Effective for dates of service on or after April 1, 2013, refer to:
https://www.bcbsal.org/providers/policies/careCore.cfm

Name of Policy:
Positron Emission Tomography (PET)-Miscellaneous Applications

Policy #: 121       Latest Review Date: February 2013
Category: Radiology       Policy Grade: B

Background/Definitions:
As a general rule, benefits are payable under Blue Cross and Blue Shield of Alabama health plans only in cases of medical necessity and only if services or supplies are not investigational, provided the customer group contracts have such coverage.

The following Association Technology Evaluation Criteria must be met for a service/supply to be considered for coverage:

1. The technology must have final approval from the appropriate government regulatory bodies;
2. The scientific evidence must permit conclusions concerning the effect of the technology on health outcomes;
3. The technology must improve the net health outcome;
4. The technology must be as beneficial as any established alternatives;
5. The improvement must be attainable outside the investigational setting.

Medical Necessity means that health care services (e.g., procedures, treatments, supplies, devices, equipment, facilities or drugs) that a physician, exercising prudent clinical judgment, would provide to a patient for the purpose of preventing, evaluating, diagnosing or treating an illness, injury or disease or its symptoms, and that are:

1. In accordance with generally accepted standards of medical practice; and
2. Clinically appropriate in terms of type, frequency, extent, site and duration and considered effective for the patient’s illness, injury or disease; and
3. Not primarily for the convenience of the patient, physician or other health care provider; and
4. Not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient’s illness, injury or disease.
Description of Procedure or Service:
Standard radiologic techniques, such as computed tomography (CT) and magnetic resonance imaging (MRI) are not able to image biochemical reactions and physiological function. However, Positron Emission Tomography (PET) does image biochemical reactions and physiological function. Concentrations of radioactive chemicals that are partially metabolized in the body region of interest are measured.

Radiopharmaceuticals, which are used for PET, are generated in a cyclotron or nuclear generator and then placed into the body by respiration or by intravenous injection. The PET imaging scanners used are similar to the scanners used for x-ray computed tomography. The technology, computerized mathematical models of physiologic functions and tracer kinetics for the generation of image requirements, are more complicated for PET.

*Note: Oncologic PET scans are more common. These are considered separately in the Oncologic Applications of Positron Emission Tomography (PET) Scanning policy (Policy #40). This policy focuses primarily on neurologic and psychiatric disorders. This policy addresses the use of radiotracers detected with the use of dedicated PET scanners.

Policy:
Effective for dates of service on or after July 8, 2008 through March 31, 2013:
Positron emission tomography (PET) using 2-[fluorine-18]-fluoro-2-deoxy-D-glucose (FDG) meets the Blue Cross and Blue Shield of Alabama medical criteria for coverage for detection of and follow-up of disease activity in sarcoidosis (ICD-9 code: 135).

Positron emission tomography (PET) using 2-[fluorine-18]-fluoro-2-deoxy-D-glucose (FDG) meets the Blue Cross and Blue Shield of Alabama medical criteria for coverage in the assessment of selected patients with epileptic seizures (ICD-9 codes: 345.00-345.91) who are candidates for surgery.

Effective for dates of service on or after February 17, 2004 through March 31, 2013:
Positron emission tomography (PET) using 2-[fluorine-18]-fluoro-2-deoxy-D-glucose (FDG) meets the Blue Cross and Blue Shield of Alabama medical criteria for coverage for patients with chronic granulomatous disease. (ICD-9 code: 288.1)

Effective for dates of service on or after January 4, 2005 through March 31, 2013:
Positron emission tomography (PET) using 2-[fluorine-18]-fluoro-2-deoxy-D-glucose (FDG) meets the Blue Cross and Blue Shield of Alabama medical criteria for coverage for the assessment of pheochromocytoma when urine and serum catecholamine levels are elevated, but the tumor has not been localized with MRI (ICD-9 codes: 227.0 and 194.0).

Effective for dates of service on or after April 1, 2006 through March 31, 2013:
Positron emission tomography (PET) scanning meets Blue Cross and Blue Shield of Alabama’s medical criteria for coverage for patients with suspected Huntington’s chorea when:
• Magnetic resonance imaging (MRI) is nondiagnostic for Huntington’s chorea; and
• Genetic testing is not available or the patient refuses genetic testing.
In addition to the above indications effective for dates of service on or after March 1, 2007 through March 31, 2013:

Positron emission tomography (PET) scanning meets Blue Cross and Blue Shield of Alabama’s medical criteria for coverage for the following conditions when medically necessary and supported by clinical and laboratory findings:

- Chronic cerebrovascular disorders when extracranial-intercranial bypass surgery (EC-IC bypass) is indicated

Individual case consideration will be given to patients with conditions not described above. Clinical notes will be required for review.

PET for all other indications (except oncologic applications as discussed above) is considered investigational, including, but not limited to:

CNS Diseases

1. Autoimmune disorders with CNS manifestations
   a. Behcet’s syndrome (ICD-9 code: 136.1)
   b. Lupus erythematosus (ICD-9 codes: 695.4 and 710.0)

2. Cerebrovascular diseases
   a. Arterial occlusive disease (arteriosclerosis, atherosclerosis) (ICD-9 codes: 433.00-434.91)
   b. Carotid artery disease (ICD-9 codes: 433.10-433.11)
   c. Cerebral aneurysm (ICD-9 code: 747.81)
   d. Cerebrovascular malformations (AVM and Moya Moya disease) (ICD-9 code: 747.81)
   e. Hemorrhage (ICD-9 code: 459.0)
   f. Infarct (ICD-9 code: 434.91)
   g. Ischemia (ICD-9 code: 437.1)

3. Degenerative motor neuron diseases
   a. Amyotrophic lateral sclerosis (ICD-9 code: 335.20)
   b. Friedreich’s ataxia (ICD-9 code: 334.0)
   c. Olivopontocerebellar atrophy (ICD-9 code: 333.0)
   d. Parkinson’s disease (ICD-9 code: 332.0)
   e. Progressive supranuclear palsy (ICD-9 code: 333.0)
   f. Shy-Drager syndrome (ICD-9 code: 333.0)
   g. Spinocerebellar degeneration
   h. Steele-Richardson-Olszewski disease (ICD-9 code: 333.0)
   i. Tourette’s syndrome (ICD-9 code: 307.23)

4. Demyelinating diseases
   a. Multiple sclerosis (ICD-9 code: 340)
5. Developmental, congenital, or inherited disorders
   a. Adrenoleukodystrophy
   b. Down’s syndrome (ICD-9 code: 758.0)
   c. Huntington’s chorea (ICD-9 code: 333.4) (Effective April 1, 2006). See above criteria
   d. Kinky-hair disease (Menkes’ syndrome) (ICD-9 code: 759.89)
   e. Sturge-Weber syndrome (encephalofacial angiomatosis) and the phakomatoses (ICD-9 code: 759.6)

6. Nutritional or metabolic diseases and disorders
   a. Acanthocytes (ICD-9 codes: 701.2 and 530.89)
   b. Hepatic encephalopathy (ICD-9 code: 572.2)
   c. Hepatolenticular degeneration (ICD-9 code: 275.1)
   d. Metachromatic leukodystrophy (ICD-9 code: 330.0)
   e. Mitochondrial disease
   f. Subacute necrotizing encephalomyelopathy (ICD-9 codes: 349.9 and 330.8)

7. Psychiatric diseases and disorders
   a. Affective disorders (ICD-9 codes: 296.81, 296.90-296.99)
   b. Depression (ICD-9 codes: 311, 296.20-296.26, 296.30-296.36, 313.1, 300.4, 298.0, 309.0, 309.1)
   c. Obsessive-compulsive disorder (ICD-9 code: 330.3)
   d. Psychomotor disorders (ICD-9 codes: 307.9 and 300.11)
   e. Schizophrenia (ICD-9 codes: 295-295.95)

8. Pyogenic infections
   a. Aspergillosis (ICD-9 code: 117.9)
   b. Encephalitis (ICD-9 code: 323.9)

9. Substance abuse
   a. CNS effects of alcohol, cocaine, and heroin (ICD-9 codes: 303.00-303.93, 304.00-304.93)

10. Trauma
    a. Brain injury (ICD-9 codes: 851.00-854.19)
    b. Carbon monoxide poisoning (ICD-9 code: 986)

11. Viral infections
    a. Acquired immune deficiency syndrome (AIDS) (ICD-9 code: 042)
    b. AIDS dementia complex (ICD-9 codes: 042 and 294.11)
    c. Creutzfeldt-Jakob syndrome (ICD-9 code: 046.1, effective October 1, 2008, 046.11, 046.19)
    d. Progressive multifocal leukoencephalopathy (ICD-9 code: 046.3)
    e. Progressive rubella encephalopathy (ICD-9 code: 056.01)
    f. Subacute sclerosing panencephalitis (ICD-9 code: 046.2)
12. Migraine (ICD-9 code: 346-346.2, 346.8, 346.9, 625.4)
13. Anorexia nervosa (ICD-9 code: 307.1)
14. Cerebral blood flow in newborns
15. Alzheimer’s Disease (ICD-9: 294.10, 294.11, 331.0, 331.2)

Pulmonary Diseases
1. Adult respiratory distress syndrome (ICD-9 code: 518.5)
2. Diffuse panbronchiolitis
3. Emphysema (ICD-9 code: 492.8)
4. Obstructive lung disease (ICD-9 code: 496)
5. Pneumonia (ICD-9 code: 486)

Blue Cross and Blue Shield of Alabama does not approve or deny procedures, services, testing, or equipment for our members. Our decisions concern coverage only. The decision of whether or not to have a certain test, treatment or procedure is one made between the physician and his/her patient. Blue Cross and Blue Shield of Alabama administers benefits based on the members' contract and corporate medical policies. Physicians should always exercise their best medical judgment in providing the care they feel is most appropriate for their patients. Needed care should not be delayed or refused because of a coverage determination.

Key Points:
As a molecular diagnostic imaging modality, PET can detect rates of biological activity, as contrasted with other imaging modalities such as x-ray films, computed tomography (CT) and magnetic resonance imaging (MRI), which depict the anatomical location of both normal and abnormal structures in the body.

There are essentially three separate activities involved in a PET scan:
1. Manufacture of the radiopharmaceutical, which may be manufactured on site, or manufactured at a regional delivery center with delivery to the institution performing PET
2. Actual performance of the PET scan
3. Interpretation of the results

The purpose for patients receiving a PET examination is to avoid subjecting the patient to extended pre-operative electroencephalographic recording with implanted electrodes.

Patients with complex partial seizures that have failed to respond to medical therapy and have been advised to have a resection of a suspected epileptogenic focus located in a region of the brain accessible to surgery are considered appropriate candidates. Seizure localization conventional techniques must have been tried and provided data that suggested a seizure focus, but were not sufficiently conclusive to permit surgery.
The advances in PET have had an impact on the evaluation of neurologic disease. The most significant development in PET radiotracer technology has been the production and subsequent automation of $[^{18}\text{F}]$-fluorodeoxyglucose (FDG). This radiotracer is useful in the evaluation of regional glucose metabolism in neurologic disorders. FDG is able to cross the blood-brain barrier and its distribution in the brain is proportional to regional metabolic activity in the brain.

Chronic granulomatous disease (CGD) is a rare syndrome (one person in 500,000) caused by metabolic defects that selectively impair the intracellular killing mechanisms of phagocytes, resulting in immunodeficiency. Because of the central role of superoxide and other respiratory burst products in microbial killing, patients with CGD have severe, recurrent bacterial and fungal infections.

In most cases, the immunodeficiency of CGD is evident during infancy or early childhood, but onset has been reported as late as age 16 years. Affected patients present with severe recurrent lymphadenitis and infection of the oropharynx, skin, gastrointestinal tract, and respiratory system. Because surgical incisions and wounds often heal poorly, open diagnostic procedures in these patients should be avoided.

Published studies have shown that in children with CGD who have an inherited deficiency of nicotinamide adenine dinucleotide phosphate, reduced oxidase with diminution of the respiratory burst, FDG intake in increased in active infective lesions. After tissue sequestration, neutrophil priming, cell shape change, and phagocytosis can lead to increased glucose metabolism which is measured by FDG uptake. Gungor et al found that computed tomography (CT) does not discriminate between active and inactive lesions. Whole body FDG PET can be used to screen for active infective lesions in CGD patients. In addition, Theobald and colleagues found that FDG-PET is a useful tool in screening for the spread of CGD as well as evaluating disease activity.

Pheochromocytoma (PHEO) is a rare chromaffin cell tumor that produces catecholamines. Ninety-eight percent of tumors occur in the abdomen (mainly the adrenal medulla) and pelvis; less than 2% occur in the chest; and about 0.2% in the neck. Manifestations may include sustained or paroxysmal hypertension, headaches, palpitations, sweating, tremor, and hyperglycemia. Of these tumors, 10-33% are malignant and metastases may occur in the lungs, liver, lymph nodes and bone.

The standard biochemical screening tests include measurement of plasma and/or urine catecholamines and/or their metabolites. The radiographic imaging procedures MRI and CT scan are used to locate the PHEO or metastatic disease. These studies have a high sensitivity of detecting PHEOs ≥ 1 cm, but less than optimal specificity. The nuclear medicine imaging study used in the work up is either $[^{131}\text{I}]$ or $[^{123}\text{I}]$ metalobezylgluanidine (MIBG). The scintigraphy is done after 24 to 48 hours. However, not all PHEOs concentrate MIBG and MIBG uptake can be adversely affected by a variety of medications.

Positron emission tomography (PET) has also been used in the evaluation for PHEO. The PET scan uses either 2-$[^{18}\text{F}]$ fluoro-2-deoxy-D-glucose (FDG), carbon 11 (11C) hydroxyephedrine, fluorine 18 (18 F) dihydroxyphenylalanine (DOPA), or 6-$[^{18}\text{F}]$-
fluorodopamine (DA). PET has the advantages of low radiation exposure and superior spatial resolution, although the cost and limited availability of the radiopharmaceuticals and PET equipment still limit its widespread use.

Shulkin, B, et al (1999), reported on 29 patients with pheochromocytoma who underwent FDG PET and MIBG scintigraphy. The results showed 22 of 29 patients had tumor uptake of FDG. Most benign (7 of 12) and most malignant (15 of 17) tumors concentrated FDG. There were 4 patients whose tumors failed to accumulate MIBG, but showed intense uptake of FDG. The authors concluded that most PHEOs accumulate FDG.

Hoegerie, et al (2002), reported on 14 patients suspected of having pheochromocytomas who underwent PET with (18-F) DOPA and MRI. The results showed MRI detected 17 tumors with PET having concordant results. In contrast, MIBG scintigraphy had false-negative results in 5 patients. The authors concluded that (18-F) DOPA PET is highly sensitive and specific for detection of pheochromocytomas.

Ilias, et al (2003), reported on 16 patients with metastatic PHEO who underwent CT, MRI [18F]-DA PET scanning and [131 I]-MIBG scintigraphy. Out of 16 patients, 15 patients had positive findings on CT and/or MRI consistent with pheochromocytoma. The PET scan was positive in all 16 patients, but the MIBG study was positive in only 9 of 16 patients. There were 38 foci of uptake by both PET and MIBG, 90 by PET only, and 10 by MIBG only. The authors concluded that in this study, PET was superior to MIBG in detecting metastatic PHEO. They also noted that [18 F]-DA PET scanning is currently available only at NIH.

Huntington's disease, an inherited, progressive neurodegenerative disorder, is probably the best known of the trinucleotide repeat diseases. Symptoms of HD include abnormal movements, cognitive impairment leading to dementia, and psychiatric illness. Its autosomal dominant pattern of inheritance was recognized first by George Huntington in his classic paper describing the disorder. Prevalence of HD is estimated at approximately 5 cases per 100,000 people. The disorder is seen less commonly among those of non-European ancestry. Typically, onset is in the 30s or 40s, although onset as early as age 2 and well into the 80s has been reported.

PET can use a number of ligands other than glucose, and these applications are of particular interest in neurological disorders involving neurotransmitter abnormalities. Parkinson's disease and Huntington's disease are the prototypical examples of such conditions, but dystonias and other movement disorders have also been studied with PET. To study the activity of the nigrostriatal dopaminergic system, fluorodopa (a derivative of levodopa) is typically used. In Huntington's disease, most PET attention has focused on its putative utility in preclinical detection and the monitoring of clinical disease progression.

Published trials indicate that PET is useful in the management of patients with sarcoidosis. Whole-body imaging with PET allows the detection of clinically silent sites or unsuspected lesions. With the exception of the rare instance where the clinical findings are very specific for sarcoidosis, final diagnosis will require a tissue biopsy and whole body FDG PET scans are proving to be very sensitive in the identification of occult diagnostic biopsy sites. FDG-PET is also useful in monitoring the response to treatment.
**Key Words:**
Positron emission tomography, PET, FDG-PET

**Approved by Governing Bodies:**
FDA approved

**Benefit Application:**
Coverage is subject to member’s specific benefits. Group specific policy will supersede this policy when applicable.

**ITS:** Home Policy provisions apply
**BellSouth/AT&T contracts:** No special consideration
**FEP contracts:** FEP does not consider investigational. Will be reviewed for medical necessity
**Wal-Mart contracts:** Special benefit consideration may apply. Refer to member’s benefit plan.

**Pre-certification requirements:** Effective for dates of service on or after November 1, 2007, required when ordered by a provider in a Blue Cross and Blue Shield of Alabama’s Preferred or Participating Network for a patient covered by Blue Cross and Blue Shield of Alabama who will receive outpatient imaging service(s) from a Preferred Medical Doctor (PMD) or Preferred Radiology Participating (PRP) provider.

**Exceptions to the Alabama PMD and PRP pre-certification requirement:** NASCO, Wal-Mart, Blue Advantage, Flowers Foods, Inc., FEP.

In addition to the above Blue Cross and Blue Shield of Alabama PMD/PRP Network requirement, **some self-insured national account groups** may require pre-certification for all MRIs effective for dates of service on or after January 1, 2009. Please confirm during your benefit verification process if a pre-certification is required.

**Coding:**
**CPT codes:**
- 78608 Brain imaging, PET scan; metabolic evaluation
- 78609 Brain imaging, PET scan; perfusion evaluation
- 78811 Positron emission tomography (PET) imaging; limited area (eg, chest, head/neck)
- 78812 Positron emission tomography (PET) imaging; skull base to mid-thigh
- 78813 Positron emission tomography (PET) imaging; whole body
- 78814 Positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization imaging; limited area (eg, chest, head/neck)
Positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization imaging; skull base to mid-thigh

Positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization imaging; whole body

References:

**Policy History:**

TEC Assessment, 1994
TEC Assessment, 1995
Medical Policy Group, April 1996
TEC Assessment, 1997
Medical Policy Group, February 2001 (2)
Medical Policy Group, June 2003 (2)
Medical Policy Administration Committee, June 2003
Available for comment July 28-September 10, 2003
Medical Policy Group, February 2004
Medical Policy Administration Committee, February 2004
Available for comment February 27-April 12, 2004
Medical Policy Group, January 2005 (3)
Medical Policy Administration Committee, February 2005
Available for comment February 14-March 30, 2005
Medical Policy Group, June 2005 (1)
Medical Policy Group, February 2006 (2)
Medical Policy Administration Committee, February 2006
Available for comments February 13-March 31, 2006
Medical Policy Group, January 2007 (2)
Medical Policy Administration Committee, January 2007
Available for comments, January 30-March 8, 2007
Medical Policy Group, July 2008 (2)
Medical Policy Administration Committee, August 2008
Available for comment July 17-August 30, 2008
Medical Policy Group, December 2008 (2)
Medical Policy Group, December 2010 (1)
Medical Policy Group, February 2013 (2) Updated policy with link to CareCore National©
medical policies effective April 1, 2013
Medical Policy Administration Committee, March 2013
Available for comment February 15 through March 31, 2013
Medical Policy Group, November 2013 (2): Updated link to CareCore National©

This medical policy is not an authorization, certification, explanation of benefits, or a contract. Eligibility and benefits are determined on a case-
by-case basis according to the terms of the member’s plan in effect as of the date services are rendered. All medical policies are based on (i) 
research of current medical literature and (ii) review of common medical practices in the treatment and diagnosis of disease as of the date 
hereof. Physicians and other providers are solely responsible for all aspects of medical care and treatment, including the type, quality, and 
levels of care and treatment.

This policy is intended to be used for adjudication of claims (including pre-admission certification, pre-determinations, and pre-procedure 
review) in Blue Cross and Blue Shield’s administration of plan contracts.