

Innovations for Active Healing



Precision in Pain Management: Best Practices and Reimbursement Trends in Peripheral Nerve Stimulation for Chronic Pain

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Faculty Disclosures

- **Hemant Kalia, MD:** Advisory Board—Abbott, Nalu Medical, Curonix, Nervonik
- **Alexandra Adler, MD:** Consultant—Bioventus

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Program Information

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Learning Objectives

- Review best practices using PNS to treat chronic pain, as well as the locations that have offered the best outcomes
- Describe clinical experiences and evidence-based best practices for using Peripheral Nerve Stimulation (PNS) in chronic pain management, including anatomical targets associated with optimal outcomes
- Interpret current reimbursement policies, including Local Coverage Determinations (LCDs), and project future trends influencing access to PNS therapy

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Navigating the PNS Frontier: A Strategic Analysis of Clinical Evidence, Reimbursement, and Coding

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ASIPP Clinical Guidelines Foundation

Evidence Classification

Permanent Systems

Level III “Fair” evidence with Moderate recommendation strength

Temporary 60-Day Systems

Level III “Fair” evidence with Moderate recommendation strength



ASPN Guidelines: High-Level Evidence



Chronic Migraine

Level I, Grade B for occipital nerve stimulation



Hemiplegic Shoulder Pain

Level I, Grade B evidence rating



Lower Extremity Pain

Level I, Grade B for neuropathic and post-amputation pain

ASPN uses USPSTF criteria for indication-specific, granular ratings.

Risk Stratification and Best Practices



Low Risk

PNS trials and implantation for extremities and superficial nerves



Moderate Risk

Procedures targeting lumbar medial branches



High Risk

Thoracic/cervical medial branches, trigeminal and cranial nerve procedures

Patient education remains crucial for successful PNS treatment outcomes.

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Clinical Experiences and Evidence-Based Best Practices for Using PNS in Chronic Pain Management

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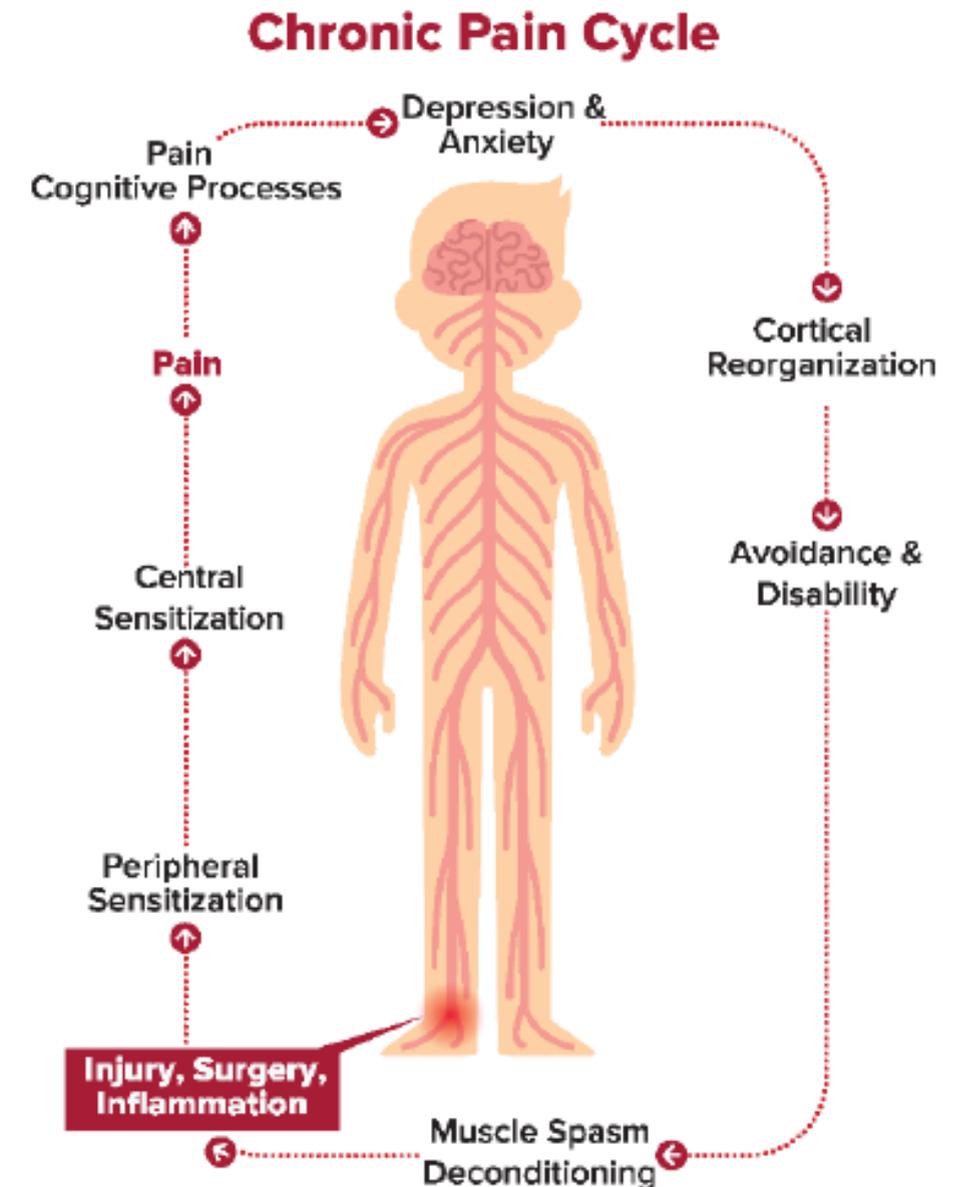
Overview

- Brief overview of PNS
- Patient selection criteria and exclusions
- Review of evidence of PNS overall and for select conditions
- Overview of the trial and implant process
- Case study

How Does Chronic Peripheral Neuropathic Pain Develop?

Continued pain sends signals resulting in peripheral and central sensitization, which cause chronic pain through maladaptive cortical plasticity.

If sensitization and maladaptive cortical change has already taken place, pain may remain even following mechanical correction and removal of the initial pain generator.



What Is PNS?

- Neuromodulation is the use of electricity to treat pain
 - Electrical pulses are delivered to the spinal cord or peripheral nerves, changing the transmission of pain signals locally and to the brain (Gate Theory)
- The goal is to selectively stimulate sensory fibers (including creating a paresthesia) while typically avoiding activating motor fibers, triggering muscle contractions
- PNS uses similar concepts to spinal cord stimulation but targets the peripheral nervous system
 - However, this does not mean that the central nervous system is not involved
- For today's purposes, in PNS, a small electrode is introduced via a percutaneous approach in the close vicinity of a nerve

Why is PNS Useful?

- PNS decreases central sensitization and impacts activity in the spinal cord
 - Affects wide dynamic range neurons (important for spinal transmission of nociceptive information) in the dorsal horn
- May affect chemo-signaling in the brain as well
- ? Peripheral reconditioning of the central nervous system

PNS vs SCS

- Targeted pain relief
 - Ability to target a specific peripheral nerve or areas that are traditionally hard to stimulate with SCS (distal extremities, clavicle, abdomen)
- Ease of placement
 - Less invasive and typically smaller leads
 - In some cases, PNS may be placed in outpatient setting using local anesthesia only
- Lower risk profile
 - Lower risk of serious complications such as spinal cord injury, nerve injury, or dural puncture
 - Although there is less data available for PNS, rates of lead fracture and migration appear to be similar to or less than SCS
- Minimally invasive
 - Fewer post-procedure mobility restrictions
 - Wearable battery, no need for battery replacement

SCS = spinal cord stimulation.

Eldabe S, et al. *Pain Med.* 2016 Feb;17(2):325-36.

Pre-Implant General Considerations

- PNS is indicated for patients with chronic intractable pain believed to be of neuropathic origin that has been refractory to or inadequately treated by other modalities
 - Choice of conditions to treat is based both on evidence and clinician experience
 - Temporary vs permanent systems
- Pain type (neuropathic vs nociceptive, mixed) and patient type (susceptibility to nerve injury)
- Prior treatments and efficacy
- Diagnostic nerve block
 - Does not always correlate to an outcome (eg, post-stroke shoulder pain)
- Psychological screening

Pre-Implant Assessment

- Contraindications, including relative contraindications
 - Active systemic or localized infection
 - Inability to manage or understand the device
 - Inability of patient to consent or patient refusal
 - Allergy to device components
 - Active substance use disorder
 - Untreated or concern for secondary gain
 - Anticoagulation
 - Psychiatric illness
 - Active litigation
 - Bleeding disorder
 - Need for certain types of MRI
 - High infection risk (eg, uncontrolled diabetes, immunosuppression)

MRI = magnetic resonance imaging.

Strand N, et al. *J Pain Res.* 2022;15:2483-2504. Manchikanti L, et al. *Pain Physician.* 2024;27(S9):S115-S191.

Bleeding Risk Management

- American Society of Interventional Pain Physicians (ASIPP) guidelines
 - Peripheral nerve stimulation trial and implantation of extremities and other superficial nerves is a low-risk procedure on par with peripheral nerve blocks, facet joint interventions, and joint injections
 - Peripheral nerve stimulation trial and implantation of lumbar medial branch nerves is a moderate risk procedure on par with lumbar interlaminar epidural and cervical/thoracic/high lumbar transforaminal epidural
- American Society of Regional Anesthesia (ASRA) guidelines
 - Considered to be a low-to-intermediate-risk
 - Typically performed in readily compressible area, and thus bleeding risk is small for most patients
 - Patients with increased risk for bleeding (advanced liver and kidney disease, prior history of bleeding, or coexistent use of anticoagulants)
- More studies are needed—many implanters opt to continue anticoagulation, high-quality ultrasound may be useful for reducing vascular complications

Evidence-Based Condition Selection

RCT data is general to overall use

- Deer, et al. 2016: “Patients reported significant pain reduction at three months and safety follow-up to one year demonstrating this tested system to be a safe and viable tool in the pain treatment algorithm ... The StimRouter Neuromodulation System is FDA cleared for adults who have severe intractable chronic pain of peripheral origin, as an adjunct to other modes of therapy (eg, medications) and is therefore accessible to patients, allowing for additional larger scale use.”
- Hatheway, et al. 2025: “The results presented here are long-term outcomes from the first RCT examining the treatment of peripheral neuralgia/neuropathy with an externally powered micro-IPG, where CMM+PNS outcomes were compared with CMM alone. Responder rates ranged from 86% to 89% at 12 months, depending on which of the cohorts (active, crossover, combined) were considered. Pain reduction was 69% across all three cohorts.”

RCT = randomized controlled trial; IPG = implantable pulse generator; CMM = conventional medical management.

Deer T, et al. *Neuromodulation*. 2016;19(1):91-100. Hatheway J, et al. *Reg Anesth Pain Med*. 2025;50(7):561-567.

Evidence for Common Conditions Treated with PNS (ASPN)

Region	Target	Level	Grade
Head/neck	Occipital nerves*	I	B
Upper extremity	Axillary/Suprascapular nerves (post-stroke shoulder)	I	B
Lower extremity	Sciatic nerves and branches (lower extremity neuropathic pain, post-amputation)	I	B
Low back	Medial branch nerves (axial, mechanical low back pain)	II-2	B
Other	CRPS	III	C

Level I: At least 1 properly-designed RCT

Level II-2: Cohort or case studies and well-designed controls, preferably multicenter

Level III: Clinical experience-based, descriptive studies or reports of experts

Grade A: Extremely recommendable (good evidence of efficacy and benefits>harm)

Grade B: Recommendable (moderate evidence of efficacy and benefits>harm)

Grade C: Neither recommendable nor inadvisable (at least moderate evidence that the measure is effective, but benefits are similar to harms, and a general recommendation cannot be justified)

***On-label for SPRINT only.**

ASPN = American Society of Pain and Neuroscience.

Strand N, et al. *J Pain Res.* 2022;15:2483-2504.

Common Conditions Treated with PNS

Indication	Target	Evidence
Chronic migraine	Occipital nerves	Systematic review (Xu, et al.), level I and II evidence
Post-surgical knee pain	Infrapatellar branch of saphenous and genicular nerves	Systematic review (Amirianfar, et al.) chronic knee pain Following TKA, low level of evidence
Post-surgical and post-stroke shoulder pain	Suprascapular and axillary nerves	Single-site pilot RCT (Wilson, et al.), PNS and PT can improve shoulder biomechanics; changes in biomechanics alone do not account for the greater pain relief associated with PNS than PT
CRPS of the lower extremity or post-surgical pain from ankle/foot surgery	Tibial, peroneal, and sural nerves	
Low back pain	Medial branch nerves (typically L2)	Systematic review (D'Souza, et al.) modest to moderate pain relief in patients with low back pain, evidence limited

TKA = total knee arthroplasty; PT = physical therapy; CRPS = complex regional pain syndrome.
 Xu J, et al. *Pain Physician*. 2021;24:E131-E152. Amirianfar E, et al. *Pain Manag*. 2023;13:667-676. Wilson RD, et al. *Am J Phys Med Rehabil*. 2017;96(3):191-198. D'Souza RS, et al. *Curr Pain Headache Rep*. 2023;27:117-128.

Nerve Selection

- Careful history taking and physical exam
- Diagnostic nerve block
 - No evidence-based recommendations, but common sense
- Specific nerve testing (eg, EMG, NCS)
- Specific physical exam maneuvers
 - Prone instability test for multifidus dysfunction

Table 3 A List of Common Peripheral Nerve Targets Amenable to Percutaneous PNS Treatment

Upper Extremity	Lower Extremity	Trunk/Pelvis	Head/Neck
<ul style="list-style-type: none"> • Suprascapular • Axillary • Radial • Median • Ulnar • Brachial plexus (at interscalene interval) 	<ul style="list-style-type: none"> • Sciatic • Femoral • Obturator • Lateral femoral cutaneous • Saphenous • Posterior femoral cutaneous • Common peroneal • Tibial • Sural • Superficial peroneal • Genicular nerves (knee) 	<ul style="list-style-type: none"> • Genitofemoral • Ilioinguinal • Iliohypogastric • Pudendal • Cluneal • Medial Branch 	<ul style="list-style-type: none"> • Greater occipital

EMG = electromyography; NCS = nerve conduction study.

Strand N, et al. *J Pain Res.* 2022;15:2483-2504. Manchikanti L, et al. *Pain Physician.* 2024;27(S9):S115-S191.

Implant Process: All About Choices

- Trial
 - Length
 - $\geq 50\%$ relief (insurance)
 - Patient-specific outcomes and scoring instruments
- Choice of imaging and type
 - No large studies comparing the placement of peripheral nerve stimulators using ultrasound vs fluoroscopic guidance
- Implant
 - Understanding different devices (especially MRI compliance)
 - Choosing imaging modality
 - Fluoroscopy may be appropriate for nerves with a more predictable course over bony areas
- Post-op
 - Expectations
 - Teaching
 - Programming

Case Study: Post-Surgical Shoulder Pain

- 70yo Female
- S/p 2 rotator cuff surgeries: Significant pain and limited movement interfering with dressing and eating
- Medically not a candidate for shoulder replacement
- 2 lead PNS implant targeting axillary and suprascapular nerves using ultrasound guidance

Case Study: Post-Surgical Shoulder Pain

THE  SUN

- Baseline scores
 - VAS: 10/10
 - SPADI: 76% (pain), 41% (disability), 55% overall
- 3mos post-op
 - VAS: 0/10
 - SPADI: 6% (pain), 8% (disability), 7% overall
- 9mos post-op
 - VAS: 1/10
 - SPADI: 10% (pain), 11% (disability), 11% overall

LOCAL NEWS

'It was a blessing': Dracut woman finds chronic pain relief from StimRouter

Medical device implanted at Lowell General Hospital Spine and Pain Clinic



VAS = Visual Analog Scale; SPADI = Shoulder Pain and Disability Index.

Brighton P. The Lowell Sun. Published November 19, 2024. Accessed August 6, 2025. <https://www.lowellsun.com/2024/11/19/it-was-a-blessing-dracut-woman-finds-chronic-pain-relief-from-stimrouter>.

Case Study: Post-Surgical Shoulder Pain



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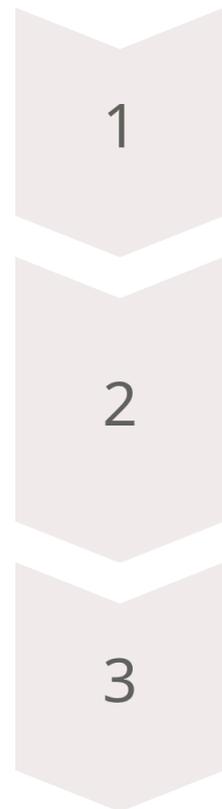
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Policy Change Advocacy



Current LCDs

Limited coverage determinations restrict patient access

ASIPP Recommendation

Expand coverage for craniofacial pain, phantom limb pain, nociceptive low back pain

Evidence Basis

Same Level III/Fair evidence supports expansion



Comparative Guidelines Analysis

Indication	ASIPP Rating	ASPN Rating
Occipital Neuralgia/Chronic Migraine	Level III/Fair, Moderate	Level I, Grade B
Post-Amputation Pain	Level III/Fair, Moderate	Level I, Grade B
Chronic Low Back Pain	Level III/Fair, Moderate	Level II-2, Grade B
CRPS	Level III/Fair, Moderate	Level III, Grade C

 Guidelines are complementary, not contradictory—ASPN provides granular ratings while ASIPP offers broad technology endorsement.

The Reimbursement Reality

National Coverage Determinations (NCDs)

Set by CMS nationally. Current Electrical Nerve Stimulators NCD 160.7 dates to 1995



Local Coverage Determinations (LCDs)

Created by regional MACs. Define day-to-day coverage requirements

The Disconnect: High-quality evidence procedures may be non-reimbursable under restrictive LCDs.

CPT Code Challenges



1 Missing RVU for 64596

New 2024 Category I code for integrated neurostimulation systems has \$0.00 Medicare allowed amount

2 Misinterpreting 64590

Code applies to both initial insertion AND replacement procedures, not just new pocket creation

RUC process typically takes 24 months to assign values to new codes.

Future Outlook and Recommendations



Policy Advocacy

Professional societies will leverage evidence to update restrictive LCDs and standardize coverage



Coding Standardization

RUC will assign RVU to CPT 64596, removing adoption barriers for integrated PNS systems



Value-Based Focus

Shift narrative to highlight PNS functional outcomes and long-term neurological reconditioning

PNS represents a clinically effective therapy facing reimbursement challenges. Success requires staying current on guidelines, thorough documentation, and supporting professional advocacy efforts.