrast scan is still deemed appropriate the referral should include details around the risk/benefit for the patient concerned and state that they are unsuitable for the usual hydration regime.

- For outpatient scans it is the responsibility of the Medical Imaging team to inform the clinician's secretary of the time and date of the radiological procedure, thus enabling the referring team to expedite the intravenous hydration protocol where indicated. For in-patient scans the medical imaging team will contact the ward nursing staff with the time of the scan to allow the intravenous hydration protocol to be commenced at the appropriate time.

- The nurse organising the transfer of patients on the hydration protocol to the medical imaging department should ensure this has been administered as per guidance and hand this over to the medical imaging team.

PATIENTS LACKING CAPACITY

Sometimes it will be necessary to provide care and treatment to patients who lack the capacity to make decisions related to the content of this policy. In these instances staff must treat the patient in accordance with the Mental Capacity Act 2005 (MCA 2005).

- A person lacking capacity should not be treated in a manner which can be seen as discriminatory.
- Any act done for, or any decision made on behalf of a patient who lacks capacity must be done, or made, in the persons Best Interest.
- Further information can be found in the MCA policy, and the Code of Practice, both available on the intranet.

There is no single definition of Best Interest. Best Interest is *determined on an individual basis. All factors relevant to the decision must be taken into account, family and friends should be consulted, and the decision should be in the Best interest of the individual. Please see S5 of the MCA code of practice for further information.*

5. SOUTH YORKSHIRE AND BASSETLAW (SYB) INTEGRATED CARE SYSTEM (ICS): SHARED CONTRAST INDUCED ACUTE KIDNEY INJURY GUIDELINES V6

Application

The shared guidelines are applicable to organisations comprising the South Yorkshire and Bassetlaw ICS, including Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust, The Rotherham NHS Foundation Trust, Sheffield Teaching Hospitals NHS Foundation Trust, Barnsley Hospital NHS Foundation Trust and Chesterfield Royal Hospital NHS Foundation Trust.

Introduction

Contrast-induced acute kidney injury (CI-AKI), previously known as contrast –induced nephropathy, refers to an acute decline in kidney function in association with the use of iodinated contrast medium. The risk of CI-AKI remains uncertain for patients with an estimated glomerular filtration rate (eGFR) less than 45 mL/min/1.73 m^2, but if there is a risk, it is greatest in those with eGFR less than 30 mL/min/1.73 m^2. Commonly recognised risk factors include:

Patient factors:

- **Known renal insufficiency**
- **diabetes**
- **malignancy**
- **age over 65 years**
- **use of non-steroidal anti-inflammatory drugs**

Procedural factors:

- **high contrast media volumes**
- **multiple administrations of contrast media within a few days**

General Principles

- **Inpatients undergoing contrast investigations are often acutely unwell and are at risk of acute kidney injury from other causes e.g. sepsis, hypovolaemia, the use of nephrotoxic drugs. Therefore, a full risk assessment of AKI should be undertaken as per individual trust AKI guidelines (see appendix 2)**
- **Emergency imaging procedures requiring contrast media administration e.g. acute stroke, acute bleeding, trauma etc. should NOT be delayed in order to obtain renal function tests prior to the procedure or to discuss with Renal registrar.**
- **Intravascular iodinated contrast media should be given to any patient regardless of renal function status if the perceived diagnostic benefit to the patient justifies this administration**
- **When using pre and post hydration for prevention of CI-AKI, the responsible clinician should make an assessment of the patient's volume status and appropriateness of hydration e.g. heart failure patients, established dialysis patients.**
- **In non-emergency studies, kidney transplant and dialysis dependent patients should always be discussed with the renal team.**
- **Management of CI-AKI follows the same principles of managing any case of AKI which involves monitoring, attention to volume status and management of concurrent AKI risk factors (Appendix 2)**

Prevention and Monitoring Algorithm

Intravascular iodinated contrast media should be given to any patient regardless of renal function status if the perceived diagnostic benefit to the patient justifies this administration. Emergency studies should NOT be delayed to assess the risk of contrast-induced AKI

Well / Stable Patient?

Yes

No

Is baseline / recent (within 3 months) serum creatinine required? *

No

Proceed

Yes

Risk Stratify as follows:

Low Risk: eGFR >30 ml/min/1.73m^2
Proceed with the Study

Medium Risk: eGFR 15-30 ml/min/1.73m^2

- Discuss CI-AKI risk with patient (Informed Consent by the patient to be recorded on ICE requesting form)
- Follow trust guideline on Stopping Metformin
- Oral Hydration**
- Check Kidney Function 48-72 hours post Contrast

High Risk: eGFR < 15 ml/min/1.73m^2

- Discuss CI-AKI risk with patient (Informed Consent by the patient to be recorded on ICE requesting form)
- If patient takes metformin it should be stopped indefinitely
- IV hydration ***
- Check Kidney Function 48-72 hours post Contrast

Acutely unwell patients (e.g. sepsis, hypovolaemia)

- Must have a baseline serum creatinine (within 7 days)
- Manage AKI (see appendix 1) if AKI alert on ICE
- Discuss CI-AKI risk with patient if possible (Informed Consent by the patient to be recorded on ICE requesting form)
- Withhold Metformin
- IV hydration***
- Monitor Urea & Electrolytes daily for the first 72 hours
- For Stage 3 AKI consult the on call Renal team but this should NOT delay obtaining an urgent scan

* Baseline / recent serum creatinine (and eGFR) is required for patients with:

- Age > 65
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- Diabetes

**Oral Hydration: At least 1 litre of water (can be mixed with cordial) in the 4 hours before the appointment time and a further 1 litre in the 4 hours following the scan

***IV hydration: 0.9% Sodium Chloride 0.9% 500 ml pre & 500 ml post-contrast, however modify according to volume status. Sodium bicarbonate 1.26% or 1.4% can be used as alternative.

Appendix 1 SYB guidance: Metformin Guidance

Metformin is not nephrotoxic but is entirely renally excreted. Patients who develop CI-AKI are at risk of accumulation with a small risk of developing lactic acidosis.

Elective contrast studies:

- **eGFR >30 ml/min: Continue with Metformin**
- **eGFR < 30 ml/min or who have deteriorating renal function should cease metformin for at least 48 hours from the time of the examination. The patient / GP should be informed as it is generally recommended that patients with eGFR < 30 should not be on metformin in any case.**

Urgent or emergency studies:

- **Stop the Metformin and re-instate when eGFR > 30 ml/min/1.73m^2**

Appendix 2 SYB guidance: Management of CI-AKI

Inpatients:
The management should be part of the management of their overall conditions and in accordance with individual trust AKI policy

Outpatients:
Most of these patients are monitored and managed by their primary care physicians and should follow the primary care guidelines for AKI management

References

- The Royal Australian and New Zealand College of Radiologists. Iodinated Contrast Media Guideline. Sydney: RANZCR; 2016.
- The Renal Association, British Cardiovascular Intervention Society and The Royal College of Radiologists. Prevention of Contrast Induced Acute Kidney Injury (CI-AKI) In Adult Patients.
- STH AKI Care bundle and guidelines
- STH AKI policy

6. TRAINING/ SUPPORT

As the professional, with overall clinical responsibility for patients, the consultant will ensure that clinical standards are maintained and that any deviation from this protocol is documented in the clinical notes.

The consultant will supervise medical staff in training to ensure compliance with this protocol.

Please note: The Standard Training Needs Analysis (TNA) – The training requirements of staff will be identified through a training needs analysis. Role specific education will be delivered by the service lead.

7. MONITORING COMPLIANCE WITH THE PROCEDURAL DOCUMENT

NHSLA Criteria	Monitoring	Who	Frequency	How Reviewed
Level 1:	Audit of medical imaging referrals for compliance with Guidelines	Medical Imaging Clinical Governance Group	Annually	Results forwarded to departmental clinical governance meetings – with non compliance presented to PSRG

8. EQUALITY IMPACT ASSESSMENT

The Trust aims to design and implement services, policies and measures that meet the diverse needs of our service, population and workforce, ensuring that none are disadvantaged over others. Our objectives and responsibilities relating to equality and diversity are outlined within our equality schemes. When considering the needs and assessing the impact of a procedural document any discriminatory factors must be identified.

An Equality Impact Assessment (EIA) has been conducted on this procedural document in line with the principles of the Equality Analysis Policy (CORP/EMP 27) and the Fair Treatment For All Policy (CORP/EMP 4).

The purpose of the EIA is to minimise and if possible remove any disproportionate impact on employees on the grounds of race, sex, disability, age, sexual orientation or religious belief. No detriment was identified. (see appendix 2).

9. ASSOCIATED TRUST PROCEDURAL DOCUMENTS

PAT/PS 19 - Mental Capacity Act 2005 Policy and Procedure, including Deprivation of Liberty Safeguards (DoLS)
PAT/PA 28 - Privacy and Dignity Policy
CORP/EMP 4 – Fair Treatment for All Policy
CORP/EMP 27 – Equality Analysis Policy

10. DATA PROTECTION

Any personal data processing associated with this policy will be carried out under 'Current data protection legislation' as in the Data Protection Act 2018 and the UK General Data Protection Regulation (GDPR) 2021.

For further information on data processing carried out by the trust, please refer to our Privacy Notices and other information which you can find on the trust website:
https://www.dbth.nhs.uk/about-us/our-publications/information-governance/

11. REFERENCES

Department of Constitutional Affairs Mental Capacity Act (2005): Code of Practice, 2007
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/497253/Mental-capacity-act-code-of-practice.pdf

Katzberg R W Contrast Induced Nephropathy in 2010. *Journal of Applied Radiology (Sept 2010)* vol 39, No 9

Kshirsagar AV, Poole C, Mottl A, Shoham D,Fraceschini N, Tudor G, Agrawal M, Denu-Ciocca C, Magnus Oman E, Finn WF, N-Acetylcysteine for the prevention of radiocontrast induced nephropathy: a meta-analysis of prospective controlled trials. *J Am Soc Nephrology 2004 March*: 15(3): 761-9. Review

Navaneethan SD. Sodium Bicarbonate Therapy for Prevention of Contrast Induced Nephropathy: A Systematic Review and Meta-analysis: *American Journal of Kidney Diseases;* (April 2009); Vol 53, No 4: 617-27

RCR (2013)Prevention of contrast induced kidney injury in adult patients. On behalf of the renal association, British Cardiovascular Society and the Royal College of Radiologists**.**

Stacul F, Van der Molen AJ, Reimer P, Webb AJ Thomasen HS, Morcos SK, Almen T, Aspelin P, Bellin MF, Clement o, Hienz-Peer G Contrast Induced Nephropathy: update
EUSR Contrast Media Safety Committee Guidelines *Journal of European Radiology* 2011 Dec 21(12): 2527-41

APPENDIX 1 - DIAGNOSIS AND MANAGEMENT OF ACUTE KIDNEY INJURY (AKI): BRIEF GUIDANCE

Diagnosis:
Acute kidney injury (AKI) should be diagnosed where there is evidence of rising serum creatinine or persistently reduced urine output. AKI can be staged according to the KDIGO classification:

Stage

Stage 1-AKI 1
Creatinine Increased by > 26.5 umol/l or 1.5-1.9 times baseline
Urine Output <0.5ml/kg/hour for 6-12 hours

Stage 2-AKI 2
Creatinine increased by 2-3 times baseline
Urine Output <0.5ml/kg/hour for >12 hours

Stage 3-AKI 3
Creatinine increased by > 3 times baseline or rise to > 354umol/l or need for dialysis
Urine Output <0.3ml/kg/hour for > 24 hours or anuria for > 12 hours

Where creatinine results are consistent with AKI the laboratory system will attach a note to the U&E report to this effect (however the absence of such a report does not exclude AKI, especially if no previous results are available for comparison).

Management:
When AKI is identified the following should be considered:

A: ABC
The first priority is initial resuscitation. A conventional ABC approach should be followed.

I: Initiate appropriate fluid management
If the patient is hypovolaemic then urgent fluid resuscitation should be commenced with boluses of fluid. A typical regime would be: 250ml bolus of Crystalloid given over 15 minutes with regular assessment of BP, pulse, capillary refill time, urine output and auscultation of lung bases to exclude crepitations. Repeat in the absence of signs of overload, up to 2L max. If still no response then call for senior review.

If the patient has evidence of fluid overload restrict fluid intake and consider loop diuretic.

M: Medication review
Review all medication and stop any potentially nephrotoxic agents. In particular consider ACE inhibitors, angiotensin receptor antagonists, NSAIDs, diuretics (unless indicated for overload), metformin, trimethoprim and aminoglycosides such as gentamicin (with microbiology advice if needed for alternatives).

Adjust doses of drugs which are renally excreted: Review all medications and consider need for dose reduction. In particular review antibiotics (eg cefuroxime), analgesia (eg morphine) and anticoagulants (eg dalteparin).

Brief AKI Guidance Final May 2013 I Stott

APPENDIX 2 – EQUALITY IMPACT ASSESSMENT - PART 1 INITIAL SCREENING

Service/Function/Policy/Project/ Strategy	Division	Assessor (s)	New or Existing Service or Policy?	Date of Assessment
Prevention of Contrast Induced Acute Kidney Injury Guidelines in Adults (CI-AKI) – PAT/T 48 v.4	Diagnostics & Pharmacy	Julie Kay	Existing	17/9/19

1) Who is responsible for this policy? Cross Division

2) Describe the purpose of the service / function / policy / project/ strategy? The purpose of this document is to provide clear instruction on the correct operational procedure for at risk patients receiving intravascular contrast medium Ensuring high risk patients are given appropriate hydration regime prior to receiving contrast will reduce the risk of contrast induced nephropathy

3) Are there any associated objectives? RCR guidance on this topic, SY&B guidance being adopted

4) What factors contribute or detract from achieving intended outcomes? Involves all Divisions

5) Does the policy have an impact in terms of age, race, disability, gender, gender reassignment, sexual orientation, marriage/civil partnership, maternity/pregnancy and religion/belief? no

6) Is there any scope for new measures which would promote equality? no[any actions to be taken

7) Are any of the following groups adversely affected by the policy? no

Protected Characteristics	Affected?	Impact
a) Age	No	
b) Disability	No	
c) Gender	No	
d) Gender Reassignment	No	
e) Marriage/Civil Partnership	No	
f) Maternity/Pregnancy	No	
g) Race	No	
h) Religion/Belief	No	
i) Sexual Orientation	No	

8) Provide the Equality Rating of the service / function /policy / project / strategy – tick (✓) outcome box

Outcome 1 ✓	Outcome 2	Outcome 3	Outcome 4

Date for next review: March 2023

Checked by: Jas Sawhney **Date: March 2020**