TRA MEDICAL IMAGING

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CT Chest HRCT
CT Chest WO

Reviewed By: Jacob McPhee, MD
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Contact: (866) 761-4200, Option 1

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 reformats should be in separate series from Abdomen/Pelvis reformats, where applicable
- **kVp**
  - 100 @ <=140lbs
  - 120 @ >140lbs
- **mAs**
  - Prefer: Quality reference mAs for specific exam, scanner and patient size
  - Auto mAs, as necessary

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Indication: Interstitial lung disease, chronic progressive dyspnea/shortness of breath, bronchiectasis, abnormal PFTs, history of connective tissue/rheumatologic disorder, etc.

> **Note: If routine chest CT has been performed within 1 week, please contact body/chest radiologist to discuss if supine inspiration series should be acquired**

See below for detailed breathing instructions. Following breathing instructions exactly is critical for this examination.

Patient Position:

- Supine: Inspiration and expiration, feet down with arms above head
- Prone: Inspiration, feet down with arms above head

Scan Range (CC z-axis): Lung apices through L1

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: None

IV Contrast: Not applicable

Acquisitions: 3 (multiple non-contrast positions/breath-holds – *see instructions below*)

- **Non-contrast chest supine inspiration** → Helical acquisition with pitch as follows:
  - GE → pitch of 1.375
  - Siemens 64 Sensation → pitch of 0.8
  - Siemens 16 Sensation → pitch of 1.0
  - Siemens 16 Emotion → pitch of 0.8
  - Toshiba 64 Aquilion → pitch of 1.484
- **Non-contrast chest supine expiration**
- **Non-contrast chest prone inspiration**

Breathing instructions MUST be followed to ensure diagnostic quality HRCT images

- This is especially CRITICAL for adequate end-expiratory images.
- Use the below instructions verbatim.
  - **Inspiration:**
    1. Take a deep breath in, breath out (2 second delay)
    2. Take a deep breath in, hold it
    3. Scan immediately at end-inspiration
  - **Expiration:**
    1. Take a deep breath in, blow it out (2 second delay)
    2. Take a deep breath in, now blow all your air out (1 second), keep exhaling (1 second), blow all the air out, now stop breathing
    3. Scan immediately at end-exhalation

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Series + Reformats:

1. **Non-contrast chest supine inspiration**
    a. Axial 2-2.5 mm ST kernel
    b. Axial 1-1.5 mm lung kernel
    c. Axial 10 x 2 mm MIP ST kernel
    d. Coronal 2 mm ST kernel
    e. Sagittal 2 mm ST kernel
    f. Axial 1.25 x 1 mm ST kernel (SuperD where doable)
2. **Non-contrast chest supine expiration**
    a. Axial 1-1.25 mm thickness with 20 mm intervals in lung kernel
3. **Non-contrast chest prone inspiration**
    a. Axial 1-1.25 mm thickness with 20 mm intervals in lung kernel

****SuperD series should be sent on all scanners capable of creating this series****

*****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

***Lung Kernel, machine-specific thickness (axial)**

- GE = 1.25 mm
- Siemens = 1.2 mm or 1.5 mm on older generation
- Toshiba = 1 mm

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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 m^2) **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 m^2: 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

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✓ 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