# PET-CT

## Special Instructions
For PET-CTs on cancer patients, ask the patient whether they have recently undergone chemotherapy or radiation therapy, and if so, date of last therapy, planned timing for next therapy, and any upcoming physician appointments. If patient has had any kind of chemotherapy in the last 10 days or any radiation in the last 2 months, consult with the radiologist about whether the PET-CT should be rescheduled.

Check BUN and creatinine on Powerchart prior to administering intravenous contrast. If one or both are abnormal, contact the radiologist.

To be done at UNMH only.

## Radiopharmaceutical:
F-18 fluorodeoxyglucose (FDG)

## Dose (Adult/Pediatric):
Refer to Nuclear Medicine Dose Chart

## Route of Administration:
Intravenous. Instruct the patient to remain in a quiet state, resting comfortably, during the uptake phase (between administration of the radiopharmaceutical and imaging).

## Patient Preparation:
NPO (except for water and medications) for at least 4 hours prior to FDG administration. Patients should consult with their physician about whether or not to take diabetic medications prior to the examination.

Low-carbohydrate, high-protein diet on the day prior to the PET-CT, if possible (OK to omit).

All metal must be removed from the patient prior to scanning, including (but not limited to) glasses, bras, dentures, earrings, rings, and watches if arms are left down. For whole-body scans, pants with metal zippers may be pulled down to below the imaged region (typically knee level if scanning to thighs), or the patient may wear a gown.

If the scan is with intravenous contrast, the patient must fill out a contrast form, which must be reviewed by the technologist prior to the examination.

For all brain PET-CTs, the patient should be in a quiet/darkened room during the uptake phase. The patient should stay awake with eyes open and rest comfortably, with as little muscular activity as possible.

For brain PET-CTs to evaluate seizures, the patient should be free of seizures for a minimum of 4 hours. Consult with the radiologist if the last seizure occurred less than 4 hours ago.

## Equipment Setup:
Time per bed position (minutes):
PET-CT (continued)

<table>
<thead>
<tr>
<th>PET-CT protocol:</th>
<th>OSIS PET-CT</th>
<th>UNMH PET-CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain only</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Head/neck</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Whole body or eyes to thighs</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Limited (pelvis, legs, etc)</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

**Regions to be imaged:**

- #1 = eyes to thighs, arms up; with oral and intravenous contrast
- #3 = two acquisitions:
  - head/neck, skull base through upper mediastinum; arms down; with IV contrast only (no oral or water), AND
  - clavicles to thighs, arms up; with IV contrast only (no oral or water);

Note: divide IV contrast dose between two portions =

- #3 with dedicated neck CT: perform #3 and reconstruct neck CT separately per CT protocol; send to separate accession number

**Brain** = brain only; arms down; no oral contrast; no intravenous contrast unless specified by the radiologist

**Limited** = region to image and intravenous/oral contrast as specified by radiologist

**Treatment planning** = perform noncontrast CT in region of radiotherapy cradle; follow with PET-CT protocol as above, making sure that the radiotherapy planning CT and PET-CT are performed over the same region and with the patient in the same position.

Additional modifications may be made by the radiologist, e.g., to include extremities.

For patients with diagnoses such as melanoma, sarcoma, and multiple myeloma, consult with the radiologist about any additional regions that may need to be imaged (e.g., the entire skull or the extremities). Preference is to include the extremities as part of the whole-body acquisition when possible, rather than as separate acquisitions. Consult with radiologist if there are any questions about whether additional regions need to be included, e.g., if the patient has obvious involvement of an area not included or mentions a particular concern they or their physician had.

**Oral contrast (if requested by the radiologist):**

Outpatients and inpatients:

- #1: routine protocol is water oral contrast during the uptake phase (and for 1 hour prior when possible)
- #3 (head/neck cancer patients): No oral contrast (no water, no Redicat, no Gastrografin)

If positive oral contrast is requested by the radiologist:

Outpatient: 1 bottle of Redicat to consume after injection of FDG.
Inpatient: 7 mL Gastrografin in 8 oz water immediately and 30 minutes after injection.
PET-CT (continued)

**Intravenous contrast (if requested by the radiologist):**
100 mL, power injected, typically 3 mL/sec (slower if needed) unless otherwise specified (see above); follow pediatric CT protocols for intravenous contrast in children (< 18 years old).

For head/neck studies, 150 mL contrast is divided between the two portions of the examinations (75 mL for each). Follow pediatric CT protocols for intravenous contrast in children (< 18 years old).

Timing of CT scan delay with respect to IV contrast:
- Neck CT: 90-second delay
- Whole body CT: 75-second delay
- Extremities (if imaged by themselves for, e.g., infection): 90-second delay

Please see separate CT imaging protocols for details of CT protocol settings, including for dedicated neck CT imaging performed at the time of the PET-CT.

**Patient Positioning:**
Supine. Head first (unless limited examination of the legs/feet, then feet first)

If the extremities are imaged by themselves (either as a limited study or as part of a whole-body examination), a BB must be placed on the right leg or right arm in the imaged field of view.

**Procedure:**
Imaging time post FDG-injection: One hour for all protocols EXCEPT minimum 45 minutes for brain PET-CTs

1) Measure the patient’s blood glucose level by glucometer. If it is 200 mg/dL or below, proceed. If it is above 200 mg/dL, consult with the radiologist. Typically, oncology patients with blood glucose greater than 200 will either need to wait until their glucose is lower or be rescheduled. Infection PET patients can typically be imaged even with blood glucose over 200 mg/dL and NPO less than 4 hours, with approval of the radiologist.

2) Inject FDG, and flush with normal saline (10 mL for butterfly needles; 20 mL for angiocatheters, 40 mL or greater for indwelling catheters).

3) If applicable, have patient drink oral (usually water) contrast during the uptake phase as above.

4) Perform CT examination of region of interest, followed by PET.

**Acquisition:**
1. On chronicle, enter PET dose, time administered, and time per bed position
2. Load topogram
3. Set parameters for scan
4. Load → move → start
5. When CT is complete (approximately 25 secs), you will be prompted to move patient for PET scan (table moves all the way to the back of the gantry)
6. Options → PET monitor to view scan length if desired (applies to UNMH
PET only; displays how long the entire PET scan will take).

7. When acquisition is complete, load fusion on Wizard before sending to PACS and Leonards

After the examination, the patient should be encouraged to drink lots of fluids and void frequently to minimize bladder/pelvic organ radiation exposure (Image Wisely campaign, “Considerations Regarding Radiation Exposure in PET-CT”).

**Processing:**

Follow automatic processing workflow

Process CT in B 5 31 algorithm

Process PET into attenuation corrected and non attenuation corrected PET files

Generate PET-CT fused axial data set

Use “Microdelta Hot Metal” color scheme

For whole-body images, the liver should be PINK (not bright orange, not dim purple)

**Items Required For Complete Study:**

- Enter protocol, protocling physician, FDG dose, blood glucose, and injection site in comments section on PACS
- Processing and transfer of all images to PACS and/or Leonardo as appropriate
  - Topogram (to PACS)
  - Fused axial images (to PACS)
  - CT, PET Corrected, and PET Uncorrected to PACS and Leonardo.
- Complete the examination in RIS