

MEDICAL POLICY

MEDICAL POLICY DETAILS	
Medical Policy Title	Deep Brain Stimulation
Policy Number	7.01.23
Category	Technology Assessment
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Product Disclaimer	<ul style="list-style-type: none"> • Services are contract dependent; if a product excludes coverage for a service, it is not covered, and medical policy criteria do not apply. • If a commercial product (including an Essential Plan or Child Health Plus product), medical policy criteria apply to the benefit. • If a Medicaid product covers a specific service, and there are no New York State Medicaid guidelines (eMedNY) criteria, medical policy criteria apply to the benefit. • If a Medicare product (including Medicare HMO-Dual Special Needs Program (DSNP) product) covers a specific service, and there is no national or local Medicare coverage decision for the service, medical policy criteria apply to the benefit. • If a Medicare HMO-Dual Special Needs Program (DSNP) product DOES NOT cover a specific service, please refer to the Medicaid Product coverage line.

POLICY STATEMENT

- I. Based upon our criteria and assessment of the peer-reviewed literature, conventional unilateral or bilateral deep brain stimulation of the ventral intermediate nucleus (VIM) thalamus has been medically proven to be effective and, therefore, is considered a **medically appropriate** treatment option in the management of disabling, medically unresponsive essential tremor or tremor due to Parkinson's disease (bilateral deep brain stimulation (DBS) would be utilized for bilateral tremor).

Disabling, medically unresponsive tremor is defined as both of the following:

- tremor causing significant limitation in daily activities; and
- inadequate control with maximal dosage of medication for at least three months before implant.

- II. Based upon our criteria and assessment of peer-reviewed literature, conventional bilateral deep brain stimulation of the subthalamic nucleus (STN) or globus pallidus interna (GPi) has been medically proven to be effective and, therefore, is considered a **medically appropriate** treatment option in the management of a patient with Parkinson's disease with **ALL** of the following:

- The patient has a good response to levodopa;
- Motor complications are not controlled by pharmacologic therapy; and
- ONE** of the following:
 - a minimum score of 30 points on the motor portion of the Unified Parkinson Disease Rating Scale (UPDRS) when the patient has been without medication for approximately 12 hours; or
 - Parkinson disease for at least four (4) years.

- III. Based upon our criteria and assessment of the peer-reviewed literature, conventional unilateral or bilateral deep brain stimulation of the STN or GPi has been medically proven to be effective and, therefore, is considered a **medically appropriate** treatment option in the management of patients seven years of age or older who experience chronic,

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intractable primary dystonia, including generalized and/or segmental dystonia, hemidystonia and cervical dystonia (torticollis).

- IV. Based upon our criteria and assessment of the peer-reviewed literature, unilateral or bilateral deep brain stimulation of the anterior nucleus of the thalamus (ANT) is considered **medically appropriate** for individuals with a confirmed diagnosis of epilepsy and who have met **ALL** of the following criteria:
- 18 years of age or older;
 - Focal partial onset seizures with or without generalized seizure;
 - Refractory to medical therapy defined as failure to adequately control seizures after two (2) (or more) appropriate and adequately dosed anti-seizure medications or intolerance to anti-seizure medications;
 - Currently having an average of three (3) or more disabling seizures (for example, motor partial seizures, complex partial seizures, or secondary generalized seizures) per month over the most recent three months;
 - Absence of progressive neurological conditions such as neurodegenerative disease.
- V. Repair and/or replacement of a medically necessary DBS and/or components not under warranty will be considered **medically appropriate** when the following criteria are met:
- Physician documentation includes **ALL** of the following:
 - date of device implantation/initiation,
 - manufacturer warranty information, and
 - attestation that the patient has been compliant with the use of device and will continue to benefit from the use of the device;**AND ONE OF THE FOLLOWING APPLY:**
 - Repair* of the currently used device, when **ALL** of the following are met:
 - it is no longer functioning adequately,
 - inadequate function interferes with activities of daily living, and
 - repair is expected to make the equipment fully functional (as defined by manufacturer);**OR**
 - Replacement* of the currently used device, when the following are met:
 - it is no longer functioning adequately, **AND EITHER**
 - has been determined to be non-repairable, or
 - the cost of the repair is in excess of the replacement cost;**OR**
 - Replacement* of the currently used device, when **BOTH** of the following are met:
 - there is documentation that a change in the patient's condition makes the present unit non-functional, and
 - improvement is expected with a replacement unit.
- VI. Based upon our criteria and assessment of the peer-reviewed literature, directional deep brain stimulation (e.g., St. Jude Medical Infinity DBS System and Vercise DBS System) has not been medically proven to be effective, and therefore, is considered **investigational** for all indications.
- VII. Based upon our criteria and assessment of the peer-reviewed literature, conventional deep brain stimulation has not been medically proven to be effective and, therefore, is considered **investigational** for all conditions not specifically identified in Policy Statements I through IV, including, but not limited to, the following conditions:
- multiple sclerosis tremor;
 - post-traumatic dyskinesia;
 - all other movement disorders;
 - chronic pain syndromes, including cluster headache;
 - tardive dyskinesia;
 - Tourette syndrome;
 - dementias, including Alzheimer's disease;
 - eating disorders, including anorexia nervosa;

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- I. alcohol addiction;
- J. treatment-resistant depression;
- K. treatment-resistant obsessive-compulsive disorder.

VIII. Based upon our criteria and assessment of the peer-reviewed literature, deep brain stimulation is contraindicated in the following situations:

- A. Patients who are not good surgical candidates because of unstable medical problems;
- B. Patients who have a cardiac pacemaker;
- C. Patients who have medical conditions that require repeated magnetic resonance imaging (MRI);
- D. Patients who have dementia that may interfere with the ability to cooperate;
- E. Patients who have had botulinum toxin injections within the last six months.

This medical policy does not address occipital nerve stimulation for chronic migraines or occipital neuralgia. In occipital nerve stimulation, the neurostimulator delivers electrical impulses via insulated lead wires tunneled under the skin near the occipital nerves at the base of the head.

Refer to Corporate Medical Policy #07.01.103 Responsive Neurostimulation for the Treatment of Refractory Focal Epilepsy

Refer to Corporate Medical Policy #11.01.03 Experimental or Investigational Services

POLICY GUIDELINE

Bilateral stimulators may be implanted simultaneously or in staged procedures.

DESCRIPTION

Deep brain stimulation (DBS) has been investigated as an alternative to permanent neuro-ablative procedures, such as thalamotomy and pallidotomy. The procedure involves the stereotactic placement of an electrode into a targeted region of the brain. The electrode is then attached, via a cable/wire, to a programmable stimulator implanted subcutaneously. DBS is designed to turn off overactive brain regions without destroying them. The immediate advantage of DBS over conventional destructive surgery is that the lesions are titratable and, hence, reversible. After implantation, noninvasive programming of the neurostimulator can be adjusted to the patient's symptoms.

The effect of DBS depends on where the electrodes are placed. The three common target sites are the VIM thalamus, STN and GPi. Whereas unilateral/bilateral DBS of the thalamus is utilized to treat essential tremor or tremors of advanced Parkinson's disease, DBS of the STN or of the GPi is used for treatment of the entire constellation of Parkinsonian symptoms (e.g., tremor, rigidity, and bradykinesia). DBS is performed at specialty centers.

DBS has also been investigated for the treatment of primary dystonia, defined as a neurological movement disorder characterized by involuntary and painful muscle contractions and contortions. Dystonia can be classified according to cause and the bodily distribution of symptoms. Primary or idiopathic dystonia is not associated with any other pathology, whereas secondary dystonia is caused by a known insult (e.g., trauma, infarct, stroke) to the basal ganglia. Generalized dystonia affects a wide range of body areas, while focal dystonia affects specific body parts (e.g., spasmodic torticollis/cervical dystonia, blepharospasm). Dystonia is the third most common movement disorder, behind Parkinson's disease and essential tremor. Unless contraindicated, DBS of either the STN or GPi requires a bilateral procedure.

In addition to essential tremors, Parkinson's disease, and primary dystonia, DBS is also being investigated for disorders such as major depression, cluster headaches, chronic pain syndromes, Tourette syndrome, epilepsy, and obsessive-compulsive disorder.

Unified Parkinson Disease Rating Scale (UPDRS)

The Unified Parkinson's Disease Rating Scale (UPDRS) is the most widely applied rating instrument for the evaluation of a person with Parkinson's Disease to determine disease severity. The total UPDRS score includes 31 items contributing to three (3) subscales: (I) Mentation, Behavior and Mood; (II) Activities of Daily Living; and (III) Motor Examination. The

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UPDRS does not assess general cardiovascular fitness and provides only limited information on functional performance relative to daily activities.

Conventional DBS

Conventional DBS systems use ring-shaped electrodes, which generate an approximately spherical electrical field. In these systems, programming of polarity and stimulation pulse parameters allows only limited control of the shape of the volume of tissue activated. While physicians try to target a very specific area of the brain with conventional DBS, there is a risk of stimulating neighboring regions as they cannot steer the stimulation precisely.

Directional DBS

Directional DBS systems use novel lead designs with segmented, multi-contact electrodes that allow for the activation of individual electrode contacts which also allow the physician to specify the exact amount of current needed for every contact of the electrode. By activating specific electrode contacts and defining the amount of stimulation for each contact, stimulation precision is significantly increased. More precise stimulation is thought to reduce side effects of DBS, such as muscle contractions, dysarthria, and cognitive or behavioral disturbances sometimes seen in conventional DBS.

RATIONALE

The U.S. Food and Drug Administration (FDA) has approved the Activa Tremor Control System (Medtronic, Inc.) for DBS. While the original 1997 FDA-labeled indications were limited to unilateral implantation of the device for the treatment of tremor, in January 2002, the FDA-labeled indications were expanded to include bilateral implantation as a treatment to decrease the symptoms of advanced Parkinson's disease that are not controlled by medication. In February 2016, the FDA expanded the approval for Medtronic's DBS for Parkinson's disease. The expanded approval covers patients who have had a Parkinson's diagnosis for four years and who have recently developed motor complications or have long-standing motor complications that cannot be controlled with drugs. The expanded approval is based on data from the EARLYSTIM clinical study (Schuepbach WM et al., 2013), which found that patients treated with Medtronic DBS Therapy and best medical therapy (BMT) reported a mean improvement of 26 percent in their disease-related quality of life at two years, compared to a one percent decline in patients treated with BMT alone. In a study of patients with longer-standing motor complications, DBS patients' quality of life improved 20 percent from baseline to six months, compared to no improvement in the patients treated with BMT alone.

In April 2003, the FDA gave Humanitarian Device Exemption (HDE) approval to the Activa Therapy System for the unilateral or bilateral stimulation of the internal STN or GPi, to aid in the management of chronic, intractable (drug-resistant) primary dystonia, including generalized and/or segmental dystonia, hemidystonia, and cervical dystonia in patients seven years of age or older. In 2016, the FDA identified that the HDE for the Activa Therapy System remained appropriately approved for pediatric use. In 2018, the Activa deep brain stimulation system received FDA approval with an expanded indication as an adjunctive therapy for epilepsy.

The Brio Neuromodulation System (St. Jude Medical) received FDA approval in June of 2015. The device is indicated for the following conditions: (1) bilateral stimulation of the STN as an adjunctive therapy to reduce some of the symptoms of advanced levodopa-responsive Parkinson's disease that are not adequately controlled by medications; and (2) unilateral or bilateral stimulation of the VIM thalamus for the suppression of disabling upper extremity tremor in adult essential tremor patients whose tremor is not adequately controlled by medications and where the tremor constitutes a significant functional disability. The Brio device differs from the Activa system in that it uses a constant current of electricity to the brain to provide stimulation, while Activa uses constant voltage. Per the FDA Summary of Safety and Effectiveness Data, the data supporting its use come from two clinical trials of the device, one in 136 Parkinson's disease patients and the other in 127 patients with essential tremor. In both studies, symptoms were not adequately controlled with medication. The system was used as an adjunct to medication for the patients with Parkinson's, while "the majority of patients with essential tremor who used the device were able to control their symptoms without the need for medications," the FDA said. All patients in the studies were implanted with the system; Parkinson's disease patients were evaluated at three months, and the essential tremor patients after six months of therapy. "Both groups showed statistically significant improvement on their primary effectiveness endpoint when the device was turned on compared to when it was turned off," the statement notes.

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Published clinical trials have provided evidence to support the efficacy and safety of unilateral DBS of the VIM thalamus for essential tremor and for tremor of Parkinson's disease, and of bilateral DBS of the STN or GPi for advanced Parkinson's disease. In studies of unilateral thalamic DBS, tremor suppression was either total or clinically significant in 82-91% of patients who underwent implantation. Results were durable, and side effects were minimal. An additional benefit of DBS is that recurrence of tremor may be managed by changes in stimulation parameters. Although long-term data are minimal, studies have demonstrated that bilateral stimulation of the STN or GPi results in improvements of neurologic function. Case series investigating the use of DBS for the treatment of dystonia found that patients with primary dystonia experienced significant improvement in movement and in ADLs, but those patients with secondary dystonia experienced little improvement.

Directional DBS

The St. Jude Medical Infinity DBS System is the first FDA-approved system to feature a directional lead, designed to deliver electrical current to a specific target in the brain and, thereby, minimize unwanted side effects from brain stimulation to non-targeted areas. On September 19, 2016, this St. Jude DBS system was approved by the FDA as a supplement to an earlier Premarket Approval (PMA) for the St. Jude Medical Brio Neurostimulation System. This approval was for a change in design, components, specifications, and material. According to the manufacturer, the Infinity DBS system is indicated for:

...bilateral stimulation of the subthalamic nucleus (STN) as an adjunctive therapy to reduce some of the symptoms of advanced levodopa-responsive Parkinson's disease that are not adequately controlled by medications, and unilateral or bilateral stimulation of the ventral intermediate nucleus (VIM) of the thalamus for the suppression of disabling upper extremity tremor in adult essential tremor patients whose tremor is not adequately controlled by medications and where the tremor constitutes a significant functional disability.

The St. Jude Medical Infinity DBS System, 8 Channel Directional Leads was recalled in 2018 due to a manufacturing issue; however, the recall was terminated in September 2020.

In January 2020, Abbott received approval from the U.S. Food and Drug Administration (FDA) for a new, expanded indication for the Infinity Deep Brain Stimulation (DBS) system to include targeting of an area of the brain called the internal globus pallidus (GPi) which plays an integral role in the motor function and can be targeted with DBS to improve the symptoms of Parkinson's disease not adequately controlled by medication. The Abbott Infinity DBS system with directional leads provides directed stimulation to areas of the brain to optimize patient outcomes and limit side effects.

The Vercise PC Deep Brain Stimulation (DBS) System and the Vercise Gevia Deep Brain Stimulation (DBS) System (Boston Scientific, Inc.) were originally FDA approved on January 10, 2019. The Vercise Genus DBS System was FDA approved on January 21, 2021. These systems are indicated for use in the following: 1) bilateral stimulation of the subthalamic nucleus (STN) as an adjunctive therapy in reducing some of the symptoms of moderate to advanced levodopa-responsive Parkinson's disease (PD) that are not adequately controlled with medication; 2) bilateral stimulation of the globus pallidus internus (GPi) as an adjunctive therapy in reducing some of the symptoms of advanced levodopa responsive Parkinson's disease (PD) that are not adequately controlled with medication and 3) unilateral thalamic stimulation of the ventral intermediate nucleus (VIM) is indicated for the suppression of tremor in the upper extremity for which the system is intended for use in patients who are diagnosed with essential tremor or parkinsonian tremor not adequately controlled by medications and where the tremor constitutes a significant functional disability. The Vercise DBS system utilizes current steering across eight contacts per DBS lead, which is intended to provide precise positioning of stimulation.

Obsessive Compulsive Disorder (OCD)

In February of 2009, the FDA granted HDE approval to Medtronic's ReClaim Deep Brain Stimulator device as the first implant to treat OCD. The device is indicated for bilateral stimulation of the anterior limb of the internal capsule (AIC), as an adjunct to medications and as an alternative to anterior capsulotomy for the treatment of chronic, severe, treatment-resistant OCD in adult patients who have failed at least three selective serotonin reuptake inhibitors (SSRIs). The HDE

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approval was based on a review of data from 26 patients with severe, treatment-resistant OCD who were treated with the device at four sites. On average, patients had a 40 percent reduction in their symptoms after 12 months of therapy. One of the major limitations of this study was the fact that many of the study population were aware of when the device was turned on and off, so investigators were unable to rule out that some of the improvements were due to a placebo effect. According to their consensus guidelines published in 2021, the World Society for Stereotactic and Functional Neurosurgery considers DBS to be an emerging but not yet established treatment for OCD. While there is limited evidence to suggest that DBS may be an option for patients with severe, disabling OCD, well-designed large group studies are necessary to demonstrate its long-term safety and efficacy.

Epilepsy

Results of Medtronic's Stimulation of the Anterior Nuclei of Thalamus for Epilepsy (SANTÉ) trial (Fisher et al., 2010) showed promising outcomes on the adjunct use of DBS of the ANT over placebo stimulation for patients suffering from severe, refractory, partial-onset seizures. All subjects underwent DBS implantation followed by three months of randomized and blinded active stimulation (n=54) or no stimulation (n=55), then followed by nine months of active stimulation for all subjects. Two years after implantation of the device, seizures were reduced by a median 56% compared with baseline, and 14 patients (12.7%) became seizure-free for at least six months. Longer-term studies were needed to better define its safety and efficacy, as well as the subset of patients who would benefit most from this treatment.

Salanova and others published a long-term follow-up study of the SANTÉ trial in 2015. Beginning 13 months following device implantation, 105 subjects receiving active stimulation were followed for an additional four years. The authors reported that for subjects with at least 70 diary entries recorded at one (1) year (n=99), median change for seizure frequency from baseline decreased by 41% (p <0.001), and by 69% at five (5) years (n=59; p <0.001). For the same population, reduction in the most severe type of seizure was 39% at one year (p <0.001) and 75% at five years (p <0.001). During the 5-year study, 17 of 109 subjects (16%) reported a 6-month seizure-free interval. A 2-year seizure-free interval was reported for 6 of 109 subjects (5.5%). Mean improvement in the Liverpool Seizure Severity Score (LSSS) was 13.4 at one year and 18.3 at five years (p <0.001 for both). Similarly, results from the Quality of Life in Epilepsy-31 (QOLIE-31) tool improved from baseline by 5.0 points at one (1) year and 6.1 points at (5) five years (p <0.001 for both). A change of 5 points on this measure is considered clinically significant and was experienced by 46% and 48% of subjects at one and five years. Device-related adverse events included site infection, leads not within the target area, depression and memory impairment. This study demonstrated significant long-term benefit from DBS for individuals with epilepsy, although the study was relatively small and unblinded.

On April 27, 2018, the FDA approved the Medtronic DBS System for Epilepsy for bilateral stimulation of the anterior nucleus of the thalamus (ANT) based on the SANTÉ trials as an adjunctive therapy for reducing the frequency of seizures in individuals 18 years of age or older who are diagnosed with epilepsy characterized by partial-onset seizures, with or without secondary generalization, that are refractory to three or more antiepileptic medications. The FDA indicated that the Medtronic DBS System for Epilepsy has demonstrated safety and effectiveness for patients who average six (6) or more seizures per month over the three (3) most recent months prior to implant of the DBS system (with no more than 30 days between seizures). The Medtronic DBS System for Epilepsy has not been evaluated in patients with less-frequent seizures.

The effect of deep brain stimulation of the anterior nuclei of the thalamus (ANT-DBS) after implantation has been reported as approximately 50% seizure frequency reduction in approximately 60% of patients (Herrman et al., 2019) and the seizure frequency reduction increased over the following ten years (Salanova, 2018 and Salanova et al., 2021). Multiple literature reviews of randomized and blinded clinical trials and case series with high-quality data support the use of DBS for the treatment of medically refractory epilepsy.

In December of 2021, the American Society of Stereotactic and Functional Neurosurgery (ASSFN) published the following position statement: "Deep brain stimulation (DBS) of the bilateral anterior nucleus of the thalamus (ANT) is a Food and Drug Administration (FDA)-approved, safe, and efficacious treatment option for patients with refractory focal epilepsy" who meet specific criteria.

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Other Indications

Published clinical trials have not provided evidence to support the efficacy and safety of DBS for other conditions, including, but not limited to multiple sclerosis, post-traumatic dyskinesia, treatment-resistant depression, Alzheimer's disease, and Tourette syndrome; or for bilateral DBS of the VIM thalamus. Studies of DBS for the treatment of chronic pain have not provided evidence that DBS is an effective treatment method over already-established treatment methods.

CODES

- Eligibility for reimbursement is based upon the benefits set forth in the member's subscriber contract.
- **CODES MAY NOT BE COVERED UNDER ALL CIRCUMSTANCES. PLEASE READ THE POLICY AND GUIDELINES STATEMENTS CAREFULLY.**
- Codes may not be all inclusive as the AMA and CMS code updates may occur more frequently than policy updates.
- Code Key: Experimental/Investigational = (E/I), Not medically necessary/appropriate = (NMN)

CPT Codes

Code	Description
61863	Twist drill, burr hole, craniotomy or craniectomy with stereotactic implantation of neurostimulator electrode array in subcortical site (e.g., thalamus, globus pallidus, subthalamic nucleus, periventricular, periaqueductal gray), without use of intraoperative microelectrode recording; first array
61864	each additional array
61867	Twist drill, burr hole, craniotomy or craniectomy with stereotactic implantation of neurostimulator electrode array in subcortical site (e.g., thalamus, globus pallidus, subthalamic nucleus, periventricular, periaqueductal gray), with use of intraoperative microelectrode recording; first array
61868	each additional array
61880	Revision or removal of intracranial neurostimulator electrodes
61885	Insertion or replacement of cranial neurostimulator pulse generator or receiver, direct or inductive coupling; with connection to a single electrode array
61886	with connection to two or more electrode arrays
61888	Revision or removal of cranial neurostimulator pulse generator or receiver
95970	Electronic analysis of implanted neurostimulator pulse generator/transmitter (e.g., contact group[s], interleaving, amplitude, pulse width, frequency [Hz], on/off cycling, burst, magnet mode, dose lockout, patient selectable parameters, responsive neurostimulation, detection algorithms, closed loop parameters, and passive parameters) by physician or other qualified health care professional; with brain, cranial nerve, spinal cord, peripheral nerve, or sacral nerve, neurostimulator pulse generator/transmitter, without programming
95983	Electronic analysis of implanted neurostimulator pulse generator/transmitter (e.g., contact groups[s], interleaving, amplitude, pulse width, frequency [HZ], on/off cycling, burst, magnet mode, dose lockout, patient selectable parameters, responsive neurostimulation, detection algorithms, closed loop parameters, and passive parameters) by physician or other qualified health care professional; with brain neurostimulator pulse generator/transmitter programming, first 15 minutes face-to-face time with physician or other qualified health care professional
95984	each additional 15 minutes face-to-face time with physician or other qualified health care professional (list separately in addition to code for primary procedure)

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Code	Description
C1767	Generator, neurostimulator (implantable), non-rechargeable
C1787	Patient programmer; neurostimulator
C1820	Generator, neurostimulator (implantable), with rechargeable battery and charging system
C1822	Generator, neurostimulator (implantable), high frequency with rechargeable battery and charging system
L8679	Implantable neurostimulator pulse generator, any type
L8680	Implantable neurostimulator electrode, each
L8681	Patient programmer (external) for use with implantable programmable neurostimulator pulse generator, replacement only
L8685	Implantable neurostimulator pulse generator, single array, rechargeable, includes extension
L8686	Implantable neurostimulator pulse generator, single array, non-rechargeable, includes extension
L8687	Implantable neurostimulator pulse generator, dual array, rechargeable, includes extension
L8688	Implantable neurostimulator pulse generator, dual array, non-rechargeable, includes extension
L8689	External recharging system for battery (internal) for use with implantable neurostimulator, replacement only

ICD10 Codes

Code	Description
G20.A1-G20.C	Parkinson's disease (code range)
G21.11-G21.9	Secondary Parkinsonism (code range)
G24.1-G24.3	Dystonia (code range)
G24.8	Other dystonia
G24.9	Dystonia, unspecified
G25.0	Essential tremor
G40.0-G40.919	Epilepsy and recurrent seizures (intractable) (code range)
Investigational Codes:	
All other ICD10 diagnosis codes are considered investigational.	

REFERENCES

*Abelson JL, et al. Deep brain stimulation for refractory obsessive-compulsive disorder. Biol Psych 2005 Mar 1;57(5):510-6.

*Ackermans L, et al. Double-blind clinical trial of thalamic stimulation in patients with Tourette syndrome. Brain 2011 March;134(Pt 3):832-44.

*Air EL, et al. Deep brain stimulation in children: experience and technical pearls. J Neurosurg Pediatr 2011 Dec;8(6):566-74.

*Anderson VC, et al. Pallidal vs subthalamic nucleus deep brain stimulation in Parkinson's disease. Arch Neurol 2005 Apr;62(4):554-60.

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- *Andrade P, et al. A systematic review of the efficacy of globus pallidus stimulation in the treatment of Parkinson's disease. J Clin Neurosci 2009 Jul;16(7):877-81.
- *Andrade P, et al. Neurostimulatory and ablative treatment options in major depressive disorder: a systematic review. Acta Neurochir 2010 Apr;152(4):566-77.
- *Antonini A, et al. A 5-year prospective assessment of advanced Parkinson disease patients treated with subcutaneous apomorphine infusion or deep brain stimulation. J Neurol 2011 Apr;258(4):579-85.
- *Appleby BS, et al. Psychiatric and neuropsychiatric adverse events associated with deep brain stimulation: A meta-analysis of ten years' experience. Mov Disord 2007 Sep 15;22(12):1722-8.
- *Baumer T, et al. Effects of DBS, premotor rTMS, and levodopa on motor function and silent period in advance Parkinson's disease. Mov Disord 2009 Apr 15;24(5):672-6.
- *Bewernick BH, et al. Nucleus accumbens deep brain stimulation decreases ratings of depression and anxiety in treatment-resistant depression. Biol Psychiatry 2010 Jan 15;67(2):110-6.
- *Blomstedt P, et al. Deep brain stimulation in the treatment of depression. Acta Psychiatr Scand 2011 Jan;123(1):4-11.
- Bouwens van der Vlis TAM, et al. Deep brain stimulation of the anterior nucleus of the thalamus for drug-resistant epilepsy. Neurosurg Rev 2019; 42(2):287-296.
- *Bronstein JM, et al. Deep brain stimulation for Parkinson disease: an expert consensus and review of key issues. Arch Neurol 2011 Feb;68(2):165-71.
- *Cannon E, et al. Deep brain stimulation of anteromedial globus pallidus interna for severe Tourette's syndrome. Am J Psychiatry 2012 Aug 1;169(8):860-6.
- *Capecci M, et al. Functional improvement after subthalamic stimulation in Parkinson's disease: a non-equivalent controlled study with 12-24 month followup. J Neurol Neurosurg Psych 2005 Jun;76(6):769-74.
- *Castrioto A, et al. Ten-year outcome of subthalamic stimulation in Parkinson disease: a blinded evaluation. Arch Neurol 2011 Dec;68(12):1550-6.
- *Charles PD, et al. Is deep brain stimulation neuroprotective if applied early in the course of PD? Nat Clin Pract Neurol 2008 Aug;4(8):424-6.
- *Clarke CE, et al. Systematic review of apomorphine, levodopa infusion and deep brain stimulation in advanced Parkinson's disease. Parkinsonism Relat Disord 2009 Dec;15(10):728-41.
- *Coubes, P, et al. Treatment of DYT11-generalized dystonia by stimulation of the internal globus pallidus. Lancet 2000;355:2220-1.
- *Coubes P, et al. Electrical stimulation of the globus pallidus internus in patients with primary generalized dystonia: long-term results. J Neurosurg 2004 Aug;101(2):189-94.
- Cruz S, et al. Deep brain stimulation in obsessive-compulsive disorder: results from meta-analysis. Psychiatry Research 2022;317:114869.
- *Damier P, et al. Bilateral deep brain stimulation of the globus pallidus to treat tardive dyskinesia. Arch Gen Psych 2007 Feb;64(2):170-6.
- *Denys D, et al. Deep brain stimulation of the nucleus accumbens for treatment-refractory obsessive-compulsive disorder. Arch Gen Psychiatry 2010 Oct;67(10):1061-8.
- *Deuschl G, et al. A randomized trial of deep-brain stimulation for Parkinson's disease. NEJM 2006 Aug 31;355(9):896-908.
- *Diamond A, et al. Globus pallidus deep brain stimulation in dystonia. Mov Disord 2006 May;21(5):692-5.

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*Egidi M, et al. A survey of Italian cases of dystonia treated by deep brain stimulation. J Neurosurg Sci 2007 Dec;51(4):153-8.

Elkaim LM, et al. Deep brain stimulation for pediatric dystonia: a meta-analysis with individual participant data. Dev Med Child Neurol 2019 Jan;61(1):49-56.

*Eltahawy HA, et al. Primary dystonia is more responsive than secondary dystonia to pallidal interventions: outcomes after pallidotomy or pallidal deep brain stimulation. Neurosurg 2004 Mar;54(3):613-21.

*Esselink RA, et al. Unilateral pallidotomy versus bilateral subthalamic nucleus stimulation in PD: a randomized trial. Neurol 2004 Jan 27;62(2):201-7.

*Esselink RA, et al. Long-term superiority of subthalamic nucleus stimulation over pallidotomy in Parkinson disease. Neurology 2009 Jul 14;73(2):151-3.

Farrand S, et al. Deep brain stimulation for severe treatment-resistant obsessive-compulsive disorder: An open-label case series. Aust N Z J Psychiatry 2018 Jul;52(7):699-708.

*Figueiras-Mendez R, et al. Further supporting evidence of beneficial subthalamic stimulation in Parkinson's patients. Neurol 2002 Feb 12;58(3):469-70.

*Fisher R, et al. Electrical stimulation of the anterior nucleus of the thalamus for treatment of refractory epilepsy. Epilepsia 2010 May 5;51(5):899-908.

*Fontaine D, et al. Anatomical location of effective deep brain stimulation electrodes in chronic cluster headache. Brain 2010 Apr;133(pt 4):1214-33.

*Ford B, et al. Subthalamic nucleus stimulation in advanced Parkinson's disease: blinded assessments at one year follow up. J Neurol Neurosurg Psych 2004 Sep;75(9):1255-9.

*Fraix V, et al. Clinical and economic results of bilateral subthalamic nucleus stimulation in Parkinson's disease. J Neurol Neurosurg Psych 2006 Apr;77(4):443-9.

*Franzini A, et al. Stimulation of the posterior hypothalamus for treatment of chronic intractable cluster headaches: first reported series. Neurosurg 2003 May;52(5):1095-9.

Geraedts VJ, et al. What predicts quality of life after STN DBS in Parkinson's disease? A systematic review. Eur J Neurol 2019 Dec 25; 27(1):419-428.

*Germano IM, et al. Unilateral stimulation of the subthalamic nucleus in Parkinson disease: a double-blind 12-month evaluation study. J Neurosurg 2004 Jul;101(1):36-42.

*Gervais-Bernard H, et al. Bilateral subthalamic nucleus stimulation in advanced Parkinson's disease: five-year follow-up. J Neurol 2009 Feb;256(2):225-33.

*Goodman WK, et al. Deep brain stimulation for intractable obsessive-compulsive disorder: pilot study using a blinded, staggered-onset design. Biol Psychiatry 2010 Mar 15;67(6):535-42.

Graat I, et al. Long-term outcome of deep brain stimulation of the ventral part of the anterior limb of the internal capsule in a cohort of 50 patients with treatment-refractory obsessive-compulsive disorder. Biological Psychiatry 2021 Nov 15; 90:714-720.

*Greenberg BD, et al. Three-year outcomes in deep brain stimulation for highly resistant obsessive-compulsive disorder. Neuropsychopharmacol 2006 Nov;31(11):2384-93.

*Greenberg BD, et al. Deep brain stimulation of the ventral internal capsule/ventral striatum for obsessive-compulsive disorder: worldwide experience. Mol Psychiatry 2010 Jan;15(1):64-79.

*Grover PJ, et al. Deep brain stimulation for cluster headache. J Clin Neurosci 2009 Jul;16(7):861-6.

*Gruber D, et al. Long-term effects of pallidal deep brain stimulation in tardive dystonia. Neurol 2009 Jul 7;73(1):53-8.

Medical Policy: DEEP BRAIN STIMULATION

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*Halbig TD, et al. Pallidal stimulation in dystonia: effects on cognition, mood, and quality of life. J Neurol Neurosurg Psych 2005 Dec;76(12):1713-6.

*Harries AM, et al. Deep brain stimulation of the subthalamic nucleus for advanced Parkinson disease using general anesthesia: long-term results. J Neurosurg 2012 Jan;116(1):107-13.

*Hauptman JS, et al. Potential surgical targets for deep brain stimulation in treatment-resistant depression. Neurosurg Focus 2008;25(1):E3.

*Haynes WI, et al. High-frequency stimulation of deep brain structures in obsessive-compulsive disorder: the search for a valid circuit. Eur J Neurosci 2010 Oct;32(7):1118-27.

*Herrman H, et al. Anterior thalamic deep brain stimulation in refractory epilepsy: A randomized, double-blinded study. Acta Neurol Scand 2019 Mar;139(3):294-304.

*Hung SW, et al. Long-term outcome of bilateral pallidal deep brain stimulation for primary cervical dystonia. Neurol 2007 Feb 6;68(6):457-9.

*Kahn E, et al. Deep brain stimulation in early stage Parkinson's disease: operative experience from a prospective randomized clinical trial. J Neurol Neurosurg Psychiatry 2012 Feb;83(2):164-70.

*Kennedy SH, et al. Canadian Network for Mood and Anxiety Treatments (CANMAT) Clinical guidelines for the management of major depressive disorder in adults. IV. Neurostimulation therapies. J Affect Disord 2009 Oct;117(Suppl 1):S44-53.

*Kennedy SH, et al. Deep brain stimulation for treatment-resistant depression: follow-up after 3 to 6 years. Am J Psychiatry 2011 May;168(5):502-10.

*Kiss ZH, et al. The Canadian multicentre study of deep brain stimulation for cervical dystonia. Brain 2007 Nov;130(Pt11):2879-86.

*Kleiner-Fisman G, et al. Subthalamic nucleus deep brain stimulation: summary and meta-analysis of outcomes. Mov Disord 2006 Jun;21(Suppl 14):S290-304.

Klinger N and Mittal S. Deep brain stimulation for seizure control in drug-resistant epilepsy. Neurosurg Focus 2018 Aug;45(2):E4.

*Krause M, et al. Deep brain stimulation for the treatment of Parkinson's disease: subthalamic nucleus versus globus pallidus internus. J Neurol Neurosurg Psych 2001 Apr;70(4):464-70.

*Krauss JK, et al. Pallidal deep brain stimulation in patients with cervical dystonia and severe cervical dyskinesias with cervical myelopathy. J Neurol Neurosurg Psych 2002 Feb;72(2):249-56.

Kumar KK, et al. Comparative effectiveness of neuroablation and deep brain stimulation for treatment-resistant obsessive-compulsive disorder: a meta-analytic study. J Neurol Neurosurg Psychiatry 2019 Apr;90(4):469-473.

*Kupsch A, et al. Pallidal deep-brain stimulation in primary generalized or segmental dystonia. NGJM 2006 Nov 9;355(19):1978-90.

*Laxton AW, et al. A phase I trial of deep brain stimulation of memory circuits in Alzheimer's disease. Ann Neurol 2010 Oct;68(4):521-534.

*Lee JY, et al. Thalamic deep brain stimulation for management of essential tremor. J Neurosurg 2005 Sep;103(3):400-3.

Lehtimäki K, et al. The surgical approach to the anterior nucleus of thalamus in patients with refractory epilepsy: experience from the international multicenter registry (MORE). Neurosurgery 2019 Jan 1;84(1):141-150.

*Leone M, et al. Lessons from 8 years' experience of hypothalamic stimulation in cluster headache. Cephalalgia 2008 Jul;28(7):787-97.

*Levy R, et al. Intracranial neurostimulation for pain control: a review. Pain Physician 2010 Mar;13(2):157-65.

Medical Policy: DEEP BRAIN STIMULATION

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*Liu W, et al. Quantitative assessments of the effect of bilateral subthalamic stimulation on multiple aspects of sensorimotor function for patients with Parkinson's disease. Parkinsonism Relat Disord 2005 Dec;11(8):503-8.

Liu Y, et al. Improvement of deep brain stimulation in dyskinesia in Parkinson's disease: a meta-analysis. Front Neurol 2019 Feb 25;10:151.

*Loher TJ, et al. Long-term follow-up study of chronic globus pallidus internus stimulation for post-traumatic hemidystonia. J Neurosurg 2000 Mar;92(3):457-60.

*Loher TJ, et al. Long-term pallidal deep brain stimulation in patients with advanced Parkinson disease: 1-year follow-up study. J Neurosurg 2002 May;96(5):844-53.

*Ludwig J, et al. Effects of subthalamic nucleus stimulation and levodopa on the autonomic nervous system in Parkinson's disease. J Neurol Neurosurg Psych 2007 Jul;78(7):742-5.

*Mallet L, et al. Subthalamic nucleus stimulation in severe obsessive-compulsive disorder. NEJM 2008 Nov 13;359(20):2121-34.

*Mayberg H, et al. Deep brain stimulation for treatment-resistant depression. Neuron 2005 Mar 3;45: 651-60.

Mazzoleni A, et al. Clinical practice guidelines on the use of deep brain stimulation for the treatment of obsessive-compulsive disorder: systematic review. BJ Psych Open 2023; 9(e148):1-10.

*Merola A, et al. Subthalamic nucleus deep brain stimulation outcome in young onset Parkinson's disease: a role for age at disease onset? J Neurol Neurosurg Psychiatry 2012 Mar;83(3):251-7.

*Moro E, et al. Long-term results of a multicenter study on subthalamic and pallidal stimulation in Parkinson's disease. Mov Disord 2010 Apr 15;25(5):578-86.

*Mueller J, et al. Pallidal deep brain stimulation improves quality of life in segmental and generalized dystonia: results from a prospective, randomized sham-controlled trial. Mov Disord 2008 Jan;23(1):131-4.

*Nakamura K, et al. Effects of unilateral subthalamic and pallidal deep brain stimulation on fine motor functions in Parkinson's disease. Mov Disord 2007 Apr 15;22(5):619-26.

*National Institute for Health and Clinical Excellence. Deep brain stimulation for tremor and dystonia (excluding Parkinson's disease). IPG188. 2006 Aug [<https://www.nice.org.uk/guidance/ipg188>] accessed 02/27/24.

*National Institute for Health and Clinical Excellence. Deep brain stimulation for Parkinson's disease. IPG19. 2003 Nov [<https://www.nice.org.uk/guidance/ipg19>] accessed 02/27/24.

*National Institute for Health and Clinical Excellence. Deep brain stimulation for intractable trigeminal autonomic cephalalgias. IPG381. 2011 Mar [<https://www.nice.org.uk/guidance/ipg381>] accessed 02/27/24.

*National Institute for Health and Clinical Excellence. Deep brain stimulation for refractory chronic pain syndromes. IPG382. 2011 Mar [<https://www.nice.org.uk/guidance/ipg382>] accessed 02/27/24.

National Institute for Health and Clinical Excellence. Deep brain stimulation for refractory epilepsy in adults. IPG678. 2020 Aug 12 [<https://www.nice.org.uk/guidance/ipg678>] accessed 02/27/24.

*Obwegeser AA, et al. Quantitative and qualitative outcome measures after thalamic deep brain stimulation to treat disabling tremors. Neurosurg 2001 Feb;48(2):274-84.

*Okun MS, et al. Subthalamic deep brain stimulation with a constant-current device in Parkinson's disease: an open-label randomized controlled trial. Lancet Neurol 2012 Feb;11(2):140-9.

*Ondo W, et al. Thalamic deep brain stimulation: comparison between unilateral and bilateral placement. Arch Neurol 2001 Feb;58(2):218-22.

*Ostrem JL, et al. Subthalamic nucleus deep brain stimulation in primary cervical dystonia. Neurol 2011 Mar 8;76(10):870-8.

Medical Policy: DEEP BRAIN STIMULATION

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- *Owen SL, et al. Deep brain stimulation for the alleviation of post-stroke neuropathic pain. Pain 2006 Jan;120(1-2):202-6.
- *Pahwa R, et al. Long-term evaluation of deep brain stimulation of the thalamus. J Neurosurg 2006 Apr;104 (4):506-12.
- *Pahwa R, et al. Practice Parameter: treatment of Parkinson disease with motor fluctuations and dyskinesia (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurol 2006 Apr 11;66(7):983-95.
- *Pansaon Piedad JC, et al. What patients with Gilles de la Tourette syndrome should be treated with deep brain stimulation and what is the best target? Neurosurg 2012 Jul;71(1):173-92.
- *Piboolnurak P, et al. Levodopa response in long-term bilateral subthalamic stimulation for Parkinson's disease. Mov Disord 2007 May 15;22(7):990-7.
- *Pretto TE, et al. A prospective blinded evaluation of deep brain stimulation for the treatment of secondary dystonia and primary torticollis syndromes. J Neurosurg 2008 Sep;109(3):405-9.
- *Rasche D, et al. Deep brain stimulation for the treatment of various chronic pain syndromes. Neurosurg Focus 2006 Dec 15;21(6):E8.
- Ravindran K, et al. Deep brain stimulation versus peripheral denervation for cervical dystonia: a systematic review and meta-analysis. World Neurosurg 2019 Feb;122:e940-e946.
- *Rodriguez-Oroz MC, et al. Efficacy of deep brain stimulation of the subthalamic nucleus in Parkinson's disease 4 years after surgery: double blind and open label evaluation. J Neurol Neurosurg Psych 2004 Oct;75(10):1382-5.
- *Rodriguez-Oroz MC, et al. Bilateral deep brain stimulation in Parkinson's disease: a multicentre study with 4 years follow-up. Brain 2005 Oct;128(pt 10):2240-9.
- Rodrigues FB, et al. Deep brain stimulation for dystonia. Cochrane Database Syst Rev 2019 Jan 10;1:CD012405.
- *Rodrigues JP, et al. Globus pallidus stimulation in advanced Parkinson's disease. J Clin Neurosci 2007 Mar;14(3):208-15.
- *Roh D, et al. Long-term follow-up of deep brain stimulation for refractory obsessive-compulsive disorder. Psychiatry Res 2012 Dec 30;200(2-3):1067-70.
- *Salanova V, et al. The SANTÉ study at 10 years of follow-up: effectiveness, safety, and sudden unexpected death in epilepsy. Epilepsia. 2021;62(6):1306-17.
- *Schlaepfer TE, et al. Deep brain stimulation for treatment of refractory depression. Lancet 2005 Oct 22-28;366(9495):1420-2.
- Schnitzler A, et al. Directional deep brain stimulation for Parkinson's Disease: results of an international crossover study with randomized, double-blind primary endpoint. Neuromodulation 2022;25:817-828.
- *Schupbach WM, et al. Neurosurgery at an earlier stage of Parkinson disease: a randomized, controlled trial. Neurol 2007 Jan 23;68(4):267-71.
- *Schoorman PR, et al. A comparison of continuous thalamic stimulation and thalamotomy for suppression of severe tremor. NEJM 2000 Feb 17;342(7):505-8.
- *Sharma A, et al. Efficacy and safety of deep brain stimulation as an adjunct to pharmacotherapy for the treatment of Parkinson disease. Ann Pharmacother 2012 Feb;46(2):248-54.
- *Skogseid IM. Pallidal deep brain stimulation is effective, and improves quality of life in primary segmental and generalized dystonia. Acta Neurol Scand Suppl 2008;188:51-5.
- *Slowinski JL, et al. Unilateral deep brain stimulation of the subthalamic nucleus for Parkinson disease. J Neurosurg 2007 Apr;106(4):626-32.

Medical Policy: DEEP BRAIN STIMULATION

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Staudt MD, et al. Congress of Neurological Surgeons systematic review and evidence-based guidelines for deep brain stimulation for obsessive-compulsive disorder: update of the 2014 guidelines. Neurosurgery 2021; 88(4):710-712.

*Temel Y, et al. Single electrode and multiple electrode guided electrical stimulation of the subthalamic nucleus in advanced Parkinson's disease. Neurosurg 2007 Nov;61(5 Suppl 2):346-55.

*Timmermann L, et al. Multiple-source current steering in subthalamic nucleus deep brain stimulation for Parkinson's disease (the VANTAGE study): a non-randomised, prospective, multicentre, open label study. Lancet Neurol 2015 Jul;14(7):693-701.

*Tir M, et al. Exhaustive, one-year follow-up of subthalamic nucleus deep brain stimulation in a large, single-center cohort of Parkinsonian patients. Neurosurg 2007 Aug;61(2):297-304.

*The Deep Brain Stimulation for Parkinson's Disease Study Group. Deep-brain stimulation of the subthalamic nucleus or the pars interna of the globus pallidus in Parkinson's disease. NEJM 2001 Sep;345(35):956-63.

Tröster AI, et al. Memory and mood outcomes after anterior thalamic stimulation for refractory partial epilepsy. Seizure 2017 Feb;45:133-141.

Tsuboi T, et al. Quality of life outcomes after deep brain stimulation in dystonia: A systematic review. Parkinsonism Relat Disord 2020 Jan;70:82-93.

U. S. Food and Drug Administration. Brio neuromodulation system. Summary of safety and effectiveness data. [http://www.accessdata.fda.gov/cdrh_docs/pdf14/P140009b.pdf] accessed 02/27/24.

U. S. Food and Drug Administration. Vercise Deep Brain Stimulation System. Summary of safety and effectiveness data. [https://www.accessdata.fda.gov/cdrh_docs/pdf15/P150031B.pdf] accessed 02/27/24.

U. S. Food and Drug Administration. Medtronic DBS System for Epilepsy. Summary of safety and effectiveness data. [https://www.accessdata.fda.gov/cdrh_docs/pdf/P960009S219B.pdf] accessed 02/27/24.

*Valdeoriola F, et al. Efficacy and safety of pallidal stimulation in primary dystonia: results of the Spanish multicentric study. J Neurol Neurosurg Psych 2010 Jan;81(1):65-9.

Vetkas A, et al. Deep brain stimulation targets in epilepsy: Systematic review and meta-analysis of anterior and centromedian thalamic nuclei and hippocampus. Epilepsia. 2022;63:513–524.

*Vidailhet M, et al. Bilateral deep-brain stimulation of the globus pallidus in primary generalized dystonia. NEJM 2005 Feb 3;352(5):459-67.

*Vidailhet M, et al. Bilateral, pallidal, deep-brain stimulation in primary generalized dystonia: a prospective 3-year follow-up study. Lancet Neurol 2007 Mar;6(3):201-2.

*Visser-Vanderwalle V, et al. Long-term effects of bilateral subthalamic nucleus stimulation in advanced Parkinson disease: a four-year follow-up study. Parkinsonism Relat Disord 2005 May;11(3):157-65.

*Volkman J, et al. Pallidal deep brain stimulation in patients with primary generalized or segmental dystonia: a 5-year follow-up of a randomized trial. Lancet Neurol 2012 Dec;11(12):1029-38.

*Welter ML, et al. Internal pallidal and thalamic stimulation in patients with Tourette's syndrome. Arch Neurol 2008 Jul;65(7):952-7.

*Williams A, et al. Deep brain stimulation plus best medical therapy versus best medical therapy alone for advanced Parkinson's disease (PD SURG trial): a randomized, open-label trial. Lancet Neurol 2010 Jun;9(6):581-91.

*Zesiewicz TA, et al. Practice parameter: therapies for essential tremor: report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurol 2005 Jun 28;64(12):2008-20.

*Zesiewicz TA, et al. Evidence-based guideline update: treatment of essential tremor: report of the Quality Standards subcommittee of the American Academy of neurology. Neurology 2011 Nov 8;77(19):1752-5.

Medical Policy: DEEP BRAIN STIMULATION

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Zong H, et al. Clinical study of the effects of deep brain stimulation on urinary dysfunctions in patients with Parkinson's disease. Clin Interv Aging 2019 Jun 25;14:1159-1166.

*Zorzi G, et al. Stimulation of the globus pallidus internus for childhood-onset dystonia. Mov Disord 2005 Sep;20(9):1194-200.

*Key Article

KEY WORDS

Brain stimulation, Parkinson's disease, Reclaim, thalamus, tremor, dystonia.

CMS COVERAGE FOR MEDICARE PRODUCT MEMBERS

There is currently a National Coverage Determination (NCD#160.24) for deep brain stimulation. Please refer to the following NCD website for Medicare Members: [<http://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=279&ncdver=1&CoverageSelection=Both&ArticleType=All&PolicyType=Final&s=New+York+-+Upstate&CptHcpcsCode=36514&bc=gAAAABAAAA&>] accessed 02/27/24.