

AmeriHealth Caritas Louisiana

National Imaging Associates, Inc.*	
Clinical guidelines PET SCANS: <u>includes</u> <ul style="list-style-type: none"> • <u>PET</u> • <u>PET with CT Attenuation</u> • <u>PET/CT</u> 	Original Date: September 1997
	Last Revised Date: June May 2022
Guideline Number: NIA_CG_070-1	Implementation Date: January 2023

GENERAL NOTES:

ADULT AND PEDIATRIC MALIGNANCIES¹: ONCOLOGICAL PET IS INDICATED FOR BIOPSY-PROVEN CANCER OR STRONGLY SUSPECTED CANCER BASED ON OTHER DIAGNOSTIC TESTING. The appropriateness of an ordered PET/CT study is dependent on which radiopharmaceutical will be used for the PET/CT.

FDG-PET/CT (fluorodeoxyglucose-positron emission tomography)

LUNG NODULE seen on LDCT or CT+ contrast (without known malignancy)

- Solid Component of Dominant Nodule (either solitary or clearly dominant) ≥ 8 mm and < 3 cm or Part solid/mixed nodules with the solid component 8 mm or larger
- Mixed nodule (i.e., ground glass and solid nodule) with solid component of the nodule ≥ 4 mm on LDCT when there has been
 - Interval growth of the solid component of at least 1.5mm on subsequent LDCT scans

OR

 - Interval development of a new mixed nodule on subsequent LDCT with the solid nodule component ≥ 4 mm

NOTE: > 3 cm is considered a MASS; therefore, a tissue type is usually needed prior to PET (to determine if SCLC vs or NSCLC). ~~determining if a PET is approvable (ie need to know whether the lung cancer is small cell or non-small cell)~~. However, if the chest CT imaging findings meet

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

criteria for limited stage SCLC ~~and no prior imaging shows metastatic disease elsewhere, PET can be approved prior to biopsy to determine if meets approval see GL~~ in order to guide biopsy of any FDG-avid adenopathy at the same time the primary is biopsied. If disease clearly is in both sides of the chest and/or outside the chest, then PET is not needed/approvable prior to tissue diagnosis.

USEFUL DEFINITIONS (to aid in using the following table(s))

- **INITIAL STAGING** refers to imaging that is performed AFTER the diagnosis of cancer is made, and generally before any treatment.
 - **RESTAGING** includes scans that are either needed **during active treatment*** (**subsequent treatment strategy****) to determine response to treatment, within 6 months after the **end of treatment**, or when there is clinical **concern for recurrence** (i.e., new imaging, new signs, rising labs/tumor markers or symptoms relative to type of cancer and entire clinical picture) (recurrence is not required to be biopsy proven)
 - ***ACTIVE TREATMENT** includes traditional chemotherapy, immunotherapy, radiation, as well as patients on “maintenance therapy” who have known, or existing, metastatic disease being held in check by this treatment. Allogenic bone marrow transplant and CART T-cell therapy should be considered ‘active’ treatment for at least 6 months after infusion/transplant and as such can be approved at 30 days, 100 days, and 6 months after the most recent infusion.
 - ****SUBSEQUENT TREATMENT STRATEGY**
 - For restaging or monitoring response during active treatment (including immunotherapy), and/or a single evaluation after completion/cessation of therapy. The interval should **ideally**[‡] be 6-12 weeks after surgery, and 12 weeks after radiation (to avoid false positive findings that can be caused by treatment changes or healing).
 - PET/CT can be performed 1 - 3 weeks after neoadjuvant chemotherapy or neoadjuvant chemoradiation if done for presurgical planning to evaluate for distant metastatic disease or to evaluate known metastatic disease located in areas separate from the site(s) being radiated.
- [‡]NOTE: a valid clinical reason explaining why the interval needs to be shorter than ideal must be present
- **INCONCLUSIVE IMAGING** see **Background** section at end of guidelines
 - **SURVEILLANCE PET** is generally **not approvable**. Surveillance means no active treatment, no current suspicion of recurrence and occurs 6 months or more after

completion of treatment. **Possible exceptions† where PET “may be considered” for surveillance:**

- Ewing’s
- Osteosarcoma
- Breast (Stage 4)
- Cervical (stage 2-4)
- Diffuse Large B Cell Lymphoma when disease was only seen previously on PET
- Histiocytic neoplasms every 3-6 months for the first 2 years post completion of treatment
- Melanoma (stage 2b-4)
- ⊖ Myeloma/plasmacytoma (ideally use same type imaging as was used in initial dx, up to 5 yrs after the diagnosis of plasmacytoma)
-
- ⊖ Seminoma (Stage 2b, 2c and 3)
-
-

†NOTE: These cases would need to include a clinical reason why PET is needed (i.e., being considered), rather than conventional imaging (CT, MRI, bone scan). Generally, this would be accepted only when ordered by the treating oncologist or clearly at their recommendation (not as routine follow-up ordered by PCP).

FDG PET

ONCOLOGICAL INDICATIONS FOR FDG PET

(SEE SPECIAL TRACERS SECTIONS FOR INDICATIONS OTHER TRACERS)

CANCER TYPE	INITIAL STAGING	RESTAGING
ADRENAL (other than pheochromocytoma/ paraganglioma)	Not Indicated	Not Indicated
AIDS-related KAPOSI SARCOMA	with prior inconclusive imaging	Not Indicated
ACUTE LYMPHOBLASTIC LEUKEMIA (ALL)	lymphomatous extramedullary disease	lymphomatous extramedullary disease
ACUTE MYELOGENOUS LEUKEMIA (AML)	If suspected extramedullary involvement	If suspected/known extramedullary involvement
ANAL <u>(Note that normal size pelvic adenopathy can be considered as inconclusive)</u>	with prior inconclusive imaging (can be done with PET (PET/CT or PET/MR ** if available)).	with prior inconclusive imaging
BASAL CELL (BCC of the skin)	Not Indicated	Not Indicated
BLADDER	Muscle invasive only, with prior inconclusive imaging	With inconclusive imaging and suspected metastatic disease or recurrence outside of the urinary tract
BREAST	Indicated for stage IIb and above (if only T and N are provided, this equates to T3 (tumor > 50mm); or T4 (tumor of any size with direct extension	with prior inconclusive imaging. OR if initial staging staging was done performed with PET <u>OR if recurs with IIb or higher disease (based on</u>

	to chest wall and/or skin); or N2 (>3 axillary LN, ipsilateral internal mammary node); or the combination of T2 (tumor >20mm but <50mm) plus N1 (any positive lymph node involvement)	pathology/imaging/exam) since no previous initial staging would have typically been doneperformed for lower grade breast cancer
CERVICAL	Indicated (can consider PET/MR ** if available)	Indicated
CHORDOMA	with prior inconclusive imaging	Not Indicated with prior inconclusive imaging
CHOLANGIOCARCINOMA	with prior inconclusive imaging	with prior inconclusive imaging
CHONDROSARCOMA (bone)	Not Indicated	Not Indicated
COLORECTAL	with prior inconclusive imaging OR or (PET/CT indicated if potentially surgically curable M1 disease; OR or when considered for image-guided liver- re -directed therapies)	with prior inconclusive imaging
ENDOMETRIAL	with prior inconclusive imaging	with prior inconclusive imaging
ESOPHOGEAL and EGJ (esophagogastric junction epicenter < 2cm into stomach)	Indicated	Indicated
EWING SARCOMA-Osseous	Indicated (all ages)	Patients <30 yrs old: Indicated Patients >30 yrs old: <u>Indicated for</u> known or suspected

metastatic disease -(based on
PE/imaging)-indicated

FALLOPIAN TUBE CANCER

with prior inconclusive imaging

with prior inconclusive imaging

GALLBLADDER

with prior inconclusive imaging

with prior inconclusive imaging

GASTRIC
(include EGJ tumors with
epicenter >2cm into stomach)

with prior inconclusive imaging
or if radiation is being
considered (**Not indicated for
T1N0M0 or M1**)

with prior inconclusive imaging.
PET/CT is indicated or for post
radiation imaging

**GESTATIONAL TROPHOBLASTIC
CANCER**

with prior inconclusive imaging

with prior inconclusive imaging

HEAD and NECK (including
mucosal melanoma of the head
and neck)

Indicated

- May be done in conjunction
with a dedicated face/neck
MRI (or CT)-when surgery
or radiation is planned

Indicated

- Can concurrently approve a
Neck MRI and PET 3-4
months after definitive
treatment in patients with
locoregionally advanced
disease or with altered
anatomy.
- PET should not be done
earlier than 12 weeks after
definitive treatment unless
signs or symptoms of
recurrence
- If final PET/CT is equivocal
or borderline for residual
disease, a repeat PET/CT at
≥ 6 weeks may help identify
those that can be safely
observed without additional
surgery

HEPATOCELLULAR

with prior inconclusive imaging

with prior inconclusive imaging

LEUKEMIA (refer to specific types listed in table when possible)

If there is lymph node involvement (lymphomatous features), soft tissue and/or extramedullary involvement (myeloid sarcoma) and/or if forms “chloromas” (leukemia tumor balls)

If there is lymph node involvement (lymphomatous features), soft tissue and/or extramedullary involvement (myeloid sarcoma) and/or if forms “chloromas” (leukemia tumor balls)

LUNG

- **Non-Small Cell**
- **Limited stage small cell**
Stage I-III
 - And T3/T4 if disease is encompassed in tolerable radiation plan (potentially curable)

Indicated

Indicated

Indicated

Indicated

- **Extensive small cell**
 - Stage IV and T3 or T4 disease not able to be treated with curative intent

Not indicated

Not indicated

LYMPHOCYTIC LEUKEMIA

- **Chronic (CLL) and Small (SLL)**

For suspected high-grade transformation or to guide biopsy with prior inconclusive imaging

with accelerated CLL or to guide biopsy with prior inconclusive imaging (includes negative CT with rising tumor markers or if conventional imaging documents mets, IF clearly considering resection)

LYMPHOMA (Non-Hodgkins and Hodgkins)

Indicated (can consider PET/MR^{**})

Indicated (can consider PET/MR^{**})

MELANOMA

(See Uveal melanoma below for indications)

only stage III, IV indicated

only stage III, IV indicated

MERKEL CELL

Indicated

Indicated

MESOTHELIOMA (malignant)

- ~~Pleural~~ Pleural

Indicated only prior to surgery for stage I-III A

Indicated only prior to surgery for stage I-III A

- Peritoneal

Indicated

Indicated

MULTIPLE MYELOMA

- Smoldering myeloma (asymptomatic)

Indicated

~~Not indicated (unless labs suggest progression to active myeloma)~~ Indicated annually or possibly more frequently or as clinically indicated (labs and/or symptoms to suggest progression)

- Active myeloma

Indicated

- Plasmacytoma

Indicated

Indicated

Indicated

NEUROBLASTOMA

Indicated when MIBG is negative, inconclusive, or there are discordant findings between MIBG and pathology

Indicated when ~~the~~ FDG PET was used for initial staging or if MIBG has become inconclusive or discordant**NEUROENDOCRINE TUMORS (-NET) WHEN****UNDIFFERENTIATED/DE-DIFFERENTIATED** (including pheochromocytoma, paraganglioma, extrapulmonary large/small cell)

Indicated if used after prior negative or inconclusive Ga68 Dotatate scan

Indicated when FDG was used for initial staging, or when used after prior negative/inconclusive Ga68 Dotatate scan (or MIBG scan) OR after inconclusive conventional imaging

OVARIAN

with prior inconclusive imaging

with prior inconclusive imaging

OCCULT PRIMARYwith prior inconclusive imaging ~~(can consider~~

with prior inconclusive imaging

PET/MR⁺⁺) appropriate to pathology of the biopsy that identified the occult malignancy

OSTEOSARCOMA

- Osseous

For patients >30 years old:
Indicated when the prior bone scan is inconclusive or negative (i.e., the primary bone tumor is not seen on bone scan). PET can be approved in conjunction with MR of primary site

For patients >30 yrs old:
Indicated when disease is positive on prior FDG-PET or when there is inconclusive conventional imaging. PET can be approved in conjunction with MR of primary site

For patients <30 years old:
Indicated
PET can be approved in conjunction with MR of primary site

For patients <30 years old:
Indicated
PET can be approved in conjunction with MR of primary site

PANCREATIC

With prior inconclusive imaging OR with any of the following high-risk features:

- borderline resectable disease
- markedly elevated CA19-9 >180 U/ml
- large primary tumor/lymph nodes
- very symptomatic (jaundice, symptomatic gastric outlet obstruction, venous thromboembolism, extreme pain and excessive weight loss)

~~Not Indicated~~ When PET was used for initial staging and need to assess response to treatment in order to determine if now a surgical candidate

PENILE

with prior inconclusive imaging

with prior inconclusive imaging

PERITONEAL CANCER (PRIMARY)

with prior inconclusive imaging

with prior inconclusive imaging

**POST TRANSPLANT
LYMPHOPROLIFERATIVE
DISORDER (PTLD)**

Indicated when the diagnosis is made OR if suspected based on abnormal PE, abnormal imaging or abnormal labs (i.e., significantly elevated or rising viral titers)

Indicated

PROSTATE (FDG PET only)
See other PET tracer section below for prostate cancer

Not Indicated

Not Indicated

RENAL

ONLY when conventional imaging is equivocal for metastatic disease and if present would alter initial treatment plan
~~Not Indicated~~

ONLY when conventional imaging is clearly insufficient in these circumstances:

- ~~—~~For suspected recurrence/metastatic disease outside of the urinary tract
~~—To determine bland vs tumor thrombosis/emboli~~
- ~~—~~To monitor treatment with a Tyrosine Kinase Inhibitor (such as sunitinib, sorafenib) for advanced RCC when disease was only seen previously on PET

SKIN SQUAMOUS CELL

with prior inconclusive imaging

Not Indicated

SMALL BOWEL CARCINOMA

Not indicated

with prior inconclusive imaging

**SOFT TISSUE SARCOMA
(including soft
tissue/extraosseous Ewing
sarcoma and soft
tissue/extraosseous
osteosarcoma)/ GIST/
Rhabdomyosarcoma**

For patients >30 years old: with prior inconclusive imaging

For patients >30yrs old with prior inconclusive imaging

For patients <30 years old:
Indicated (does not require inconclusive conventional imaging)

For patients <30 yrs old:
Indicated (does not require inconclusive conventional imaging)

TESTICULAR

- Seminoma

Not Indicated

with prior inconclusive imaging
~~or~~ **OR** residual mass >3cm **with**
normal AFP and beta-hcG
~~and~~ 6 weeks post
chemotherapy
(If **this** final PET/CT is equivocal
or borderline for residual
disease ~~PET/CT, a repeat~~
additional repeat PET/CT ~~a~~ **>>** 6
weeks **later** may help identify
those that can be safely
observed without additional
surgery)

- Non-Seminoma

Not Indicated

Not Indicated

THYMOMA/THYMIC CANCER

Indicated

Indicated

THYROID

- Papillary, Follicular, ~~Hurthle~~ **Not Indicated**

Indicated with the following 3
criteria:

- A thyroidectomy and radioiodine ablation were done initially; AND
- Serum thyroglobulin (**Tg**) is >2 ng/ml (unstimulated or stimulated) OR there is a high anti- thyroglobulin antibody (anti-Tg Ab) >1 year after treatment AND
- A Negative current I-131/~~I~~-123 scan OR a Negative prior stimulated whole body I-131/ I-123 scan done at **Tg** level similar to the

		current TgG level (a current scan is needed if on radioiodine sensitizing medications)
<ul style="list-style-type: none"> <u>Hurthle</u> Anaplastic Medullary 	<p><u>If Tg is high and/or pathology is high-risk</u></p> <p>With prior inconclusive imaging</p> <p>Not Indicated (see <u>NET</u>/Dotatate indications below)</p>	<p><u>If Tg is high and/or pathology is high-risk</u></p> <p>With prior inconclusive imaging</p> <p>Wwith prior inconclusive imaging when calcitonin levels ≥ 150 pg/ml or CEA levels >5 ng/ml post-surgery with prior insufficient Dotatate scan</p>
UTERINE	with prior inconclusive imaging	with prior inconclusive imaging
UVEAL MELANOMA	Not Indicated	with prior inconclusive imaging
VAGINAL	Indicated	Indicated
VULVAR	≥T2 or after prior inconclusive imaging	Indicated

MISCELLANEOUS (NON-ONCOLOGIC) INDICATIONS FOR FDG PET

(excluding brain and cardiac PET which have separate Guidelines)

TYPE	INITIAL STAGING	RESTAGING
CASTLEMAN'S DISEASE	Indicated	Indicated

MISCELLANEOUS (NON-ONCOLOGIC) INDICATIONS FOR FDG PET

(excluding brain and cardiac PET which have separate Guidelines)

TYPE	INITIAL STAGING	RESTAGING
HISTIOCYTIC NEOPLASMS:		
• <u>Langerhan's</u>	Indicated	Indicated if on active treatment for multiple bone disease, high risk bone disease or multisystem involvement
• <u>Erdheim Chester</u>	<u>Indicated</u>	<u>Indicated if on active treatment</u>
• <u>Rosai-Dorfman</u>	<u>Indicated</u>	<u>Indicated if on active treatment</u>
Erdheim Chester	Indicated	Indicated if on active treatment
Rosai-Dorfman	Indicated	Indicated if on active treatment

*SARCOIDOSIS

- ~~ONLY if conventional testing (CXR, CT and inflammatory serology) remain inconclusive to determine:~~ for known sarcoid to determine:

- ~~if treatment might be helpful~~
- ~~extent of disease, if it will potentially change management~~
- ~~most suitable site to biopsy~~
- ~~response to treatment~~
- ~~OR if s-Strongly suspected sarcdoid to determine, -most suitable site to biopsy~~

*VASCULITIS:

- ~~In limited circumstances, with known vasculitis, AFTER conventional imaging (MRA/CTA/MR/CT) have clearly been shown to be insufficient to determine treatment~~

*Adjudications should occur on a case-by-case basis ~~by a PET PCR.~~

NON FDG PET TRACERS

~~OTHER (NON-FDG) PET TRACERS covered~~

GA68-DOTATATE, GA68-DOTATOC and CU64-DOTATATE

FOR NET (Neuroendocrine Tumors)

CANCER TYPE	INITIAL STAGING	RESTAGING
CARCINOID EXTRAPULMONARY LARGE AND SMALL CELL MEN-1/MEN-2 SYNDOMES NEUROENDOCRINE TUMORS (NET) PHEOCHROMOCYTOMA PARAGANGLIOMA	<ul style="list-style-type: none"> Indicated (can consider PET/MR^{†‡}) <u>can be considered</u> 	<ul style="list-style-type: none"> Indicated <u>PET/MR^{†‡}</u> can be considered
MEDULLARY THYROID	Prior CT/ MRI insufficient to <ul style="list-style-type: none"> Determine extent of treatment plan Determine if candidate for invasive diagnostic/therapeutic procedure Determine optimal anatomic location for invasive procedure 	When calcitonin levels ≥ 150 pg/ml or CEA levels >5 ng/ml post-surgery

YTTRIUM-90 (Y90)

Y90 PET SCAN: Indicated when ~~done~~performed immediately after treatment of liver malignancy (primary or metastatic) with Y90 (usually within 24 hours while ~~the~~-Y90 is still detectable). The Y90 treatment is the tracer for this PET (see Y90 background section).

PSMA TRACERS (such as F18 piflufolastat (Pylarify®), GA 68 PSMA-11, ~~and~~ GA 68 gozetotide (Locametz®), and GA 68 gozetotide (Illuccix®)); F18 FLUCICLOVINE (AXUMIN®) and C11 CHOLINE

For PROSTATE CANCER

CANCER	INITIAL STAGING	RESTAGING
PROSTATE (PET/CT or <u>PET/MRI</u> ^{**}) <ul style="list-style-type: none"> After a negative Axumin® PET, a subsequent PSMA PET is not covered until a repeat PSA (done at least 3 months later) shows a progressive rise 11-Choline should be approved only if PSMA and/or Axumin® are not available. Order of preference typically would be PSMA, then Axumin®, then 11-Choline 	<p>Only PSMA (not Axumin® or Choline) is indicated <u>in</u> initial staging for high risk; defined as 1 or more of the following:</p> <ul style="list-style-type: none"> Gleason 8, 9 or 10 (specimen contains pattern 4 or 5) Gleason 7 IF primary pattern** is 4 (4+3=7) Gleason 7 primary pattern 3 (3+4=7) must ALSO have a PSA >10 and/or cT2b-cT3c disease Gleason 6 disease (3+3=6) must ALSO have a PSA > 20 and/or cT3a-cT4 disease >50% cores positive for cancer in random biopsy <p>**The Primary Pattern refers to the 1st number in the Gleason Pattern</p> <p>Pelvic MRI can be approved concurrently if needed for surgical planning</p>	<p>For post-surgery/radiation in suspected recurrence with- at least two separate detectable PSA levels above the nadir for that patient <u>withfor:</u></p> <ul style="list-style-type: none"> • Axumin® (or Choline) • <u> </u> <ul style="list-style-type: none"> ○ Indicated if bone scan and CT/MRI are negative or inconclusive • PSMA (preferred tracer) <ul style="list-style-type: none"> ○ PSA < 10 Indicated ○ PSA > 10 Indicated if bone scan and CT/MRI are negative or inconclusive <p>For post surgery/radiation in known recurrence, PSMA is approvable if:</p> <p>Patient is a candidate for Lu-PSMA treatment (Pluvicto) (must be clearly documented in note) typically metastatic castrate resistant disease</p>

Restaging on Lu-PSMA
treatment (Pluvicto)

- **Disease** was previously
seen only on PSMA PET

-

For metastatic castrate
resistant disease that have
failed both taxanes and ARDI,
PSMA is approvable if:

- Individual is a
candidate for Lu-PSMA
treatment (Pluvicto®)
(must be clearly
documented in note)
- Restaging on Lu-PSMA
treatment (Pluvicto®)

BACKGROUND

Inconclusive Imaging includes the following:

- Equivocal or ambiguous other prior standard imaging if results will change management
- Biopsy guidance (e.g., tumors with necrosis)
- High suspicion of metastases due to clinical or histopathological or laboratory considerations but with no evidence of metastases on standard initial staging
- Clinical or laboratory disease progression with negative standard imaging
- Contraindications to IV contrast, including allergy and chronic renal failure precluding MRI in a patient with a known or highly suspected malignancy
 - PET/CT may be indicated if CT cannot be performed due to significant iodinated contrast allergy or chronic renal failure **AND** MRI cannot be performed due to significant gadolinium contrast allergy or if renal failure with $\text{GFR} < 30$.²
- Evaluation for other distant metastases prior to surgical resection of limited metastases/local disease and otherwise negative prior standard imaging
- Response to neoadjuvant therapy when CT/MR insufficient
- Residual masses after completion of therapy
- Target definition for radiation planning
- If previous conventional imaging has been inconclusive, and it seems reasonable to expect that to still be the case, new conventional imaging is NOT required

In situations where there is questionable disease in an area that requires significantly invasive procedures to obtain tissue (such as open surgical procedures), and malignancy is high on the radiographic differential diagnosis, it is reasonable and medically appropriate to attempt to gain

as much information about diagnosis from imaging prior to subjecting the patient to tissue diagnosis that has real risk of morbidity/mortality.

Definition of Disease Progression:

For any signs of progression, as noted below, that could not be confirmed by other imaging, PET/CT is needed. Findings concerning for progression of disease include:

- Worsening of symptoms such as pain or dyspnea
- Evidence of worsening or new disease on physical examination
- Declining performance status
- Unexplained weight loss
- Increasing alkaline phosphatase, alanine aminotransferase (ALT), aspartate transaminase (AST), or bilirubin
- Hypercalcemia
- New radiographic abnormality or increase in the size of pre-existing radiographic abnormality
- New areas of abnormality on functional imaging (e.g., bone scan, PET/CT)
- Increasing tumor markers (e.g., carcinoembryonic antigen [CEA], CA 15-3, CA27.29)
- To help differentiate possible recurrent/active tumor from necrotic or inactive scar tissue, malignant from benign tissue, and nondescript benign changes.
- ~~PET/CT also helps to differentiate active tumor from necrotic or inactive scar tissue, malignant from benign tissue, and recurrent tumor from nondescript benign changes.~~

PET and separate CT/MR: Positron Positron emission tomography-Computed Tomography (PET/CT) is a rapidly developing and changing technology that is able to detect biochemical reactions, e.g., metabolism, or abnormal distribution of cell receptors within body tissues. A radioactive tracer is used during the procedure. Unlike other nuclear medicine examinations, PET/CT can measure metabolic activity of the cells of body tissues, providing information about the functionality and structure of the particular organ or tissue examined. PET/CT may also detect biochemical changes that help to evaluate malignant tumors and other lesions.

TYPICALLY, separate CT/MR scans being requested concurrently with a PET are not needed. There should be very few instances where separate studies are needed, and when this does happen, it is usually SITE-SPECIFIC. Most PET scanners now in use can “simultaneously” perform PET and CT (whether **for** CT Attenuation or a Diagnostic CT). Contrast can be given for the CT portion of the PET/CT. A separate request for diagnostic CTs in addition to PET is, therefore, not needed. The ordering MDO can specify to the imaging provider details about what type of CT scan is desired to be done with the PET portion. “Exceptions” generally occur when CT is needed in a plane other than standard axial imaging (for example: coronal CT for facial bone imaging that might be needed for surgical reconstruction). Separate MRIs are likewise rarely needed, but are perhaps somewhat more frequently needed than additional, separate CTs, since MRI does allow multiple imaging planes and may provide additional information. When

evaluating for these “exceptions”, the reason additional separate imaging is needed should be clearly delineated before approval.

~~The degree of radioactive tracer uptake may indicate increased metabolism in the cells of body tissues or an abnormal distribution of cell receptors. Cancer cells may show increased radioactive tracer relative to tissue not involved with tumor. Radioactive tracer uptake is often higher in fast-growing tumors; PET/CT is often not as beneficial for slow-growing tumors. Radioactive tracer uptake may occur in various types of active inflammation and is not specific for cancer. FDG is the most widely known and frequently requested radiotracer; however, the use of “special tracers” is a rapidly progressing field. These “special tracers” are typically somewhat specific to a certain cancer type due to their physiological properties. As such, a particularly careful review should be made when there is concern that a “special tracer” is needed or requested, regardless of whether the ST icon is present. If the notes clearly indicate the desired tracer (and guidelines are met for the tracer and cancer type), the case should be adjudicated according to the notes rather than the presence or absence of the ST icon. However, if the notes do not clearly indicate what tracer is requested, this needs to be clarified when there is discrepancy between notes and the ST icon (or lack thereof). the tumor type may require a tracer other than FDG.~~

~~Patients with certain malignancies may benefit more from PET/MRI since it detects brain and liver metastases better when compared with PET/CT. NCCN does suggest consideration of PET/MR in some malignancies (see table for specific cancers), but not specifically for replacing PET/CT. PET/MRI should only be considered for certain malignancies and in specific situations (such as when extensive travel would be needed, for pediatric cases, particularly those requiring sedation or when reasonably expect a need for multiple PET scans where radiation exposure from CT would be a significant factor). Typically, PET/CT should suffice; however, under some circumstances, with clear explanation of why PET/MR is preferred rather than PET/CT, PET/MR may be an appropriate study^{††, 1}~~

~~††, 1 **PET/MR: Patients with certain malignancies may benefit from PET/MRI since it detects brain and liver metastases better when compared with PET/CT. NCCN does suggest consideration of PET/MR in some malignancies, but not specifically for replacing PET/CT. PET/MRI should only be considered for those specific malignancies (see table for specific cancers) and in certain situations. Typically, PET/CT should suffice; however, under some circumstances, with clear explanation of why PET/MR is preferred rather than PET/CT, PET/MR may be an appropriate study.** We are not currently able to approve PET/MRI’s and must refer the MDO to HP. Currently, there is no CPT code for PET/MR. As noted in our GLs, PET/MR may be considered only for a few specific certain cancers, and it typically would only be those that would need to be referred to the HP directly.~~

Langerhans Cell Histiocytosis is the most common type of histiocytosis, with variable presentations and sites involvement. Some studies suggest PET/CT may be more effective in detecting bone lesions compared with MRI and bone scans in assessing disease response as

healing/treatment changes of bone lesions on conventional imaging may be delayed. However, PET/CT is not the modality of choice in assessing disease response of lung or brain lesions.

Y90 PET Scans:

Hepatic radioembolization, involving ~~Radioembolization with Y90~~ intraarterial injection of yttrium-90 (Y90)-labeled glass or resin microspheres, is used for liver-dominant malignancy or metastases that are unresectable. ~~(such as hepatocellular carcinoma or metastatic colon cancer among others).~~ It involves intraarterial injection of yttrium 90 (Y90) labeled glass or resin microspheres. A Tc99m MAA nuclear scan (typically requiring SPECT ~~similar in size to the Y90 microspheres~~) is done-performed before the actual treatment with Y90. MAA, which is similar in size to the Y90 microspheres, MAA mimics the distribution of the Y90 particles and selective arterial injections should embolize within the tumor's hepatic arterioles, thus outlining the expected localization of the radiation. The scan is compared to a CTA/MRA to evaluate for any possible shunting of the treatment agent to the lungs or the GI tract. Coils can be placed as needed to minimize any shunting of Y90 to areas other than the desired target.

Post-procedure imaging (within 24 hours) with either SPECT or PET (at the discretion of the treating physicians) is then done-performed to confirm the final distribution of the Y90 and to calculate the actual radiation dose delivered to the tumor. Utilizing the Bremsstrahlung radiation of the Y90 embolization agent, SPECT, (or SPECT/CT) can be done-completed with routine nuclear medicine collimators. However, due to ~~it~~ their higher energy level (as compared to routine nuclear medicine agents), the Y90 photons scatter and/or pass through the collimator septa and degrade the image quality. Alternatively, **PET scanning can be done, again using the Y90 treatment agent itself**, but for PET via a minor decay pattern that emits a positron (32 in every one million decays) that is detectable with PET scanners.

FDG PET may be needed later (ideally performed >12 weeks after treatment) to assess tumor response to this radiation, in accordance with the tumor-specific guidelines for FDG PET restaging (in the table above) ~~so~~ and may still require inconclusive conventional imaging, if necessary for the type of cancer being treated.

POLICY HISTORY

Date	Summary
June <u>May</u> 2022	<ul style="list-style-type: none"> • Updated changes for <u>based on</u> NCCN including updates most notably for prostate cancer, <u>Hurthle</u>, NETs • <u>Clarified when PET may be approved prior to biopsy for lung nodules and when PET is unnecessary (e.g., disease clearly present in both sides of chest and/or outside the chest)</u> • Added some indications for rare specific histiocytic syndromes, and for sarcoid and vasculitis for non-oncological indications • Added restaging for RCC <u>and pancreatic cancer</u> in specific situations • Added information about <u>indications for</u> Y90 <u>PET scan (liver malignancy)</u> • <u>Updated definitions of clinical guidelines (PET, PET/CT, and PET with CT Attenuation)</u> • <u>Minor wording clarifications, table adjustments</u>
June 2021	<p>Added:</p> <ul style="list-style-type: none"> • Definitions • CART T info • PTLT information added • PET/MRI information • Updated/added details for Prostate cancer and PSMA, Axumin and Choline • Minor adjustments to the PET FDG table, such as added details from NCCN, clarifications, separation of non-malignant uses
May 2020	<ul style="list-style-type: none"> • Modified to table format • Added section of follow up of a new or interval growth of a mixed pulmonary lung nodule on subsequent LDCT (NCCN 2020) • Initial staging indicated <ul style="list-style-type: none"> ○ Changed AML to extramedullary disease (previously lymphomatous involvement) ○ Changed Breast cancer stage IIb and above (previously III and IV) ○ Added Castleman's disease ○ Added for Chronic Lymphocytic Leukemia to guide biopsy ○ Changed Mesothelioma to only prior to surgery for stage I-IIIa ○ Added "soft tissue" sarcoma in pediatric patient

	<ul style="list-style-type: none"> ○ Added Thymoma and thymic cancer ○ Added Langerhans Cell Histiocytosis-predominantly osseous disease (previously not included) • Initial staging which is only indicated after prior inconclusive imaging (NCCN 2019/2020) <ul style="list-style-type: none"> ○ Added AIDS related Kaposi sarcoma ○ Changed Anal carcinoma (previously indicated) ○ Added Ewing sarcoma-osseous ○ Added Gestational trophoblastic disease ○ Added Hepatocellular/Intrahepatic Cholangiocarcinoma (previously not included) ○ Added Fallopian tube and primary peritoneal cancer ○ Added Osteosarcoma-osseous ○ Changed Penile cancer (previously indicated with palpable nodes) • Initial staging NOT indicated (NCCN 2019/2020) <ul style="list-style-type: none"> ○ Changed testicular (previously indicated) ○ Added Uveal Melanoma ○ Added Langerhans Cell Histiocytosis-predominantly non-osseous disease (previously not included) • Restaging indicated (NCCN 2019/2020) <ul style="list-style-type: none"> ○ Added Castleman's disease ○ Added for accelerated Chronic Lymphocytic Leukemia and to guide biopsy ○ Added Gastric Cancer post radiation treatment ○ Changed Mesothelioma to only prior to surgery for stage I-IIIa ○ Added "soft tissue" to sarcoma in pediatric patient ○ Added Thymoma and thymic cancer ○ Added Langerhans Cell Histiocytosis-predominantly osseous disease (previously not included) • Restaging which are only indicated after prior inconclusive imaging (NCCN 2019/2020) <ul style="list-style-type: none"> ○ Removed for resectable disease in Colorectal cancer ○ Removed for if candidate for surgery/locoregional therapy for endometrial cancer ○ Specified Ewing's sarcoma-osseous ○ Added Extrahepatic Cholangiocarcinoma (previously not indicated) ○ Added Gallbladder carcinoma (previously not indicated) ○ Changed Gastric Cancer to prior inconclusive imaging or if radiation planning considered (previously indicated if no metastasis or early disease)
--	---

	<ul style="list-style-type: none"> ○ Added Gestational trophoblastic disease ○ Added Hepatocellular/Intrahepatic Cholangiocarcinoma (previously not included) ○ Changed Ovarian cancer (previously indicated for greater than Stage I) ○ Added Fallopian tube and all stages of primary peritoneal cancer ○ Added Osteosarcoma- osseous ○ Added that for pheochromocytoma/ paraganglioma, extrapulmonary large/small cell, restaging FDG PET/CT can be done after inconclusive CT ○ Modified Seminoma with residual mass >3cm or 6 weeks post chemotherapy (previously indicated) ○ Added Uveal melanoma • Restaging NOT indicated (NCCN 2019/2020) <ul style="list-style-type: none"> ○ Added AIDS related Kaposi sarcoma ○ Changed Testicular non seminoma (previously indicated) ○ Added Langerhans Cell Histiocytosis-predominantly non-osseous disease (previously not included) • Added CT face/neck may be done in conjunction with PET when surgery or radiation is planned • Added to head and neck cancer that if a final PET is equivocal or borderline for residual disease PET, a repeat PET/CT a ≥ 6 weeks may help identify those that can be safely observed without additional surgery • Medullary thyroid: added FDG restaging indicated when CEA >5ng/ml post-surgery and after prior insufficient Dotatate scan • Modified pancreatic cancer symptoms to excessive weight loss • Added to Seminoma: if final PET is equivocal or borderline for residual disease PET, a repeat PET/CT a ≥ 6 weeks may help identify those that can be safely observed without additional surgery) • Thyroid FDG- changed serum thyroglobulin level to >2ng/ml (previously >5ng/ml) and added 'current OR two prior stimulated whole body I-131/ I-123 scans are negative (a current scan is needed if on radioiodine sensitizing medications)' • GA⁶⁸ Dotatate- added restaging calcitonin levels ≥ 150 pg/ml or CEA levels >5 ng/ml post-surgery • F18 Fluciclovine (Axumin) <ul style="list-style-type: none"> ○ Initial staging changed to: With prior inconclusive bone scan with no CT/MRI correlate; or inconclusive bone SPECT/CT
--	---

	<ul style="list-style-type: none"> ○ Restaging changed to with rising/persistent PSA and after CT/MRI has been performed and is insufficient for detection of metastases • Added Inconclusive imaging features to background as noted in NCCN 2020 • Added Disease progression to Background as noted in NCCN 2020 • Added Section of Langerhans Cell Histiocytosis to background section
September 2019	<ul style="list-style-type: none"> • Removed Introduction section • Removed “Important Note” • Changed title “The following are noncovered for all other indications including (but not limited to):” to <u>“The following are noncovered for F¹⁸ FDG, Ga⁶⁸ Dotatate, F¹⁸ Fluciclovine_(NCCN 2019):”</u> • Under noncovered for F¹⁸ FDG, Ga⁶⁸ Dotatate, F¹⁸ Fluciclovine section, added the following: <ul style="list-style-type: none"> ○ Breast cancer - Initial Staging for Stage I and II Breast Cancer ○ Melanoma - Initial and Restaging for Stage I and II Melanoma (NCCN 2016) ○ Bladder Cancer - non muscle invasive (by imaging or tissue sample) ○ Vulvar Cancer < T2 or no suspicion of metastatic disease ○ Prostate Cancer - Initial or Restaging ○ Small cell lung cancer - Staging (Initial or Restaging) for extensive disease ○ Ovarian Cancer - Restaging if stage I ○ Pancreatic Cancer - Restaging ○ Renal Cancer - Initial and Restaging ○ Skin Squamous Cell Carcinoma - Restaging ○ Gastric Cancer - Initial staging if there is evidence of metastases (M1), or very early disease (T1) ○ Malignant Pleural Mesothelioma - Initial staging except if stage I-IIIA and pre-surgical ○ Hepatocellular / Intrahepatic Cholangiocarcinoma - Initial and Restaging ○ Gallbladder/ Extrahepatic Cholangiocarcinoma - Restaging ○ Small bowel adenocarcinoma - Initial Staging ○ Chordoma – Restaging

	<ul style="list-style-type: none"> ○ Adrenal (except pheochromocytoma/ paraganglioma) - Initial or Restaging ○ Smoldering Myeloma - except to discern smoldering from active myeloma with negative skeletal survey ○ ALL (Acute Lymphoblastic Leukemia)/ AML (Acute Myelogenous Leukemia) - Unless prior imaging suggests lymphomatous involvement ○ BCC (Basal Cell Carcinoma (of the skin)) ○ Infection and/or Inflammation: removed “- PET for chronic osteomyelitis, infection of hip arthroplasty, and fever of unknown origin.” <ul style="list-style-type: none"> • Under indications for oncological PET heading, added: “Note: for radiation treatment planning, contact health plan directly” • Under Initial Treatment Strategy, the first sentence now specifies “active myeloma” instead of “myeloma” previously • Under Initial Treatment Strategy, the last sentence now replaces “after a” with “AND”: “To determine the optimal anatomic location for an invasive procedure AND prior imaging insufficient” • “CLL – chronic lymphocytic leukemia (PET/CT is generally not useful in CLL/SLL but may be necessary to direct nodal tissue sampling when high-grade histologic transformation is suspected) (NCCN, 2018).” has been changed to “CLL (Chronic Lymphocytic Leukemia): only when high-grade histologic transformation is suspected (NCCN, 2018)” • Changed references for SPN to “(Bueno, 2018; MacMahon, 2017)” from previous “(Vansteenkiste, 2006)” • Removed the section: <ul style="list-style-type: none"> “ Excluding <ul style="list-style-type: none"> • ALL- acute lymphoblastic leukemia <ul style="list-style-type: none"> ○ Unless prior CT imaging suggest lymphomatous involvement • AML – acute myelogenous leukemia <ul style="list-style-type: none"> ○ Unless clinical suspicion for extramedullary disease • BCC – basal cell carcinoma (of the skin) • Prostate cancer (NCCN, 2018)” • Added “EXCEPT for the following, which are only indicated after prior inconclusive imaging (NCCN 2019): <ul style="list-style-type: none"> ○ Colorectal ○ Ovarian/ fallopian ○ Sarcoma/ GIST/ Uterine/Rhabdomyosarcoma ○ Chordoma ○ Muscle invasive bladder cancer
--	---

	<ul style="list-style-type: none"> ○ Endometrial Cancer ○ Penile (for palpable nodes only) ○ Occult Primary ○ Pancreatic Cancer (unless high risk features: borderline resectable, markedly elevated CA19-9 > 180 U/ml, large primary tumor/ lymph nodes) ○ Skin squamous Cell Carcinoma ○ Gallbladder/ Extrahepatic Cholangiocarcinoma ○ Poorly differentiated neuroendocrine tumors with prior negative Ga68 Dotatate/ MIBG/Octreotide scan (includes Pheochromocytoma/ paraganglioma, extrapulmonary large/small cell)” <ul style="list-style-type: none"> • Under subsequent Treatment Strategy, first line has been modified by adding parenthesis as follows: Restaging or monitoring response to active treatment (including immunotherapy)” • Under subsequent Treatment Strategy, changed “not to be performed within 4 weeks of completion of therapy (ideally F¹⁸ FDG, Ga⁶⁸ Dotatate, F¹⁸ Fluciclovine PET is delayed 2 - 3months after surgical therapy, 2 - 3 months after radiation therapy if locoregional assessment is the imaging goal), and/or evaluation for suspicion of recurrence due to new or changing signs/symptoms. (Asymptomatic surveillance is not approvable) (NCCN, 2018).” to “The interval should ideally be 6 - 12 weeks after surgery, and 12 weeks after radiation. PET can be performed 1-3 weeks after neoadjuvant chemotherapy or neoadjuvant chemoradiation to assess stage for surgery. PET evaluation can also be done for suspicion of recurrence due to new or changing signs/symptoms or rising tumor markers, or inconclusive findings on CT. Asymptomatic surveillance is not approvable. (NCCN 2018, 2019)” • List of cancers under subsequent imaging (without needing prior inconclusive imaging) has been changed. The following were removed: Breast cancer (female and males), colorectal cancer (including colon, rectal, appendiceal or anal cancer), ovarian cancer. The following were changed as follows: • “Lung cancer - Non-small cell” to “Lung cancer - Non-small cell and limited stage small cell cancer” • “Esophageal cancer” to “Esophageal and esophagogastric cancer” • “Melanoma” to Melanoma- only stage III, IV (excludes uveal melanoma) • “Myeloma to “Active Myeloma/plasmacytoma”
--	--

	<ul style="list-style-type: none"> • Added for Soft tissue sarcoma: “only stage II/III for response to neoadjuvant Rx” • Added Merkel cell carcinoma • Added “Mesothelioma, if also presurgical” • Individual References were removed for soft tissue sarcoma and vulvar/ vaginal cancer. • Statement regarding subsequent PET scans needing prior inconclusive imaging has been modified from “only” if other imaging (ie. US, CT, MRI, NM) is inconclusive in determining a treatment plan or unable to be performed “ to “ only if other imaging (ie. US, CT, MRI, NM) is inconclusive/ insufficient in determining a treatment plan or unable to be performed or with rising tumor markers and negative/ insufficient other imaging. PETCT is to be used only if the cancer is known to be generally F¹⁸ FDG, Ga⁶⁸ Dotatate, F¹⁸ Fluciclovine avid. It may be indicated if iodinated and gadolinium contrast are both contraindicated due to significant allergy or chronic renal failure without dialysis (NCCN 2019). “ • Under subsequent PET scans needing prior inconclusive imaging, the following were changed: <ul style="list-style-type: none"> ○ Added: Breast cancer (female and males), Bladder cancer, only if metastatic, Colorectal Cancer – resectable metastatic disease only, Anal/ Vulvar/ Penile Carcinoma, Bone Sarcoma, Sarcoma/ GIST/ Uterine/Rhabdomyosarcoma, Ovarian/ malignant germ cell tumors/primary peritoneal cancer – Stage II-IV, Endometrial cancer if candidate for surgery/locoregional therapy; Poorly differentiated Cancers, or Dedifferentiated neuroendocrine tumors with prior negative Ga68 Dotatate/ MIBG/Octreotide scan • Removed: prostate cancer, pancreatic cancer, individual references for cancers • Changed: “Lung cancer -Small cell” to “Extensive small cell lung cancer”; “Tumor of unknown Origin” to “Occult primary”; “Neuroendocrine cancer (e.g. carcinoid, pheochromocytoma, etc)” to “Poorly differentiated or dedifferentiated neuroendocrine tumors with prior negative Ga68 Dotatate/ MIBG/Octreotide scan (includes Pheochromocytoma/ paraganglioma, extrapulmonary large/small cell)”. • Last sentence has been changed from “Other malignancies where the tumor has been shown to be F¹⁸ FDG, Ga⁶⁸ Dotatate, F¹⁸ Fluciclovineavid on prior PET/CT imaging if done, and other imaging (ie: US, CT, MRI, NM) is inconclusive in determining a
--	---

	<p>treatment plan or unable to be performed “ to “Other malignancies where other imaging (i.e., US, CT, MRI, NM) is inconclusive in determining a treatment plan or unable to be performed.”</p> <ul style="list-style-type: none"> • Under thyroid Cancer, <ul style="list-style-type: none"> ○ Added references “(NCCN 2019, ATA 2015)” to subsequent treatment strategy for papillary/follicular/hurthle cancers <ul style="list-style-type: none"> ▪ Changed “Stimulated serum thyroglobulin > 2 ng/ml” to “Stimulated serum thyroglobulin > 5 ng/ml or high anti- thyroglobulin antibody (anti-Tg Ab) > 1 year after treatment (Na SJ 2012)” ▪ Changed “Current whole body I-131 scan is negative (Kloos, 2005)” to “Current stimulated whole body I-131/ I-123 scan is negative (Alzahrani 2012)” ○ Changed “Medullary thyroid cancer when calcitonin levels > 150 pg/ml post-operatively (Wells, 2015)” to “Medullary thyroid cancer when calcitonin levels ≥ 150 pg/ml post primary treatment (NCCN 2019, Souteiro 2019)” ○ Changed “Anaplastic 3-6 months after initial treatment, 3-6 month interval if persistent structural disease (Smallridge, 2012)” to “Anaplastic: Initial and Restaging after prior inconclusive/ insufficient CT/MRI (NCCN 2019)” • Added pediatric cancers section as follows: “PEDIATRIC CANCERS (for indications different from adult guidelines): <ul style="list-style-type: none"> ○ Sarcoma - Initial and Restaging (Quartuccio 2015) ○ Neuroblastoma/ other cancers under Ga68 imaging: only with prior negative/ inconclusive MIBG/ Octreotide/ Ga68 PETCT (Uslu 2015, Alexander 2018, Kong 2016, Li 2018, Elkhatab 2017) ○ Nasopharyngeal Cancer- Initial staging after inconclusive/ insufficient MRI; Restaging. (Cheuk 2012) • For Gallium 68 Dotatate PET: <ul style="list-style-type: none"> ○ Added references for initial or subsequent treatment strategy: (NCCN 2019, Deppen, 2016 a, b) ○ Added under neuroendocrine tumors: “Medullary Thyroid Cancer for Initial staging; and Restaging when calcitonin ≥ 150 pg/ml”
--	--

	<ul style="list-style-type: none"> ○ Modified last part of the last sentence as follows: “and rising biomarkers (asymptomatic surveillance is not approvable). “ ● Under 18F-Fluciclovine PET/CT SCAN: <ul style="list-style-type: none"> ○ Added “(Axumin)” after 18F-Fluciclovine ○ Removed reference “(Bach-Gansmo, 2017)” ○ Changed “18F-Fluciclovine PET/CT scans should be performed only if other imaging (CT, MRI, US, NM) is inconclusive/insufficient AND the patient has not already been evaluated with an F18 FDG, Ga68 Dotatate, F18 Fluciclovine PET/CT Scan” to “Known prostate cancer for workup of recurrence and response to treatment, only if other imaging (CT, MRI) AND Bone scan is inconclusive/insufficient. (NCCN 2019, Andriole 2019, Bach-Gansmo 2017)” ○ Removed:” Known prostate cancer for workup of recurrence and response to treatment:” ○ “Initial treatment by radical prostatectomy with” was replaced by “Post radical prostatectomy with” ○ “Initial treatment radiation therapy with” was replaced by “Post radiation therapy with” ○ “Post-RT rising PSA or positive digital exam and is candidate for local therapy” was replaced by “rising/persistent PSA (increase should be >2ng/ml unless doubling time ≤ 8 months or pt is a candidate for local salvage therapy)” ● Removed: “NOTE: Not all plans cover 18F-Fluciclovine (A9588), such as Magellan Complete Care of Florida and Magellan Complete Care of Arizona. If you are unsure, you should check with the Health Plan prior to requesting a PET with Fluciclovine from NIA.” ● Added Background section as follows: “BACKGROUND: Positron emission tomography (PET) is a rapidly developing and changing technology that is able to detect biochemical reactions, e.g., metabolism, or abnormal distribution of cell receptors within body tissues. A radioactive tracer is used during the procedure. Unlike other nuclear medicine examinations, PET can measure metabolic activity of the cells of body tissues, providing information about the functionality and structure of the particular organ or tissue examined. PET may also detect biochemical changes that help to evaluate malignant tumors and other lesions.
--	--

	<p>The degree of radioactive tracer uptake may indicate increased metabolism in the cells of body tissues or an abnormal distribution of cell receptors. Cancer cells may show increased radioactive tracer relative to tissue not involved with tumor. Radioactive tracer uptake is often higher in fast-growing tumors; PET is often not as beneficial for slow growing tumors. Radioactive tracer uptake may occur in various types of active inflammation and is not specific for cancer.”</p>
--	--

REFERENCES

1. NCCN Imaging Appropriate Use Criteria™. National Comprehensive Cancer Network (NCCN). Updated 2021. Accessed November 4, 2021. <https://www.nccn.org/professionals/imaging/default.aspx>
2. Radiological Society of North America. RSNA Statement on Gadolinium-Based MR Contrast Agents. Radiological Society of North America. Updated April 15, 2018. Accessed December 22, 2021. https://www.rsna.org/uploadedfiles/rsna/content/role_based_pages/media/rsna-gadolinium-position-statement.pdf

ADDITIONAL RESOURCES

1. American College of Radiology. ACR Appropriateness Criteria®. American College of Radiology (ACR). Updated 2021. Accessed December 22, 2021. <https://acsearch.acr.org/list>
2. American Society of Clinical Oncology. Ten things physicians and patients should question. Choosing Wisely Initiative ABIM Foundation. Updated July 26, 2021. Accessed December 22, 2021. <https://www.choosingwisely.org/societies/american-society-of-clinical-oncology/>
3. Araz M, Çayır D. (18)F-Fluorodeoxyglucose-Positron Emission Tomography/Computed Tomography for Other Thyroid Cancers: Medullary, Anaplastic, Lymphoma and So Forth. *Mol Imaging Radionucl Ther*. Feb 5 2017;26(1):1-8. Diğer Tiroid Kanseri için 18F-Fluorodeoksiglukoz-Pozitron Emisyon Tomografisi/Bilgisayarlı Tomografi: Medüller, Anaplastik, Lenfoma ve Fazlası. doi:10.4274/mirt.60783
4. Bach-Gansmo T, Nanni C, Nieh PT, et al. Multisite Experience of the Safety, Detection Rate and Diagnostic Performance of Fluciclovine ((18)F) Positron Emission Tomography/Computerized Tomography Imaging in the Staging of Biochemically Recurrent Prostate Cancer. *J Urol*. Mar 2017;197(3 Pt 1):676-683. doi:10.1016/j.juro.2016.09.117
5. Bueno J, Landeras L, Chung JH. Updated Fleischner Society Guidelines for Managing Incidental Pulmonary Nodules: Common Questions and Challenging Scenarios. *Radiographics*. Sep-Oct 2018;38(5):1337-1350. doi:10.1148/rg.2018180017
6. Gavrila A. Thyroid cancer: Thyroid cancer that no longer responds to radioactive iodine may become sensitive after starting anti-cancer drugs. *Clin Thyroidology for the Public*. 2019;12(8):11-12.
7. Mayerhoefer ME, Prosch H, Beer L, et al. PET/MRI versus PET/CT in oncology: a prospective single-center study of 330 examinations focusing on implications for patient management and cost considerations. *Eur J Nucl Med Mol Imaging*. Jan 2020;47(1):51-60. doi:10.1007/s00259-019-04452-y
8. Savir-Baruch B, Banks KP, McConathy JE, et al. ACR-ACNM Practice Parameter for the Performance of Fluorine-18 Fluciclovine-PET/CT for Recurrent Prostate Cancer. *Clin Nucl Med*. Dec 2018;43(12):909-917. doi:10.1097/rlu.0000000000002310
9. Castaldi P, Leccisotti L, Bussu F, Micciché F, Rufini V. Role of (18)F-FDG PET-CT in head and neck squamous cell carcinoma. *Acta Otorhinolaryngol Ital*. Feb 2013;33(1):1-8.

10. Castroneves LA, Coura Filho G, de Freitas RMC, et al. Comparison of 68Ga PET/CT to Other Imaging Studies in Medullary Thyroid Cancer: Superiority in Detecting Bone Metastases. *J Clin Endocrinol Metab*. Sep 1 2018;103(9):3250-3259. doi:10.1210/jc.2018-00193
11. Chagpar AB. How I treat breast cancer with positive lymph nodes. *Clin Adv Hematol Oncol*. Jul 2018;16(7):486-490.
12. Chatterjee A, Serniak N, Czerniecki BJ. Sentinel lymph node biopsy in breast cancer: a work in progress. *Cancer J*. Jan-Feb 2015;21(1):7-10. doi:10.1097/ppo.000000000000090
13. Choi SJ, Jung KP, Lee SS, Park YS, Lee SM, Bae SK. Clinical Usefulness of F-18 FDG PET/CT in Papillary Thyroid Cancer with Negative Radioiodine Scan and Elevated Thyroglobulin Level or Positive Anti-thyroglobulin Antibody. *Nucl Med Mol Imaging*. Jun 2016;50(2):130-6. doi:10.1007/s13139-015-0378-5
14. Crispo F, Notarangelo T, Pietrafesa M, et al. BRAF Inhibitors in Thyroid Cancer: Clinical Impact, Mechanisms of Resistance and Future Perspectives. *Cancers (Basel)*. Sep 18 2019;11(9)doi:10.3390/cancers11091388
15. Deppen SA, Blume J, Bobbey AJ, et al. 68Ga-DOTATATE Compared with 111In-DTPA-Octreotide and Conventional Imaging for Pulmonary and Gastroenteropancreatic Neuroendocrine Tumors: A Systematic Review and Meta-Analysis. *J Nucl Med*. Jun 2016;57(6):872-8. doi:10.2967/jnumed.115.165803
16. Deppen SA, Liu E, Blume JD, et al. Safety and Efficacy of 68Ga-DOTATATE PET/CT for Diagnosis, Staging, and Treatment Management of Neuroendocrine Tumors. *J Nucl Med*. May 2016;57(5):708-14. doi:10.2967/jnumed.115.163865
17. Eary JF, Conrad EU. Imaging in sarcoma. *J Nucl Med*. Dec 2011;52(12):1903-13. doi:10.2967/jnumed.111.092999
18. Ecanow JS, Abe H, Newstead GM, Ecanow DB, Jeske JM. Axillary staging of breast cancer: what the radiologist should know. *Radiographics*. Oct 2013;33(6):1589-612. doi:10.1148/rg.336125060
19. Ehman EC, Johnson GB, Villanueva-Meyer JE, et al. PET/MRI: Where might it replace PET/CT? *J Magn Reson Imaging*. Nov 2017;46(5):1247-1262. doi:10.1002/jmri.25711
20. Fendler WP, Czernin J, Herrmann K, Beyer T. Variations in PET/MRI Operations: Results from an International Survey Among 39 Active Sites. *J Nucl Med*. Dec 2016;57(12):2016-2021. doi:10.2967/jnumed.116.174169
21. Groheux D, Cochet A, Humbert O, Alberini JL, Hindié E, Mankoff D. ¹⁸F-FDG PET/CT for Staging and Restaging of Breast Cancer. *J Nucl Med*. Feb 2016;57 Suppl 1:17s-26s. doi:10.2967/jnumed.115.157859
22. Hawkins MA, Aitken K. Image-guided radiotherapy for esophageal cancer. *Imaging Med*. 2012;4(5):515-25. doi:10.2217/iim.12.43
23. Hillner BE, Siegel BA, Liu D, et al. Impact of positron emission tomography/computed tomography and positron emission tomography (PET) alone on expected management of patients with cancer: initial results from the National Oncologic PET Registry. *J Clin Oncol*. May 1 2008;26(13):2155-61. doi:10.1200/jco.2007.14.5631
24. Ishii S, Shimao D, Hara T, et al. Comparison of integrated whole-body PET/MR and PET/CT: Is PET/MR alternative to PET/CT in routine clinical oncology? *Ann Nucl Med*. Apr 2016;30(3):225-33. doi:10.1007/s12149-015-1050-y

25. Kalemkerian GP. Staging and imaging of small cell lung cancer. *Cancer Imaging*. Jan 12 2012;11(1):253-8. doi:10.1102/1470-7330.2011.0036
26. Kanno S. Paraneoplastic neurologic syndrome: A practical approach. *Ann Indian Acad Neurol*. Jan 2012;15(1):6-12. doi:10.4103/0972-2327.93267
27. Kidd EA, Siegel BA, Dehdashti F, et al. Lymph node staging by positron emission tomography in cervical cancer: relationship to prognosis. *J Clin Oncol*. Apr 20 2010;28(12):2108-13. doi:10.1200/jco.2009.25.4151
28. Kreydin EI, Barrisford GW, Feldman AS, Preston MA. Testicular cancer: what the radiologist needs to know. *AJR Am J Roentgenol*. Jun 2013;200(6):1215-25. doi:10.2214/ajr.12.10319
29. Kushchayev SV, Kushchayeva YS, Tella SH, Glushko T, Pacak K, Teytelboym OM. Medullary Thyroid Carcinoma: An Update on Imaging. *J Thyroid Res*. 2019;2019:1893047. doi:10.1155/2019/1893047
30. MacMahon H, Naidich DP, Goo JM, et al. Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017. *Radiology*. Jul 2017;284(1):228-243. doi:10.1148/radiol.2017161659
31. Marcus C, Whitworth PW, Surasi DS, Pai SI, Subramaniam RM. PET/CT in the management of thyroid cancers. *AJR Am J Roentgenol*. Jun 2014;202(6):1316-29. doi:10.2214/ajr.13.11673
32. Mc CD, Gemignani ML. Current Management of the Axilla. *Clin Obstet Gynecol*. Dec 2016;59(4):743-755. doi:10.1097/grf.0000000000000232
33. Møller AK, Loft A, Berthelsen AK, et al. A prospective comparison of 18F-FDG PET/CT and CT as diagnostic tools to identify the primary tumor site in patients with extracervical carcinoma of unknown primary site. *Oncologist*. 2012;17(9):1146-54. doi:10.1634/theoncologist.2011-0449
34. Moy L, Newell MS, Mahoney MC, et al. ACR Appropriateness Criteria Stage I Breast Cancer: Initial Workup and Surveillance for Local Recurrence and Distant Metastases in Asymptomatic Women. *J Am Coll Radiol*. Nov 2016;13(11s):e43-e52. doi:10.1016/j.jacr.2016.09.023
35. Mueller WP, Melzer HI, Schmid I, Coppenrath E, Bartenstein P, Pfluger T. The diagnostic value of 18F-FDG PET and MRI in paediatric histiocytosis. *Eur J Nucl Med Mol Imaging*. Feb 2013;40(3):356-63. doi:10.1007/s00259-012-2278-6
36. P. D. Q. Pediatric Treatment Editorial Board. *Langerhans Cell Histiocytosis Treatment (PDQ®): Health Professional Version*. PDQ Cancer Information Summaries. National Cancer Institute (US); 2002.
37. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines): Small Cell Lung Cancer Version 2.2022. National Comprehensive Cancer Network (NCCN). Updated November 24, 2021. Accessed December 7, 2021. https://www.nccn.org/professionals/physician_gls/pdf/nscl.pdf
38. Ospina MB, Horton J, Seida J, et al. *AHRQ Technology Assessments. Positron Emission Tomography for Nine Cancers (Bladder, Brain, Cervical, Kidney, Ovarian, Pancreatic, Prostate, Small Cell Lung, Testicular)*. Agency for Healthcare Research and Quality (US); 2008.
39. Parab TM, DeRogatis MJ, Boaz AM, et al. Gastrointestinal stromal tumors: a comprehensive review. *J Gastrointest Oncol*. Feb 2019;10(1):144-154. doi:10.21037/jgo.2018.08.20
40. Pyo J, Won Kim K, Jacene HA, Sakellis CG, Brown JR, Van den Abbeele AD. End-therapy positron emission tomography for treatment response assessment in follicular lymphoma: a systematic review and meta-analysis. *Clin Cancer Res*. Dec 1 2013;19(23):6566-77. doi:10.1158/1078-0432.Ccr-13-1511

41. Quint LE. PET: other thoracic malignancies. *Cancer Imaging*. Oct 31 2006;6(Spec No A):S82-8. doi:10.1102/1470-7330.2006.9015
42. Rauscher I, Eiber M, Fürst S, et al. PET/MR imaging in the detection and characterization of pulmonary lesions: technical and diagnostic evaluation in comparison to PET/CT. *J Nucl Med*. May 2014;55(5):724-9. doi:10.2967/jnumed.113.129247
43. Rijkers AP, Valkema R, Duivenvoorden HJ, van Eijck CH. Usefulness of F-18-fluorodeoxyglucose positron emission tomography to confirm suspected pancreatic cancer: a meta-analysis. *Eur J Surg Oncol*. Jul 2014;40(7):794-804. doi:10.1016/j.ejso.2014.03.016
44. Robertson NL, Hricak H, Sonoda Y, et al. The impact of FDG-PET/CT in the management of patients with vulvar and vaginal cancer. *Gynecol Oncol*. Mar 2016;140(3):420-4. doi:10.1016/j.ygyno.2016.01.011
45. Scheier BY, Lao CD, Kidwell KM, Redman BG. Use of Preoperative PET/CT Staging in Sentinel Lymph Node-Positive Melanoma. *JAMA Oncol*. Jan 2016;2(1):136-7. doi:10.1001/jamaoncol.2015.3664
46. Sekine T, Barbosa FG, Sah BR, et al. PET/MR Outperforms PET/CT in Suspected Occult Tumors. *Clin Nucl Med*. Feb 2017;42(2):e88-e95. doi:10.1097/rlu.0000000000001461
47. Sherry SJ, Tahari AK, Mirpour S, Colucci A, Subramaniam RM. FDG-PET/CT in the evaluation of paraneoplastic neurologic syndromes. *Imaging Med*. 2014;6(1):117-26.
48. Siva S, Herschtal A, Thomas JM, et al. Impact of post-therapy positron emission tomography on prognostic stratification and surveillance after chemoradiotherapy for cervical cancer. *Cancer*. Sep 1 2011;117(17):3981-8. doi:10.1002/cncr.25991
49. Smallridge RC, Ain KB, Asa SL, et al. American Thyroid Association guidelines for management of patients with anaplastic thyroid cancer. *Thyroid*. Nov 2012;22(11):1104-39. doi:10.1089/thy.2012.0302
50. Songmen S, Nepal P, Olsavsky T, Sapire J. Axumin Positron Emission Tomography: Novel Agent for Prostate Cancer Biochemical Recurrence. *J Clin Imaging Sci*. 2019;9:49. doi:10.25259/jcis_139_2019
51. Spick C, Herrmann K, Czernin J. 18F-FDG PET/CT and PET/MRI Perform Equally Well in Cancer: Evidence from Studies on More Than 2,300 Patients. *J Nucl Med*. Mar 2016;57(3):420-30. doi:10.2967/jnumed.115.158808
52. Srirajaskanthan R, Kayani I, Quigley AM, Soh J, Caplin ME, Bomanji J. The role of 68Ga-DOTATATE PET in patients with neuroendocrine tumors and negative or equivocal findings on 111In-DTPA-octreotide scintigraphy. *J Nucl Med*. Jun 2010;51(6):875-82. doi:10.2967/jnumed.109.066134
53. Varadhachary GR, Raber MN. Cancer of unknown primary site. *N Engl J Med*. Aug 21 2014;371(8):757-65. doi:10.1056/NEJMra1303917
54. Wells SA, Jr., Asa SL, Dralle H, et al. Revised American Thyroid Association guidelines for the management of medullary thyroid carcinoma. *Thyroid*. Jun 2015;25(6):567-610. doi:10.1089/thy.2014.0335

<https://www.researchgate.net/publication/337658174>
 A guide to 90Y radioembolization and its dosimetry

~~Article in Physica Medica – November 2019~~

~~Physica Medica~~

~~journal homepage: www.elsevier.com/locate/ejmp~~

~~Review paper~~

~~A guide to ⁹⁰Y radioembolization and its dosimetry~~

~~S. Peter Kima,^{a,*}~~

~~, Claire Cohalan^b~~

~~, Neil Kopeck~~

~~, Shirin A. Engera,^{d,e}~~

~~^a Medical Physics Unit, McGill University, Montreal, Quebec H4A 3J1, Canada~~

~~^b Department of Physics and Biomedical Engineering, CHUM, Montreal, Quebec H2C0X1, Canada~~

~~^c Department of Radiation Oncology, McGill University Health Centre, Montreal, Quebec H4A 3J1, Canada~~

~~^d Department of Oncology, McGill University, Montreal, Quebec, H4A 3J1, Canada~~

~~^e Research Institute of the McGill University Health Centre, Montreal, Quebec H3H 2L9, Canada~~

~~<https://ejnm.mires.springeropen.com/articles/10.1186/s13550-021-00764-z>~~

~~The value of yttrium-90 PET/CT after hepatic radioembolization: a pictorial essay~~

~~Ahmed A. Alsultan, Maarten L. J. Smits, Maarten W. Barentsz, Arthur J. A. T. Braat & Marnix G. E. H. Lam~~

~~Clinical and Translational Imaging volume 7, pages 303–312 (2019) Cite this article~~

Reviewed / Approved by NIA Clinical Guideline Committee

GENERAL INFORMATION

It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.

Disclaimer: Magellan Healthcare service authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Magellan Healthcare subsidiaries including, but not limited to, National Imaging Associates (“Magellan”). The policies constitute only the reimbursement and coverage guidelines of Magellan. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. Magellan reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.