CONTRAST MEDIA USE IN RADIOLOGY

1. **PURPOSE:** To establish policy, procedures, and responsibility for assuring the safe, effective use of contrast media in the Radiology department at the Phoenix VA Health Care System (PVAHCS) and Community Based Outpatient Clinics (CBOCs).

2. **POLICY:** The policy is designed to provide consistency for radiology staff in the prescreening and administration of contrast media to patients across multiple modalities at the Phoenix VA Medical Center. It also outlines procedures for dealing with complications of contrast administration. The policy addresses qualifications and training of staff who administer contrast media. The policy also delineates a preapproved list of clinical indications for commonly requested Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) exams which may be performed by technologists.

3. **PROCEDURES:**

   a. Radiological Technologists (RT) and Registered Nurses (RN) must complete initial contrast media training and annual competency to intravenously administer contrast media.

   b. Pre-Contrast
      (1) Screening for iodinated contrast-For outpatients, a baseline serum creatinine and Estimated Glomerular Filtration Rate (eGFR) should be obtained in these patients before the injection of contrast: Age over 60, history of renal disease including dialysis, kidney transplant, single kidney, renal cancer, or renal surgery, history of hypertension requiring medical therapy, history of diabetes mellitus, taking metformin or metformin-containing drug combinations. Safety screening also consists of identifying those patients with cardiac history (symptomatic congestive heart failure, severe aortic stenosis, prior pulmonary hypertension, severe cardiomyopathy), recent cardiac decompensation resulting in pulmonary edema, dehydration, recent prior contrast administration within 72 hours, a potential drug interaction, prior contrast reaction or recent meal (within 2 hours-increased risk of emesis and aspiration).
      (a) For iodinated contrast agents, a serum creatinine should be obtained within 30 days of the procedure if the above prescreening criteria for outpatients are met. For inpatients or Emergency Department (ED) patients, a serum creatinine and eGFR are required within 2 days. For any patient, if the creatinine is greater than 1.4 on baseline, or if the eGFR has fallen 25% or creatinine has risen >150% of baseline, then a creatinine will be obtained within 1 day of the exam.
      (b) If the creatinine is above 1.4 the ordering physician must determine the risk of renal compromise versus benefit of the exam. An alert appears when the ordering physician orders contrast (see attachment C).
      (c) Notify the radiologist prior to using contrast in patients with a creatinine higher than 1.4. Also, if there has been an increase in serum creatinine of >0.3 or >= 150% of baseline within the last 48 hours, or if there is a decrease in eGFR of 25% within the last 48 hours.

(d) A note is required in Computerized Patient Records System (CPRS) from referring clinician acknowledging approval of contrast administration for a patient with a creatinine higher than 1.4. The referring physician is also responsible for obtaining consent from the patient for the CT with contrast prior to the exam.
(e) There is a high risk for contrast-induced nephropathy if the eGFR is < 45 for IV administration or <60 for intra-arterial administration.
(f) Contrast should not be given to patients whose eGFR is less than 30 or creatinine is >2 unless life threatening indication or benefits clearly outweigh the risks. If the patient is on dialysis, and has significant cardiac dysfunction or seizure disorder. Dialysis is done the same day after the exam to avoid potential complications. Limit the dose of contrast media in dialysis patients and consider the use of Iso-Osmolar Contrast Media (IOCM).

(2) Screening for gadolinium based contrast-For outpatients, a baseline serum eGFR should be obtained in these patients before injection intravenous administration of contrast: Age over 60, history or renal disease including dialysis, kidney transplant, single kidney, kidney surgery, or known cancer involving the kidney, history of diabetes mellitus, history of hypertension requiring medical therapy. Safety screening also consists of identifying those patients with cardiac history (symptomatic congestive heart failure, severe aortic stenosis, prior pulmonary hypertension, severe cardiomyopathy), recent cardiac decompensation resulting in pulmonary edema, dehydration, recent prior contrast administration within 72 hours, a potential drug interaction, prior contrast reaction or recent meal (within 2 hours-increased risk of emesis and aspiration).
   (a) For gadolinium contrast agents, a serum eGFR should be obtained within 45 days of the procedure if the above prescreening criteria are met. For any patient, if the eGFR is less than 45 on baseline, or if the eGFR has fallen 25% or creatinine has risen >150% of baseline, then an eGFR will be obtained within 1 day of the exam.
   (b) If the eGFR is less than 40 the ordering physician must determine the risk of renal compromise versus benefit of the exam. An alert appears when the ordering physician orders contrast (see attachment C).
   (c) Notify the radiologist prior to using contrast in patients with an eGFR less than 40. Also, if there has been an increase in serum creatinine of >0.3 or >= 150% of baseline within the last 48 hours, or if there is a decrease in eGFR of 25% within the last 48 hours.
   (d) A note is required in CPRS from the referring clinician acknowledging approval of contrast administration for a patient with an eGFR less than 40. The referring physician is also responsible for obtaining consent from the patient for the MRI with contrast prior to the exam.
   (e) If the eGFR is less than 40 and greater than 30, consider MRI without contrast or use of another modality. If gadolinium contrast is given, use 'single dose' only, 0.1 mmol/kg. Avoid the use of Omniscan, Magnavist or OptiMark.
   (f) Contrast should not be given to patients whose eGFR is less than 30 unless there is urgent clinical need. If gadolinium cannot be avoided, use the lowest possible diagnostic dose. Avoid use of Omniscan, Magnavist, or OptiMark. Ensure the patient is not dehydrated and give discharge instructions for Per OS (PO) fluids. If patient is on dialysis or has acute renal failure use of gadolinium is strongly discouraged, CT with iodinated contrast may be a better choice. Patient should

have hemodialysis the same day. Decision to image should be made in conjunction with the Nephrology service.

(3) Identification of pregnant patients-All female patients will be asked about possible pregnancy prior to giving contrast agents of any kind. If there is concern for possible pregnancy, a pregnancy test (urine or serum) will be obtained prior to giving contrast. If the patient is known to be pregnant, the risks of contrast must be considered before proceeding with the study. Informed consent must be obtained (iMed consent-CT scan (pregnant). Contrast should be administered only when there is a potential significant benefit to the patient or fetus that outweighs the possible risk of radiation exposure to the fetus. The radiologist should confer with the referring physician and document in the radiology report or Electronic Medical Record (EMR) the following:
   (a) That the information requested cannot be acquired without contrast administration.
   (b) That the information needed affects the care of the patient and fetus during pregnancy.
   (c) That the referring physician is of the opinion that it is not prudent to wait to obtain this information until after the patient is no longer pregnant.

(4) Exam and contrast – must be reflected by the order in the electronic medical record. As long as the clinical indication for the ordered exam matches one of the preapproved protocols (See link in Attachment E) then the technologist or RN may proceed with the exam and give contrast per protocol, as long as there are no safety concerns identified on the prescreening form (Attachment F). If there is a discrepancy, the radiologist should be contacted to resolve the issue prior to performing the exam. A radiologist may change a study to add or omit contrast, and the study should be edited in Veterans Health Information Systems and Technology Architecture (VistA) by selection of the appropriate Current Procedural Terminology (CPT) codes to reflect the actual procedure performed. When making verbal changes to contrast administration, the technologist must confirm the change by reading back the contrast order to the radiologist.

(5) Consent – In accordance with Veterans Health Administration (VHA) Handbook 1004.01 patients who are "high risk" for intravenous contrast administration must sign an informed consent document. Signature consent for high risk patients must be obtained by a Licensed Independent Practitioner (the patient's provider is preferred, but this can also be done by the radiologist). The Diagnostic exam and/or procedure, risks, benefits and alternatives must be explained to all patients who receive IV contrast. This may be done by a physician or by a RN, Certified Nuclear Medical Technologist (CNMT) or a Diagnostic Radiologist Technologist (DRT) using an educational script approved by the Radiology Service Chief. This can also be done by giving the patient written educational materials prior to the exam (Attachment B). In accordance with VHA Handbook 1004.01 patients who are "high risk" for intravenous contrast administration must sign an informed consent document. Alternatively the IMed Consent electronic consent system may be used (CT scan with contrast or MRI with gadolinium). Signature consent for high risk patients must be obtained by a Licensed Independent Practitioner (the patient's provider is preferred, but this can also be done by the radiologist). See Intravenous Contrast administration high risk criteria noted below and in the Phoenix VA HCS Facility Policy Memorandum Health Information and Management Systems (HIMS)-05 Informed Consent. HIMS-05

(a) For intravascular iodinated contrast (I-Med consent Computed Tomography (CT) Scan with Contrast):
- Prior allergic contrast reaction requiring pretreatment.
- Patients with Creatinine >1.4 or eGFR < 45 (intravenous administration) or <60 (intra-arterial administration), particularly those with recent hypotension, cardiac decompensation or diabetes. The consent should state that risk of Contrast Induced Nephropathy (CIN) is increased in those with pre-existing kidney disease.
- Patients who have had an iodinated contrast injection within 72 hours, and who are undergoing a second injection.
- Patients who have eaten a meal within 2 hours of the injection.

(b) For intravascular gadolinium (I-Med consent: MRI with Gadolinium):
- Prior allergic reaction to gadolinium requiring pretreatment.
- Prior allergic reaction to iodinated contrast, and no prior gadolinium injection so that cross sensitivity is unknown.
- Patients with eGFR <40.
- Patients with Nephrogenic Systemic Fibrosis (NSF)/Nephrogenic Fibrosing Dermopathy (NFD).

(6) History – Before administering oral and intravenous contrast agents, the list of medications must be reviewed, and the patient must be screened for possible drug interactions, such as Metformin, and for possible contraindications, such as impaired renal function and prior contrast reactions. This may be done by a physician, by a nurse operating under an approved protocol, or by a CNMT or DRT with competency review who is operating under an approved protocol and who has access to a physician if questions arise. An approved prescreening protocol for RN's or technologists is outlined in Attachment F.

(7) Oral contrast agents- Safety screening for oral iodinated contrast agents consists of determining whether the patient has a history of aspiration. If the radiologist, Certified Nuclear Medicine Technologist (CNMT) or Diagnostic Radiologic Technician (DRT) determines there is a significant risk of aspiration, the study will be performed without oral contrast, with an alternative contrast, or else the study will be cancelled and the ordering physician notified.

(8) Hydration prior to intravenous iodinated contrast-

(a) For eGFR<30—No IV contrast administered. Consider alternate imaging modality or noncontrast exam.

(b) For eGFR 30-45: Encourage oral hydration. IV hydration per protocol. Consider reducing IV contrast dose by 80%.

(c) For eGFR 45-60 and diabetes or history of CHF: Encourage oral hydration. IV hydration per protocol.

(d) For eGFR 45-60 and no additional risk factors: Encourage oral hydration.

(e) For eGFR > 60: Encourage oral hydration.

(f) For intra-arterial administration, hydration should be considered for eGFR <60.

a. Hydration protocols:

- 250cc Normal Saline (NS) Intravenous therapy (IV) at 100cc/hr, 100 cc given before contrast and remainder after contrast.
- Alternatively, sodium bicarbonate solution can be given IV for 7 hours (approx. 750cc), starting 1 hour before contrast and 6.5 hours after contrast.

- The IV line should be flushed with normal saline before and after infusing contrast medium.

b. It is recommended that the provider obtain a follow up creatinine within 2 days of contrast administration.

(9) Pretreatment for contrast allergy

(a) Recommended elective premedication: methylprednisolone 32mg PO 12 hours prior to the contrast examination, and methylprednisolone 32mg PO 2 hours prior to the contrast examination. Diphenhydramine 50 mg IV, IM or PO 1 hour before contrast can be added to this regimen.

(b) Recommended emergency premedication: methylprednisolone 40 mg IV or hydrocortisone 200 mg IV every 4 hours until contrast study is required plus diphenhydramine 50 mg IV 1 hour prior to contrast.

(c) If prior reaction was severe (broncho/laryngospasm), consider asking Anesthesiology service to be in attendance.

(d) Steroids should be avoided or used with caution in patients with diabetes mellitus, active tuberculosis, peptic ulcer disease and in the presence of systemic infection.

(10) Metformin – should be held on the day of the contrast, and for 48 hours following iodinated contrast administration. A physician alert appears regarding metformin when the order is placed (see attachment C). Decision to reinstitute metformin should be made by the provider. In patients with multiple comorbidities (liver dysfunction, alcohol abuse, cardiac failure, myocardial or peripheral muscle ischemia, sepsis or severe infection) or who have known renal dysfunction, follow up renal function studies may be required before metformin may be resumed. These studies should be ordered by the patient's provider who must follow up with the patient. List of medications containing metformin such as but not limited to:

- Metformin-Glucophage, Glucophage XR, Fortamet, Glumetza, Riomet
- Glyburide/metformin-Glucovance
- Glipizide/metformin-Metaglip
- Pioglitazone/metformin-ActoPlus Met, ActoPlus Met XR
- Repaglinide/metformin-Prandimet
- Rosiglitazone/metformin-Avandamet
- Saxagliptin/metformin-Kombiglyze XR
- Sitagliptin/metformin-Janumet, Janumet XR

c. Administration of contrast

(1) Extrinsic warming of iodinated contrast material to human body temperature (37 degrees C) may be helpful to minimize complications and improve vascular opacification. Visipaque specifically should be warmed before administration. A sufficient quantity of Visipaque will be placed in a lockable contrast warmer each day. The expiration date of 30 days from the date the agent Visipaque was placed in the contrast media warmer should be written on the Visipaque bottle. If the Visipaque bottle is not used within 30 days of heating, it should be discarded. Temperatures will be recorded daily on a control chart, with an upper limit of 37 and lower limit of 30 degrees Celsius.

(2) Gadolinium-based contrast media are administered at room temperature and should not be externally warmed for routine clinical applications.

(3) Vein site selection – a large vein in the forearm or antecubital area is preferred. A DRT or CNMT may start an IV line to administer contrast if this practice is allowed by State law and if they received their American Registry of Radiologic Technologists (ARRT) (R) certification in the year 2005 or later or have undertaken post didactic training and a prescribed regimen of proctoring by a Radiology physician or Interventional Radiology nurse. Documentation of an initial Intravenous site noting time of insertion, size, location, patency, insertion site assessment "no redness, no infiltration" and time of IV removal if applicable.
(4) Arterial – only administered by an interventionalist Doctor of Medicine (MD).
(5) Sterile technique – hand hygiene and skin prep per hospital infection control policies. See: Facility Policy Memorandum 00-30, 00-33, 00-66, and 00-70.
(6) Power injecting – no greater than 300 psi except in interventional radiology under the direction of a physician. Observe site closely for signs of infiltration.
(7) High power Peripherally inserted central catheter (PICC) lines may be used with power injection setting: 300 psi and up to 5ml/sec.
(8) Technologists injecting through or accessing ports, PICC lines or central lines must receive documented training prior to independently utilizing these lines.
(9) CT contrast:
(a) Visipaque 320-The most frequently administered amount is 100cc. For Chest CT only 70cc is administered and for liver CT or patients over >200lbs 120cc is administered.
(b) Ultravist 100 cc is given for urograms only
(10) MRI contrast: 0.1-0.2 mmol/kg is given.
(a) ProHance17 ml is usually given to patients less than 197 lbs or 20 ml is usually given to patients over 197 lbs.
(b) Magnevist 20 ml is usually given if the patient has not been NPO for 6 hours.
(11) Post contrast administration flushing – should be done with 10 ml of sterile normal saline following all contrast media injections.
(12) During intravascular injection of contrast material, a physician must be present in the vicinity of the imaging suite. This includes physicians in the ED that may be called upon to respond to a contrast reaction after hours. The hospital's rapid response team should be called in any case of a contrast reaction that requires evaluation by a physician, at any time of the day. They must be immediately available to respond to an adverse event.

d. Post-Contrast
(1) Observe for reactions
(2) Patient instructions (see attachment B).
(3) Breast feeding patients may choose to discontinue breast feeding from the time of contrast administration for a period of 12-24 hours, and discard milk from this time period.
(4) Patients at risk for NSF should be followed up 4-8 weeks after contrast-enhanced MR exam, to promptly identify any symptom or sign suggestive of NSF and confirm or rule out a diagnosis of NSF. Should a new diagnosis of NSF be made, it is recommended that all regulatory authorities be notified.
(5) For inpatients at risk for contrast-induced nephropathy, assess a serum creatinine and eGFR on the morning following contrast administration and in 3 days after administration of contrast. For outpatients, assess serum creatinine and eGFR 3 days after administration of contrast.

e. Documentation of contrast media
(1) MRI & CT: contrast name, route of administration and amount will be documented on the image, and in radiology exam report.
(2) IVP: contrast name, route of administration and amount will be documented on the radiology exam report.
(3) Conventional Angiograms: contrast name, route of administration and amount will be documented on the intra-procedure patient care notes, and on the first film of each exam.
(4) Documentation of contrast reactions will be completed in Vista by the person administering the contrast. This triggers the alert to appear in CPRS allergy posting, and it triggers an alert to pharmacy.
(5) The radiologist, technologist and/or radiology nurse caring for the patient must document the contrast reaction in CPRS. This includes posting of the allergy in CPRS and a contrast reaction note.
(6) Contrast reactions (Attachment A) will be presented to the Radiology Department monthly meeting and to the Pharmacy Service.

f. Infiltration should be checked for following the use of contrast media. If infiltration is discovered:
(1) Notify the radiologist assigned to the section.
(2) Notify the radiology nurse, if one is available.
(3) Because of the severity and prognosis of a contrast medium extravasation injury is difficult to determine on initial evaluation of the affected site, close clinical follow-up for several hours is recommended for all patients in whom extravasations occur. Outpatients may need to be admitted in order to properly monitor the patient, depending on the severity of the extravasation.
(4) Elevation of the affected extremity above the level of the heart to decrease capillary hydrostatic pressure and thereby promote resorption of extravasated fluid is recommended. Either warm or cold compresses can be used.
(5) The person injecting the contrast will complete an Patient Event Report (ePER) in Vista.
(6) Radiologist and nurse (if available) will document the event and care provided in the patient's chart.
(7) Outpatients should be released from the radiology department only after the radiologist is satisfied that the signs and symptoms that were present initially have improved or that new symptoms have not developed during the observation period. Clear instructions should be given to the patient to seek additional medical care, should there be any worsening of symptoms, skin ulceration, or the development of any neurologic or circulatory symptoms, including paresthesias.
(8) Surgical consultation should be obtained whenever there is concern for a severe extravasation injury. This includes progressive swelling or pain, altered tissue perfusion as evidenced by decreased capillary refill, change in sensation in the affected limb, skin ulceration or blistering.

g. Emergency care
(1) At the first sign of an untoward patient reaction notify the radiologist assigned to the section, and a radiology nurse, if one is available. The rapid response team should be called immediately.
(2) Radiologist and nurse will each complete a note in the patient's chart.
(3) For Advanced Radiology Life Support recommended treatments (see attachment A).

4. **RESPONSIBILITIES:**
a. Physicians, ward, and clinical personnel are responsible for following the established procedures in requesting examinations with contrast.
b. Radiologists and technologists are responsible for adhering to the policy and following the correct procedures outlined above, including for prescreening and performing exams on patients where contrast is used.
c. Chief of Radiology is responsible for ensuring Radiology staff comply with the policy.

5. **REFERENCES:**
Facility Policy Memorandum 00-30 Exposure Control Plan for Blood borne Pathogens
Facility Policy Memorandum 00-37 Tuberculosis Control Program
Facility Policy Memorandum 00-66 Standard and Transmission-Based Precautions
Facility Policy Memorandum 00-70 Artificial / Long Nails
Facility Policy Memorandum IS/HIMS-05 Informed Consent
Carl T Hayden VAMC (CTH) normal lab values
American College of Radiology Interventional Practice Guidelines
ACR Manual on Contrast Media– Version 9, 2013
The Joint Commission Comprehensive Accreditation Manual (current edition)

6. **RESCISSION:** None

7. **ATTACHMENTS:**

APPENDIX A– Contrast Media Emergency Treatment Guideline. *This is adapted from Advanced Radiology Life Support, approved by the Pharmacy & Therapeutics Committee. It is available for reference on all emergency carts within the radiology department.*
APPENDIX B- CT with contrast -Patient Information. MRI with gadolinium contrast-Patient Information
APPENDIX C-Alert on CPRS when ordering any procedure that will use contrast
APPENDIX D-Protocol for Gadolinium Use in Patients at Risk for Nephrogenic Systemic Fibrosis
APPENDIX E-Protocols for Common Indications in MRI and CT
APPENDIX F-Prescreening Forms MRI and CT

8. **EXPIRATION DATE:** June 2018

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APPENDIX A
Phoenix VA Medical Center Radiology Department
Contrast Media Emergency Treatment Guideline

Situation	Medication	Dose
Hives		
Urticaria.....	No treatment in most cases Diphenhydramine (if severe).....	50mg IV, IM, or PO
Diffuse Erythema		
Mild	IV access ..... Diphenhydramine ..... Hydrocortisone .... (or equiv.)..... Epinephrine (1:10,000 – 0.1mg/ml) Call Code	Normal Saline or Lactated Ringers: 1-2 L rapidly 50 mg IM or IV IV – 200-300 mg IV – 0.1 mg slowly, repeat up to 1 mg
Severe		
Facial/Laryngeal Edema	IV access/fluids ..... Oxygen..... Epinephrine (1:10,000 – 0.1mg/ml) Hydrocortisone .... (or equiv.)..... Call Code	Normal saline or Lactated Ringers 10 liter mask IV 0.1 mg slowly, may repeat up to 1 mg total IV – 200-300 mg
Bronchospasm		
Mild	Metered dose inhaler (B-agonist). Oxygen..... IV access	2 puffs and inhale 10 liter mask
Moderate.....	Epinephrine (1:1,000 – 1mg/ml) ...	SQ – up to 0.3mg, repeat up to 1 mg total
Severe	Epinephrine (1:10,000 – 0.1mg/ml) Call Code	IV – 0.1mg slowly, repeat up to 1 mg total
Pulmonary Edema	Oxygen ..... IV access ..... Elevate head of bed Furosemide ..... Morphine ..... Hydrocortisone .... (or equiv.).....	10 liter mask slow fluids IV 10-40 mg slowly IV 1-3 mg, repeat q5-10 minutes (Narcan for hypotension or resp depression) IV – 200-300 mg
Hypotension w/Bradycardia		
Mild	Elevate legs IV access ..... Oxygen ..... Atropine ..... Call Code	Normal Saline or Lactated Ringers 1-2 L rapidly 10 liter mask 0.6-1mg IV slowly, repeat up to 3 mg total
Severe		
Hypotension w/Tachycardia		
Mild	IV access ..... Oxygen ..... Epinephrine (1:10,000 – 0.1mg/ml) Call Code	Normal Saline or Lactated Ringers 1-2 L rapid 10 liter mask IV 0.1mg slowly, repeat up to 1 mg
Severe		
Hypertension Crisis (Diastolic BP >120mmHg)	Oxygen IV access Furosemide ..... Nitroglycerin tablet/paste	10 Liter mask slow fluids IV 40 mg slowly 0.4mg tablet SL, repeat q5-10 min/ 1" paste
and Convulsions		
Mild	Oxygen, IV access, observe Lorazepan ..... Diazepam	Turn to side to avoid aspiration IV 2-4 mg , max 4 mg IV 5-10 mg, max 30 mg
Severe		
Diabetic Hypoglycemia		
Able to swallow	Oral glucose	4 oz fruit juice or 15 Grams of glucose tablet/gel
Unable to swallow	Oxygen, IV access, observe Dextrose 50% (if IV access) ..... Glucagon (if no IV access)	½ amp (12.5 grams) IM or SQ 1 mg, follow with snack when awake
Panic Attack		
Severe	None Lorazepam	Reassure, observe 0.5-2 mg if necessary

Adapted from Advanced Radiology Life Support
Approved by the Pharmacy & Therapeutics Committee 9/18/09.

Phoenix VA Medical Center
Radiology Department
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CT with contrast
Patient Information

Please tell the technologist if you are allergic to x-ray dye, x-ray contrast or iodine. If you are female, please tell the technologist if you may be pregnant.

I understand my condition to be among the following common indications for CT with contrast: To examine your body's tissues for disease or abnormality. To assess the internal structures inside the body.

Please read the following information about CT with contrast:

1. Brief description of the treatment/procedure: This procedure involves your doctor taking images of your internal organs using a CT scan. CT scan uses radiation to produce images. You will lie on a table that slides into the scanning machine. The x-ray unit of the machine will rotate around you. You may be asked to hold your breath while images are taken. This procedure will not make you radioactive. A special dye (contrast material) will be used during a CT scan. The contrast will help show the differences between the tissues on the images. This may make it easier for the provider to see what is wrong. The contrast may be injected through a needle that is placed into a vein in your arm or hand. It could be given as a drink. Another dye, possibly different than the injected dye, may also be given as a drink or injected into or around the area of interest such as a joint. You may need test(s) of your kidney function before and after receiving contrast agents. Neither anesthesia nor moderate sedation will be used in this treatment/procedure. It is not expected that blood products will be used in this treatment/procedure.
2. Potential benefits of the exam: This procedure may allow your doctor to find out what is wrong. Your doctor can then provide the appropriate treatment.
3. Known risks and side effects of this exam include, but are not limited to:
   - A flushed feeling, often in the face or neck.
   - Dizziness or unsteadiness.
   - Exposure to radiation. Pregnant women and women of childbearing age should talk with their doctor about this.
   - Nausea and/or vomiting.
   - You may have problems, diseases or abnormalities but this test may not find them.
   - You may need additional tests or treatment.
   - Your doctor may not be able to make a proper diagnosis.
   - Reactions to dye used for imaging. These may include hives, swelling of the face and/or throat, difficulty breathing and kidney failure.
   - Risk of contrast dye induced kidney injury: The risk of kidney injury is increased in patients with pre-existing kidney disease.
   - Increased risk of cancer due to radiation exposure.

- Allergic reaction that could become severe or life threatening. May include itching, hives, swelling, difficulty breathing, drop in blood pressure, possible loss of consciousness.

4. Alternatives to the exam:
   - Watching and waiting with your doctor.
   - CT scan without contrast.
   - Other types of imaging test such as ultrasound, MRI or nuclear medicine.
   - Other types of x-ray imaging procedures.
   - Exploratory surgery or surgical taking of samples (biopsy).
   - You may choose not to have this procedure.
5. After the exam you should:
   - Drink an extra 24 ounces of water (three extra glasses).
   - If you were given (or took) a sedative for this exam, please do not drive or operate machinery until its effects have worn off.
   - If you take an oral medication for diabetes that contains metformin, this should be discontinued for 48 hours (Let the technologist know that you are taking this drug if you haven't already). Consult with your diabetes doctor for instructions on when to resume, and if some other blood sugar lowering medicine needs to be used in the interim. The following is a list of some of the drugs that contain metformin; please contact your pharmacist if you are not sure about the diabetes medicine you are taking:
     a. Glucophage
     b. Glucovance
     c. Metaglip
     d. Avandamet
     e. Any generic drug containing metformin
   - While exceedingly rare, some patients may experience a delayed response to the contrast. Contact your doctor immediately, call 911, or go to the emergency room if any of these changes suddenly occur:
     a. Trouble breathing
     b. Dizziness or lightheadedness
     c. Have not urinated for 24 hours
     d. Unusual or unexpected stomach pain, weakness/tiredness, and muscle pain
     e. Hives or itching
     f. Any other sudden change of concern to you
   - Your injection of contrast required a puncture through your skin. Even though proper steps were taken to prevent infection as a result of this skin puncture, an infection in this area is possible. Please seek medical care if:
     a. The injection site becomes red, painful to the touch, or hot to the touch.
     b. A lump that was not present when you finished your scan develops at the injection site, or a small lump that was present becomes larger over time.

Phoenix VA Medical Center
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Magnetic Resonance Imaging (MRI) with gadolinium contrast
Patient information

Please tell the technologist if you are allergic to x-ray or MRI dye, x-ray or MRI contrast, iodine or gadolinium. If you are female, please tell the technologist if you may be pregnant.

I understand my condition to be among the following common indications for MRI with contrast: To examine your body's tissues for disease or abnormality. To assess the internal structures inside the body.

Please read the following information about MRI with contrast:

1. Brief description of the treatment/procedure: This procedure takes images on the inside of your body from different angles. This is done using a magnetic field and radio waves. MRI does not use radiation. A computer will compile these images to make three-dimensional models of the scanned area. Your provider will use a contrast agent (gadolinium) in this procedure. The contrast will help show the differences between the tissues on the images. This may make it easier for the provider to see what is wrong. The contrast will be injected through a needle that is placed into a vein in your arm. You may need test(s) of your kidney function before and after receiving contrast agents. Because the magnet is so strong, you will need to remove all metal objects from your body. This may include jewelry, hairpins, eyeglasses, and hearing aids. You should inform your provider if you have any metal implants in your body, such as a cardiac pacemaker or dental work. You should also inform them if you have a history of working with metal. You may be given a medicine to help you relax. You will lie on the MRI table. You may be given earplugs or headphones to block the noise of the machine. The table will slide into the machine that is shaped like a tube. You may be asked to adjust your position. Then, you will lie very still while the machine takes images. Neither anesthesia nor moderate sedation will be used in this treatment/procedure. It is not expected that blood products will be used in this treatment/procedure.
2. Potential benefits of the exam: This procedure allows your physician to see images of the inside of your body. This may allow your physician to tell between healthy and abnormal tissue. This may help your physician to find what is wrong and decide on proper treatment. Compared to other imaging methods, MRI does not involve radiation. MRI without gadolinium contrast may not show the full extent of your condition.
3. Known risks and side effects of the exam include, but are not limited to:
   - The safety of this procedure to the fetus has not been established for pregnant women.
   - You may have problems, diseases or abnormalities but this test may not find them.
   - You may need additional tests or treatment.
   - Your doctor may not be able to make a proper diagnosis.

- Allergic reaction. May include itching, hives, swelling, difficulty breathing, drop in blood pressure, possible loss of consciousness.
- If you have renal insufficiency, chronic kidney disease, acute kidney injury or other severe kidney condition, you may be at risk for Nephrogenic Systemic Fibrosis (NSF). This risk may be increased if you are or have been on dialysis. NSF may result in limitation of movement in different body parts. It may also result in internal organ function failure or death. There is currently no treatment for NSF. Please tell the technologist if you have kidney problems prior to the exam.

4. Alternatives to the exam:
   - Watching and waiting with your doctor.
   - MRI without contrast agents.
   - Other imaging techniques, such as a CT scan, nuclear medicine test, ultrasound or conventional angiography.
   - You may choose not to have any treatment.
6. After the exam you should:
   - Drink an extra 24 ounces of water (three extra glasses).
   - If you were given (or took) a sedative for this exam, please do not drive or operate machinery until its effects have worn off.
   - While exceedingly rare, some patients may experience a delayed response to the contrast. Contact your doctor immediately, call 911, or go to the emergency room if any of these changes suddenly occur:
     a. Trouble breathing
     b. Dizziness or lightheadedness
     c. Slow or irregular heart beat
     d. Hives or itching
     e. Any other sudden change of concern to you
   - Your injection of contrast required a puncture through your skin. Even though proper steps were taken to prevent infection as a result of this skin puncture, an infection in this area is possible. Please seek medical care if:
     a. The injection site becomes red, painful to the touch, or hot to the touch.
     b. A lump that was not present when you finished your scan develops at the injection site, or a small lump that was present becomes larger over time.

Alert on CPRS when ordering any procedure that will use contrast:

A creatinine level will be needed within 30 days before contrast can be administered.
Creatinine levels higher than 1.25mg/dl carry a risk of renal impairment when contrast is administered. The ordering physician must determine the risk of renal compromise verses benefit of exam. Recommend post contrast creatinine evaluation at 24 – 48 hours to for all at risk patients to evaluate for renal compromise.

Glucophage should be temporarily discontinued at the time of, or prior to use of IV contrast media, and withheld for 48 hours subsequent to the procedure and reinstituted only after renal function has been reevaluated and found to be normal.

Protocol for Gadolinium Use in (MRI) Patients at Risk for Nephrogenic Systemic Fibrosis:

Patients will have computer checked for a prior creatinine value and be asked about a "history of kidney disease" during routine MRI screening. Outpatients who have ever had an abnormal creatinine or have a history of kidney disease must have a creatinine checked within 30 days of the scan.

For patients with severe chronic kidney disease (eGFR < 30 mL/min/1.73m^2), gadolinium should be administered only with the greatest caution and in situations where there is no reasonable alternative and where the scan may be life saving. Written informed consent using the NSF-specific form should be obtained and documented by the radiologist or radiology resident. Whenever possible, nephrology should be consulted in these patients. Gadoteridol (ProHance) or gadobenate (MultiHance) at the lowest reasonable dose will be used as the contrast agent.

For patients on dialysis, the same considerations should apply as to patients with severe CKD. Nephrology should always be consulted in these patients. In addition dialysis should be performed as soon as possible after gadolinium administration, preferably on the same day (every effort should be made to scan these patients before noon).

Patients with acute kidney injury (acute renal failure): Patients with ARF (>25% drop in eGFR within 24 hours and the current eGFR is <60 mL/min/1.73m^2) should be considered similar in risk to and treated the same as those with severe CKD. Whenever possible, nephrology should be consulted in these patients. Patients with ARF due to the hepato-renal syndrome or in the perioperative liver transplantation period may be at special risk for NSF even in the setting of renal failure of
mild to moderate severity.

Nephrology consultation should be obtained whenever possible in all groups to help referring patients and clinicians make the best possible risk-benefit assessment, but is *mandatory prior to MRI in dialysis patients*. For elective procedures requiring nephrology input, consultations can be scheduled in the outpatient clinic, at the Kidney and Blood Pressure Center.

Informed consent procedure for patients in any of these three groups should be will be rigorous and will fully apprise them that the use of gadolinium contrast puts them at a risk of unknown magnitude of a severely debilitating, potentially fatal, and untreatable disease. It is unlikely that any patient would (or should) give such consent without in-depth discussion between their attending physician and radiology and extensive counseling by their primary clinical caregiver(s) regarding the risk-benefit ratio. For patients in these three risk groups, it is generally advisable to perform contrast-enhanced CT with hydration and noncontrast MRI prior to considering MRI with contrast, as this combination is likely to produce substantially the same information with a lower risk profile than MRI with contrast.

Abbreviations

CKD, Chronic Kidney Disease
ARF, Acute Renal Failure
eGFR, estimated glomerular filtration rate (based on the 4-variable MDRD equation as reported automatically in Soarian) where AA is African American and NAA is non-African American
NSF, nephrogenic systemic fibrosis

Protocols for Common Indications in MRI and CT

Technologists may follow these pre-approved protocols for common MRI and CT exams as long as the clinical indications match the ordered exam. If there is a discrepancy between the ordered exam and the pre-approved protocols then the radiologist must be consulted prior to performing the exam.

Protocols are found here: http://intranet.visn18.med.va.gov/phoenix/613976/

PRESCREENING FORMS CT AND MRI

TECHNOLOGIST PRESCREENING FORM MRI

Does patient need eGFR prior to contrast administration? If yes to any question, then eGFR should be obtained within 45 days of administration (or 72 hours if inpatient/ED patient).

YES NO Inpatient or ED patient?

YES NO Age over 60

YES NO History of renal disease
- Includes dialysis, kidney transplant, single kidney, renal cancer or surgery

YES NO Hypertension requiring medical therapy

YES NO Diabetes

Does the patient have one of the following, which may preclude contrast administration? If yes to any question, consult with a radiologist prior to administering contrast. If afterhours, discuss with ordering provider, and page on call radiologist if any question.

YES NO Cardiac history
- symptomatic CHF, severe aortic stenosis, pulmonary HTN, severe cardiomyopathy

YES NO Impaired renal function (eGFR < 45 for gadolinium), increase in serum creatinine of >0.3 or >= 150% of baseline within the last 48 hours, or if there is a decrease in eGFR of 25% within the last 48 hours.

YES NO Recent cardiac decompensation resulting in pulmonary edema

YES NO Dehydration

YES NO Recent prior contrast administration within 72 hours

YES NO Prior contrast reaction

YES NO Recent meal (within 2 hours)

YES NO Possibility of pregnancy

YES NO History of aspiration (for oral contrast only)

Patient information sheet must be given to all patients getting contrast.

In addition, iMed Consent must be obtained if yes to any of the following situations:

YES NO Prior allergic reaction to gadolinium requiring pretreatment.

YES NO Prior allergic reaction to iodinated contrast, and no prior gadolinium injection so that cross sensitivity is unknown.

YES NO Patients with eGFR <40.

YES NO Patients with NSF/NFD.

Is protocol required from radiologist? Check the indication for the exam falls under the preapproved protocol list. If no, written or electronic protocol must be obtained from radiologist (or verbal with read back if after hours), and protocol approval sent for scanning in the patient's chart if hand written.

TECHNOLOGIST PRESCREENING FORM CT

Does patient need eGFR prior to contrast administration? If yes to any question, then eGFR should be obtained within 30 days of administration (or 72 hours if inpatient/ED patient).

YES NO Inpatient or ED patient?

YES NO Age over 60

YES NO History of renal disease

- Includes dialysis, kidney transplant, single kidney, renal cancer or surgery

YES NO Hypertension requiring medical therapy

YES NO Diabetes

YES NO Taking metformin or metformin-containing drug combinations

Does the patient have one of the following, which may preclude contrast administration? If yes to any question, consult with a radiologist prior to administering contrast. If afterhours, discuss with ordering provider, and page on call radiologist if any question.

YES NO Cardiac history

- symptomatic CHF, severe aortic stenosis, pulmonary HTN, severe cardiomyopathy

YES NO Impaired renal function (Creatinine >1.4 or eGFR <45) or an increase in serum creatinine of >0.3 or > or = 150% of baseline within the last 48 hours, or if there is a decrease in eGFR of 25% within the last 48 hours. For eGFR 45-60 and diabetes or history of CHF: IV hydration.

YES NO Recent cardiac decompensation resulting in pulmonary edema

YES NO Dehydration

YES NO Recent prior contrast administration within 72 hours

YES NO Prior contrast reaction

YES NO Recent meal (within 2 hours)

YES NO Possibility of pregnancy

YES NO History of aspiration (for oral contrast only)

YES NO Potential drug interaction (metformin containing medication)

Patient information sheet must be given to all patients getting contrast.

In addition, iMed Consent must be obtained if yes to any of the following situations:

YES NO Prior allergic contrast reaction requiring pretreatment.

YES NO Patients with Creatinine >1.4 or eGFR < 45 (intravenous administration) or <60 (intra-arterial administration), particularly those with recent hypotension, cardiac decompensation or diabetes.

YES NO Patients who have had an iodinated contrast injection within 72 hours, and who are undergoing a second injection.

YES NO Patients who have eaten a meal within 2 hours of the injection.

Is protocol required from radiologist? Check the indication for the exam falls under the preapproved protocol list. If no, written or electronic protocol must be obtained from radiologist (or verbal with read back if after hours), and protocol approval sent for scanning in the patient's chart if hand written.