



# MASSACHUSETTS

Blue Cross Blue Shield of Massachusetts is an Independent Licensee of the Blue Cross and Blue Shield Association

## Medical Policy

# Dopamine Transporter Imaging with Single Photon Emission Computed Tomography

### Table of Contents

- [Policy: Commercial](#)
- [Policy: Medicare](#)
- [Authorization Information](#)
- [Coding Information](#)
- [Description](#)
- [Policy History](#)
- [Information Pertaining to All Policies](#)
- [References](#)

### Policy Number: 918

BCBSA Reference Number: 6.01.54 (For Plan internal use only)

NCD/LCD: N/A

### Related Policies

Deep Brain Stimulation, #473

### Policy

## Commercial Members: Managed Care (HMO and POS), PPO, and Indemnity Medicare HMO Blue<sup>SM</sup> and Medicare PPO Blue<sup>SM</sup> Members

Dopamine transporter imaging with single-photon emission computed tomography may be considered **MEDICALLY NECESSARY** when used for individuals with:

- clinically uncertain Parkinson disease; or
- clinically uncertain dementia with Lewy bodies.

Use of dopamine transporter imaging with single-photon emission computed tomography is considered **INVESTIGATIONAL** for all other indications not included above.

### Prior Authorization Information

#### Inpatient

- For services described in this policy, precertification/preauthorization **IS REQUIRED** for all products if the procedure is performed **inpatient**.

#### Outpatient

- For services described in this policy, see below for products where prior authorization **might be required** if the procedure is performed **outpatient**.

	Outpatient
Commercial Managed Care (HMO and POS)	Prior authorization is <b>not required</b> .
Commercial PPO and Indemnity	Prior authorization is <b>not required</b> .
Medicare HMO Blue <sup>SM</sup>	Prior authorization is <b>not required</b> .
Medicare PPO Blue <sup>SM</sup>	Prior authorization is <b>not required</b> .

## CPT Codes / HCPCS Codes / ICD Codes

Inclusion or exclusion of a code does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage as it applies to an individual member.

Providers should report all services using the most up-to-date industry-standard procedure, revenue, and diagnosis codes, including modifiers where applicable.

The following codes are included below for informational purposes only; this is not an all-inclusive list.

The above **medical necessity criteria MUST** be met for the following codes to be covered for Commercial Members: Managed Care (HMO and POS), PPO, Indemnity, Medicare HMO Blue and Medicare PPO Blue:

### HCPCS Codes

HCPCS codes:	Code Description
A9584	Iodine I-123 ioflupane, diagnostic, per study dose, up to 5 millicuries

The following ICD Diagnosis Codes are considered medically necessary when submitted with the HCPCS code above if **medical necessity criteria** are met:

### ICD-10 Diagnosis Coding

ICD-10-CM-diagnosis codes:	Code Description
F02.80	Dementia in other diseases classified elsewhere without behavioral disturbance
F02.811	Dementia in other diseases classified elsewhere, unspecified severity, with agitation
F02.818	Dementia in other diseases classified elsewhere, unspecified severity, with other behavioral disturbance
G20.A1	Parkinson's disease without dyskinesia, without mention of fluctuations
G20.A2	Parkinson's disease without dyskinesia, with fluctuations
G20.B1	Parkinson's disease with dyskinesia, without mention of fluctuations
G20.B2	Parkinson's disease with dyskinesia, with fluctuations
G20.C	Parkinsonism, unspecified
G21.9	Secondary parkinsonism, unspecified
G31.83	Dementia with Lewy bodies
R25.0	Abnormal head movements
R25.1	Tremor, unspecified
R25.8	Other abnormal involuntary movements
R25.9	Unspecified abnormal involuntary movements
R26.0	Ataxic gait
R26.2	Difficulty in walking, not elsewhere classified
R26.89	Other abnormalities of gait and mobility
R26.9	Unspecified abnormalities of gait and mobility
R41.89	Other symptoms and signs involving cognitive functions and awareness
R41.9	Unspecified symptoms and signs involving cognitive functions and awareness

## Description

### Parkinsonian Syndromes

Parkinsonian syndromes are a group of diseases that share similar cardinal signs, characterized by bradykinesia, rigidity, resting tremor, and gait disturbance. Parkinson disease (PD) is the most common cause of parkinsonism.

Despite the well-known symptoms of PD, diagnosis is challenging even for experienced clinicians, particularly in the early stages of the disease. In addition, other etiologies such as essential tremor, corticobasal degeneration, multiple system atrophy, progressive supranuclear palsy, vascular parkinsonism, and drug-induced parkinsonism can lead to a similar set of symptoms. One recent approach to improve the accuracy of clinical diagnosis of PD and other parkinsonian syndromes is to evaluate the integrity of dopaminergic pathways in the brain using dopamine transporter imaging with single-photon emission computed tomography (DaT-SPECT) imaging.

### **Dementia with Lewy Bodies**

Dementia with Lewy bodies is a type of dementia characterized by parkinsonism, visual hallucinations, cognitive fluctuation, sleep disorders, and severe neuroleptic sensitivity. Dementia with Lewy bodies is the second most common form of degenerative dementia; Alzheimer disease, which can have similar symptoms at onset, is the most common.

Diagnosis can be challenging, particularly when patients have multiple comorbidities including cerebrovascular disease and/or Alzheimer disease.<sup>1</sup> As with PD, dementia with Lewy bodies is characterized by the degeneration of nigrostriatal neurons; as such, DaT-SPECT is also proposed to differentiate dementia with Lewy bodies from Alzheimer disease.

### **Dopamine Transporter Imaging with Single-photon Emission Computed Tomography (DaT-SPECT)**

DaT-SPECT is based on the selective affinity of dopamine transporter (DaT) ligands for dopamine-synthesizing neurons, which allows visualization of deficits in the nigrostriatal dopaminergic pathway.

DaT ligands include iodine 123I-2β-carbomethoxy-3β-(4-iodophenyl) tropane (<sup>123</sup>I-β-CIT), which is a cocaine analogue with an affinity for both dopamine and serotonin transporters. Intravenous <sup>123</sup>I-β-CIT requires a delay between injection and scan of about 24 hours. Iodine-123 N-(3-fluoropropyl)-2β-carbomethoxy-3β-(4-iodophenyl) nortropane (<sup>123</sup>I-FP-CIT) is a fluoropropyl derivate of β-CIT that is selective for brain striatal DaT but can also bind to the serotonin transporter. Intravenous <sup>123</sup>I-FP-CIT can be injected 3 to 6 hours before the scan (DaTscan). Other SPECT ligands with affinity for dopamine transporter include technetium 99m (2β((N,Nϕ-bis(2-mercaptoethyl) ethylene diamino)methyl) and 3β-(4-chlorophenyl) tropane (<sup>99m</sup>Tc-TRODAT-1).<sup>2,3</sup>

Binding of ligands with an affinity for DaT ligands in the striatum is, in general, reduced in PD, genetic parkinsonism, dementia with Lewy bodies, corticobasal degeneration, progressive supranuclear palsy, and multiple system atrophy. In contrast, striatal DaT ligand binding is expected to be within the normal range of Alzheimer disease, essential tremor, dystonic tremor, orthostatic tremor, drug-induced parkinsonism, and psychogenic parkinsonism.<sup>2</sup>

Visualization of striatal dopamine transporter binding, through DaT-SPECT, permits assessment of presynaptic dopaminergic deficit. It is proposed that an abnormal DaT-SPECT scan supports the diagnosis of PD, dementia with Lewy bodies, or other neurodegenerative parkinsonian syndromes, while a normal DaT-SPECT scan in a symptomatic patient supports the diagnosis of a disease not affecting the nigrostriatal dopaminergic pathway.

Analysis of DaT-SPECT images can be visual, semiquantitative, or quantitative. In patients with PD, physical symptoms start after 30% to 50% of dopaminergic neurons have degenerated.<sup>4,5</sup> Symptomatic patients with PD would be thus expected to have sufficient abnormality on DaT-SPECT for visual analysis to be adequate for interpretation. A variety of methods are being tested to improve the validity and reliability of ratings, including commercially available software to define the region of interest for analysis and the development of an atlas for visual interpretation. Several research centers are developing quantitative and semiquantitative classification methods for the evaluation of DaT-SPECT images.<sup>6,7,8,9</sup>

Anatomic variation in the brain, including vascular lesions, may interfere with the distribution of the iodine-123 tracer and could result in an abnormal scan.<sup>10</sup> Dopamine agonists and levodopa may also affect DaT expression, which could influence the ability of DaT-SPECT to monitor the progression of disease unless

these agents are discontinued prior to imaging. Patients with clinically diagnosed PD or dementia with Lewy bodies, who present with a normal DaT-SPECT scan, are referred to in the literature as having "scans without evidence of dopaminergic deficit." While many of these patients are ultimately diagnosed with non-PD syndromes, a portion of patients with normal DaT-SPECT imaging are confirmed to have PD or dementia with Lewy bodies by the reference standard. In studies where clinical diagnosis is used as an endpoint, scans without evidence of dopaminergic deficit are present in 3% to 20% of PD patients.<sup>11</sup> In a study of patients clinically diagnosed with dementia with Lewy bodies, van der Zande et al (2016) found that 10% of these patients had normal scans.<sup>12</sup> Further research may shed light on these cases.

## Summary

Dopamine transporter imaging with single-photon emission computed tomography (DaT-SPECT), using radiopharmaceutical ioflupane injection, is a neuroimaging modality being evaluated to improve the differential diagnosis of parkinsonian syndromes from nonparkinsonian tremor, as well as dementia with Lewy bodies from Alzheimer disease.

### Summary of Evidence

For individuals who have clinically uncertain Parkinson disease (PD) who receive dopamine transporter imaging with single-photon emission computed tomography (DaT-SPECT), the published evidence includes randomized controlled trials (RCTs), cohort studies, and case series. Relevant outcomes are symptoms, functional outcomes, and treatment-related mortality and morbidity. In populations with clinically apparent PD, studies of diagnostic accuracy have reported high sensitivity and specificity for PD. Studies of clinical validity in the target population of clinically uncertain PD are limited by gaps in study design, conduct, and relevance. Evidence on clinical utility in the target population includes an RCT showing no significant difference in outcomes over time between patients who received a DaT-SPECT scan and those who did not. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have clinically uncertain dementia with Lewy bodies who receive DaT-SPECT, the published evidence includes RCTs, cohort studies, and case series. Relevant outcomes are symptoms, functional outcomes, and treatment-related mortality and morbidity. No studies with the optimal reference standard to assess clinical validity have been performed in the target population of clinically uncertain dementia with Lewy bodies. No studies have directly evaluated the effect of DaT-SPECT on health outcomes in the target population. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

## Policy History

Date	Action
12/2024	Annual policy review. Description, summary, and references updated. Policy statements unchanged.
12/2023	Annual policy review. No references added. Policy statements unchanged.
10/2023	Clarified coding information.
12/2022	Annual policy review. No references added. Policy statements unchanged.
10/2022	Clarified coding information.
12/2021	Annual policy review. Description, summary, and references updated. Policy statements unchanged.
1/2021	Annual policy review. Description, summary, and references updated. Policy statements unchanged.
1/2020	Clarified coding information.
10/2019	Annual policy review. Description, summary, and references updated. Policy statements unchanged.
4/2019	Annual policy review. New medically necessary indications described for clinically uncertain Parkinson disease and clinically uncertain dementia with Lewy bodies. Clarified coding information. Effective 4/1/2019.
11/2017	Annual policy review. New references added.
10/2016	Annual policy review. New references added.

1/2016	Annual policy review. New references added.
12/2015	Added coding information.
9/2014	Annual policy review. New references added.
10/2013	Annual policy review. New references added.
2/2013	New policy describing non-coverage.

## Information Pertaining to All Blue Cross Blue Shield Medical Policies

Click on any of the following terms to access the relevant information:

[Medical Policy Terms of Use](#)

[Managed Care Guidelines](#)

[Indemnity/PPO Guidelines](#)

[Clinical Exception Process](#)

[Medical Technology Assessment Guidelines](#)

## References

1. Elahi FM, Miller BL. A clinicopathological approach to the diagnosis of dementia. *Nat Rev Neurol*. Aug 2017; 13(8): 457-476. PMID 28708131
2. Kägi G, Bhatia KP, Tolosa E. The role of DAT-SPECT in movement disorders. *J Neurol Neurosurg Psychiatry*. Jan 2010; 81(1): 5-12. PMID 20019219
3. Levine CB, Fahrback KR, Siderowf AD, et al. Diagnosis and Treatment of Parkinsons Disease: A Systematic Review of the Literature (Evidence Report/Technology Assessment No. 57). Rockville, MD: Agency for Healthcare Research and Quality; 2003
4. Burke RE, O'Malley K. Axon degeneration in Parkinson's disease. *Exp Neurol*. Aug 2013; 246: 72-83. PMID 22285449
5. Fahn S, Oakes D, Shoulson I, et al. Levodopa and the progression of Parkinson's disease. *N Engl J Med*. Dec 09 2004; 351(24): 2498-508. PMID 15590952
6. Prashanth R, Roy SD, Mandal PK, et al. High-Accuracy Classification of Parkinson's Disease Through Shape Analysis and Surface Fitting in 123I-Ioflupane SPECT Imaging. *IEEE J Biomed Health Inform*. May 2017; 21(3): 794-802. PMID 28113827
7. Skanjeti A, Castellano G, Elia BO, et al. Multicenter Semiquantitative Evaluation of (123)I-FP-CIT Brain SPECT. *J Neuroimaging*. 2015; 25(6): 1023-9. PMID 25923060
8. Ueda J, Yoshimura H, Shimizu K, et al. Combined visual and semi-quantitative assessment of 123 I-FP-CIT SPECT for the diagnosis of dopaminergic neurodegenerative diseases. *Neurol Sci*. Jul 2017; 38(7): 1187-1191. PMID 28389938
9. Booij J, Dubroff J, Pryma D, et al. Diagnostic Performance of the Visual Reading of 123 I-Ioflupane SPECT Images With or Without Quantification in Patients With Movement Disorders or Dementia. *J Nucl Med*. Nov 2017; 58(11): 1821-1826. PMID 28473597
10. Nuvoli S, Spanu A, Piras MR, et al. 123I-ioflupane brain SPECT and 123I-MIBG cardiac planar scintigraphy combined use in uncertain parkinsonian disorders. *Medicine (Baltimore)*. May 2017; 96(21): e6967. PMID 28538394
11. Erro R, Schneider SA, Stamelou M, et al. What do patients with scans without evidence of dopaminergic deficit (SWEDD) have? New evidence and continuing controversies. *J Neurol Neurosurg Psychiatry*. Mar 2016; 87(3): 319-23. PMID 25991401
12. van der Zande JJ, Booij J, Scheltens P, et al. [(123)I]FP-CIT SPECT scans initially rated as normal became abnormal over time in patients with probable dementia with Lewy bodies. *Eur J Nucl Med Mol Imaging*. Jun 2016; 43(6): 1060-6. PMID 26830298
13. GE Healthcare. DaTscan Ioflupane I123 Injection Full Prescribing Information. 2022; <https://www.gehealthcare.com/products/nuclear-imaging-agents/datscan>. Accessed August 28, 2024.
14. Bhatia KP, Bain P, Bajaj N, et al. Consensus Statement on the classification of tremors. from the task force on tremor of the International Parkinson and Movement Disorder Society. *Mov Disord*. Jan 2018; 33(1): 75-87. PMID 29193359
15. Postuma RB, Berg D, Stern M, et al. MDS clinical diagnostic criteria for Parkinson's disease. *Mov Disord*. Oct 2015; 30(12): 1591-601. PMID 26474316
16. Rizzo G, Copetti M, Arcuti S, et al. Accuracy of clinical diagnosis of Parkinson disease: A systematic review and meta-analysis. *Neurology*. Feb 09 2016; 86(6): 566-76. PMID 26764028

17. Scherfler C, Schwarz J, Antonini A, et al. Role of DAT-SPECT in the diagnostic work up of parkinsonism. *Mov Disord.* Jul 15 2007; 22(9): 1229-38. PMID 17486648
18. Tu XJ, Hwang WJ, Ma HI, et al. Determinants of generic and specific health-related quality of life in patients with Parkinson's disease. *PLoS One.* 2017; 12(6): e0178896. PMID 28650957
19. Hastings A, Cullinane P, Wrigley S, et al. Neuropathologic Validation and Diagnostic Accuracy of Presynaptic Dopaminergic Imaging in the Diagnosis of Parkinsonism. *Neurology.* Jun 11 2024; 102(11): e209453. PMID 38759132
20. Marshall VL, Reiningner CB, Marquardt M, et al. Parkinson's disease is overdiagnosed clinically at baseline in diagnostically uncertain cases: a 3-year European multicenter study with repeat [<sup>123</sup>I]FP-CIT SPECT. *Mov Disord.* Mar 15 2009; 24(4): 500-8. PMID 19117369
21. Vlaar AM, de Nijs T, Kessels AG, et al. Diagnostic value of 123I-ioflupane and 123I-iodobenzamide SPECT scans in 248 patients with parkinsonian syndromes. *Eur Neurol.* 2008; 59(5): 258-66. PMID 18264015
22. Kupsch AR, Bajaj N, Weiland F, et al. Impact of DaTscan SPECT imaging on clinical management, diagnosis, confidence of diagnosis, quality of life, health resource use and safety in patients with clinically uncertain parkinsonian syndromes: a prospective 1-year follow-up of an open-label controlled study. *J Neurol Neurosurg Psychiatry.* Jun 2012; 83(6): 620-8. PMID 22492213
23. Kupsch A, Bajaj N, Weiland F, et al. Changes in clinical management and diagnosis following DaTscan SPECT imaging in patients with clinically uncertain parkinsonian syndromes: a 12-week follow-up study. *Neurodegener Dis.* 2013; 11(1): 22-32. PMID 22571977
24. Hauser RA, Bajaj N, Marek K, et al. Sensitivity, specificity, positive and negative predictive values and diagnostic accuracy of DaTscan(TM) (Ioflupane I123 injection): Predicting clinical diagnosis in early clinically uncertain parkinsonian syndrome. *J Neurol Stroke.* May 11 2014;1(1):00003
25. Bajaj N, Hauser RA, Seibyl J, et al. Association between Hoehn and Yahr, Mini-Mental State Examination, age, and clinical syndrome predominance and diagnostic effectiveness of ioflupane I 123 injection (DaTSCAN™) in subjects with clinically uncertain parkinsonian syndromes. *Alzheimers Res Ther.* 2014; 6(5-8): 67. PMID 25478029
26. Brigo F, Matinella A, Erro R, et al. [<sup>123</sup>I]FP-CIT SPECT (DaTSCAN) may be a useful tool to differentiate between Parkinson's disease and vascular or drug-induced parkinsonisms: a meta-analysis. *Eur J Neurol.* Nov 2014; 21(11): 1369-e90. PMID 24779862
27. O'Brien JT, Oertel WH, McKeith IG, et al. Is ioflupane I123 injection diagnostically effective in patients with movement disorders and dementia? Pooled analysis of four clinical trials. *BMJ Open.* Jul 03 2014; 4(7): e005122. PMID 24993764
28. Bega D, Kuo PH, Chalkidou A, et al. Clinical utility of DaTscan in patients with suspected Parkinsonian syndrome: a systematic review and meta-analysis. *NPJ Parkinsons Dis.* May 24 2021; 7(1): 43. PMID 34031400
29. Sadasivan S, Friedman JH. Experience with DaTscan at a tertiary referral center. *Parkinsonism Relat Disord.* Jan 2015; 21(1): 42-5. PMID 25465746
30. Oravivattanakul S, Benchaya L, Wu G, et al. Dopamine transporter (DaT) scan utilization in a movement disorder center. *Mov Disord Clin Pract.* Oct 2015;3(1):31-35
31. Bega D, Gonzalez-Latapi P, Zadikoff C, et al. Is There a Role for DAT-SPECT Imaging in a Specialty Movement Disorders Practice?. *Neurodegener Dis.* 2015; 15(2): 81-6. PMID 25592727
32. Catafau AM, Tolosa E. Impact of dopamine transporter SPECT using 123I-ioflupane on diagnosis and management of patients with clinically uncertain Parkinsonian syndromes. *Mov Disord.* Oct 2004; 19(10): 1175-82. PMID 15390019
33. Tolosa E, Borghet TV, Moreno E. Accuracy of DaTSCAN (123I-ioflupane) SPECT in diagnosis of patients with clinically uncertain parkinsonism: 2-year follow-up of an open-label study. *Mov Disord.* Dec 2007; 22(16): 2346-51. PMID 17914722
34. McKeith I, O'Brien J, Walker Z, et al. Sensitivity and specificity of dopamine transporter imaging with 123I-FP-CIT SPECT in dementia with Lewy bodies: a phase III, multicentre study. *Lancet Neurol.* Apr 2007; 6(4): 305-13. PMID 17362834
35. Galvin JE. IMPROVING THE CLINICAL DETECTION OF LEWY BODY DEMENTIA WITH THE LEWY BODY COMPOSITE RISK SCORE. *Alzheimers Dement (Amst).* Sep 01 2015; 1(3): 316-324. PMID 26405688

36. McCleery J, Morgan S, Bradley KM, et al. Dopamine transporter imaging for the diagnosis of dementia with Lewy bodies. *Cochrane Database Syst Rev*. Jan 30 2015; 1(1): CD010633. PMID 25632881
37. Walker RW, Walker Z. Dopamine transporter single photon emission computerized tomography in the diagnosis of dementia with Lewy bodies. *Mov Disord*. 2009; 24 Suppl 2: S754-9. PMID 19877236
38. Thomas AJ, Attems J, Colloby SJ, et al. Autopsy validation of 123I-FP-CIT dopaminergic neuroimaging for the diagnosis of DLB. *Neurology*. Jan 17 2017; 88(3): 276-283. PMID 27940650
39. Walker Z, Moreno E, Thomas A, et al. Clinical usefulness of dopamine transporter SPECT imaging with 123I-FP-CIT in patients with possible dementia with Lewy bodies: randomised study. *Br J Psychiatry*. Feb 2015; 206(2): 145-52. PMID 25431431
40. Walker Z, Moreno E, Thomas A, et al. Evolution of clinical features in possible DLB depending on FP-CIT SPECT result. *Neurology*. Sep 06 2016; 87(10): 1045-51. PMID 27511183
41. Kemp PM, Clyde K, Holmes C. Impact of 123I-FP-CIT (DaTSCAN) SPECT on the diagnosis and management of patients with dementia with Lewy bodies: a retrospective study. *Nucl Med Commun*. Apr 2011; 32(4): 298-302. PMID 21278615
42. Harvey HB, Watson LC, Subramaniam RM, et al. American College of Radiology (ACR). ACR Appropriateness Criteria Movement Disorders and Neurodegenerative Diseases. 2019; <https://acsearch.acr.org/docs/3111293/Narrative/>. Accessed August 28, 2024.
43. Moonis G, Subramaniam RM, Trofimova A, et al. American College of Radiology (ACR). ACR Appropriateness Criteria: Dementia. 2019; <https://acsearch.acr.org/docs/3111292/Narrative/>. Accessed August 28, 2024.
44. McKeith IG, Boeve BF, Dickson DW, et al. Diagnosis and management of dementia with Lewy bodies: Fourth consensus report of the DLB Consortium. *Neurology*. Jul 04 2017; 89(1): 88-100. PMID 28592453
45. Berg D, Adler CH, Bloem BR, et al. Movement disorder society criteria for clinically established early Parkinson's disease. *Mov Disord*. Oct 2018; 33(10): 1643-1646. PMID 30145841
46. Cardoso F, Goetz CG, Mestre TA, et al. A Statement of the MDS on Biological Definition, Staging, and Classification of Parkinson's Disease. *Mov Disord*. Feb 2024; 39(2): 259-266. PMID 38093469
47. National Institute for Health and Care Excellence (NICE). Parkinson's disease in over 20s: diagnosis and management [CG35]. 2006; <https://www.nice.org.uk/guidance/cg35#diagnosing-parkinsons-disease>. Accessed August 26, 2024.
48. National Institute for Health and Care Excellence (NICE). Parkinson's disease in adults [NG71]. 2017; <https://www.nice.org.uk/guidance/NG71>. Accessed August 27, 2024.
49. Rogers G, Davies D, Pink J, et al. Parkinson's disease: summary of updated NICE guidance. *BMJ*. Jul 27 2017; 358: j1951. PMID 28751362
50. National Institute for Health and Care Excellence (NICE). Dementia: assessment, management and support for people living with dementia and their carers [NG97]. 2018; <https://www.nice.org.uk/guidance/ng97>. Accessed August 28, 2024.
51. Morbelli S, Esposito G, Arbizu J, et al. EANM practice guideline/SNMMI procedure standard for dopaminergic imaging in Parkinsonian syndromes 1.0. *Eur J Nucl Med Mol Imaging*. Jul 2020; 47(8): 1885-1912. PMID 32388612
52. Djang DS, Janssen MJ, Bohnen N, et al. SNM practice guideline for dopamine transporter imaging with 123I-ioflupane SPECT 1.0. *J Nucl Med*. Jan 2012; 53(1): 154-63. PMID 22159160