

**YALE-NEW HAVEN HOSPITAL
DEPARTMENT OF RADIOLOGY AND BIOMEDICAL IMAGING POLICY AND PROCEDURE MANUAL**

Administrative Policy Title:	USE OF IV AND ORAL CONTRAST MEDIA IN RADIOLOGY	Manual Code:	I.15
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I. Policy

To provide guidelines for the use of intravenous or oral, iodinated and gadolinium based contrast media, as well as the proper response of Radiology staff in the event of a contrast media event.

See policy I.21 for use of IV contrast on breast feeding patients.

See policy II.6 for Emergency Equipment and Contrast Reaction Kits

II. Responsibility

1. IV and oral contrast media agents are considered medications according to the Joint Commission and, therefore, all adherences to the Medication Management Standards and all applicable YNHH drug use policies apply.
2. The patient's physician, PA, or APRN is responsible to order radiology exams, including those that require contrast media, either by written requisition or via computer order entry system. Inpatient and ED requests for contrast exams must include the patient's pregnancy status and renal function as appropriate.
3. The radiologist has primary responsibility to review pertinent, available patient history, including eGFR levels, and the appropriateness of the request for contrast media, the dose, and the type of contrast administered prior to assigning imaging protocols.
4. Per YDR and DR administration, the responsibility to protocol CT exams with contrast is limited to radiology physicians and/or advanced practitioners. For exams ordered with IV contrast, the patients' eGFR should be ≥ 30 . If the eGFR is < 30 , should follow low eGFR workflow listed below.
 - a. **eGFR results for in-patient and ER patients should be within 48 hours. For out-patients, eGFR values are acceptable for up to 6 weeks before exam (the most recent Creatinine value can be used to compute the eGFR).**
5. **eGFR work flow for CT-**

If a CT study is ordered WITH contrast and eGFR is OVER 30, you can protocol it with IV contrast.

If a CT is ordered WITH contrast and eGFR is BELOW 30 when patient arrives:

 - a. Technologist will call the appropriate reading room to notify a radiologist. Radiologist then has to review the case and make a decision.
 - i. **Give contrast despite eGFR<30:** A few studies have shown NO added risk of deterioration of renal function with IV contrast compared to matched controls regardless of renal function (2, 3, 5), however one study showed higher risk with eGFR <30 (1). If you have any doubt on best choice, discuss with ordering provider and document reasoning in your report.
 - ii. **Change CT to WITHOUT contrast:** If clinical question can be answered sufficiently without IV contrast, document the following in your dictation. ie "Current study was initially ordered with IV contrast.

However the patient's eGFR on "date X" was 'X'. Thus, the exam was switched to without IV contrast to eliminate risk of renal injury."

- iii. **Exam should be canceled/re-scheduled:** If exam canceled, CSA (clinical scheduling assistant) will note the cancel reason as "lab function out of range" in the order history in EPIC.

- b. Technologist should document in EPIC study notes the name of radiologist who made decision. If radiologist is ever unclear on what to do, they should discuss case with ordering provider.

If order is being CHANGED (to without contrast or canceled), then technologist will communicate the radiologist's decision to CSA and ask CSA to contact the ordering physician's office.

- c. CSA, working from an approved script, will communicate the information to the ordering provider (or ordering providers staff) including the eGFR value and the radiologist's recommendation for the patient's imaging.
 - i. If the ordering provider does not agree with the radiologist's decision, CSA will connect provider to radiologist for discussion. CSA will wait for further direction from the radiologist and/or technologist once that call is completed.
 - ii. If the ordering provider agrees with the radiologist's decision, the CSA will edit exam order with ordering provider.
 - iii. IF CSA cannot get in touch with ordering physician (or surrogate), the radiologist's decision will prevail. **It is crucial that all our reports have documentation for reasoning to give or withhold contrast for this reason.**
- o If the ordering provider agrees with the radiologist decision the CSA will-
 -
 - If changing order to CT WITHOUT contrast:
 - EPIC Provider:
 - ❖ CSA will change the order in EPIC to a non-contrast exam and send the order via EPIC in-basket request for co-sign
 - ❖ CSA will track the order to ensure co-sign is received
 - Non-EPIC Provider:
 - ❖ CSA will change the order in EPIC to a non-contrast exam
 - ❖ CSA will request a new requisition from the ordering physician
 - ❖ CSA will track to ensure the new requisition is received
 - ❖ CSA will upload the new requisition into the Media Manager section of EPIC
 - ❖ Regardless of EPIC or non-EPIC provider, CSA will contact PFAS via PFASDRCHANGES@YNHH.ORG to alert the Pre-service team of the change in procedure code.
 - ❖ Pre-service team will address any issues with authorization

- ❖ CSA to track each order change via the change order excel spreadsheet
 - If cancelling the exam:
 - CSA will cancel the appointment in EPIC and take direction from the ordering physician's office about reschedule
6. All personnel involved in the administration of contrast media are responsible to be aware of the steps that can be taken to anticipate a contrast reaction in order to try to prevent it, or if one occurs, recognize it and take appropriate measures. Contrast reactions may be dealt with by technologists, nurses, RA, radiologists, code-teams or a combination of the above. See Addendum 1.15A *Recognition and Response to a Contrast Reaction*.

III. Procedure Guidelines for IV Contrast

1. Intravenous contrast will be injected through an intravenous line previously established by the nurse or technologist. See DR Policy 1.17: *Medication Administration by Technologists in Diagnostic Radiology*.
2. Prior to the administration of IV contrast, the patient's history including medications, allergies, and questions screening for renal impairment will be reviewed by the technologist in the patient's medical record, or obtained using the appropriate outpatient questionnaire, and subsequently scanned or entered into the medical record.
 - a. If no contraindications to contrast are noted, the technologist proceeds with IV contrast administration as per protocol identified by the radiologist.
 - b. If contraindications are noted, the case is referred to the radiologist for further consideration.
 - c. An IV line will stay in place during the examination, should IV drug therapy be necessary.
 - d. A physician must be readily available during the contrast examination.
 - e. A contrast reaction kit and emergency equipment (including a code cart, if a hospital site), must be readily available.

See Policy II.6 – Emergency Equipment & Supplies

IV. Point of Care Testing

A. Point-of-Care eGFR testing will be performed by the technologist/technologist aid or nursing as required for Outpatients (and rarely for in-patients), at the time of appointment. This test is inspected by the College of American Pathologists as part of the accreditation of the Department of Laboratory Medicine at Yale-New Haven Hospital. The meter will diagnose the quantitative measurement of creatinine in capillary, venous, and arterial whole blood and convert the creatinine value by means of standard algorithms into estimated glomerular filtration rate (eGFR) in order to evaluate renal function. The eGFR will be recorded in separate dedicated log as well as on the patients' safety sheet.

B. Point of Care Meter:

Will be maintained by the MRI and CT Scan departments and a QA schedule will be strictly adhered to. Staff will be trained in the use of the meter during their orientation and reviewed for competency annuals. "Super users" will be assigned for training of staff members.

POINT-OF-CARE Renal Function Testing in Radiology

(Formerly Addendum I.15J)

C. MRI Patients:

- Those outpatients who have answered yes to contrast related questions on the MR safety screening form (diabetic, hypertensive, renal disease, liver disease) must be screened with the Point of Care meter before the administration of contrast if no Cr/eGFR value is available within 6 weeks. eGFR values for out-patients below 30 are referred to the radiologist. Please see MRI safety manual for full details.
- Inpatients and ED patients should have Cr/eGFR value available within 48 hours of scheduled test.

D. CT Patients:

- Any outpatient that answers "Yes" to the contrast related questions on the CT Oral / IV Contrast Data Form will be given a Point-of-Care test to determine eGFR level if no eGFR/Cr value is available within 6 weeks.
- eGFR levels under 30 are referred to the radiologist as detailed in section 2.5.

Pre-medication policy for prior allergic like reactions to contrast media

(Formerly Addendum 1.15B)

For Planned Administration of Contrast Agents:		
Previous reaction to allergens (eg shellfish, peanuts, medications etc):		
Mild	Moderate	Severe
None	None	None
Previous reaction to same class of contrast agent going to be given:		
Mild (Excluding hives/facial swelling/itching)	Moderate (Including hives/facial swelling/itching)	Severe
None	Pre-medicate and use different agent	Do not give contrast*
Previous reaction to a different class of Contrast agent than type to be given.		
Mild	Moderate	Severe
None	None	None

**Unless in the opinion of the responsible health care professional and supervising radiologist, the potential benefits outweigh the risks i.e. emergency situations.*

In these instances, specific indications and reason(s) for exception should be documented in the report.

- ◆ Premedication with steroids and Benadryl is now recommended only for patients who have had a reaction to contrast of a similar class (iodinated agents are one class, gadolinium based agents are separate class) to the one planned to be given.
- ◆ Prophylaxis for those with reactions to other allergens is no longer necessary.

This policy decision is based on the following information:

- Current estimated reaction risk in the general population is about 0.6% (Wang et al.)
- Only patients with a prior reaction to contrast are known to be at higher risk (3-11% reaction rate, with 2% break-through) (Mervak et al. Lasser et al).
- The rate of reaction for patients with prior anaphylaxis to substances other than contrast may be higher than the normal population, but this is not proven.
- The current standard of care in the United States is to premedicate patients with steroids and Benadryl to decrease risk of repeat contrast reaction in patients who have had a reaction in the past to a similar class contrast agent.

References:

Wang CL, Cohan RH, Ellis JH, Caoili EM, Wang G, Francis IR. Frequency, outcome, and appropriateness of treatment of nonionic contrast media reactions. AJR 2008; 191:409-415
 Lasser EC, Berry CC, Mishkin MM, Williamson B, Zheutlin N, Silverman JM. Pretreatment with corticosteroids to prevent adverse reactions to nonionic contrast media. AJR 1994; 162:523-526
 Mervak BM, Davenport MS, Ellis JH, et al. Breakthrough reaction rates in high-risk inpatients premedicated before contrast-enhanced CT. AJR 2015;205:77-84.

Pre-Medication Regimen

*Premedication order set is now available in EPIC

If click on the order set trigger, this screen appears:

Alternative Selection

CONTRAST REACTION ORDER SET TRIGGER: Starting Today at 1513

To order contrast reaction pre-medications (**diphenhydramine/corticosteroid**) for pediatric or adult patients, please go to Manage Orders, click "Order Sets" and enter "contrast reaction" and choose:

contrast reaction pre-medication

Web Links

No additional information.

Facility List Search - Rachel, Testing

CONTRAST REACTION

Browse (F4) | Preference List (F5) | Facility List (F6) | Database Lookup (F7)

Medications
 Procedures
 Order Panels
 Split

Name	Type	Approx Cost	Dose	Route	Freq	Pref List	Px Cod	Phase c	Code
Contrast reaction pre-medication (corticosteroid/diphenhydramine)	Medica					YNH	IP F		4081

1 loaded. No more to load.

Order Sets

Multiple Versions of User Order Sets

You can now save multiple versions of user order sets. Click the Manage My Version link below to begin. [Learn More](#)

▼ Contrast reaction pre-medication [Manage My Version](#) ▼

Pre-Medications (Adult) Collapse

> Pre-Medications (Adult) - Standard therapy Click for more

> Pre-Medications (Adult) - Emergency setting Click for more

Pre-Medication (Pediatrics) Collapse

> Pre-Medications (Pediatric) - Standard therapy Click for more

> Pre-Medications (Pediatric) - Emergency setting Click for more

Collapse

You can search for an order by typing in the header of this section.

Adults:

- 50mg Prednisone PO 13, 7 and 1 hour before the injection.
- 50mg Benadryl (Diphenhydramine) IV/PO within 1 hour of the injection.

In an emergency setting an alternative faster (but less proven) regime is:

- 200mg Hydrocortisone IV 4 hours before injection.
- 50mg Benadryl (Diphenhydramine)IV/PO within 1 hour of the injection.

Pediatrics (For patients less than 50kg):

- Prednisone 0.7 mg/kg (not to exceed 50mg) PO 13, 7 and 1 hour before the injection.
- Prednisolone 0.7mg/kg (not to exceed 50mg) PO 13, 7 and 1 hour before the injection
- Benadryl (Diphenhydramine) 1mg/kg IV/PO (not to exceed 50mg) within 1 hour of the injection.

In an emergency setting an alternative faster (but less proven) regime is:

- Hydrocortisone 1mg/kg (not to exceed 200mg) IV 4 hours before injection.
- Benadryl (Diphenhydramine) 1 mg/kg IV/PO (not to exceed 50mg) within 1 hour of the injection.

V. Documentation of Adverse Events

1. If a contrast event occurs, the radiology nurse or technologist involved must document the details within the patient medical record (Epic). It will be the technologist or nurse's responsibility to ensure that the individuals involved have included the following details:
 - Contrast agent/dose administered
 - Reaction signs/symptoms
 - Patient management, including drugs administered
 - Patient outcome
 - Provide discharge instructions sheet
2. Details concerning the administration of contrast and the adverse event must also be documented in the radiology report.
3. Nurses/Techs must also enter a report in RL solutions Event Reporting System.
4. At the radiologist's discretion, the patient's clinician will be notified verbally at the time of the event.

CT Contrast Reaction or urgent adverse patient event coverage*

**MONDAY -
FRIDAY**

	Patient Location	Day Shift (8am-5pm)	Evenings and night (5pm-8am)
C T	SP2 (usually 7am-430pm)	Chest or Cardiac (S. Pavilion)	ED
	Smilow (Open 7am-8pm)	If neuro case, neuro MR (Smilow) Otherwise, body CT (Smilow)	Neuro
	ED	ED	ED
	Saint Raphael's (Open 24/7)	Body	ED
	YNHH Nuc med PET/CT (open till 7pm)	Nuclear Medicine	Neuro (smilow)
	SRC Nuc Med PET/CT	Body	ED

SATURDAY - SUNDAY

	Patient Location	Day Shift (8am-noon)	Afternoon & Nights (noon-8am)
C T	SP2	Chest if present. Otherwise ED	ED
	Smilow (Open 8am- 430 pm)	If neuro case, neuro MR (Smilow) Otherwise, body CT (Smilow)	Neuro (Smilow)
	ED	ED	ED
	Saint Raphael's (open 24/7)	ED	ED

*Non-urgent situations such as contrast extravasation, mild contrast side effects (nausea/vomiting), and falls will be handled by the supervising service during normal business hours.

NEURO SMILOW-200-3181	PEDIATRICS-688-6184	ED YNHH-688-6180
NEURO FITKIN- 688-4305	CHEST SP- 688-8811	ED SRC-789-3929
BODY SMILOW-200-5734	CARDIAC - 688-3570	
BODY FITKIN-688-3171	SRC BODY-789-6092/3	
BREAST-200-5229	SRC MRI-789-4126	

Contrast Reaction or urgent adverse patient event coverage (non-urgent situations such as contrast extravasation, mild contrast side effects (nausea/vomiting), and falls will be handled by the supervising service during normal business hours)

MONDAY - FRIDAY

	Patient Location	Day Shift (8am-5pm)	Evenings and night (5pm-8am)
MRI	Fitkin (Open 7am to 11pm)	If neuro case, neuro (Fitkin) Otherwise, body MR (Fitkin)	ED
	Smilow 2 (Open 24/7)	If neuro case, neuro (Smilow) Otherwise, body CT (Smilow)	Neuro (Smilow)
	Smilow 1 (Open 7am to 3pm)	Breast	Closed now. When open ED
	Pedi (Open 7am to 7pm)	Pediatrics	ED
	Saint Raphael's (Open 24/7)	Neuro	ED

SATURDAY - SUNDAY

	Patient Location	Day Shift (8am-noon)	Afternoon & Nights (noon-8am)
MRI	Smilow 2 (Open 24/7)	If neuro case, neuro (Smilow) Otherwise, body CT (Smilow)	Neuro (Smilow) if present. Otherwise ED
	Smilow 1 (7am to 12pm Sat only)	Breast (if present) <i>If breast not present-</i> <i>If neuro case, neuro (Smilow)</i> <i>All other cases Body CT (Smilow)</i>	ED (7am-8am)
	Fitkin (7:00am to 4pm Sat only)	If neuro case, neuro MR (Smilow) Otherwise, body CT (Smilow)	ED
	Saint Raphael's (Open 24/7)	ED	ED

NEURO SMILOW-200-3181
NEURO FITKIN- 688-4305
BODY SMILOW-200-5734
SRC MRI-789-4126

PEDIATRICS-688-6184
BREAST-200-5229
CARDIAC SP- 688-3570
SRC BODY-789-6092/3

ED YNH-688-6180
ED SRC-789-3929
BODY FITKIN-688-3171

ALGORITHM FOR RECOGNITION AND RESPONSE TO CONTRAST REACTION
(Formerly Addendum I.15A)

MAJOR REACTIONS

BREATHING PROBLEMS OR SHOCK

- a) Coughing, Choking
- b) Difficulty Breathing
- c) Wheezing / Stridor
- d) Facial / Neck Swelling
- e) Cyanosis / Severe Diaphoresis
- f) Unresponsive/hypotensive



NOTIFY RADIOLOGIST AND NURSING

1. Assess air way and lungs
2. Check vital signs - place on monitor
3. Check ability to swallow, patient color, quality of voice

IF PROBLEM- Call CODE

Within **Hospital: Call 155**

(Code Blue = Adults)
(Code White = Pedi)

Outside New Haven: Call 9-911 (Local EMS)

MINOR REACTIONS/ PHYSIOLOGIC REACTIONS

- Nausea, vomiting
- Warmth
- Headache
- Dizziness
- Altered taste
- Pallor
- Flushing
- Chills
- Sweats
- Mild nasal stuffiness
- Anxiety

If Asymptomatic

1. Comfort and reassure patient

2. Observe – continue or complete exam
3. If no further problem, can discharge.



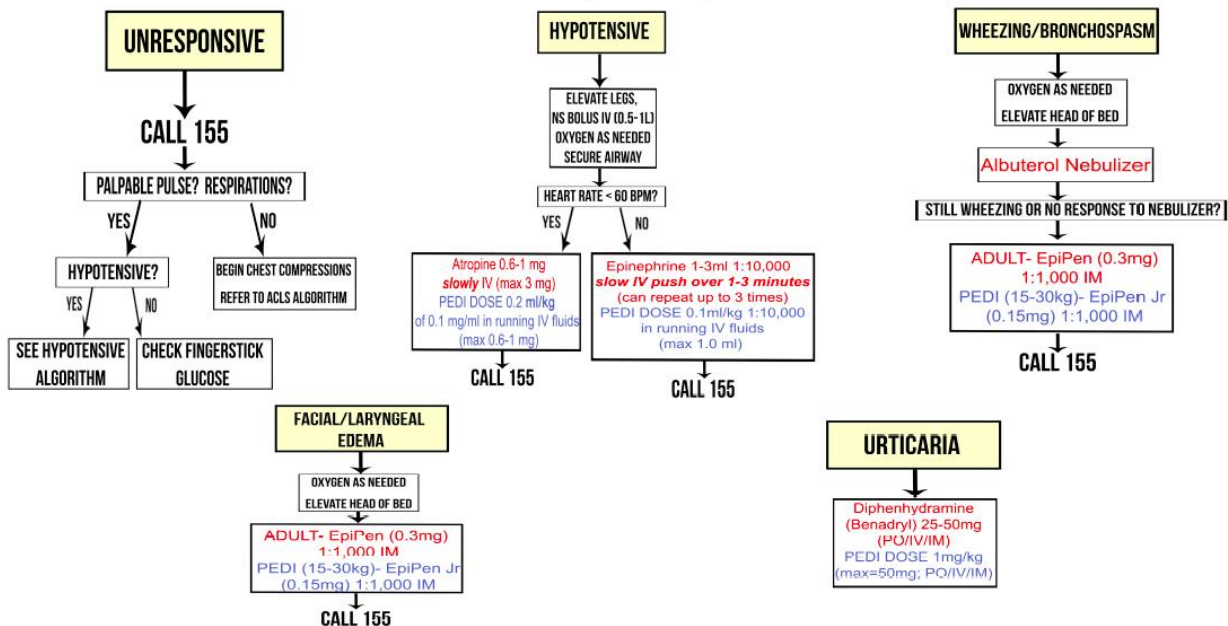
If no relief or symptoms persist

1. Maintain and secure IV access
2. Notify radiologist

MANAGEMENT SUGGESTIONS FOR MAJOR ADVERSE EVENTS

ASSESS AIRWAY, HR, BP, SPO₂, AUSCULTATE HEART AND LUNGS,

OBTAIN IV ACCESS, OXYGEN, MONITOR



USING THE EPIPEN



1. Remove EpiPen from box



2. Pull blue safety release cap.



3. Press orange tip FIRMLY against outer thigh until it 'clicks.' Hold for 10 seconds

DOSING AND CONTENTS OF CONTRAST REACTIONS KITS

<u>Radiology Tackle Box Contents</u>	<u>Adult Dosing</u>	<u>Pediatric Dosing</u>
Albuterol MDI INHALER 90 mcg/actuation	2 puffs (90mcg/puff) for a total of 180 mcg -May repeat	2 puffs (90mcg/puff) for a total of 180 mcg -May repeat up to 3 times
Albuterol Nebulizer 0.083% solution	2.5 mg (3 mL) inhaled via a nebulizer over 5-15 minutes	2.5 mg (3 mL) inhaled via a nebulizer over 5-15 minutes
Aspirin 325 mg TABLET	325 mg PO	DO NOT USE
Atropine 1mg/10mL SYRINGE	0.5 mg IV -Administer slowly, followed by saline flush -May repeat every 3 – 5 minutes up to 3 mg total	0.02 mg/kg IV (0.2 mL/kg of 0.1 mg/mL solution) -MINIMUM single dose = 0.1 mg -MAX <u>single</u> dose = 0.6 -1 mg -MAX <u>total</u> dose= 1 mg for infants and children, 2 mg for adolescents -Follow with saline flush
Dextrose 50% 25g/50mL SYRINGE	25g IV -Administer over 2 min	0.5 g/kg/dose IV -Administer over 2 min
Diphenhydramine 50mg VIAL	25-50 mg IM or IV -Administer IV dose slowly over 1-2 min	1 mg/kg IM or IV -Administer IV dose slowly over 1-2 min -MAX = 50 mg
Diphenhydramine 25mg ELIXIR/CAPSULE	25-50 mg PO	1 mg/kg PO -MAX = 50 mg
Epinephrine auto-injector (Epi-pen®) administration or Epinephrine 1:1,000 vial	Hives, diffuse erythema, bronchospasm, laryngeal edema, hypotension: 0.3mg IM **Use 0.3 mg auto-injector**	Hives, diffuse erythema, bronchospasm, laryngeal edema, hypotension: Weight ≤ 25 kg: 0.15 mg IM (Use 0.15 mg auto-injector) Weight > 25 kg: 0.3 mg IM (Use 0.3 mg auto-injector)
Epinephrine 1mg/10mL PREFILLED SYRINGE for IV administration (Anaphylaxis) (1:10,000)	Anaphylaxis (ONLY for very unstable patient: severe hypotension, tachycardia, severe airway edema) 0.1 to 0.3mg SLOW IV push (1 mL to 3mL of 1:10,000 dilution) May repeat every 5 – 15 minutes as needed up to 1 mg total	Anaphylaxis: 0.01 mg/kg IV (0.1 mL/kg of 1:10,000 dilution) -MAX individual dose:- less than or equal to 30 kg = 0.15 mg (1.5mL) > 30 kg = 0.1 to 0.3 mg (1 mL to 3mL) -May repeat up to 1 mg total dose
Furosemide 20mg VIAL	20-40 mg IV -Administer slowly over 2 min	0.5-1 mg/kg IV -Administer slowly over 2 min -MAX = 40 mg
Labetalol 100mg/20mL VIAL	20 mg IV (for hypertensive crisis, BP > 200/120 mm Hg and symptoms of end organ compromise) -Administer slowly, over 2 min -May double dose every 10 min	0.2 - 1 mg/kg IV bolus -Administer slowly, over 2 min -MAX = 20 mg
Methylprednisolone 125 mg VIAL	125 mg IVP administered over 3 minutes	0.5 mg/kg IV
Nitroglycerin 0.4mg SL tabs	0.4 mg tab SL -May repeat every 5-10 min	N/A
Sodium chloride 0.9% 500mL	1,000mL rapidly IV	10-20 mL/kg; MAX = 500mL - 1,000 mL IV

References:

ACR Committee on Drugs and Contrast Media. ACR Manual on Contrast Media Version 9. American College of Radiology. 2013.Updated/Reviewed: July 2015

Protocol for Extravasated Contrast Material

(Formerly Addendum I.15C)

Modified from the ACR Manual of Contrast Media Manual

Background:

Extravasated iodinated contrast media is hyperosmolar and toxic to the surrounding tissues. Most patients recover without sequelae but severe adverse events may occur. Extravasation produces an acute local inflammatory response that peaks at 24-48 hrs although ulceration and tissue necrosis may occur as early as 6 hours after the extravasation. Extravasation of a large volume of contrast material can produce a compartment syndrome.

Evaluation and Treatment:

- All patients in which an extravasation has occurred should be evaluated by a radiologist from the service that would be reading the exam.
- All outpatients should be monitored in the department for a **minimum of 1 hour** even if the patient is asymptomatic.
- Elevation of the extremity and a cold or warm compress should be applied to the site up to four times/day for 1-3 days (This decision is based on radiologist and patient preference)
- If the symptoms improve or the patient remains asymptomatic, they may be sent home but told to go immediately to an ER if symptoms deteriorate or if there are skin/neurologic changes (ulceration, blistering, change in sensation).
- If symptoms have not improved after 2 hours or skin/neurologic changes develop, the patient should be referred to the emergency room.
- For inpatients, the extremity should be elevated and a cold or warm compress should be applied (as above). Inpatients may be sent back to the floor but the house staff must be notified of the incident.
- A plastic surgical consult is frequently not necessary and a reliance of a volume threshold for surgical consultation is unreliable. In general, the need for surgical consultation should be made on the basis of the patient's signs and symptoms.
- An immediate plastic surgical consultation is indicated with the following:-
 - Increasing swelling/pain after 2-4 hours.
 - Altered tissue perfusion as evidenced by decreased capillary refill
 - Change in sensation of the affected limb
 - Skin ulceration or blistering.

Documentation:

- All extravasation events should be documented in the radiology report and the referring physician should be notified.
- The technologist is responsible to ensure that the extravasation incident is documented in Event Reporting system.

ACR Reference on Contrast Extravasations

"There is no clear consensus regarding effective treatment for contrast medium extravasation. 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, but controlled studies demonstrating the efficacy of this treatment are lacking. There is no clear evidence favoring the use of either warm or cold compresses in cases of extravasation. As a result there are some radiologists who use warm compresses and some who use cold compresses. Those who have used cold have reported that it may be helpful for relieving pain at the injection site. Those who have used heat have found it helpful in improving absorption of the extravasation as well as in improving blood flow, particularly distal to the site"

Contrast Extravasation Discharge Instructions

(FORMERLY Addendum I.15C)

During your test today, you had intravenous contrast material extravasation. This means that some of the IV fluid or contrast material went into the tissues of your arm/hand. This may cause swelling and discomfort. The fluid will be absorbed by your tissues and any symptoms should go away.

The contrast material used was _____

The approximate amount of extravasation was _____

Treatment:

- Try to keep the affected extremity elevated above the level of the heart as much as possible.
- You can apply either warm or cold compresses for 15 minutes a few times a day for 3 days or until the symptoms resolve.

Seek immediate medical attention if:

1. your swelling or pain do not improve
2. your skin blisters
3. there is increased firmness at the site
4. your arm or an area on your arm or hand becomes red
5. you experience a change in sensation of your hand or arm such as numbness and tingling

I have read and understand these instructions and received a copy.

Name of patient _____

Signature of patient _____

Policies Specific to CT Contrast Media

I. Procedure Guidelines for Oral Contrast

1. All Patients

- a. Prior to the administration of oral contrast, the patient's clinical history including medications, allergies and sensitivity and drugs, will be reviewed by the technologist in the patient's medical record, or obtained using the appropriate outpatient questionnaire, and subsequently scanned into the RIS medical record.
- b. If no contraindications are noted, the technologist proceeds with oral contrast administration as per protocol identified by the radiologist.
- c. All patients routinely receive an iohexol (Omnipaque®) in H2O mixture, prepared according to the radiologist protocol, labeled with patient's demographics, and provided to the patient or nurse with instructions for administration.
- d. If contraindications are noted, the request is referred to the radiologist for further consideration. An oral Barium Sulfate solution may be prescribed for patients allergic to iodinated contrast.
- e. A physician must be readily available during the contrast examination.
- f. A contrast reaction kit and emergency equipment (including a code cart, if a hospital site), must be readily available.
See Policy II.6 – Emergency Equipment & Supplies

2. In-patients

- a. Labeled oral contrast will be delivered to the in-patient floor for administration to the patient by their nurse.

3. Adult ED Patients

- a. After the ED patient's Pregnancy and eGFR test results are available (for select patients), the ED physician will order the contrast CT exam (Oral or IV) in the RIS, and include pertinent clinical history.
- b. CT exams requiring contrast will be reviewed and protocolled by radiology prior to dispensing and administering the contrast agent. The exception to this is for a "FULL Trauma" ED patient.
- c. If the study requires oral contrast it will be picked up in Radiology and given to the patient by ED nurse.
- d. Patient imaging will begin approximately 45 minutes after the patient begins drinking it. Extended oral preparation may be prescribed by the radiologist at their discretion based on exam indication.

4. Pediatric ED Patients

- a. After the contrast request has been reviewed by the radiologist, the appropriate dose will be determined.
- b. Oral contrast will be dispensed to the pediatric ED for administration to the pediatric patient by their nurse.
- c. The patient's nurse will notify the ED radiology scheduler as the patient finishes drinking the oral contrast to coordinate exam timing.

CT Scan Oral Contrast
(FORMERLY Addendum I.15I)

25ml Omnipaque (Iohexol) in 900ml of Water

Patient Name: _____
MRN: _____ Pt. Location _____
Date: _____ Exp.Date/Time _____
Start Oral: _____ Finish _____
Approx. Scan Time: _____

Please instruct patient to drink contrast over the assigned hour. Please call 8-5639 if you have any questions or the patient cannot follow instruction, so we can expedite the procedure. If the start time is delayed please inform 85639. Inform the MD if the patient experiences any adverse events such as difficulty breathing or itching.

Rev 3/18/10

CT Scan Oral Contrast
Barium Sulfate Suspension (2.1%w/v, 2.0%w/w)

Patient Name: _____
MRN: _____ Pt. Location _____
Date: _____ Exp.Date/Time _____
Start Oral: _____ Finish _____
Approx. Scan Time: _____

Please instruct patient to drink contrast over the assigned hour. Please call 8-5639 if you have any questions or the patient cannot follow instruction, so we can expedite the procedure. If the start time is delayed please inform 85639. Inform the MD if the patient experiences any adverse events such as difficulty breathing or itching.

Rev 3/18/10

For Diabetic Patients on Glucophage or Glucovance

How to take diabetes medicine that contain Metformin* after receiving a contrast injection for a CT Scan

***The diabetes medications that contain Metformin include:**

- Actoplus
 - Avandamet
 - Fortamet
 - Glucophage
 - Glumetza
 - Janumet
 - Kombiglyze
 - Metaglip
 - Prandimet
 - Riomet
-

If you suffer from:

- Alcohol abuse
- Angina
- Heart failure
- Kidney problems
- Liver disease
- Severe infection

Stop taking Metformin and contact your doctor within 48 hours before restarting. Show this sheet to your doctor.

If you do not suffer from any of the above conditions:

- Continue taking Metformin normally.
-

Information for MDs

- Category 1: Normal renal function and none of the above co-morbidities: Metformin need not be discontinued.
- Category 2: Normal renal function but above co-morbidities: May restart Metformin after 48 hours if clinically stable.
- Category 3: Renal dysfunction: May restart Metformin only after cautious follow up of renal function.

Low-Osmolar Iodinated Contrast and Myasthenia Gravis

Low-osmolar iodinated contrast has been shown to have a weak association with exacerbation of Myasthenia Gravis-related symptoms, most commonly respiratory compromise. This association has been discussed with Yale Neurology who feel that the low risk does not merit screening patients for Myasthenia at this point. If a patient declares himself or herself as suffering from Myasthenia Gravis, our policy should be to reassure them that it is highly unlikely that any deterioration in symptoms will occur.

CT TECHNOLOGIST: Policy for Power Injection

** CVDs with TPN infusions cannot be used for contrast injection unless TPN has been disconnected and vigorously flushed by RN prior to exam, before patient leaves the floor.

NOTE: No IV medication drips should be stopped or restarted without an RN's help. Injector should not be used with any IV that has questionable patency. If in doubt, question the radiologist or the patient's care givers.

CVD's – Adult use

Catheter	Used for CT Inject.	Lumen Size	Max Injection Rate	Max PSI
Power PICCS (Bard) or equivalent from other manufacturer	Yes		Check Hub	Check hub
Power Ports (Bard) or equivalent port from other manufacturer	Yes	6.5-10 French	5cc/sec.	300
Power Hickmann	Yes		Check hub	Check hub
Non Power Injectable or unknown¹ ports	Yes		1 cc/ sec	100
Micropuncture introducers placed by IR	Yes	5 French	5 cc	300
IV catheters in a foot vein	Yes	18g-22g IV access	1 cc/sec	100
EJ or IJ - IV access	Yes	18g-22g IV access	2 cc/ sec.	300
Triple-Lumen (Arrow)	Yes	16g=brown port- Used whenever possible 18g=blue port	1 cc/sec (unless higher rate listed on hub)	100 (lines that list higher injection rates at hub are usually OK to inject up to 300 psi)
Power Mid Lines	Yes	4/5 French	5 cc / sec	300
Quinton/ Non-Power Hickman/ Permacath	NO			

¹ Review Epic (lines and drains section) to research if type of port is known. If unknown, and need to inject at higher rate can review chest xray or scout image with radiologist to see if port is labeled with "CT" icon denoting power injectable port.

Non- Marked Piccs	NO			
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Process –

- 1.) Following Hand Hygiene Policy at all times: wash or Purell, don gloves, when completed remove gloves, then wash or Purell.
- 2.) *RN must access and de-access all indwelling Ports* – CVD lumen access may be performed by the CT technologist to inject contrast.
- 3.) *Prior to use:* All CVAD lines used for contrast with injector or hand injection must have a 15 sec. hub scrub with approved disinfectant and allowed to air dry (minimum 15 sec.). **(All CVD's must be checked for patency and blood return, using a 10 cc saline syringe with 3 cc removed. Flush line with 10 cc sterile saline after.** A CVD should not be used without verification of blood return.
- 4.) CT Technologist should monitor injection site for the duration of injection when possible.
- 5.) The contrast for all CVD's is Omnipaque 350 (except for Pediatrics Omnipaque 300 is used). If prior contrast reaction to Omnipaque, alternative agent like Isovue 370 may be used)

Script –

Adult Power Hickman – In-Patients: Call the floor to check IV status. If the RN states the patient has a Hickman two (2) questions need to be asked:

- 1.) Is the Hickman a **Power Hickman** (Needs to be labeled on the clamp with maximum injection rate, if not Is a P or an X seen within the line on the Chest X-Ray or is there documentation in EPIC.
 - 2.) Has there been **TPN** running?
 - a. If **Yes:** to flush vigorously now and Disconnect TPN and to clearly mark lumen used for TPN.
 - b. Send patient with no meds running. (Open flush is allowed)
 - c. Instruct RN that the patient will return **without** the catheter being flushed with heparin.
 - d. If the TPN cannot be stopped and flushed before leaving the floor, the Hickman may not be used for the contrast injection.
 - e. Follow 15 second hub scrub and allow to air dry (min. 15 seconds).
 - f. Do not disconnect injector prior to exam completion or the hub scrub will need to be repeated.
 - g. Maximum flow rate will be listed on the lumen clamp.

Power Hickman: Out- patient: Follow 15 sec. hub scrub and allow to air dry (minimum 15 sec.) Maximum flow rate will be listed on the lumen clamp. Do not disconnect injector prior to exam completion or the hub scrub will need repeating. Call South Pavilion Core IR RN, Prep Hold RN, or RN in your respected area's to flush heparin post injection per YNHH policy.

Injection rate for use of PEDI Injector: Including foot veins

Lumen Size	Flow Rate	PSI
18g, 20g IV access	2cc / sec	150
22 g IV access	2 cc / sec	150
24 g IV access	1.5 cc / sec	50

Pedi- All Central Lines including Broviac: In- Patient patients: Call the RN. Instruct RN to accompany the patient. Pedi RN will need to follow YNHH hub scrub policy. Pedi RN will hub scrub and access the pediatric patient's **Central Line** and the technologist will connect the contrast. Omnipaque 300mg. may be injected @ 1 cc / sec. at 100 PSI. With the help of the CT Tech, the Pedi RN will disconnect the injector and follow YNHH heparin flush policy.

Pedi Broviac: *Outpatient:* Call Out Patient Pedi Nursing (follow same process as above)

Intraosseous (EZ IO) Devices: Can be used with the Power Injection

See contrast manual - <http://medicine.yale.edu/diagnosticradiology/patientcare/policies/>

Approved by:

Dr. Gary Israel Chief of CT Radiology

Dr. Jay Pahade Director of Radiology Safety and Quality

Patsy Twohill RT (R) (MR) CT Manager

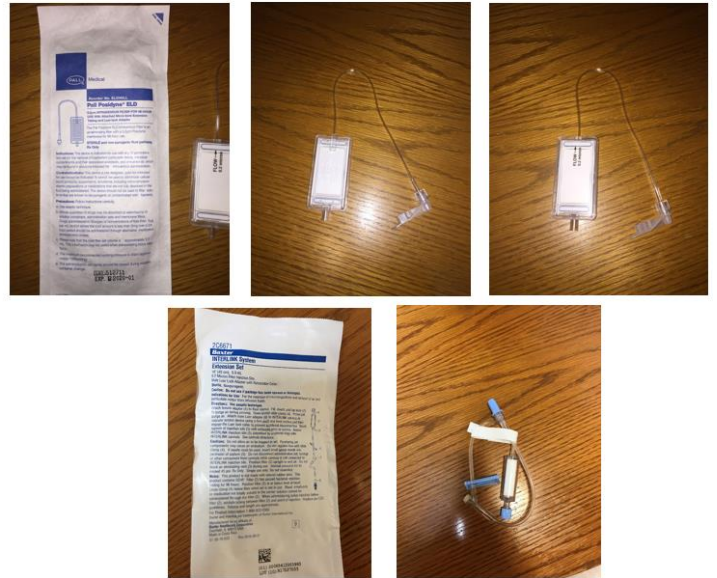
!ALERT!

Attention all technologists who inject contrast. If you see a Pall Posidyne ELD filter or a Baxter INTERLINE System Extension Set (air eliminating filters) hooked up to a patient, please stop the line and let a nurse know before proceeding. These particular filters are used for patients with patent foramen ovale, as any air introduced into their body could result in a very serious reaction. They should NEVER be used with a power injector.

If you have any questions, please contact Dave Facchini:

david.facchini@ynhh.org

203-688-4367



CT Intraosseous Iodinated Contrast Injection Policy

IO lines may be used for power injection of iodinated contrast for CT

1. Flush IO line with 20cc IO saline. If IO line does not flush easily, do not use.
2. If Patient is unconscious, no analgesia is required. If patient is conscious and responsive to pain, IO 2% epinephrine free lidocaine should be administered just prior to contrast as per the protocol below:

ADULT:

- Prime EZ-Connect extension set with lidocaine *Note that the priming volume of the EZ-Connect is approximately 1.0ml.*
- Slowly infuse lidocaine 40 mg IO over 2 minutes.
- Allow lidocaine to dwell in IO space for 1 minute.
- Flush with 5 to 10 mLs of normal saline.
- Slowly administer and additional 20 mg of lidocaine IO over 1 minute.

Pediatric:

- Usual dose is 0.5mg/kg, not to exceed 40mg.
- Prime EZ-Connect extension set with lidocaine.
- *Note that the priming volume of the EZ-Connect is approximately 1.0ml.*
- Slowly infuse lidocaine over 2 minutes.
- Allow lidocaine to dwell in IO space for 1 minute.
- Flush with 2-5 mLs of normal saline.
- Slowly administer subsequent lidocaine (half the initial dose) IO over 1 minute.

3. Hook power injector tubing directly to IO line hub.
4. Inject contrast through IO line. No guidelines exist on rates for injection so use lowest injection rate possible (up to 5cc/sec) for the study and do not exceed 300 psi.
5. Disconnect power injector tubing from the IO line hub and flush the IO line with 20 cc IO saline.

Patients with a Single Kidney

It has been shown that there are no significant differences in the rate of AKI attributable to contrast enhanced CT in patients with a solitary kidney versus two kidneys. Therefore, patients with a solitary kidney should receive the same amount of IV contrast as those with two kidneys. This can be edited at the discretion of the supervising radiologist in patients with compromised renal function.

McDonald JS et al. Radiology 278;74-81:2016

Please follow the below link for a list of CT screening forms used by the department:

<http://translation.ynhh.org/documentmanagement/Home/tabid/36/DMXModule/366/Command/Core.ViewCategory/CategoryId/151/Default.aspx>

POLICIES SPECIFIC TO **MRI CONTRAST MEDIA**

All MRI policies have been moved, and are now centrally located within the YNHH MRI safety manual. Please click the below link to be routed to the manual:

<https://ynhh.e1lucid.com/documents/view/20133>