UNIVERSITY of CALIFORNIA, SAN DIEGO
MEDICAL CENTER

UCSD HEALTHCARE
UCSDMC POLICY/PROCEDURE-RADIOLOGY
Intravenous Contrast Media Guidelines-Adult

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Approval Signature: _____

Title: INTRAVENOUS CONTRAST MEDIA GUIDELINES-ADULT

Policy Statement

To establish guidelines for the prevention, diagnosis and treatment of contrast media reactions after intravascular injection, and to reduce the chance of inducing contrast media nephrotoxicity.

Responsible Parties

All Radiologists, Radiology Residents, Fellows, Radiologic Technologists, Radiology Nurses, Student Technologists and Technical Assistants

PROCEDURE

I. Intravenous Access

When the power injector is utilized, a 22g or larger needle/cannula 1.25" to 1.5" length is preferred for IV contrast injection.

It is advisable to obtain a good backflow of blood to test adequate positioning of the needle in the vein. Adequate position of the cannula in the vein is checked again, by flushing IV with 10mls of saline flush into the vein before delivering the injection of contrast.

Use of existing access routes:

1. **Only power-injection rated PICC** or central lines are approved for CT use.
2. Pre-existing IV lines will be flushed with 10mls of saline flush, to ensure patency, prior to contrast injection.
3. Port-a-cath to be accessed by R.N. or Radiologist, with training. If no trained staff is available, send patient to the Infusion Center or Cancer Center.
4. Consult Radiologist/ Radiology RN prior to using any central line catheters.

IIa. Prevention of Nephrotoxicity with Iodinated Contrast Media

Requirements for CREATININE and Glomerular Filtration Rate (GFR) (if available) testing **prior** to contrast media injections (for the purpose of reducing the chance of contrast-induced renal failure)

A. Patients >60 years of age are to have a recent (**within 6 weeks**) serum Creatinine prior to contrast injection. If there has been significant interval change in the patient's condition, a more recent serum Creatinine should be obtained.

B. Patients ≤60 years of age do **not** require labs, **UNLESS** the patient has one or more of the following:

- History of renal disease or surgery on the kidneys
- Diabetes mellitus
- AIDS or HIV infection
- Collagen vascular diseases (Lupus, dermatomyositis, scleroderma, Wegener's)
- Prior organ transplantation or pending a transplant
- Cancer (consult with a radiologist regarding the specific type of cancer)
- Recently (within 3 months) had chemotherapy
- Receiving treatment for an infection (consult with a radiologist for potential nephrotoxic drugs)

C. When clinical findings or history raise doubt about the patient's current renal function, a radiologist will order a STAT Creatinine/eGFR test which should be done prior to injecting contrast media.

D. IODINATED CONTRAST AGENTS (Both ionic and non-ionic contrast agents): If the serum creatinine is > 1.5 mg/dl or GFR is < 60 ml/min/1.73m^2, the radiologist will be notified. If the creatinine is > 1.5 in a diabetic patient, > 2.0 in a non-diabetic patient, or the GFR is < 30, and the referring physician and radiologist have determined that a contrast-enhanced imaging study must be done to obtain critical medical information, the contrast may be given after considering the following precautions:

1. Discuss the risks, benefits, and alternatives with the patient.
2. Obtain signed consent from the patient. If patient is unable to give consent, do not give contrast agent unless a physician obtains consent from responsible family members, or the referring physician provides a "double-doc" signed consent indicating the medical necessity of giving the contrast agent. The radiologist must write the order for contrast agent, including the specific agent, dose, and reason for taking the risk.
3. Patient should be treated with one of the following:
    a. Mucomyst (N-acetylcysteine)
        • Orally, 600 mg twice daily on the day before and the day of the contrast imaging study, or
        • Intravenously, 150 mg/kg over 30 minutes before contrast administration, followed by 50 mg/kg over 4 hours.
    b. Bicarbonate 150 mEq in 1000 cc D5W, 3ml/kg bolus, then 1 ml/kg/hr x 6 hours.
4. Adequate patient hydration must be maintained (See Section E).

For patients with end stage renal disease who are on chronic peritoneal dialysis, non contrast should be considered and contrast should only be administered after discussion with the patient's nephrologist. For patients with end stage renal disease who are on chronic hemodialysis, the use of high osmolar agents should be avoided.

E. Adequate patient hydration is important to minimize the risk of nephrotoxicity. **No patient receiving radiographic contrast should have NPO orders unless they are being properly hydrated with IV fluids.** Patients having a CT with oral contrast should have nothing solid 4 hours prior to the exam, but clear liquids are allowed up until the exam. If the patient cannot take adequate oral fluids, consider intravenous infusion of 0.45% sodium chloride at 100 ml/hr, beginning 6-12 hours before and 4-12 hours after the administration of contrast material.

F. All patients should be encouraged to drink lots of fluids for several hours after receiving contrast material.

G. Patients taking **Metformin** (ACTOplusmet, Avandamet, Janumet, Fortamet, Glucovance, Glucophage, Glumetza, Riomet, Metaglip, PrandiMet):
   1. Patients taking **Metformin** medication should stop taking the medication the day of the procedure. The medication should be withheld for 48 hours after the procedure and reinstated only after renal function (BUN, creatinine, GFR) has been reevaluated and found normal.
   2. The day of the CT scan, the patients will receive instructions for the future labs tests.

H. No other medications should be stopped for patients received radiographic contrast media**. Important, unless specifically instructed by their physician, patients should continue taking their regular prescribed medications for diabetes (Insulin, etc), cardiac, and other medical conditions.**

IIb. Use of Gadolinium Based Contrast Agents in Patients with Renal Insufficiency or Failure

Gadolinium-based contrast agents using a standard dose (0.2 ml/kg [0.1 mmol/kg]) are very safe in patients with normal renal function. However, Gd-based contrast agents have been implicated in causing Nephrogenic Systemic Fibrosis (NSF). Reported cases were patients with severe renal dysfunction (on dialysis or eGFR < 30 ml/min), and most patients received double or triple doses of gadodiamide (Omniscan, Amersham/GE). Therefore, we have set the following guidelines for giving Gd-based contrast agents.

Requirements for CREATININE and GFR testing **prior** to contrast media injections:

A. Patients >60 years of age are to have a recent (**within 6 weeks**) serum Creatinine and GFR prior to contrast injection. If there has been significant interval change in the patient's condition, a more recent serum Creatinine and GFR should be obtained.
B. Patients ≤60 years of age do **not** require labs, **UNLESS** the patient has one or more of the following:
   - History of renal disease or surgery on the kidneys
   - Diabetes mellitus
   - AIDS or HIV infection
   - Collagen vascular diseases (Lupus, dermatomyositis, scleroderma, Wegener's)
   - Prior organ transplantation or pending a transplant
   - Cancer (consult with a radiologist regarding the specific type of cancer)
   - Recently (within 3 months) had chemotherapy
   - Receiving treatment for an infection (consult with a radiologist for potential nephrotoxic drugs)

C. If GFR is > 30 ml/min, then gadolinium can be given. Use MultiHance and dose at no more than 0.2 ml/kg (0.1 mmol/kg). If GFR is < 30 ml/min, **DO NOT** give gadolinium unless absolutely medically necessary. If both the radiologist and clinician decide that contrast-enhancement is necessary, the Gd-based contrast agent can be given with the following precautions:

1. Discuss the risks, benefits, and alternatives with the patient.
2. Obtain signed consent from the patient. If patient is unable to give consent, do not give gadolinium unless a physician obtains consent from responsible family members, or the referring physician provides a "double-doc" signed consent indicating the medical necessity of giving the gadolinium. The radiologist must write the order for Gadolinium, including the specific agent, dose, and reason for taking the risk.
3. Use MultiHance.
4. Dose at no more than 0.2 ml/kg (0.1 mmol/kg). Use "half" dose if adequate for the MR study.

D. **Patients who are on dialysis:** The clinical indications for the study should be assessed. If gadolinium is not necessary, a non-contrast MRI should be performed, and the referring physician should be informed about the change in the ordered exam. If gadolinium might be helpful, the referring physician should be called to discuss the risks and benefits of giving gadolinium to the patient. If both the radiologist and clinician decide that contrast-enhancement is necessary, the Gd-based contrast agent can be given following the guidelines in section C above. In addition, hemodialysis should be done as soon as possible after the scan (ACR guidelines).

E. Any patients receiving double or triple doses of Gd-based contrast agent should be screened with serum creatinine and eGFR:
1. If the GFR is normal, then the double or triple dose of Gadolinium can be given.
2. If the GFR is not normal but > 30 ml/min, no more than single dosage should be given.
3. If the GFR is < 30 ml/min, **DO NOT** give gadolinium unless absolutely medically necessary, following guidelines in section C above.

III. Allergic Type Contrast Reaction Prevention

A. For patients receiving iodinated or gadolinium contrast media, obtain a complete history of any prior reactions to dyes or contrast used in X-ray, CT, or MRI.
1. The patient is to fill in the attached questionnaire *(Patient Questionnaire-Intravenous/Intra-arterial Contrast D322).*
2. The technologist is to review the questionnaire with the patient prior to injection.
3. The questionnaire is part of the patient's medical record. The Technologist is to complete the information regarding type and volume of contrast and reactions, then sign questionnaire, post injection

B. For patients receiving iodinated or gadolinium contrast media, pre-treatment to prevent or lessen reactions should be given under the following guidelines:
1. Patients with history of
- Prior moderate or severe contrast reaction

- Severe asthmatics with active wheezing or shortness of breath
- Prior anaphylactic reaction to one or more allergens requiring life-saving medical intervention and hospital admission

C. For patients requiring pre-treatment, the referring physician should be called to discuss the following options:
1. Perform a non-contrast study only,
2. Perform an alternative imaging study (if available), or
3. Pre-treat according to the protocol below before giving the contrast agent.

Note: If an asthmatic patient is under the care of a pulmonary physician or if a patient has a history of psychotic reaction to steroids, check with their physician prior to prescribing steroids.

Standard Pre-Medication Dosing:

Medication	Type	Dose	Dose Time
Prednisone	Steroid	50 mg p.o.	13 hrs, 7 hrs, and 1 hr prior to injection
Diphenhydramine	Antihistamine	50 mg p.o.	1 hr prior to injection

a. If a patient arrives without being pre-treated, it is preferable to reschedule the exam to allow steroid treatment. Alternative options are at the discretion of the Radiologist. If there is a history of moderate to severe contrast reaction, another radiological procedure (MRI, non-contrast CT, US or Nuclear Medicine) should be considered as an alternative.

Alternate IV pre-medication dosing: *(To be used if patient requires pre-medication for contrast allergy, but exam needs to be done urgently.)*

Medication	Type	Dose	Dose Time
Hydrocortisone	Steroid	200 mg IV	6 and 2 hours prior to exam
Diphenhydramine	Antihistamine	50 mg	1 hour prior to exam

D. Do not remove the I.V. line from the patient until the exam is completed and it is confirmed that the patient is not experiencing any reaction to the contrast injection. If there is an extravasation, refer to the Extravasation Policy.

E. The emergency equipment will be checked daily.

F. Documentation: All injections will be documented in the Radiology Information System (patient notes) and written on the bottom portion of the IV contrast questionnaire and/or in the patient progress notes. The questionnaire and if used, the progress notes are to be included in the patient's Medical Records. The documentation must include:

1. Date and Time of injection
2. Contrast type utilized
3. Pre-treatment if given
4. Volume injected
5. Any reactions
6. Any Treatments

G. **Any adverse reactions to contrast (including hives) will be documented in the (RIS) Radiology Information System (Patient Notes), on an eQVR , and in the dictation of the exam/procedure.**

IV. DIAGNOSIS AND MANAGEMENT:

Look for any signs of contrast reaction, no matter how mild they may seem.

A.

Severity of Reaction	Symptoms	Treatment
Mild	*Nausea, warmth (heat), pallor, flushing* *(these are normal physiological responses to contrast injection and do not require intervention or documentation)* Cough, headache, dizziness, vomiting, anxiety, altered taste, *itching,* , chills, *shaking, sweats, rash (hives),*	Signs and symptoms appear self-limited without evidence of progression (e.g. limited urticaria with mild pruritis, transient nausea, and one episode of emesis). Requires observation (15 – 20 minutes) to confirm resolution and/or lack of progression but usually no treatment. Patient reassurance is usually helpful.
Moderate (moderate degree of clinically evident focal and/or systemic signs/symptoms)	nasal stuffiness, swelling-eyes or face, tachycardia/ bradycardia, hypertension, bronchospasm (wheezing), dyspnea, laryngeal edema, pronounced cutaneous reaction	The symptoms listed are considered as indication(s) for immediate monitoring and treatment. These situations require close, careful observation for possible progression to a life-threatening event.
Severe (Life-threatening with more severe signs/symptoms)	Laryngeal edema, profound hypotension, unresponsiveness, convulsions, clinically manifested arrhythmias, cardiopulmonary arrest	Requires immediate recognition, monitoring and treatment, almost always requires hospitalization ***Call x6111 for Code Blue**

THE MOST IMPORTANT ISSUE IS TO RECOGNIZE THAT A CONTRAST REACTION HAS OCCURRED, TO ASSESS THE SEVERITY OF THE REACTION, AND TO EVALUATE THE NEED FOR VIGOROUS RESUSCITATION (CODE BLUE)

B. Patients experiencing reaction will be monitored according to the severity of the reaction.
1. If there are few hives only, the patient may be discharged from the department as soon as the hives begin to fade, and the patient is medically stable (See Table above).
2. If the reaction is more severe follow the treatment on the following pages.

C. Management of Acute Reactions:

Reaction	Treatment (specific)	Comments
Urticaria	• Discontinue injection, if not completed • No treatment needed in most cases • Give antihistamine: Diphenhydramine 25-50 mg (PO, IM or IV)	*If severe/widely disseminated:* Alpha-agonist (arteriolar and venous constriction): **Epinephrine SC** (1:1,000) 0.1-0.3ml (if no cardiac contraindication)
Facial/Laryngeal Edema	• Give Alpha-agonist (arteriolar constriction): **Epinephrine SC** (1:1,000) 0.1-0.3 ml or if hypotension evident, then give epinephrine (1:10,000) slowly IV 1.0 ml, repeat • O_2 6-10 L/Min (via mask)	*If not responsive to therapy or for obvious laryngeal edema (acute),* seek appropriate assistance **(code blue)** Consider intubation

Bronchospasm	• O_2 6-10 ml/min via mask • Monitor: ECG; O_2 saturation (pulse oximeter); BP • Give Beta agonist inhalers: **Albuterol** • **Epinephrine** SC (1:1,000) 0.1-0.3 ml, if hypotensive give (1:10,000) slowly IV 1.0 ml Repeat prn up to a max. 1.0 mg	*Alternatively:* 1. Call for assistance (CODE) for severe bronchospasm or if 0_2 sats <88 persists
Hypotension with Tachycardia	• Legs up 60 degrees or more • Monitor: ECG, pulse ox, BP • Give O_2 6-10 L/min (via mask) • Rapid administration of large volumes of isotonic **Ringer's Lactate or Normal Saline.**	*If poorly responsive:* **Epinephrine** (1:10,000) slowly IV, 1 ml (=0.1 mg) (if no cardiac contraindications). Repeat as needed up to a maximum of 1 mg. *Call Code Blue and/or transfer to Emergency Department for further care.*
Hypotension with Bradycardia-Vagal Reaction	• Monitor vital signs • Legs up 60 degrees or more (preferred) or Trendelenberg position • Secure airway; give O_2 6-10L/min(via mask) • Secure IV access; push fluid replacement with **Ringer's Lactate** or **NS** • Give **atropine** 0.6–1 mg IV slowly if patient does not respond quickly to above. • Repeat **atropine** up to a total dose of 0.04 mg/kg (2-3 mg) in adults.	*Call Code Blue and/or transfer to Emergency Department for further care.*
Hypertension, Severe	• Give O_2 6-10 liters/min (via mask). • Monitors in place, ECG, pulse ox., BP • Give nitroglycerin 0.4 mg tablet, sublingual (may repeat x3); topical 2% ointment, apply one inch strip • Sodium nitroprusside arterial line: infusion pump necessary to titrate • Transfer to ICU or emergency department • For pheochromocytoma-phentolamine 5.0 mg (1.0mg in children) IV	
Seizures/ Convulsions	• Give O_2 6-10L/min via mask • Consider lorazepam, 1-2 mg (0.05 to 0.1 mg/kg in pediatrics) IV, diazepam (Valium) 5.0 mg, or midazolam (Versed) 2.5 mg IV • If longer effect needed, obtain consultation; consider fosphenytoin sodium infusion, 15-20 phenytoin equivalents/kg IV at 50 mg/min • Careful monitoring of vital signs required • Consider CODE for intubation if needed.	*Call Code Blue and/or transfer to Emergency Department for further care.*
Pulmonary Edema	• Elevate torso • Give O_2 6-10 L/min via mask • Give diuretics-furosemide (Lasix) 20-40 mg IV slow, push	*Call Code Blue and/or transfer to Emergency Department for further care.*

	• Corticosteroids optional	

V. Documentation

A. For mild, requiring medical intervention, to severe contrast reactions:
   - **Radiologist** will document the reaction on a Progress Note for the patient's medical record and include it in the dictated report.
   - **Technologist** will document the reaction in the RIS *(Patient Notes*) and complete an eQVR.

B. Patient Questionnaire Form (D322) insertion into the patient's Medical Records Chart after all information is documented.
   1. **Inpatients:** Upon completion of the procedure/exam the completed Patient Questionnaire Form will be placed in the designated location for progress notes.
   2. **Outpatients:** Upon completion of the procedure/exam, the completed Patient Questionnaire Form will be placed in the front of the Outpatient's Medical Record Chart. If the outpatient Medical Record chart is not available, send the completed Questionnaire Form to the Medical Records Department.

C. **Dictated Reports**: The Radiologist must include:
   1. Date and Time of injection
   2. Contrast type utilized
   3. Pre-treatment if given
   4. Volume injected
   5. Any reactions
   6. Any Treatments

VI. Giving Contrast to Breast-Feeding Mothers

A. As stated by the American College of Radiology and the American Academy of Pediatrics, beast feeding is not a contraindication for giving contrast agents.
B. Less than 1% of contrast agent is secreted in breast milk. Less than 1% ingested by baby is absorbed in the intestine. The final amount of contrast in the baby's blood is less than 1% of dose infant would get for an imaging study.

VII. Pregnant & Potentially Pregnant Patients

A. Pregnancy is not an absolute contraindication for giving contrast agents. However, caution is advised during the 1st trimester of pregnancy.
B. If the referring physician and radiologist have determined that the imaging study must be done with contrast to obtain critical medical information, it can be done after considering the following precautions:
   1. Discuss the risks, benefits, & alternatives with the patient.
   2. Consider noncontrast MRI or ultrasound
   3. Get signed consent

VIII. Emergencies

In an emergency, such as a stroke evaluation, suspected abscess, or osteomyelitis, the decision whether to give contrast agent will be based upon the physician's judgment of the risk/benefit ratio. If the information from the contrast imaging study is critical for patient care, the contrast agent may be given without consideration of allergy, renal function, or pregnancy. The physician giving the contrast must be prepared to handle any emergency contrast reaction.

References:

1. American College of Radiology - Manual on Contrast Media
2. http://www.biomedcentral.com/1471-2342/6/2 (Delaney A, Carter A, Fisher M: The prevention of anaphylactoid reactions to iodinated radiological contrast media: a systematic review. BMC Medical Imaging 2006; 6:2)