WASHINGTON BRAIN & SPINE INSTITUTE

Spinal Cord Stimulator and Implantable Pulse Generator

Preoperative Patient Education Guide — Percutaneous and Paddle Lead Placement

Provider: Lekhaj Daggubati, MD | Phone: **301.718.9611**

ROCKVILLE	TYSONS	FREDERICK	WHITE OAK
3202 Tower Oaks Boulevard, Suite 100 Rockville, MD 20852	8605 Westwood Center Drive, Suite 201 Vienna, VA	198 Thomas Johnson Drive, Suite 17 Frederick, MD 21704	11886 Healing Way, Suite 401 Silver Spring, MD 20904

Purpose of This Document

This document explains your upcoming **spinal cord stimulator (SCS) and implantable pulse generator (IPG)** placement. SCS therapy is offered in two surgical approaches — **percutaneous lead placement** and **paddle (surgical) lead placement** — and this packet covers both. Please read it carefully prior to surgery.

What Is Spinal Cord Stimulation?

Spinal cord stimulation is a neuromodulation therapy in which thin electrical leads are positioned in the **epidural space** (just outside the spinal cord's protective covering) to deliver low-voltage electrical signals to the dorsal columns of the spinal cord. These signals modulate pain transmission and can substantially reduce chronic pain — typically without producing significant medication side effects.

SCS is most commonly used for **chronic, neuropathic pain** that has not responded adequately to medications, physical therapy, injections, and other conservative measures. Common indications include:

- **Persistent spinal pain syndrome (PSPS, formerly "failed back surgery syndrome")** — chronic axial or radicular pain following one or more prior spine surgeries
- **Complex regional pain syndrome (CRPS) types I and II**
- **Painful diabetic peripheral neuropathy (PDPN)**
- **Chronic radiculopathy** not amenable to further surgical correction
- **Refractory angina pectoris** (in select cases)
- **Peripheral vascular disease** with intractable ischemic pain (in select cases)

Trial Before Permanent Implant

Nearly all patients undergo a **temporary SCS trial** lasting 5–10 days before a permanent implant is offered. The trial uses the same lead types but with an external generator worn on a belt. A trial is considered successful — and qualifies you for a permanent implant — when you experience **≥50% pain reduction**, meaningful functional improvement, and reduced opioid or analgesic use during the trial period. This packet covers the **permanent implant** procedure.

Anatomy Relevant to SCS

The **spinal cord** runs through the spinal canal, surrounded by three layers: the **pia mater** (innermost), **arachnoid mater**, and **dura mater** (outermost). The space just outside the dura — the **epidural space** — contains fat and venous plexus and is the target for SCS lead placement.

Dorsal columns are tracts of sensory nerve fibers running along the back of the spinal cord. Stimulation of these fibers modulates pain perception. **Lead placement is most commonly in the thoracic spine** (typically T7–T10 for low back and leg pain) or the **cervical spine** (typically C2–C5 for neck and arm pain). The generator (IPG) is placed in a subcutaneous pocket — usually in the **upper buttock or flank** for thoracic leads, and the **upper chest/infraclavicular area or flank** for cervical leads.

The Two Approaches: Percutaneous vs. Paddle

Percutaneous Lead Placement

Percutaneous leads are **thin cylindrical wires (1.3 mm diameter)** with multiple stimulation contacts. They are placed through a needle into the epidural space under fluoroscopic guidance — no laminectomy is required.

- **Approach:** Tuohy needle inserted into the epidural space at L1–L2 (for thoracic leads) or T1–T2 (for cervical leads), then leads advanced rostrally under fluoroscopy
- **Anesthesia:** Local anesthesia with sedation — you remain responsive for intraoperative testing (selected programs) or general anesthesia for full implant
- **Incision size:** Two small incisions (~1–2 inches each) — one for lead anchoring, one for IPG pocket
- **Operative time:** 60–120 minutes
- **Recovery:** Faster — typically same-day discharge with minimal restrictions
- **Advantages:** Less invasive; minimal tissue dissection; faster recovery; lower wound complication rates
- **Disadvantages:** Higher long-term lead migration rates (10–20%); more limited stimulation field coverage; not feasible if epidural scarring from prior surgery obstructs lead passage

Paddle (Surgical) Lead Placement

Paddle leads are **flat, broad arrays** with multiple columns of stimulation contacts on a flexible plastic carrier. They require a **small laminotomy or laminectomy** for placement directly over the dura mater.

- **Approach:** Midline incision over the target level, small laminotomy/laminectomy, paddle lead slid into the epidural space
- **Anesthesia:** General anesthesia

- **Incision size:** Midline back incision (~2–3 inches) plus separate IPG pocket incision
- **Operative time:** 90–180 minutes
- **Recovery:** Slightly longer — 1–2 weeks more activity restriction than percutaneous
- **Advantages:** Far more stable position (lower migration rates, ~3–5%); broader, more directional stimulation field; better energy efficiency (longer battery life for non-rechargeable IPGs); excellent option after failed percutaneous placement or when extensive epidural scarring is anticipated
- **Disadvantages:** More invasive; longer recovery; slightly higher wound complication rate; not reversible without a second open procedure

Which Approach Is Right for You?

Your surgeon will recommend the approach based on:

- **Trial response** — patients who responded strongly to a percutaneous trial often proceed with permanent percutaneous leads; partial responders may benefit from the broader coverage of a paddle
- **Anatomy and prior surgery** — extensive epidural fibrosis often favors paddle placement
- **Pain pattern** — broad, bilateral, or hard-to-cover pain patterns often respond better to paddle leads
- **Patient preference and lifestyle** — active patients sometimes prefer the lower migration risk of paddles
- **Body habitus and IPG longevity considerations**

The IPG (Implantable Pulse Generator)

The IPG is a small, battery-powered device — about the size of a pocket watch — implanted in a **subcutaneous pocket**. Modern IPGs are available in two types:

- **Rechargeable IPGs** — Smaller and longer-lasting (battery life 9–25 years depending on usage). Require external recharging every 1–4 weeks via a wireless charger placed over the skin.
- **Primary cell (non-rechargeable) IPGs** — Larger; no recharging required; battery lasts 3–7 years before replacement surgery is needed.

IPG pocket location is selected for comfort, ease of recharging, and minimal interference with clothing or activity. Common locations:

- Upper buttock (most common for thoracic leads)
- Flank/posterior abdominal wall
- Infraclavicular chest (more common for cervical leads)

Modern Programming Options

Today's SCS systems offer multiple waveform options that your provider may program based on your pain pattern:

- **Traditional (tonic) stimulation** — produces a gentle tingling (paresthesia) over the painful area
- **High-frequency stimulation (10 kHz)** — paresthesia-free; targets neuropathic and axial pain

- **Burst stimulation** — paresthesia-free; mimics natural firing patterns
- **Closed-loop / ECAP-controlled stimulation** — measures the spinal cord's response and adjusts in real time
- **Differential target multiplexed (DTM) stimulation** — targets both neurons and glial cells

Most modern devices are **MRI-conditional** — you can usually undergo MRI scans (1.5 T and often 3 T) with specific conditions and device programming.

Enhanced Recovery After Surgery (ERAS)

Our SCS/IPG ERAS pathway emphasizes:

- **Multimodal pain control** to minimize opioid use
- **Strict wound care** — infection prevention is paramount for any implanted hardware
- **Early mobilization** — walking the same day
- **Same-day discharge** for the vast majority of cases
- **Activity restrictions** specifically designed to prevent lead migration
- **Early follow-up programming** to optimize stimulation parameters

Preoperative Medication Instructions

⚠ CRITICAL — REVIEW WITH YOUR SURGEON

Some medications and supplements can cause **dangerous bleeding** during or after surgery. Spinal cord stimulator placement carries particular risk for **epidural hematoma**, which can cause neurologic injury. Review every medication, vitamin, and supplement (including over-the-counter items) with our office at least **2 weeks before surgery**. If you take blood thinners, you must have specific clearance instructions.

Medications to STOP Before Surgery

Medication Class	When to Stop
Aspirin (81 mg or 325 mg)	7 days before surgery
Clopidogrel (Plavix), ticagrelor (Brilinta), prasugrel (Effient)	5-7 days before surgery
Warfarin (Coumadin)	5 days before surgery — bridging may be required
Apixaban (Eliquis), rivaroxaban (Xarelto), dabigatran (Pradaxa), edoxaban (Savaysa)	72 hours before surgery (per cardiology)
NSAIDs (ibuprofen, naproxen, meloxicam, celecoxib, diclofenac)	7 days before surgery
SGLT2 Inhibitors (Jardiance, Farxiga, Invokana)	Hold 3-4 days prior to surgery (check with the anesthesia team)
Fish oil, vitamin E, ginkgo, garlic, ginseng, turmeric, CBD	7 days before surgery
GLP-1 agonists (Ozempic, Wegovy, Mounjaro, Zepbound)	1 week before surgery (anesthesia aspiration risk)
Hormone replacement, oral contraceptives	Discuss with surgeon — increases DVT risk
Recreational marijuana, nicotine products	Stop completely; nicotine impairs bone and wound healing

Medications to CONTINUE

Medication Class	Instructions
Blood pressure medications	Take with a sip of water the morning of surgery (hold ACEi/ARB only if instructed)
Antiseizure medications	Continue without interruption
Thyroid medications	Continue without interruption
Reflux medications (PPIs, H2 blockers)	Continue
Psychiatric medications	Continue (notify us about MAOIs or lithium)
Chronic pain medications (opioids, gabapentin, duloxetine)	Continue — do not abruptly stop. Inform anesthesia.
Inhalers	Bring with you and use as normal

Special Considerations

- **Diabetes medications:** Hold metformin the morning of surgery. Take half your usual dose of long-acting insulin. Hold SGLT2 inhibitors (empagliflozin, dapagliflozin) 3 days before surgery.
- **Chronic opioids:** Continue at your usual dose and inform anesthesia. Do not increase your dose in anticipation of postoperative pain.
- **Steroids:** Inform us if you take chronic steroids — stress-dose coverage may be needed.
- **Immunosuppressants and biologics:** May need to be held — coordinate with your prescribing physician. The infection risk for implanted hardware makes this particularly important.

Infection Prevention — A Critical Priority

Because SCS placement involves **permanent implanted hardware**, infection prevention is taken very seriously. A deep infection involving the leads or IPG typically requires removal of the entire system. The following measures dramatically reduce infection risk:

- **Skin preparation:** Chlorhexidine showers the night before and morning of surgery. Avoid shaving the surgical area at home — this can cause micro-abrasions.
- **Glycemic control:** If diabetic, work with your primary care provider to keep HbA1c below 7.5% prior to elective implantation; target glucose <180 mg/dL on the day of surgery.
- **Nicotine cessation:** Smokers have substantially higher wound infection and dehiscence rates.
- **Postoperative antibiotic prophylaxis:** You will be discharged home with a 10-day course of **doxycycline 100 mg twice daily** as additional protection against hardware infection during the early healing period. Take every dose as prescribed.

Preoperative Optimization Pathway

Getting Ready for Surgery — Simple Steps for Less Pain & a Faster Recovery

Patients who follow these steps tend to have **less pain, need less medication, heal faster, and return home sooner.** Please start as early as you can — ideally **4 weeks before** your surgery date.

1. Eat Well & Hit Your Protein Target

- **Eat more protein.** Include eggs, fish, chicken, dairy, beans, or a protein shake at every meal. Protein is what your body uses to heal wounds, knit bone, and keep muscle strong.

Daily protein goal: about 1.5 grams per kilogram of body weight.

Quick guide: a **150 lb person** should aim for roughly **100 g of protein per day**, spread across meals (about **25–35 g each**). Your care team can tailor this for you.

Note: patients with significant kidney disease (advanced CKD) should discuss protein targets with their nephrologist before increasing intake.

- **Choose healing foods.** Vegetables, fruit, and whole grains lower inflammation. Cut back on sugar, processed food, and alcohol.
- **Drink plenty of water** in the days before surgery. Clear liquids are usually allowed up to 2 hours before you arrive.
- **Carbohydrate drink.** Unless you are diabetic, a clear carbohydrate drink (such as ClearFast or unconcentrated Gatorade) **2–3 hours before** surgery reduces stress and nausea. Your team will advise on the specifics.

2. Plan for Comfort & Pain Control

- **We use several mild medicines together** so we can keep you comfortable while using as little opioid medication as possible.
- **Bring a full list of your medicines.** Some blood thinners, anti-inflammatories, supplements, and diabetes/weight medicines (including GLP-1 agonists such as Ozempic, Wegovy, and Mounjaro) may need to be paused.
- **Tell us if you take pain medication regularly.** A simple plan helps us keep you comfortable afterward and prevents withdrawal symptoms.

3. Helpful Supplements (but Not Necessary)

- **Protein shake or powder** — the easiest way to reach your protein goal if appetite is low. Whey or plant blend with ~20–30 g per serving.
- **Vitamin D3** — low vitamin D is linked to slower bone healing and more pain after spine surgery. We may check your level and suggest a dose (often **1,000–2,000 IU daily**).

- **Iron** — only if you are anemic or low on iron. Correcting it before surgery lowers transfusion risk. We will test first.
- **Vitamin C and zinc** — support wound healing. A daily multivitamin usually covers both.

STOP these supplements about 1 week before surgery

Fish oil, vitamin E, high-dose garlic, ginkgo, turmeric (high-dose), and CBD — these can increase bleeding. Review every supplement with your surgeon before starting or stopping anything.

4. Keep Moving & Prepare Your Home

- **Walk every day.** A 20–30 minute walk builds strength and stamina. More active patients recover noticeably faster.
- **Practice the basics.** Rehearse getting in and out of bed, using a walker if needed, and slow deep breathing exercises with an incentive spirometer.
- **Set up your home.** Clear walkways, keep items within easy reach, and arrange a ride and a helper for the first day or two.

5. Other Important Steps

- **Stop smoking and nicotine.** This is the single most powerful change you can make. Quitting even 4 weeks before surgery greatly improves healing and lowers complications.
- **Control blood sugar.** If you have diabetes, work with your doctor to keep it well managed before surgery. Target HbA1c < 7.5% for elective cases.
- **Rest and relax.** Aim for 7–8 hours of sleep nightly. Worry can make pain feel worse — gentle breathing exercises (4-7-8 breathing), guided imagery, and mindfulness apps (Calm, Headspace, Insight Timer) help.
- **Prevent infection.** You will be asked to wash with chlorhexidine (Hibiclens) antiseptic soap the night before and morning of surgery. **Please do not shave the surgical area** — this can cause micro-abrasions that increase infection risk.
- **Manage other conditions.** Keep blood pressure, heart, and breathing problems under good control with your regular physicians before surgery.

6. What to Bring on Surgery Day

- **Photo ID and insurance card.** Plus a list of all your medicines and doses.
- **Loose, comfortable clothing** and flat, non-slip shoes that are easy to put on.
- **Your CPAP machine** if you use one for sleep apnea, and any braces or walking aids.
- **A responsible adult** to drive you home and stay with you for the first 24 hours.
- **Leave valuables and jewelry at home.** Remove nail polish and contact lenses before arrival.

Day Before & Day of Surgery

Day Before Surgery

- **Nothing to eat after midnight.** Clear liquids (water, black coffee, apple juice) are allowed up to **2 hours before** arrival unless told otherwise.
- **Chlorhexidine (Hibiclens) shower** the night before — focus on the planned surgical area.
- Sleep in clean sheets and clean clothing.
- Pack your bag: ID, insurance card, complete medication list, CPAP if applicable, loose-fitting clothing for going home, slip-on shoes.
- **Do not shave** the planned surgical site at home.

Day of Surgery

- Arrive at the time given (usually 2 hours before surgery).
- **Repeat the chlorhexidine shower** the morning of surgery.
- Brush teeth but do not swallow water.
- Do **not** wear makeup, lotions, perfumes, nail polish, or jewelry.
- Wear loose, comfortable clothing.
- Bring this packet and your medication list.
- Have a responsible adult drive you home and stay with you for the first 24 hours.

Your Countdown to Surgery

Keep this page handy — it shows what to do as your surgery date gets closer.

4–2 Weeks Before — BUILD STRENGTH	1 Week Before — GET READY	1–2 Days Before — FINAL STEPS
✓ Stop smoking & nicotine	✓ Confirm medicines to pause	✓ Antiseptic (chlorhexidine) soap wash
✓ Eat more protein (~1.5 g/kg/day)	✓ Arrange ride & helper	✓ Clear carbohydrate drink (non-diabetics)
✓ Walk 20–30 min daily	✓ Practice breathing exercises	✓ Clear liquids up to 2 hours prior
✓ Manage blood sugar & BP	✓ Keep eating protein	✓ Take pre-op medicines as instructed
✓ Correct any anemia	✓ Avoid alcohol	✓ Rest & arrive on time

Questions?

Call your care team at **301.718.9611**. Always follow the specific instructions from your surgeon and anesthesiologist — those instructions come first. This guide is for patient education and does not replace advice from your doctor.

Risks of Surgery

SCS implantation is generally well-tolerated, but all surgery carries risk. Specific risks are listed below by category.

General Surgical Risks

- **Bleeding** — Usually minimal. **Epidural hematoma** is the most serious bleeding complication and can cause neurologic injury; risk is approximately 0.3% and is minimized by holding blood thinners appropriately.
- **Infection** — 3% overall (higher for paddle than percutaneous). Deep infection involving hardware typically requires explantation.
- **Anesthesia complications**
- **Blood clots (DVT/PE)** — Low risk; mitigated by early ambulation.

Risks Specific to Lead Placement

- **Lead migration** — Movement of the lead from its original position, reducing stimulation effectiveness. Higher for percutaneous (10–20% lifetime) than paddle (3–5%). May require revision.
- **Dural puncture / CSF leak** — Inadvertent puncture of the dura during needle placement (percutaneous) or laminotomy (paddle). May cause a postural headache; usually self-limited but occasionally requires a blood patch.
- **Spinal cord or nerve root injury** — Very rare (<0.5%) but potentially serious; can cause weakness, numbness, or paralysis.
- **Loss of therapeutic effect over time** — Some patients experience reduced pain relief as the nervous system adapts; reprogramming or revision may help.
- **Unpleasant stimulation** — Stimulation in areas other than the targeted pain region; usually adjustable by reprogramming.

Risks Specific to IPG Pocket

- **Pocket pain** — Discomfort at the IPG site; usually resolves within weeks but occasionally persists.
- **Hematoma or seroma at the IPG pocket** — Collection of blood or fluid; usually resolves spontaneously but may need drainage.
- **IPG migration or flipping** — The generator can shift in the pocket; uncommon with proper surgical technique.
- **Wound dehiscence (opening)** — Higher risk in smokers, diabetics, and patients on immunosuppression.

Device-Related Risks

- **Battery depletion (non-rechargeable IPGs)** — Requires a replacement procedure every 3–7 years.
- **Hardware malfunction** — Rare; may require revision.
- **MRI restrictions** — Most modern devices are MRI-conditional, but some scans may not be possible with the system in place.

Reason for Surgery

Permanent SCS/IPG implantation is recommended when the following criteria are met:

Indications

- **Chronic neuropathic pain** lasting more than 6 months that has not responded adequately to conservative care (medications, physical therapy, injections, and where appropriate, prior surgery)
- **Successful SCS trial** demonstrating ≥50% pain reduction, functional improvement, and reduced analgesic use
- **Diagnosis appropriate for SCS** (persistent spinal pain syndrome, CRPS, painful diabetic peripheral neuropathy, refractory radiculopathy, etc.)
- **Psychological clearance** — most insurers require a pre-implant psychological evaluation; depression, anxiety, and other psychological factors are addressed prior to implant
- **No contraindications** — no active infection, no untreated coagulopathy, no medical instability
- **Patient understanding** of the device, recharging requirements (if applicable), activity restrictions, and the need for ongoing follow-up

Realistic Expectations

SCS is **not a cure** for chronic pain. Realistic goals include:

- **50–70% reduction in pain intensity** for most successful implants
- **Improved function** — better sleep, increased activity tolerance, return to work for some patients
- **Reduced reliance on opioid medications** — though complete elimination is uncommon
- **Improved quality of life**

A small percentage of patients (10–20%) eventually experience loss of effectiveness and may require explantation. Honest discussion with your surgeon about goals is essential.

Hospital Stay and Discharge Planning

Most SCS/IPG patients go home the same day. Selected paddle implant patients may stay one night. Before discharge:

- Tolerate oral intake
- Walk safely with assistance
- Have pain controlled with oral medications
- Urinate independently
- Stimulation system tested and basic programming confirmed
- Patient/family education completed regarding device handling, recharging (if applicable), and activity restrictions

Contact Information

Provider: Lekhaj Daggubati, MD

Practice: Washington Brain & Spine Institute

Main Phone (All Locations): 301.718.9611 — business hours

After-Hours / Urgent Concerns: 301.718.9611 — answering service will contact the on-call provider

Clinical Office Locations

Rockville: 3202 Tower Oaks Boulevard, Suite 100, Rockville, MD 20852

Tysons: 8605 Westwood Center Drive, Suite 201, Vienna, VA

Frederick: 198 Thomas Johnson Drive, Suite 17, Frederick, MD 21704

White Oak: 11886 Healing Way, Suite 401, Silver Spring, MD 20904

Emergency: Call **911** or proceed to the nearest emergency department for life-threatening symptoms — severe difficulty breathing, sudden weakness or paralysis, loss of consciousness, seizure, severe sudden headache, chest pain, or stroke-like symptoms.