In accordance with the ALARA principle, TRA policies and protocols promote the utilization of radiation dose reduction techniques for all CT examinations. For scanner/protocol combinations that allow for the use of automated exposure control and/or iterative reconstruction algorithms while maintaining diagnostic image quality, those techniques can be employed when appropriate. For examinations that require manual or fixed mA/kV settings as a result of individual patient or scanner/protocol specific factors, technologists are empowered and encouraged to adjust mA, kV or other scan parameters based on patient size (including such variables as height, weight, body mass index and/or lateral width) with the goals of reducing radiation dose and maintaining diagnostic image quality.

If any patient at a TRA-MINW outpatient facility requires CT re-imaging, obtain radiologist advice prior to proceeding with the exam.

The following document is an updated CT protocol for all of the sites at which TRA-MINW is responsible for the administration, quality, and interpretation of CT examinations.

Include for ALL exams

- **Scout**: Send all scouts for all cases
- **Reformats**: Made from thinnest source acquisition
  - **Scroll Display**
    - Axial recons - Cranial to caudal
    - Coronal recons - Anterior to posterior
    - Sagittal recons - Right to left
  - Chest reformat should be in separate series from Abdomen/Pelvis reformat, where applicable
- **kVp**
  - 100 @ <=140lbs
  - 120 @ >140lbs
- **mAs**
  - Prefer: Quality reference mAs for specific exam, scanner and patient size
  - Auto mAs, as necessary
CT Enterography
CT Abdomen + Pelvis W (1 or 2 phase)

Indications:
- **Single phase (arterial enteric):** Known or suspected inflammatory bowel disease (Crohn’s or ulcerative colitis, not in the perioperative period), suspected small bowel disease (e.g., celiac disease), chronic diarrhea and/or abdominal pain
- **2-phase (arterial enteric, late venous):** Anemia of unknown etiology (after negative colonoscopy and upper endoscopy) or evaluate for small bowel mass

**Patient Position:** Supine, feet down with arms above head

**Scan Range (CC z-axis):** 1 cm above diaphragm through lesser trochanter

**Prep:** No solids (liquids OK) for 3 hours prior to examination
- Note: Okay to continue examination if prep is incomplete or not done

**Oral Contrast:** 48 oz Breeza (3 bottles) + water
- Breeza: 1 bottle at 60 minutes prior, 1 bottle at 40 minutes prior, 1 bottle at 20 minutes prior (image at 60 minutes)
- THEN: 500 mL water on scanner table

**IV Contrast Dose, Flush, Rate, and Delay:**
- Dose: 100 mL Isovue 370 (modify volume if using something other than Isovue 370)
- Flush: 40 mL saline
- Rate: 4 mL/sec (20-gauge or larger IV)
- Delay: Arterial (bolus tracking or 45 s) +/- late venous 90s (only for anemia, small bowel mass)

**Acquisitions:** 1 or 2 (post-contrast, as below)
- If indication for single phase (i.e., IBD): 1 (post-contrast)
  - **Arterial (Enteric) Phase** - BOLUS TRACKING on descending aorta just above diaphragmatic hiatus, start scan 20 seconds after ROI exceeds 150 HU.
    - ONLY IF scanner is NOT able to perform bolus tracking, use 45 second delay
- If indication for 2-phase (i.e., anemia, SB mass): 2 (both post-contrast)
  - **Arterial (Enteric) Phase** - BOLUS TRACKING on descending aorta just above diaphragmatic hiatus, start scan 20 seconds after ROI exceeds 150 HU.
    - ONLY IF scanner is NOT able to perform bolus tracking, use 45 second delay
  - **Late Venous Phase:** 90 second delay
Series + Reformats (varies by indication):

1. **Arterial (Enteric) Phase**
   a. Axial 2-2.5 mm ST kernel
   b. Coronal 2 mm ST kernel
   c. Sagittal 2 mm ST kernel

2. **Late Venous Phase** (if indication for 2-phase, as above)
   a. Axial 2-2.5 mm ST kernel
   b. Coronal 2 mm ST kernel
   c. Sagittal 2 mm ST kernel

***Machine specific protocols are included below for reference

Machine specific recons (axial ranges given above for machine variability):

*Soft tissue (ST) Kernel, machine-specific thickness (axial):*

- GE = 2.5 mm
- Siemens = 2 mm
- Toshiba = 2 mm

Source(s): [https://www.acr.org/~media/99D260410DF44A3BA01F1AB716DE8F2F.pdf](https://www.acr.org/~media/99D260410DF44A3BA01F1AB716DE8F2F.pdf)
General Comments

NOTE: Use of IV contrast is preferred for most indications aside from: pulmonary nodule follow-up, HRCT, lung cancer screening, and in patients with a contraindication to iodinated contrast (see below).

Contrast Relative Contraindications
- Severe contrast allergy: anaphylaxis, laryngospasm, severe bronchospasm
  - If there is history of severe contrast allergy to IV contrast, avoid administration of oral contrast
- Acute kidney injury (AKI): Creatinine increase of greater than 30% over baseline
  - Reference hospital protocol (creatinine cut-off may vary)
- Chronic kidney disease (CKD) stage 4 or 5 (eGFR < 30 mL/min per 1.73 m²) NOT on dialysis
  - Reference hospital protocol

Contrast Allergy Protocol
- Per hospital protocol
- Discuss with radiologist as necessary

Hydration Protocol
- For eGFR 30-45 mL/min per 1.73 m²: Follow approved hydration protocol

IV Contrast (where indicated)
- Isovue 370 is the default intravenous contrast agent
  - See specific protocols for contrast volume and injection rate
- If Isovue 370 is unavailable:
  - Osmolality 350-370 (i.e., Omnipaque 250): Use same volume as Isovue 370
  - Osmolality 380-320 (i.e., Isovue 300, Visipaque): Use indicated volume + 25 mL (not to exceed 125 mL total contrast)

Oral Contrast
- Dilutions to be performed per site/hospital policy (unless otherwise listed)
- Volumes to be given per site/hospital policy (unless otherwise listed)
- TRA-MINW document is available for reference if necessary (see website)

Brief Summary
- Chest only
  - Chest W, Chest WO
  - CTPE
  - HRCT
  - Low Dose Screening/Nodule
    - None
• **Pelvis only**
  ✓ Pelvis W, Pelvis WO
    ▪ Water, full instructions as indicated

• **Routine, excluding chest only and pelvis only**
  ✓ Abd W, Abd WO
  ✓ Abd/Pel W, Abd/Pel WO
  ✓ Chest/Abd W, Chest/Abd WO
  ✓ Chest/Abd/Pel W, Chest/Abd/Pel WO
  ✓ Neck/Chest/Abd/Pel W, Neck/Chest Abd Pel WO
  ✓ CTPE + Abd/Pel W
    ▪ TRA-MINW offices: Dilute Isovue-370
    ▪ Hospital sites:
      ▪ ED: Water, if possible
      ▪ Inpatient: prefer Dilute Isovue 370
        • Gastrografin OK if Isovue unavailable
        • Avoid Barium (Readi-Cat)
      ▪ FHS/MHS Outpatient: Gastrografin and/or Barium (Readi-Cat)

• **Multiphase abdomen/pelvis**
  ✓ Liver, pancreas
    ▪ Water, full instructions as indicated

  ✓ Renal, adrenal
    ▪ None

• **CTA abdomen/pelvis**
  ✓ Mesenteric ischemia, acute GI bleed, endograft
    ▪ Water, full instructions as indicated

• **Enterography**
  ▪ Breeza, full instructions as indicated

• **Esophogram**
  ▪ Dilute Isovue 370, full instructions as indicated

• **Cystogram, Urogram**
  ▪ None

• **Venogram**
  ▪ Water, full instructions as indicated