I. Pre-Assessment Of All Patients Undergoing Cross Sectional Imaging / Contrast Enhanced Testing including Lactating Patients

A. Purpose
To communicate the Department of Radiology’s documentation requirements for patient risk assessment and patient education prior to cross sectional and possibly intravascular contrast administration.

To assure that radiology staff communicates with lactating patients the evidence based practice regarding use of contrast agents while breast-feeding and allow the patient to decide regarding how to proceed.

B. Responsibility
All radiology faculty, radiology fellows, radiology residents, and radiology technologists

Definitions:
Contrast agents: Iodinated fluid used in computed tomography (CT) and gadolinium for magnetic resonance imaging/angiography (MRI/MRA) to enhance vascular or other solid structures to better view characteristics based on pathology and function of the body in normal vs. diseased state

eGFR:estimated Glomerular Filtration Rate; kidney function calculation based on the patient’s age, race, serum creatinine to determine renal functional capability

Extravasation: Infiltration of contrast into the tissues surrounding the vein

Pre-medication: Steroid and/or antihistamine medications administered with intent to prevent or minimize allergic response to contrast

Previous reaction: Known allergic response to contrast

Hydration: Patients generally need to continue to maintain intake of clear (and/or full) liquid diets in the hours prior to CT examinations. Patients should not be NPO for CT exams unless directed by the Department of Radiology staff.
C. Policy

All patients who are undergoing CT or IVP testing with or without Iodinated contrast administration will complete (or have completed) Form H-MR-506 prior to the beginning of the study. MRI/MRA studies will similarly complete the MRI Safety Checklist which includes similar questions. The information is important for appropriate individualized testing.

Patients whose studies require the administration of contrast will follow the contrast specific guidelines spelled out in the contrast product literature (package insert). Generally this means that the patient will not have a second dose of contrast given within 24 hours of a prior dose. Case by case exceptions will be based on the radiologist’s guidance and documentation of risk versus benefit.

Lactating women who receive iodinated contrast or gadolinium can continue breast feeding without interruption. The very small potential risk associated with absorption of contrast medium may be insufficient to warrant stopping breast-feeding for 24 hours following either iodinated or gadolinium contrast agents. (see reference list)

Knowledge of renal function is not required before administering IV contrast in all cases. In those patients who have an increased risk of renal insufficiency or contrast induced renal failure, the radiology physician should review the eGFR (estimated Glomerular Filtration Rate) and creatinine levels before administering the IV contrast. Criteria include:

- All adult patients with diabetes,
- All pediatric patients (under age 18 years of age) who have uncontrolled diabetes or uncontrolled hypertension,
- All patients with history of renal disease,
- All patients 65 years of age and older.

Exceptions to the above (see also Section II):

1. Patients requiring emergent / life threatening studies in which patient care may be adversely affected by waiting for eGFR results. This includes acute stroke alert and life threatening trauma alert.

2. For ADULT Emergency Department patients who have CT/MRI with contrast orders for timeliness categories other than Life Threatening, serum creatinine and eGFR results will be documented in their record for the current episode of care to assess renal function prior to contrast administration. The CT History and Assessment Form H-MR-506 will not be used for ED cases as all adult patients with non-life- threatening orders will undergo renal function testing.

D. Procedure

1. Prior to testing, the CT History and Assessment Form H-MR-506 (with exceptions as above (1C)) or the MRI Safety Checklist Form H-MR-0539 must be completed by the patient (or knowledgeable other) on the day of the exam.

2. If the patient answers “yes” to any of the questions related to risk factors for contrast induced renal failure, the technologist will enter the known eGFR, creatinine results, and date of results on the appropriate CT or MR form. If it is determined that the patient requires lab work immediately prior to the testing, the radiology nurse will perform the Point of Care Testing.

3. All inpatients need a documented eGFR in their record since admission and following any prior iodinated contrast administration if this occurred since admission. The most current eGFR documented in the patient’s electronic medical record should be utilized.

4. If the eGFR is <45 for a planned CT study or < 30 for a planned MRI, the technologist will then, prior to the performance of the test, bring the results to the attention of the radiology resident or attending on service for evaluation of the findings. If by phone, BEEP tool “Numeric Clarification” will be used to read the number out. (Example – three, six for a GFR of 36). The technologist or radiology RN will then use BEEP tool “Repeat Back” and ask the radiologist or radiology resident to repeat back the 2 numbers.

5. The radiologist will inform the technologist of the type of exam to be performed – if any.

6. The technologist will write the name of the radiology resident or attending at the bottom of the form and note the eGFR that was numerically clarified and repeated back.

7. The technologist is responsible for the modality specific worksheet (CT or MRI) with the documentation of
the POCT values and the CERNER POCT results page “Today’s date”. Both are scanned into McKesson for review by the reading radiologists.

Known lactating patients will be given the latest scientific information regarding risk of iodinated or gadolinium based contrast administration related to their infant who is ingesting their breast milk. Lactating women may be given the option to determine whether they wish to proceed or to reschedule the contrast enhanced exam at a later date.

Patients whose CT exam will involve intravascular contrast administration will complete the CT History and Assessment form which includes the “Important Patient Information about Radiographic Contrast”. The technologist will note on the CT History and Assessment form that this information was given to the patient/significant other. If not given to patient, technologist will note why, and this will become part of the patient’s permanent medical record.

Patients whose MRI exam will involve intravascular contrast administration will complete the MRI Safety Checklist form which includes the “Important Patient Information about MRI Gadolinium Contrast (Dye). The technologist will note on the MRI Safety Checklist form that this information was given to the patient/significant other. If not given to patient, technologist will note why, and this will become part of the patient’s permanent medical record.

In the Vascular Interventional Radiology Section, the pre-procedure H&P assessment form will replace this contrast media patient risk assessment form. This form documents the performance of patient screening and becomes a part of the patient’s permanent medical record.

II. Patient Lab values Assessment Prior to Contrast Administration including Point Of Care Testing (POCT) for Outpatients

A. Purpose
To define parameters for POCT to be resulted for outpatients who undergo scheduled contrast enhanced IVP, CT or MR exams. Creatinine testing and eGFR calculation to be performed by the Department of Radiology for outpatients via Point of Care testing, if not already performed and available within the timeframe established.

B. Responsibility
Radiology Department (including Nuclear Medicine): radiology faculty, radiology fellows, radiology residents, radiology section chiefs, radiology technologists, and radiology nurses
Clinical Lab Services will monitor for Quality Control and document their audits routinely.

C. Policy
Prior to administration of intravenous contrast media, a creatinine (and calculation for eGFR) must be available on all outpatients who have planned contrast enhanced IVP, CT or MRI meeting any of the following criteria:
- All adult patients with diabetes,
- All pediatric patients (under age 18 years of age) who have uncontrolled diabetes or uncontrolled hypertension,
- All patients with history of renal disease,
- All patients 65 years of age and older.

For outpatients, the timeframe between the blood test result and the scheduled study is a maximum of 30 days.

Patients who have known prior iodinated contrast administration within 72 hours will repeat labs before the administration of contrast.

If blood test results are not available in the patient’s medical record, Point of Care Testing (POCT) will be performed for outpatients.

Exceptions:
1. Life threatening study orders: This policy does not apply to patients requiring emergent imaging (i.e. life threatening study category) whose care could be compromised by a delay required for laboratory analysis (i.e. creatinine, BUN, eGFR).

2. Acute stroke: Any patient who presents as an acute stroke evaluation (inpatient, outpatient, emergency room patient or hospital to hospital transfer) will not require a creatinine or eGFR prior to the administration of IV contrast media for CT angiography or CT perfusion. This is
supported by the literature demonstrating better patient outcome with quicker cerebral
revascularization ("time is brain") and the relatively low risk of adverse events with IV contrast
administration without a prior documented creatinine level (see references below).

3. Emergency department patients: All ADULT Emergency Department patients who have
CT/MRI with contrast orders (not life threatening) will have documented serum creatinine and
eGFR results in their record for the current episode of care to assess renal function prior to IV
contrast administration. The technologist will verify laboratory results prior to administering IV
contrast.

Acute Stroke References:
1. Intravenous Contrast Material Exposure is Not an Independent Risk Factor for Dialysis or
   Mortality. McDonald, R.J., McDonald, J.S., Carter, R.E., Hartman, R.P., Katzberg, R.W.,
2. Renal Safety of CT Angiography and Perfusion Imaging in the Emergency Evaluation of Acute

D. Procedure
For OUTPATIENTS:
The Radiology Nurse or POCT trained provider will perform the required testing prior to the performance of the
study.
POCT testing for ADULT (age of eighteen and over) patients are:
1. Obtain 1 ml of venous blood and perform the POCT creatinine test.
2. The POCT device will show the creatinine result.
3. iSTAT device is docked to initiate download of data.
4. Results are transmitted electronically via the iSTAT downloader to the POCT middleware database
   where patient identification and results are evaluated. If patient identification and results pass
   evaluation criteria, results will populate in Cerner (PathNet Laboratory Results) under the patient’s
   MRN.
5. Results can be viewed in Cerner under the results tab. The MDRD calculation for eGFR for
   patients greater than 18 years will automatically calculate and also be available for viewing under
   the results tab. Staff do NOT manually enter iSTAT results into Cerner.
6. In the event of interface downtime, enter results via the iSTAT manual result form located on
   VCUHS POCT intranet website and use the approved Radiology eGFR calculation reference.
   Patient results will automatically populate in Cerner Laboratory results once the downtime has
   been resolved. The nurse will input the creatinine value directly into the Cerner interface via the
   iSTAT port and the POCT value will be documented directly into the EMR. The eGFR will posted
   be online under POCT lab values.
7. The nurse will then print the Cerner POCT values page using timeframe “Today’s date”. This page
   will accompany the patient to the scanner and be handed off to the technologist. If the creatinine or
   eGFR results are below the contrast administration threshold, the nurse or technologist will notify
   the radiologist.

POCT testing for PEDIATRIC (under the age of eighteen) patients:
1. Obtain 1ml of venous blood and perform the POCT creatinine test
2. The iStat device will display the creatinine result
3. Go to VCU Medical Center intranet and find Radiology
4. Under the Radiology section scroll and select Department Policies
5. Click on calculate eGFR and select the GFR Calculator for Children
6. Input creatinine result from iStat
7. Manually enter the eGFR only for those patients under the age of eighteen into Cerner under AD
   HOC charting. The Creatinine result will automatically download to the patient’s chart via the iStat
downloader.
8. Select POCT and enter information under iStat.

The technologist is responsible for scanning the following 2 documents when POCT is performed:
1. The modality specific assessment form (CT or MRI) with the documentation of the POCT values;
2. CERNER POCT results page using timeframe “Today’s date” Both are scanned into McKesson for review by the reading radiologists.

The technologist will communicate the eGFR to the radiologist per Section 1D. If the results are less than the threshold for contrast administration, the radiologist may decide to proceed with a non-enhanced study, recommend an alternate study, or reschedule the contrast enhanced test. The decision will be communicated to the technologist.

Iodinated Contrast enhanced studies (CT) requested or approved by VCUHS Nephrology Attending Physicians or studies with life-threatening indications are the only studies that can be performed with IV contrast despite the eGFR value under 45.

III. Intravenous Line Placement, Access Type for Contrast Administration

A. Purpose
To insure patent access and safe intravenous infusion of contrast media for all patients receiving contrast.

To standardize types and locations of access, administration, and flushing of diagnostic contrast agents by non-physician personnel.

B. Responsibility
All radiology faculty, radiology nurses, radiology technologists, radiology managers, and radiology supervisors At NO time will a student be allowed to load an injector or connect a patient’s IV to a power injector.

C. Policy Standard Protocol
The standard protocol for CT examinations using the flow rate injector is to first catheterize an antecubital or forearm (NOT HAND) vein with:
- A 20-gauge or larger bore size Autoguard which will accommodate up to a 5 ml/sec flow rate.
- A 22-gauge Autoguard may be used with the injection rate up to 3ml/sec flow rate.
- A 22-gauge Diffusics may be used at an injection rate of 3-5ml/sec flow rate.

Pediatric patients who have a power injectable IV access can be power injected at the discretion of the radiologist.

The power injector will not be used to administer IV contrast if the IV is placed in the arm on the side of a mastectomy.

IV. Appropriate Planning in Patients with Definite / Questionable Contrast Allergy

A. Purpose
Safe, consistent management of patients being scheduled or arriving at VCUHS Outpatient CT locations for exams found to have a history of prior definite or equivocal contrast allergy, or patients with severe allergic history in general. VCUHS Outpatient facilities Stony Point (S.P.) or Ambulatory Care Center (ACC) are not as optimally equipped for management of serious contrast allergies as is the main department (Main 3).

B. Responsibility
All radiology faculty, radiology fellows, radiology residents, and radiology technologists

C. Policy
CT patients will be triaged according to relative risk. Radiology will provide the safest exam possible based on the patient’s medical history information available. Three patient categories are defined below based on knowledge of previous exposure to contrast or other potential concerning factors with appropriate management following:

D. Procedure
Level 1 (Moderate/High Risk):
- Description: history of prior moderate or severe contrast allergy (e.g. anaphylaxis, hypotension, breathing difficulties, chest pain). Also included in this group are patients with severe generalized allergies including recent severe asthma attack, resulting in hospitalization or intubation (with no previous contrast history).
• Decision point in management:
  o Scheduling: Schedule in M3 department only, with pre-medication, consistent with Section V.
  o Patient already at S.P. or ACC: Contact section responsible for study (i.e., Abdominal, Chest, Neuro, etc.) to determine if non-contrast study is acceptable. If contrast is deemed necessary, re-schedule patient at M3 department with pre-medication consistent with Section V.

Level 2 (Low Risk):
• Description: history of prior mild contrast allergic reaction (e.g. hives).
• Decision point in management:
  o Scheduling: Schedule at S.P., ACC or M3, with pre-medication, consistent with Section V.
  o Patient already at S.P. or ACC: Contact section responsible for study (i.e., Abdominal, Chest, Neuro, etc.) to determine if non-contrast study is acceptable. If contrast is deemed necessary, re-schedule patient with pre-medication consistent with Section V. (M3, ACC or Stony Point).

Level 3 (Unverified Risk):
• Description: questionable allergy not directly related to contrast (e.g. food intolerance to shellfish, without verification of true allergic symptoms).
• Decision point in management: Without evidence of true allergy, there is no verified increased risk in this group.
  o Scheduling: No restrictions.
  o Patient already at S.P. or ACC: No restrictions.

V. Steroid Premedication – Previous Intravascular Contrast Reaction

A. Purpose
To standardize the steroid pre-medication regimen for patients with history of prior adverse reaction to contrast.

B. Responsibility
All Radiology faculty, radiology fellows, radiology residents, and radiology nurses

C. Policy
When patients with a previous mild (including hives), moderate, or severe reaction to **intravascular iodinated contrast media** are scheduled for a study requiring use of iodinated contrast material, consideration should be given to performing an alternative imaging study, which does not require use of iodinated contrast media.

If it is determined by the referring physician and the radiologist that a study utilizing iodinated contrast is necessary, then the patient should be pre-medicated as per the chart below (following ACR guidelines). **Besides pretreatment with steroids, the patient should be given a different type of intravenous contrast media than the contrast agent that resulted in the allergic reaction, if possible.**

There is a growing body of literature suggesting a safer profile of either iso-osmolar agents or Iopamidol regarding patients with a history of prior adverse reaction. Therefore, its use in this additional patient class may be considered on a case-by-case basis by the radiologist.

**In the rare event that a life threatening ED case has an undisclosed risk for contrast administration allergy, risk versus potential benefit will prevail in management of the patient.**

Per the ACR Manual on Contrast Media, shellfish allergy is not an indicator of iodinated contrast allergy and does not require pre-medication even if patient received pre-medication based solely on this in the past.

For patients with history of Gadolinium allergy, the same premedication regimen may be used prior to further administration of Gadolinium.
Pre-medication Orally Administered Regimens with IV Equivalency

<table>
<thead>
<tr>
<th>ADULT PATIENTS: Choose one</th>
<th>And may choose to add</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisone 50 mg by mouth 13 hours, 7 hours, and 1 hour prior to IV contrast administration.</td>
<td>Diphenhydramine (Benadryl®) 50 mg intravenously, intramuscularly, or by mouth 1 hour prior to IV contrast administration</td>
</tr>
<tr>
<td>IV EQUIVALENCY: Methylprednisolone INJ 40 mg IV 13 hours, 7 hours, and 1 hour prior to IV contrast administration</td>
<td></td>
</tr>
<tr>
<td>Methylprednisolone (Medrol®) 32 mg by mouth 12 hours and 2 hour prior to IV contrast administration</td>
<td>Diphenhydramine (Benadryl®) 50 mg intravenously, intramuscularly, or by mouth 1 hour prior to IV contrast administration</td>
</tr>
<tr>
<td>IV EQUIVALENCY: Methylprednisolone INJ 40 mg IV 12 hours and 2 hour prior to IV contrast administration</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PEDIATRIC PATIENTS:</th>
<th>and</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisone 0.5mg/kg – 1 mg/kg orally (up to 50 mg) 13 hours, 7 hours, and 1 hour prior to IV contrast administration.</td>
<td>Diphenhydramine 1.25 mg/kg orally (up to 50 mg) given 1 hour before contrast enhanced imaging.</td>
</tr>
<tr>
<td>IV EQUIVALENCY: Methylprednisolone INJ 0.4-0.56 mg/kg IV (max 50mg orally+ methylprednisolone INJ 40mg)</td>
<td>IV EQUIVALENCY: Diphenhydramine INJ 1 mg/kg IV</td>
</tr>
</tbody>
</table>

VI. Selection of Intravascular Iodinated Agents

A. Purpose
   To communicate to all radiology personnel the selection criteria for contrast media.

B. Responsibility
   All radiology faculty, radiology fellows, radiology residents, and radiology technologists

C. Policy
   Low Osmolar Contrast Media (LOCM) or iso-osmolar contrast media (IOCM) will be used for all studies involving intravenous contrast administration.

   Isovue (Iopamidol) will be used for patients undergoing diagnostic studies (e.g. computed tomography) who have any of the following conditions:
   1. Renal compromise (estimated Glomerular Filtration Rate, eGFR < 60cc/min) or history of contrast-induced nephropathy.
   2. History of sickle cell anemia/sickle trait/crisis – these patients will have a recent creatinine available and be hydrated before contrast is administered.
   3. History of multiple myeloma.

   There is a growing body of literature suggesting a safer profile of either iso-osmolar agents or Iopamidol regarding patients with a history of prior adverse reaction. Therefore, its use in this additional patient class may be considered on a case-by-case basis by the radiologist.

VII. Contrast Media, Oral Diabetic Medications

A. Purpose
   To ensure that all patients on metformin containing drugs have the medication withheld for 48 hours following intravascular iodinated contrast administration.

B. Responsibility
   Radiology faculty, radiology fellows, radiology residents, radiology nurses, and radiology technologists
C. Policy
Oral hypoglycemic agents in the class of biguanides should be stopped at the time of or prior to any procedure involving intravascular administration of iodinated contrast material and withheld for 48 hours after the procedure. Such medications are currently available under the generic name metformin and various trade names including:

- Actoplusmet® (metformin/pioglitazone)
- Avandamet® (metformin/rosiglitazone)
- Fortamet®, Glumetza® (metformin extended release (XR))
- Glipizide; Metformin Hydrochloride
- Glucophage® (metformin)
- Glucophage XR® (metformin XR)
- Glucovance® (metformin/glyburide)
- Invokamet®, Canagliflozin; Metformin Hydrochloride
- Janumet®, Metformin Hydrochloride; Sitagliptin Phosphate
- Jentadueto®, Linagliptin; Metformin Hydrochloride
- Kazano®, Alogliptin Benzoate; Metformin Hydrochloride
- Kombiglyze Xr®, Metformin Hydrochloride; Saxagliptin Hydrochloride
- Metaglip® (metformin/glipizide)
- Metformin
- Prandimet® (repaglinide/metformin)
- Riomet® (metformin oral solution)
- Xigduo Xr®, Dapagliflozin; Metformin Hydrochloride

There is no known direct interaction of this drug class with iodinated contrast, rather, intravascular administration of iodinated contrast may cause acute renal failure in a small percentage of individuals, particularly those patients with preexisting, or a predisposition to, renal compromise (e.g., diabetics). These medications are excreted by the kidneys and may build up to dangerous levels, causing the potentially fatal condition of lactic acidosis.

The patient will be educated about withholding the medication and given written instructions. They will be instructed to contact their physician if they have any concerns.

There are no contraindications to the use of such medications during other contrast studies (nonvascular injections), including those involving intra-articular and intrathecal administration of iodinated contrast media.

VIII. Nephrologist Approval For Iodinated Intravenous Contrast Agent Administration

A. Purpose: To ensure the appropriate use of iodinated intravenous contrast in patients with low eGFR. Patients with impaired renal function may occasionally need radiologic studies with iodinated intravenous contrast media, despite an estimated GFR (eGFR) of under 45 ml/min.

B. Responsibility
All radiology faculty, radiology fellows, and radiology residents

C. Policy
- For routine contrast enhanced CT studies the eGFR threshold for contrast administration is 45.
- In order to assure that only appropriate patients are given iodinated intravenous contrast media, a nephrology consult is required for patients with an estimated GFR (eGFR) of under 45 ml/min (unless the exam is ordered by a nephrologist). VCUHS and community based nephrologists are authorized to make this decision and this should be documented in the patient’s electronic medical record. The ordering physician will state in the “COMMENTS” section of the radiology order for the study that the administration of contrast media was discussed and approved by a named nephrologist or that discussion of the case with a nephrology attending is required.
- When a VCU nephrology attending or community based nephrologist approves administration of intravenous contrast medium despite a patient’s impaired renal function, intravenous contrast media should be administered on an appropriately ordered examination.
• The VCU Nephrologist group is headed by Dr. Todd W.B. Gehr. Link to their web page: http://www.intmed.vcu.edu/home/divisions/nephrology.html

• If the study is ordered as life-threatening by the referring clinician and intravenous contrast is necessary to answer the clinical question, intravenous contrast may be administered without the need for a nephrology consult in patients with eGFR < 45. This must be authorized by the referring attending physician. The referring clinician will document the necessity of the intravenous contrast despite the impaired renal status in the patient’s electronic medical record.

IX. **Contrast Media Reactions**

A. **Purpose**
   To communicate the departmental policy regarding treatment and documentation of intravascular contrast media reactions.

B. **Responsibility**
   All radiology faculty, radiology fellows, radiology residents, radiology nurses, and radiology technologists

C. **Policy**
   For any contrast reaction the radiologist and radiology nurse will be immediately notified. The radiologist or radiology resident in attendance will examine any patient who has a reaction to any administered contrast and prescribe treatment if necessary. The guidelines from the ACR Manual on Contrast Media will be posted in all areas of the department where intravascular contrast material is used (see attached Tables 4 and 5 “Management of Acute Reactions in Children” and “Management of Acute Reactions in Adults”).

For inpatients, the radiology nurse will communicate the patient’s condition to the patient care unit nurse prior to return to the patient care unit.

Outpatients will be observed in the Radiology Department for a period of time specified by the radiologist or radiology resident.

**Documentation of the contrast media reaction and any treatment will occur as follows:**

1. All contrast media reactions will be documented by the technologist in the online Safety Reports.
2. The technologist will enter the contrast allergy in the Cerner Information System.
3. The radiologist or radiology resident will include documentation of the reaction, signs and symptoms, and any treatment in the electronic medical record. The resident may also document the same information as a preliminary report for the patient’s study. The radiologist or radiology resident will also contact the primary care givers and document patient outcome.
4. Radiology nurses will document medications administered, vital signs, and patient status during observation and record discharge status for outpatients.
5. Prior to patient discharge for outpatients, radiology personnel should obtain a number from the patient to ensure a twenty four hour follow up phone call is made. Radiology personnel will attempt to contact the patient the next day and document the results of their follow up telephone communication.

X. **Intravenous Contrast Extravasation**

A. **Purpose**
   To ensure that all patients sustaining extravasation of contrast material following intravenous injection are assessed and treated at that time.

B. **Responsibility**
   All radiology faculty, radiology fellows, radiology residents, radiology nurses, and radiology technologists

C. **Policy**
   Intravenous (IV) contrast extravasation events will be managed following the guidelines listed below:
   1. All extravasations will be documented in the online Safety Reports with review by the Section Manager, Department Director, and Radiology Quality Manager.
   2. Extravasation of small amounts of contrast material at the site of injection can be treated
symptomatically, with placement of cool compresses.

3. For inpatients, the technologist will call the inpatient caregiver, then document the infiltration and communication in the patient’s medical record (Clinical Notes). If symptomatic treatment over the next 24 to 48 hours is not successful, or the patient complains of numbness/tingling at or distal to the extravasation site, arrangements for orthopedic consultation can be made (see below).

4. For outpatients, discharge instructions will be printed from patient’s electronic record and reviewed with and handed to the patient or family member. The Radiology Nurse should document a note in Cerner regarding their assessment of the patient and education provided prior to discharge. Prior to patient discharge, radiology personnel should obtain a telephone number from the patient to ensure a twenty-four hour follow up phone call is made. Radiology personnel will attempt to contact the patient the next day and document the results of their follow up telephone communication.

5. Patients who sustain major extravasation of contrast material generally require further evaluation. The amount of extravasation should be estimated, followed by physical examination, noting the degree of soft tissue swelling and the state of the overlying skin, regional and distal pulses, and presence or absence of numbness/tingling at or distal to the injection site. A brief objective note is recorded in the medical record by the radiology resident. At the request of the radiologist who assesses the site, the orthopedic physician on consult is reached through the VCUHS pager system. The consultant then evaluates the patient and will determine the need for further medical evaluation, treatment, physical therapy, or medication.

6. The details of the extravasation will be documented in the patient’s EMR by the radiology resident. They may also include the assessment and treatment in a dictated preliminary radiology report. The radiology resident will report the details of the extravasation including the estimated amount of the extravasation, the type of contrast material, the patient’s symptoms, and physical examination findings, and the disposition of the patient.

X. Contrast Media, Documentation

A. Purpose
   To insure documentation of the contrast administered to patients in the Radiology Department.

B. Responsibility
   All radiology faculty, radiology fellows, and radiology residents

C. Policy
   The specific contrast agent, concentration, dose (amount), and route of administration will be included with the patient study. This can be seen on examination images as well under the examination information in McKesson / PACS. The technologist will document this information in RadNet and this may also be included in the dictated study report for patients undergoing examinations using parenteral contrast media.

XII. Contrast Administration in Limited Access Patients

A. Purpose
   To insure safe practice for all patients receiving contrast intravenously and injection site testing.

   To standardize accessing, administration, and flushing of intravenous contrast media agents by non-physician personnel.

B. Responsibility
   All radiology faculty, radiology nurses, radiology technologists, radiology managers, and radiology supervisors

C. Central Catheter, Dialysis catheter and A/V Fistula Access Policy

Central Venous Catheters:
   In order to utilize the power injector with a central venous catheter, the catheter must be “rated” for use with a power injector. This is specified on the catheter itself or can be found in the manufacturer’s guidelines.
Central venous catheters not rated for power injectors may be used to hand inject contrast when peripheral venous access in not an option.

ACCESSING/DE-ACCESSING: Limited Access Patient’s central catheters may be used for contrast administration. Accessing/De-accessing the site will be done by RN with contrast administered by the technologist. Only registered nurses or physicians trained in proper use of these catheters may access/de-access these catheters for contrast administration.

Centrally inserted lines (such as Porta-cath, Hickman, subclavian, jugular, or triple lumen catheters) may be used to hand inject contrast. Consider contacting a point person in the patient’s clinic of origin or the Oncology Clinic at phone number 828-7999 to clarify best approach to individual patient situation and line. Another resource is the Oncology Nursing inpatient unit (828-9119; ask to speak with the charge nurse).

ADMINISTERING CONTRAST: Competent technologists or registered nurses working in Radiology may administer diagnostic agents (intravenous water-soluble contrast material) only when there is immediate availability of a physician. Contrast is cleared from the line with approximately 20 milliliters of normal saline.

FLUSHING: Appropriate lines are heparinized by RN/MD only.

**Dialysis Catheter Access:**

ACCESSING/DE-ACCESSING: Dialysis catheters are used for contrast administration only when there is no alternative intravenous access. Only registered nurses or physicians trained in proper use of dialysis catheters may access/de-access these catheters for contrast administration.

ADMINISTERING CONTRAST: Trained, competent technologists, registered nurses, and physicians working in Radiology may administer diagnostic agents (intravenous water-soluble contrast material) only when there is immediate availability of a physician. Contrast is cleared from the line with approximately 20 milliliters of normal saline.

FLUSHING: Appropriate lines are heparinized by RN/MD only.

**A/V Fistula Access:**

Patients who have A-V fistulas and need special access for contrasted studies may require access by IR attending physicians so that the site can be used to hand inject contrast when peripheral venous access in not an option.

Using the A/V fistula access requires the following process:

1. Order for contrast enhanced CT comes to radiology in a patient with known lack of IV access and nephrology requests A/V Fistula access
2. Nephrology must OK use of fistula for injection
3. The case must be discussed with an IR attending to determine if appropriate.
4. The Fistula is accessed with Micro-puncture sheath by IR attending Radiologist
5. The study is performed
6. The fistula is De-accessed by IR Radiologist or designee.
7. IR procedure note in Cerner documents communication with nephrology and need for use of the A/V fistula for contrast administration to perform the study.

**XIII. Power Injector Safety Test Injection and Flow Rate**

A. **Purpose**

To insure safe practice for all patients receiving contrast injections using flow rate injectors have an appropriate IV and injection site testing.

To standardize accessing, administration, and flushing of diagnostic contrast agents by non-physician personnel.

B. **Responsibility**

All radiology faculty, radiology nurses, radiology technologists, radiology managers, and radiology supervisors

At NO time will a student be allowed to load an injector or connect a patient’s IV to a power injector.

**Standard Protocol**

The standard protocol for CT examinations using the flow rate injector is to first catheterize an antecubital or
forearm (NOT HAND) vein with:
  • A 20-gauge or larger Autoguard which will accommodate up to a 5 ml/sec flow rate.
  • A 22-gauge Autoguard may be used with the injection rate up to 3ml/sec flow rate.
  • A 22-gauge Diffusics may be used at an injection rate of 3-5ml/sec flow rate.

Pediatric patients who have a power injectable IV access can be power injected at the discretion of the radiologist.

The IV access catheter must be rated for use with a Power injector. If it is not rated for use with a power injector, hand injection may be performed or additional access may be necessary.

The power injector will not be used to administer IV contrast if the IV is placed in the arm on the side of a mastectomy.

Only central venous catheters rated for power injection systems (≤5ml/sec and ≤300psi) may be used following the above guidelines. Currently available commercial products include the PowerPICC™ and PowerHohn™ catheters (Bard Access Systems, Salt Lake City, UT). Other similarly rated products may be used if commercially available and following FDA approval.

Butterfly, Porta Cath, Hickman, subclavian, jugular, or triple lumen catheters are not rated for power injection and cannot be used to administer contrast with the flow rate injector.

**Power Injector Safety Key Points:**

- The power injector syringe will be loaded using a sterile technique and labeled with the type and amount of contrast.
- If the contrast is not used immediately then it will be discarded.
- The connected injector tubing will be flushed with saline removing air from the line.
- The injector head will be turned in a downward position running a small amount of contrast through the injector tubing to ensure all air is removed from the tubing before connecting it to the patient’s IV.
- If a technologist is being relieved or if a shift change occurs after the injector has been loaded, the technologist who loaded the injector must verbally and/or in writing convey the amount and type of contrast in the injector.
- If a loaded injector syringe is found in the injector without any verbal or written communication then the syringe must be discarded.
- When a procedure is completed the injector syringe MUST be totally removed from the power injector and properly discarded.
- Technologist competency will be assessed by the area supervisor by skill check off documented in the technologist’s personnel record.

The following are points of care the technologist must follow for proper use and administration of both 0.9% normal saline and IV contrast using both hand and power injection technique:

- Using a 10ml prefilled saline syringe the technologist will check the IV for blood return and then hand inject the 10ml of saline while looking for any presence or signs of infiltration and or IV catheter issues such as the hub not securely attached.
- Power Injector will be loaded with necessary saline and flush and the required amount of IV contrast.
- Prior to test injection of saline all topogram and pre-contrast image phases must be completed.
- Once the prescribed scan plan is determined the technologist will then explain to the patient the possible symptoms he or she may feel from both the saline and IV contrast injection.
- The technologist will then perform the test power injection of saline followed by contrast administration. For all non CTA exams the technologist will remain in the room during the test injection of saline and the main bolus of IV contrast to palpate the IV site looking for signs of extravasation and or IV failure. For all CTA studies, the technologist will palpate the IV site during the test saline injection.
References:
2) Lamirer, N, Flombaum, C, Moreau, D, Ronco, C; Acute Renal Failure in Cancer Patients; Annals of Medicine, 2005; 37: 13-25.
6) Ask the Fish (efishman) online Q&A regarding Sickle Cell Crisis and IV Contrast posted 9/16/07 at 4:16AM. http://www.radiology.ucsf.edu/patient-care/patient-safety/contrast/iodine-allergy