

Deep Brain Stimulation Surgery: What to Expect

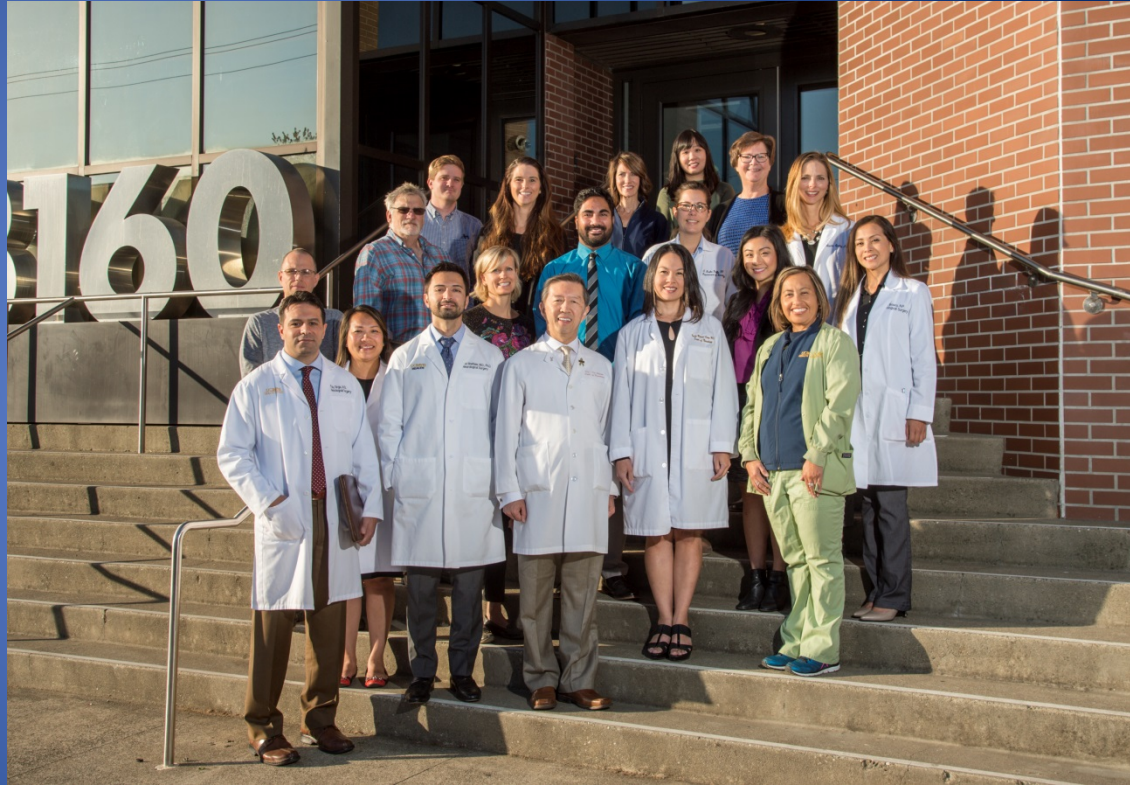
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Deep Brain Stimulation Program

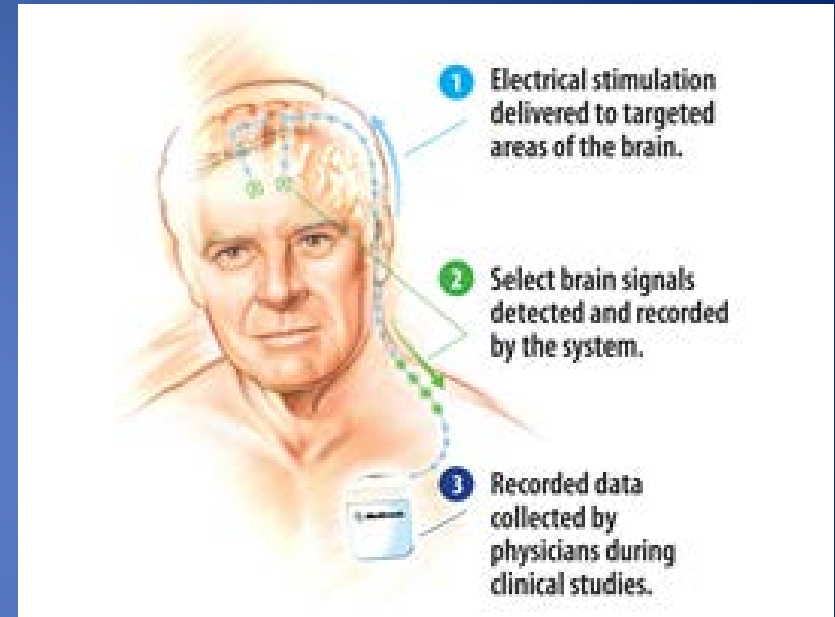
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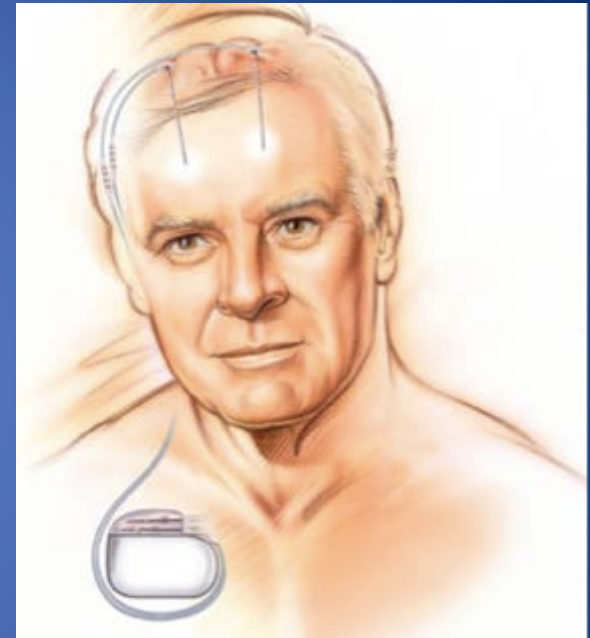
What is Deep Brain Stimulation (DBS)?

- DBS is a neurosurgical procedure that involves implanting brain electrodes and a neurostimulator (“brain pacemaker”; battery)
- The neurostimulator sends signals to specific targets in the brain
- We do not fully understand how DBS works but it appears to directly modify brain activity in a controlled manner.
- Reversible
- DBS has been around since 1987



Approved Indications

- Essential Tremor:
 - FDA approved in 1997
- Parkinson's disease:
 - FDA approved in 2002
 - FDA expanded approval in 2/2016 to include recent onset of motor complications after >4 years of PD
 - Targets dopa-responsive motor symptoms (tremor, slowness of movement, stiffness, dyskinesias)
- Dystonia:
 - FDA approved in 2003
- Obsessive Compulsive Disorder:
 - FDA approved in 2009
- Focal Epilepsy
 - FDA approved in 2018



Benefits of DBS for PD

- DBS does not cure PD
 - You will get more “On” time
- Patients may require less PD medicine after DBS, depending upon the surgical target used
- Long-term follow-up study after 5 and 10 years showed continued benefit of DBS, but there was also progression of PD

Do some PD symptoms improve more than others?

- The symptoms that respond best to PD meds are also the symptoms that respond to DBS.
- Tremor is usually better controlled with DBS than with meds.
- Dyskinesia is much better
- Cognition and non-motor symptoms do not typically improve following surgery

Benefits of DBS for Essential Tremor

- Improved ability to do everyday activities
- Less tremor
- Less disability (as reported by the patients)

Benefits of DBS for Dystonia

- DBS does not cure dystonia
- DBS can decrease the abnormal movements and postures of dystonia by 30-50%, depending upon the type of dystonia
- If you are being treated with Botox[®] before DBS surgery, you will likely resume treatment after surgery

What are the *risks* of DBS surgery?

- Stroke: bleeding or loss of blood flow to the brain (<2%)
- Infection: immediate or delayed (5%)
- Medical problems: heart attack, blood clot to lungs or legs, breathing problems (<2%)
- Seizure (<5%)
- Post-op confusion or hallucinations

Risks, continued

- Men: difficulty urinating
- Mood changes
 - Mania: abnormally elevated mood
 - Depression, anxiety
 - Apathy
- Cognitive decline: word finding
- Falling

What are the criteria for approval for DBS surgery?

- Symptoms not responding to best medical therapy:
 - Parkinson's disease (PD) The best surgical candidates have a marked difference between "on" and "off" symptoms.
 - Dystonia chronic, primary dystonia, including generalized and segmental dystonia, hemidystonia, and cervical dystonia (torticollis)
 - Essential Tremor
- Good general health
- Good cognition
- MRI of brain
- Reasonable expectations

DBS Candidate Evaluation

- Neurology consult with movement disorder specialist
 - Neurosurgery consult
 - Neuropsychology consult
 - On/ Off Testing (PD) or Off Testing (ET, Dystonia)
 - Screening MRI
- DBS CASE CONFERENCE:
 - Review results of evaluation with multidisciplinary team to develop recommendations for or against DBS surgery

Preparation for Surgery

- Obtain medical clearance from your primary physician and/or mental health provider
 - If there are changes in your physical or mental health, please contact the Neurology and/or Neurosurgery clinic immediately
- Maintain good health through regular exercise and good nutrition.
- Practice relaxation techniques
- If you smoke, stop! Smoking slows the healing process and increases your infection risk
 - We require you to stop smoking for several months prior to surgery to reduce infection risk.

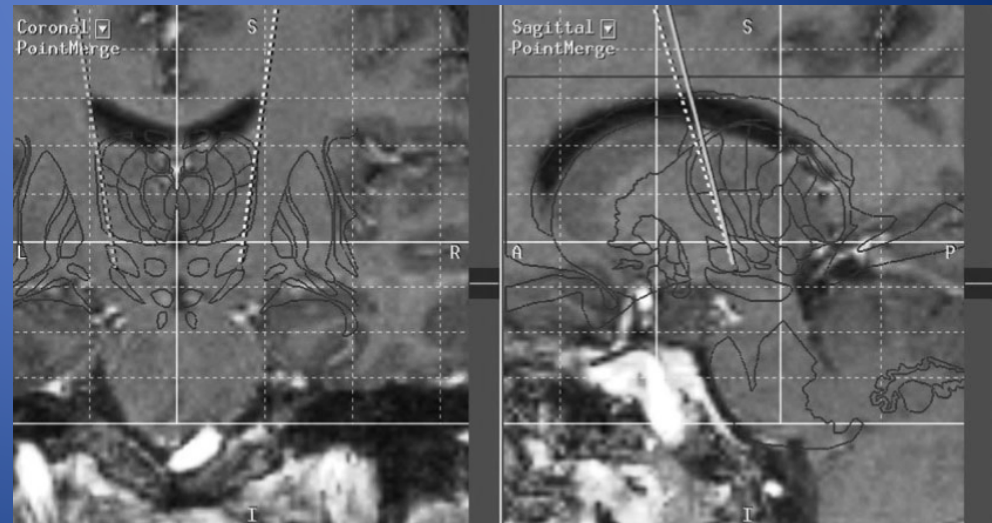
Pre-op Medications

- 4 weeks prior to surgery:
 - Stop estrogen therapy to reduce risk of blood clots
- 7-14 days prior to surgery:
 - Avoid aspirin, Plavix or aspirin-containing drugs, NSAIDS and other blood thinning agents.
 - Important: Review the plan for stopping your doctor-prescribed blood thinners with the prescribing doctor and the DBS team

1-2 weeks Prior to Surgery

- Pre-op appointment with a Neurosurgery Nurse Practitioner
 - Their team will order pre-op labs, EKG and Chest X-ray as needed
 - Write down any questions you have for this appointment.

- Targeting MRI of the brain- this is critical for your surgery.



Preparation for Surgery Day

- The Admission Office will call you a few days prior to your surgery with your arrival time and instructions
- You will stop taking your movement disorder medication(s) at midnight
- You can continue to drink water until 2 hours before your arrival time

Medtronic® DBS system

3 Neurostimulator



Lead and Electrodes

1

2 Extension

4

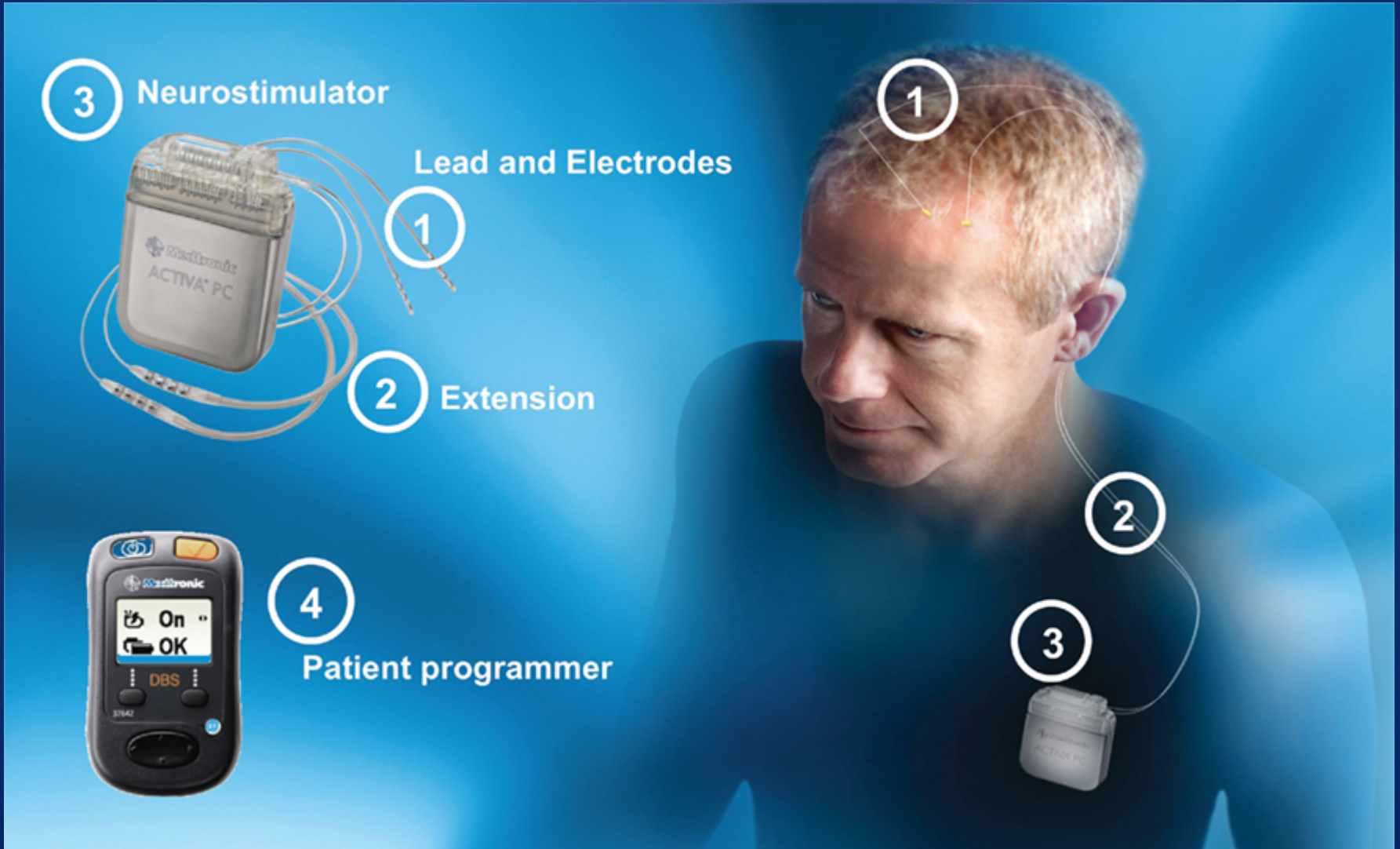
Patient programmer



1

2

3



Day of Surgery: First steps

- The preoperative nurse will insert an IV line to prevent dehydration and administer medications.
- The anesthesiologist, surgical nurse, DBS NP and neurosurgeon will complete any final assessments and surgical consents
- You will be given an intravenous medication to help you relax before the headframe is placed
- The neurosurgeon will numb the skin and place the head frame



- Once the head frame is placed, you will be taken to the Radiology suite for a head CT scan
 - This is merged with the pre-op MRI to ensure accurate targeting
- You will be taken to the OR suite and transferred to the OR bed
- Once you are comfortable on the bed, the anesthesiologist will give you some medication to help you sleep



Surgical Prep

- Your hair around the operative site will be clipped.
 - The surgeon may give you the option to shave your entire head or just the area being targeted
- Surgical site scrubbed with disinfectant
- Head draped with sterile sheets to avoid infection
- Urine catheter is placed to empty your bladder
- Arterial line is inserted into your arm to accurately monitor blood pressure

Surgery

- While you are sleeping, the surgeon will numb the skin on your scalp to make a small incision in the skin. He will then make an opening (“Burr hole”) in the skull using a drill.
- Once the surgeon has made the “Burr hole” and set up the equipment, you may be awakened so you can participate with the surgical team in determining the best location for the electrode lead.
 - In some cases, patients will be allowed to stay under anesthesia for this part of surgery.
- Placement of the lead is done by the neurophysiologist with “microelectrode recording”
 - You will hear noise that sounds like radio static
 - When instructed you will do passive and active range of motion movements with the assistance of the DBS team



Surgery, continued

- Once the target area is identified, the surgeon will implant the electrode lead
- The stimulator will be turned on to evaluate symptom control and side effects
 - If needed, we can adjust the positioning of the electrode at this time.
 - Potential side effects: numbness, tingling, pulling, a sensation of tightness, double vision or difficulty speaking.
- A final portable CT scan will be obtained to confirm placement. This is done in the operating room.
- Once placement is confirmed, the anesthesiologist will give you medication to go back to sleep if you were awake

Final steps...

- Completing the surgery:
 - The small hole(s) in your skull will be closed holding the lead firmly in place
 - A plastic cap covers the hole to keep it sealed
 - Your scalp incision(s) will be closed
 - The headframe will be removed
 - The urine catheter will be removed
- Recovery:
 - Your family and friends can see you once you are awake
 - You will be admitted to our neuro unit for a 1-2 night hospitalization

Extension and Battery Placement

- This surgery typically takes place 1-2 weeks after the lead(s) is/are placed
- This is an outpatient procedure
- You will be asleep (general anesthesia) for this surgery
- Most people find this 2nd procedure more taxing than the actual brain surgery

After Surgery

Caring for your surgical wounds

- Head wound site:
 - Bandages need to remain in place for 24 to 48 hours post-op, until removed by MD or you are given instructions to remove them yourself. Stitches will be removed 7-10 days after surgery.
- Pin sites (where the head frame was attached) are very small wounds and will close up almost immediately. They may be tender or painful.
 - Ice packs help to decrease swelling and discomfort
- Additional wounds at battery and connector sites:
 - These are small incisions which are closed internally and covered with pieces of tape (steri-strips) externally. The steri-strips will fall off as the wounds heal.

Post-Surgery Bathing

- You may shower on day 3 post-surgery
- No long steamy showers or hot tubs for 6-8 weeks.
- You can wash your hair with baby shampoo and pat the incision dry
- You may gently clean the incision sites to remove any debris. (Hydrogen peroxide works well)
- Hand-held shower heads are recommended to wash below the incision areas.

Symptoms

- Normal symptoms include swelling at the pin sites, the incisions, and your face
 - Do not be alarmed at swelling and minor bruising around the eyes; this will resolve gradually.
- You may also experience neck and/or chest swelling and bruising. This should resolve within 2 weeks post-op.
- Microlesion Effect: PD or ET symptoms may be temporarily relieved and will then return. **This is normal.** Your stimulators have not yet been activated.

Reasons to contact our office

- Incision:
 - Bleeding or drainage
 - Increased tenderness, redness, puffiness
 - Separation of wound
- Body symptoms:
 - Fever or chills
 - Dizziness or lightheadedness that is new
 - Headaches not relieved by medication
- Other:
 - Weakness in limbs or facial muscles
 - Speech changes
 - Confusion or mentation changes

Complications

- If sudden and/or severe changes occur, do not hesitate to **call 911** or **go to the ER**.

Medications

- At the time of discharge from the hospital, you will continue to take the same medications as before your surgery. DO NOT change your medication schedule unless otherwise instructed.
- Pain medication, anti-nausea medicine, and sleeping medicine will be ordered, as needed.

Neck Range of Motion Exercises

- To limit scar tissue attaching to the extension wires causing a pulling sensation, practice daily GENTLE range of motion exercises to ensure maximum neck mobility post-surgery



Limitations and Suggestions

- NO STOOPING, STRAINING, OR SQUATTING for 4 to 6 weeks after surgery to reduce increased pressure within your skull
 - Do not lift objects that weigh more than 20lbs
 - Do not garden, run, or lift weights
- Sleep on 3 or 4 pillows, to encourage drainage and help prevent/reduce swelling.
- To limit infection risk:
 - Do not go to the gym for 6 weeks after the last surgery
 - Avoid swimming or hot tubs for 2 months after surgery
 - Dental work should be deferred for 6 weeks after the last surgery
 - NO hair coloring or perm solutions can be used until 6 weeks after surgery
 - NO haircuts with clippers for 6 weeks following surgery
- You can increase your diet as tolerated.

Restricted Activities

- Depending upon your occupation, we recommend taking at least 2 weeks off after each surgery.
 - For patients with Parkinson's disease, we recommend taking off 6-8 weeks to allow time to adjust to new medication and programming settings
- DO NOT
 - drive for 2 weeks after your last surgery.
 - fly for 2 weeks after your last surgery.
 - take long car trips for 4-6 weeks after surgery (this is to prevent blood clots in the legs).
- The amount of activity you may perform after the first 2 weeks is largely individual and difficult to generalize. Let your comfort level and common sense be your guide.

Maybe you weren't going to ask...

- You may resume sexual relations 3-4 weeks after surgery.

Turning On

- Your stimulator will be turned on approximately 4 weeks after the implant date.
- You will come in off of your movement disorder medications for this appointment.
- The first activation/programming session will take several hours.
- Future programming sessions will take approx 1 hour
- Optimum stimulation results can take 3-6 months of programming adjustments



Patient Programmer



Simple Mode



Advanced Mode

You will be instructed about how to use the patient programmer to check your DBS and adjust the settings before you leave the clinic.

Safety Concerns

- It is safe to use household appliances, computers, and cell phones.
- It is safe to pass through metal detectors; however, your stimulator may get turned off.
- Carry your ID and your home programmer so that you will be able to turn your stimulator back on.
- Purchase a medical id bracelet/necklace noting “Deep Brain Stimulator”
- You may use an electronic toothbrush

Precautions

- MRI: Medtronic DBS is now FDA approved for full-body MRI in some circumstances
 - You must obtain approval from your DBS provider prior to ALL MRI procedures
- Inform all your medical providers about your DBS device
- Some procedures will need to be modified for safety
 - Bipolar electrocautery only

Things to Avoid

- Diathermy (deep heat therapy), used by some physical therapists and dentists
- Welding
- No lithotripsy (treatment for kidney stones)
- REVIEW ALL PROCEDURES WITH US FOR APPROVAL. We can forward DBS guidelines to your providers prior to any procedure

Living with DBS

- Dentist: Prophylactic antibiotics not required
- EKG – turn off DBS prior to procedure
- CT, diagnostic ultrasound, x-ray, mammogram are safe
- MRI conditional
- Monitor battery status regularly
 - Requires replacement approx every 3-5 years

Questions?

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