Protocol for the safe administration of iodinated contrast media in diagnostic radiology

Protocol statement:
This protocol applies to all staff within Radiology Departments at Heart of England NHS Foundation Trust responsible for the prescription and administration of iodinated contrast agents.

Key Points
- Introduction
- Standard safety precautions
- eGFR (estimated glomerular filtration rate)
- Identifying at risk patients
  Table summary of protocol for the administration of iodinated contrast media after renal impairment assessment using the estimated GFR (attachment 2)

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Ratified Date: December 2012
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Review Date: November 2014
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Attachment 1: Contrast questionnaire
Attachment 2: Table summary of protocol for the administration of iodinated contrast media after renal impairment assessment using the estimated GFR
1. Introduction

This protocol applies to all staff within Radiology Departments at Heart of England NHS Foundation Trust responsible for the prescription and administration of iodinated contrast agents. There has been an increase in the use of iodinated contrast agents in recent times. The incidence of severe adverse reactions/events following the administration of contrast agents is very small. This guideline aims to ensure their safe use by identifying patients potentially at a greater risk of an adverse reaction/event. Particular attention is drawn to the risks of contrast induced nephropathy (CIN), and the reduction of those risks wherever possible. Standard safety precautions are also described.

2. Circulation

This protocol should be read by all radiology staff involved in the prescription, preadministration patient assessment, preparation and administration of contrast agents. Student radiographers should be aware/informed of this protocol and work within their scope of practice under a qualified Radiographers supervision.

3. Scope

This protocol was devised following discussion with Consultant Radiologists, Advanced Practitioners and Senior Radiographers and with reference to ESUR guidance on the safe administration of iodinated contrast agents. This protocol applies to radiology staff administering contrast agents to patients at the Heart of England NHS Trust. The prescription should include the volume and type of contrast to be administered. The decision to administer contrast agents to potentially at risk patients is the responsibility of the radiologist having assessed the risk/benefit for the patient which may include discussion with the lead clinician in charge of the patient’s care and/or a Consultant Nephrologist. It may not be possible to fully stratify the risk in some patients e.g. unconscious patients, obtunded patients, confused patients. The decision to administer contrast agents to potentially at risk patients is ultimately the responsibility of the radiologist leading the procedure having assessed the risk/benefit for the patient of iodinated contrast administration. The management of contrast reactions is not covered in this protocol but information and training is available in the radiology department.

4. Reason for Development of the Protocol

Ensure safe conditions for patients during the administration of contrast agents.
Ensuring that patients potentially at risk of an adverse reaction/event are identified and that there is a standardised approach to reducing the risk of administration of iodinated contrast in this group of patients.

5. Aims and Objectives

The aims and objectives of this protocol are to provide staff with guidance on safe administration of contrast agents by ensuring a uniform approach to decision making in patients identified at greater risk, taking all appropriate steps to safeguard the patient.

6. Standard safety precautions

- Identify at risk patients e.g. contrast questionnaire (attachment 1), medical notes, blood results
- Staff trained to recognise and manage contrast reactions
- ‘Crash’ team available for severe adverse reactions
- Suitably trained person to deal with severe adverse reactions in the radiology department
- Resuscitation (‘crash’) trolley
- Emergency drugs box available
- Oxygen available
- Suction available
- Emergency equipment checked regularly
- Encourage patients to be well hydrated and hydrate post procedure where appropriate
- Patients should be supervised in the first 5 minutes after the injection, and remain on the premises for 15 minutes. Potentially at risk patients should be observed for 30 minutes post injection
- All adverse contrast reactions should be documented in the Radiology Information System as well as within the main hospital Electronic Patient Record via an alert.
- Contrast should only be administered by suitably trained personnel

7. Prescribing contrast

Radiologists prescribe the use of contrast during the vetting procedure which is recorded on the radiology information system. Patient group directives allow for radiographers to administer contrast using standard CT protocols.
Out of normal hours, the on call radiologist will prescribe contrast in discussion with the radiographer who can administer under the patient group directive.

8. Patient consent

Whenever possible the patient should be given a full explanation of the procedure and consent to it happening.
9. Estimated glomerular filtration rate (e GFR)

The e GFR gives an indication of any renal impairment and the severity. Whenever possible the e GFR should be determined in advance of the test to aid in decision making and reduce inconvenience to the patient e.g. cancelled contrast examinations as a result of poor renal function. It is the responsibility of the referring clinician to ensure that a recent blood test result is available. Outpatients should be given a blood test form for urea and electrolytes at consultation so the blood test is performed in advance of the day of the procedure. GP referrals should be checked prior to the day of the procedure to ensure a result is available. The patient can have the blood test performed at the surgery for convenience.

The decision to administer contrast agents to patients potentially at risk from renal impairment (up to date e GFR unknown) is the responsibility of the radiologist having assessed the risk/benefit for the patient. If a patient attends for an examination without any up to date Urea and Electrolyte results, and the patient has no known risk factors (no to all screening questions), the responsible radiologist may feel that it is reasonable to proceed with intravenous contrast. If risk factors are identified, a urea and electrolyte result should be obtained prior to proceeding with the examination.

The decision to proceed without an up to date eGFR in potentially at risk patient groups may occasionally take place in an emergency situation where the risk of withholding contrast outweigh the risk posed by potential renal dysfunction. This decision will be made between the supervising Consultant Radiologist and the clinical team in charge of the patient’s management.

Low risk patients – e GFR result < 6 months
Low risk patients are patients with no known renal impairment, no history of kidney problems and no history of diabetes or medical complaint that may be associated with renal impairment.

Medium risk patients – e GFR result < 3 months
Medium risk patients are patients with a history of kidney problems, history of diabetes or medical complaint that may be associated with renal impairment.

High risk patients – e GFR < 4 weeks (depending on degree of impairment - as close to test as possible)
High risk patients are patients with known significant renal impairment and patients where there is a possibility of renal obstruction due to malignancy e.g. renal, prostatic, gynaecological.
For inpatients at risk or with known renal impairment a request for a U+E blood test can be made just prior to the test.
10. Identifying at risk patients

Information sought from patient should include:

- Previous contrast reaction
- Known allergies
- Asthma
- Renal problems
- Heart problems
- Diabetes
- Metformin therapy

A contrast questionnaire (attachment 1) should be completed whenever possible. It may be necessary to review patient notes, speak to the clinician caring for the patient or review hospital information systems to obtain the necessary information.

Previous contrast reaction

Administration of a contrast agent is contraindicated in patients with a known contrast allergy. Where there is some doubt about the cause of the previous reaction the full details of the severity, cause and circumstances need to be ascertained if contrast is to be considered by the radiologist. Contrast allergies must be documented on the radiology information system and within the radiological report as well as an alert on the hospital wide EPR.

Known allergies

Details of the allergies (reactions) should be recorded.

Asthma

Record the use of inhalers / medication, current control of asthma, any hospital admissions as a result.

Renal problems

Record details of renal problems and e GFR.

A table summary of the protocol for the administration of iodinated contrast media after renal impairment assessment using the estimated GFR is attached (attachment 3).
Contrast induced nephropathy (CIN) is defined as an increase in serum creatinine by 25% or 44umol/l occurring within 3 days of the intravascular administration of contrast medium in the absence of an alternative aetiology.

Risk factors for CIN are as follows:

**Patient related**
- e GFR <60mls/min
- Diabetes Mellitus
- Dehydration
- Congestive cardiac failure
- Gout
- Myeloma
- Age >70
- Nephrotoxic drugs

**Contrast media**
- High Osmolarity agents
- Large doses of contrast media

Within the Radiology department we should endeavour to identify the patients most at risk of CIN, most importantly being aware of their renal function and whether they are diabetic. We can control the volume and type of contrast agent given (or whether contrast is omitted), and try and ensure the patient is as well hydrated as possible.

It may also be relevant to consider the trend in renal function: Patients with longstanding renal impairment may be close to end stage renal impairment with plans for dialysis in place. In these patients it may be reasonable to administer iodinated contrast if the benefits outweigh the risks, although this is best decided consulting with the responsible renal physicians. The patients who it may be most important to identify are those with acute renal impairment, which may not be known about, and in whom a further insult to the kidneys may push them into irreversible renal impairment.

Whilst it is advisable that nephrotoxic drugs are omitted prior to contrast examinations, this is beyond the scope of what radiologists are entitled to do for their patients, and should remain the responsibility of the referring clinicians.

The only strong evidence for prophylactic measures to prevent CIN is for intravenous rehydration with 0.9% saline at 1ml/kg per hour for 6 hours before and after administration of iodinated contrast.

**For emergency patients:**

If e GFR >60mls/min, intravenous iodinated contrast may be administered with minimal risk.

If e GFR<60mls/min:

1) Can the clinical question be answered by another imaging modality or by withholding intravenous iodinated contrast?
2) If not, can the examination be deferred until the patient is maximally rehydrated and/or renal function optimised?

3) If contrast must be administered
   a. Recommend clinicians start intravenous rehydration with 0.9% saline as early as possible
   b. Use as small a volume of iodinated contrast as possible (use modern generation scanner).
   c. Continue IV rehydration for at least 6 hours.

For elective patients:

If e GFR >60mls/min: iodinated contrast can be administered with minimal risk.

If e GFR <60mls/min:
   1) Consider an alternative imaging method not using iodinated contrast media.
   2) Minimise volume of iodinated contrast agent used (use modern generation scanner)
   3) Encourage maximal oral rehydration

If e GFR <45mls/min, and it is felt essential for iodinated contrast to be administered, in addition to the above, consider administering 500mls 0.9% saline, run over 2 hours before and 2 hours after contrast administration.

Diabetes / Metformin

Record if the patient is a diabetic and medication. There is no need to stop Metformin after contrast in patients with e GFR>60mls/min. If the e GFR <60mls/min, any decision to stop it for 48hours should be made in consultation with the referring clinician.

After administering iodinated contrast in renal impairment:

In outpatients where a clinical decision has been made to administer iodinated contrast when there is known renal impairment, and particularly when the patient is on Metformin it is recommended that a communication is made with the clinicians to inform them that this has happened and recommending that they recheck the renal function thereafter.

Heart problems

Record recent history of myocardial infarction, congestive cardiac failure and other cardiac problems.
The medical history and renal function must be reviewed before contrast administration. In patients indicating a history of significant contraindications advice should be sought from the supervising radiologist on whether to proceed with administering contrast.

11. Communication

This protocol will be disseminated throughout radiology via email. A copy of this protocol will be electronically held on the Radiology_Directorate on 'bhhcx4004' (V) shared drive.

12. Protocol review

This protocol will be reviewed every 2 years by the CT Modality lead and consultant radiologists.

13. References:


Standards For Iodinated Intravascular Contrast Agent Administration To Adult Patients. BFCR(05)7, Royal College of Radiologists

Metformin: Updated guidance for use in Diabetics with renal impairment, The Royal College of Radiologists. June 2009
Safety Questionnaire for Patients Undergoing Computed Tomography Imaging at Heart of England NHS Foundation Trust

We need to know about your general health before we give you an injection of 'X-ray Dye' so please answer all the questions below very carefully. Please ASK if you have any questions.

<table>
<thead>
<tr>
<th>Surname</th>
<th>First Name</th>
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<tbody>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>Date of Birth</td>
<td>Weight (in stones or kgs)</td>
</tr>
</tbody>
</table>

Please tick and give details for any that apply:

**HAVE YOU HAD A CT SCAN BEFORE?**
- If Yes, where? When? What part of your body?

- Have you had an injection of 'dye' during an X-ray or scan in the past?
- If you have had this injection before were there any ill-effects or problems after?
- Have you ever had any allergic reactions to anything else?

- Do you take any medication for diabetes?
- Have you had any kidney problems in the past?
- Do you take medication for asthma or have you had any recent heart problems?
- Do you have glaucoma in your eyes?

**Female patients – what was the date of your last period.**

**Female patients – I confirm I am not pregnant**

Patients Signature.

<table>
<thead>
<tr>
<th>Patient signature</th>
<th>Checked &amp; Identified by Radiographer signature</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CONTRAST</th>
<th>CONCENTRATION</th>
<th>U&amp;E?'s DATE</th>
<th>GFR</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMOUNT</td>
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<tr>
<td>EXPIRY</td>
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<tr>
<td>BATCH No.</td>
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<td>CANNULATED BY</td>
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<td>SITE</td>
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<tr>
<td>RADIOLOGIST DIRECTING</td>
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**PREVIOUS IMAGING**
- Is request still valid? CHECKED ON CRIS
- RADIOGRAPHER INITIATING EXPOSURE
- ANY OTHER CONTRAINDICATIONS NO YES
- PROCEED WITH INJECTION NO YES

<table>
<thead>
<tr>
<th>Dose (DLP)</th>
<th>PACS CHECK (INITIAL)</th>
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## Table summary of protocol for the administration of iodinated contrast media after renal impairment assessment using the estimated GFR

<table>
<thead>
<tr>
<th>eGFR Level</th>
<th>Protocol Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>eGFR 60-90+</strong></td>
<td>Intravenous contrast can be administered normally.  Patients should be encouraged to hydrate normally before and after the exam.</td>
</tr>
<tr>
<td><strong>eGFR 46-59</strong></td>
<td>Intravenous contrast can be administered normally.  Patients should be orally hydrated before and after the exam.</td>
</tr>
<tr>
<td><strong>eGFR 31-45</strong></td>
<td>Intravenous contrast can be administered but consider alternative imaging or lower volume of contrast.  Out Patients should be orally hydrated before and after the exam with 1 litre of water and encouraged to keep fluid intake a little higher than normal for 24 hours. IV hydration can be considered.  Inpatients should have IV hydration for 6 hours pre and post procedure. Consider iso-osmolar contrast.</td>
</tr>
<tr>
<td><strong>eGFR&lt;30</strong></td>
<td>Intravenous contrast should not be administered unless authorised by a radiologist. This may be authorised when required for critical patient management decisions eg aortic rupture, vascular bleeding  End stage dialysis patients can have contrast administered prior to dialysis.</td>
</tr>
<tr>
<td><strong>Unknown eGFR</strong></td>
<td>Intravenous contrast should not be administered unless authorised by a radiologist.  This may be authorised in patients at very low risk or when required for critical patient management decisions e.g. aortic rupture, vascular bleeding</td>
</tr>
</tbody>
</table>

### Notes

In cases of acute renal failure dialysis no contrast should be administered.

End stage dialysis patients should be appointed prior to dialysis.

No proven role for N-Acetyl cysteine.

Low risk patients eGFR result < 6 months

Medium risk patients eGFR result < 3 months

High risk patients/ known renal impairment < 4 weeks (as close to test as possible)