**UPH-Meriter Iodinated Contrast Conservation Strategies: Prioritization and Allocation Guidance (2022)**

Goal: To provide strategies to reduce not only the actual doses of contrast used for contrast-enhanced CT examinations, but also general guidelines on when to use non-contrast CT exams as a substitute for traditionally contrast enhanced CT exams at Meriter Hospital (please see separate document, ‘Mitigation/Alternative to CT’ strategies, regarding alternative imaging modalities to consider in lieu of contrast-enhanced CT).

Prioritization Strategies for CT Contrast Conservation will be organized as follows:

Tier 1 (Green): IV Contrast inventory is ***concerning, but adequate*** to continue with routine practice. Contrast Inventory is >/= 4 weeks on-hand

Tier 2a/2b (Yellow): IV Contrast Inventory is***insufficient*** to continue with routine practice. Tier 2a: Contrast Inventory is at 3-4 weeks on hand, Tier 2b: Contrast inventory is at 2-3 weeks on hand.

Tier 3a/3b (Red): IV Contrast Inventory is ***near-depleted or insufficient*** to meet the needs of patients with non-elective indications and/or needs of all patients. Tier 3a: Contrast Inventory is at 10-14 days on hand; Tier 3b: Contrast Inventory is at 7-9 days on hand.

Tier 4 (Purple): IV Contrast Inventory is at a ***critical/critically depleted*** level and unable to meet the needs of patients with emergent indications. Contrast Inventory is at < 7 days on hand.

Tier 1: Green: **IV Contrast inventory is concerning, but adequate to continue with routine practice.**

1. Reduce waste
	1. For single use vials, try to round down if within 10-25 mls (for example, if 112 ml is needed based on weight-based dosing, round down and only open a 100 ml vial).  For our smallest (BMI) group of patients, adjust the dose down to 60 ml (floor).
	2. Diligently coach patients on breathing instructions before each PE exam to minimize repeat boluses.  Re-bolus only after discussing with radiologist.
	3. Explore with pharmacy the potential of repackaging large single use containers into either a multiuse container or into smaller single use containers.
2. Minimize Omni/Isovue use for non-IV administration (especially oral contrast).
	1. If oral contrast is indicated and there is not high concern for perforated bowel, use barium.
	2. If there is high concern for leak/perforated bowel, discuss with radiologist.
		1. Can consider performing the exam WITHOUT oral contrast.
		2. For patients requiring oral contrast, reasonable alternatives to Omniscan including Gastrograffin or Breeza.
	3. Use CystoConray for cystograms as would be done in GI.
3. For contrast-enhanced neurological exams, can consider rounding down to use a single dose 100 ml vial if the total typical dose is < 125 ml (CT Neck, CT Maxiface, CT orbit).
4. For bulk injectors, reduce the amount of contrast administered for all non-perfusion, non-coronary CTA exams by 20%.  Adjust rate of injection rather than timing.

Tier 2: Yellow: **IV Contrast Inventory is insufficient to continue with ROUTINE practice.**

Tier 2(a). Consider employing both all prior tier strategies and performing common routine CT examinations WITHOUT the use of contrast or triaging exams to alternative modalities.

Tier 2(a): Contrast Inventory is at 3-4 weeks on hand.

1. Consider Performing Routine CT examinations WITHOUT IV or ORAL Contrast depending on indication for examination. Some examples of where contrast would/would not be indicated include:
	1. Neck CT:
		1. Routine Neck CT for palpable lump: NO contrast.
		2. Routine Neck CT for infection: IV Contrast Indicated.
	2. Chest CT:
		1. Routine Chest CT (pulmonary nodules, cancer-follow-ups): No IV contrast.
		2. Follow up CT for Routine Thoracic Aortic Aneurysm Surveillance (patient has prior contrast enhanced CTA). Also, consider gating the non-contrast exam.
		3. Chest CTA for Pulmonary Embolism:
			1. During the business hours/when MRI technologist is in-house, CT technologist can directly contact the ordering provider to see if the patient is a candidate for pulmonary MRA (if provider has questions, they can contact Radiologist or refer to “Mitigation Strategies” document).
			2. Meriter MRI techs are in-house until 10 pm (M-F) and 230 pm (Sat/Sun)
			3. During after-hours, chest CTA is OK to be done in the emergent/in-patient setting (attempt to avoid calling in MRI technologist, if possible).
		4. Trauma Chest CT typically can be done non-contrast unless there is HIGH suspicion for traumatic injury, such as scenarios where the mechanism of injury involves high-energy trauma or there is high suspicion for vascular injury.
	3. Abdominal/Pelvic CT: Consider performing common CT Abdominal/Pelvis exams WITHOUT IV OR ORAL contrast (adults only).
		1. Common CTAP indications to consider NOT using contrast:
			1. Nonspecific/General Abdominal Pain
			2. Concern for Hernia (perform with Valsalva Maneuver)
			3. Diverticulitis, Appendicitis (non-pediatric)
			4. Abdominal Distension/Diarrhea
			5. Suspected Abdominal Obstruction (BMI > 25).
			6. Adrenal Nodule Follow-up Scans.
			7. CT for Routine Abdominal Aortic Aneurysm Surveillance (patient has prior contrast enhanced CTA). Consider gating the non-contrast examination.
		2. CT Urograms: Consider substituting non-contrast CT ONLY for microhematuria to assess for stones (please check with Urologist prior to changing order).
		3. *The radiologist will reserve the option to call-back the patient for repeat CT imaging with contrast as needed/indicated.*
	4. Oncologic Exams (single phase and multi-phase cancer follow-up scans):
		1. CT Contrast STILL required for the following oncologic indications:
			1. GI Malignancies (Esophago-gastric, liver, pancreas, colorectal, GIST, Neuroendocrine), melanoma, breast cancer, GU malignancies (renal cell carcinoma, bladder cancer, ovarian cancer, endometrial cancer, and cervical cancer)
			2. Pancreatic Protocol CT: Pancreatic Cancer and Pancreatic neuroendocrine tumor.
		2. CT Contrast is NOT required for the following oncologic exams:
			1. Testicular Cancer, Lymphoma, myeloma, leukemia, prostate cancer.
	5. Inpatients/ICU/ER/Trauma/Complex Medical History Patients: Contrast administration is at the discretion of the radiologist or at specific request from the referring provider/specialist (please contact Radiologist for direction).
		1. Examinations that will typically need IV and/or Oral Contrast:
			1. Patients with prior history of abdominal surgery or concern for recent procedural complication or concern for intra-abdominal abscess.
		2. Patients with HIGH clinical suspicion for solid organ injury after trauma (mechanism of injury is high energy, etc).
	6. Stroke CT:
		1. High Suspicion of Stroke: Perform CTA H/N with CT Perfusion
		2. Moderate Suspicion for Stroke: Perform CTA H/N WITHOUT Perfusion (can obtain CT perfusion and/or MRI later if needed)
		3. Less Suspicion for Stroke (or other neurological etiologies such as dizziness, etc):

Consider Non-Contrast Head CT or non-contrast MRI.

1. Consider MITIGATION Strategies (employing alternative imaging modalities instead of contrast-enhanced CTA) at the discretion/availability based at each site.
	1. Please see separate document for Radiologists/Providers regarding ‘Mitigation Strategies.’
	2. If the CT technologist thinks an ordered exam is better suited for an alternative modality (MRI, etc), the technologist can refer to the ‘Mitigation Strategies’ document for guidance and then directly discuss with the provider regarding the possibility of an alternative imaging modality (if the patient is a suitable candidate for the alternative modality, such as MRI).
		1. If the providers have questions, they can refer to the ‘Mitigation Strategies’ document or discuss directly with the Radiologist.
2. Fluoroscopic Use of Contrast for Joint Injections: Consider using air and/or Multihance instead of contrast for fluoroscopically guided therapeutic injections (for air, please inject 5-10 mL).
	1. Please follow routine protocol for MR-arthrograms (using Omni/Cystoconray when available).
		1. Can consider using NO contrast and performing by ‘feel’ of injection also
	2. Tech to discuss with radiologist prior to performing the procedure.

Tier 2(b): Yellow: IV Contrast Inventory is at *increasingly insufficient* to meet the needs of routine practice.

Tier 2(b): Contrast Inventory is at 2-3 weeks supply on-hand. Perform all above tier strategies, and consider delaying the following types of cases (may need discussion with provider’s office by tech staff for some cases):

1. Routine Subacute Cases (potentially delayed 1-3 weeks without significantly affecting patient care)
	1. Chronic Infection requiring regular follow-up.
	2. Cancer patients in clinical trials or needing study to determine next step in management.
2. Routine Delayed Subacute Cases (potentially delayed 4-6 week without significantly affecting patient care).
	1. Cancer follow-up in patients responding to treatment on previous exam without new or concerning symptoms.
	2. Unexplained microscopic hematuria.
3. Chronic Cases (Delaying 2-3 months is unlikely to result in significant patient harm)
	1. Annual cancer or lesion follow-up in patients with remission or uneventful clinical status.
	2. Annual follow-up of syndromic condition with no new symptoms or clinical concerns.
	3. Adrenal work-up in asymptomatic patient without history of cancer.
	4. Characterization or follow-up of a renal mass < 2 cm in size (can also consider MRI).
		* Language adapted from the “Prioritization Tiers for Contrast CT examination” plan from Vanderbilt University.

Tier 3: Red: IV Contrast Inventory is ***near-depleted or insufficient*** to meet the needs of patients with non-elective indications and/or needs of all patients.

Tier 3 (a): Perform all prior tier strategies, but also consider **DELAYING** the following types of cases to a later date (will need discussion with provider’s office by tech staff). Contrast Inventory is at 10-14 days supply on hand.

1. Urgent Cases (delaying 1-6 days may not affect patient care).
	1. Should also consider noncontrast exams, alternative modalities (please see separate document regarding “Mitigation/Alternative to CT”)
	2. New Cancer Work-Up in stable patients (such as aggressive cancer types, including large renal cell, pancreatic, invasive melanoma).
	3. Transplant Work-Up
	4. Suspected Infection in a Stable Patient.
	5. Suspected Post-Procedural Complication in a Stable Patient
	6. Pre-Operative Work-up for a patient scheduled for surgery in > 24 hours.

Tier 3 (b): Consider delaying the following types of cases to a later date. ***All CT exams using contrast must be reviewed and approved by a Radiologist.***

1. Emergent Cases (delaying will likely result in significant patient harm)
	1. Consider implementing use of non-contrast CT, alternative modalities.
	2. Stroke
	3. Level 1 Trauma
	4. Acute MI
	5. Aortic Dissection/Aortic Rupture
	6. Patients with HIGH suspicion of active bleeding/hemodynamic instability.
	7. Septic Shock.

Tier 4 (Purple): IV Contrast Inventory is at ***critical/critically depleted*** levels and cannot meet the needs of patients with emergent indications. Perform all prior tier strategies but will need to discuss DELAYING/DEFERRING the following types of cases. ***All contrast use is to be determined and approved by designated Triage officer.***

Contrast Inventory < 1 week supply on-hand.

1. **Contrast is reserved for procedures where there are potential life/limb-saving benefits.**

2. Consider deferring all imaging examinations to only examinations where there is clear diagnostic AND therapeutic benefit.

 a. Will need to discuss with attending provider whether other imaging modalities can be considered for diagnostic value.

 b. Contrast is to be reserved to procedures where there is potential life/limb-saving benefit/intervention that can be achieved.

*Questions/Concerns? Please contact the on-call Radiologist in acute cases. For general questions, can contact Drs. Bour, Meduri, Khalil, Chase, or Kim by pager.*

*Last Edited: VM, 5/20/22.*