# Cost of Neuromodulation Therapies for Overactive Bladder: Percutaneous Tibial Nerve Stimulation Versus Sacral Nerve Stimulation

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**Abbreviations and Acronyms**

AE = adverse event

ICER = incremental cost-effectiveness ratio

OAB = overactive bladder

PTNS = percutaneous or posterior tibial nerve stimulation

SAE = serious adverse event

SNS = sacral nerve stimulation

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**Purpose:** Conservative therapy and antimuscarinic agents are first line therapies for overactive bladder. Patients refractory to treatment are candidates for neuromodulation therapy. We estimated the costs and cost-effectiveness of percutaneous tibial nerve stimulation and sacral nerve stimulation.

**Materials and Methods:** A Markov model was constructed to simulate the total costs and effectiveness of percutaneous tibial and sacral nerve stimulation during 2 years. Cost data used average Medicare national physician payments, and ambulatory payment classification and diagnosis related group payments for hospital based care and office visits. Clinical effectiveness, and the rates of patient adherence to treatment and adverse events were estimated by a review of the literature.

**Results:** The costs of initial therapy were $1,773 for 12 weekly percutaneous tibial nerve stimulation treatments and $1,857 for test sacral nerve stimulation. For ongoing therapy the cost of the sacral nerve stimulation surgical implant was $22,970. Cumulative discounted 2-year costs were $3,850 for percutaneous tibial nerve stimulation and $14,160 for sacral nerve stimulation, including those who discontinued therapy. Of the patients 48% and 49%, respectively, remained on therapy. The incremental cost-effectiveness ratio was $573,000 per additional patient on sacral nerve stimulation. When considering only patients who completed initial stimulation successfully, the costs were $4,867 and $24,342 for percutaneous tibial and sacral nerve stimulation with 71% and 90%, respectively, remaining on therapy for an incremental cost-effectiveness ratio of $99,872.

**Conclusions:** Percutaneous tibial nerve stimulation and sacral nerve stimulation are safe, effective neuromodulation therapies for overactive bladder. In this economic model percutaneous tibial nerve stimulation had substantially lower cost. An additional 1% of patients would remain on therapy at 2 years if sacral nerve stimulation were used rather than percutaneous tibial nerve stimulation but the average cost per additional patient would be more than $500,000.

**Key Words:** urinary bladder, overactive; urinary incontinence; transcutaneous electric nerve stimulation; implantable neurostimulators; costs and cost analysis

Overactive bladder is defined by the International Continence Society as urinary urgency with or without urge incontinence that is usually associated with urinary frequency and nocturia.[1] The condition significantly impacts quality of life, work productivity, social relationships, sexuality and phys-



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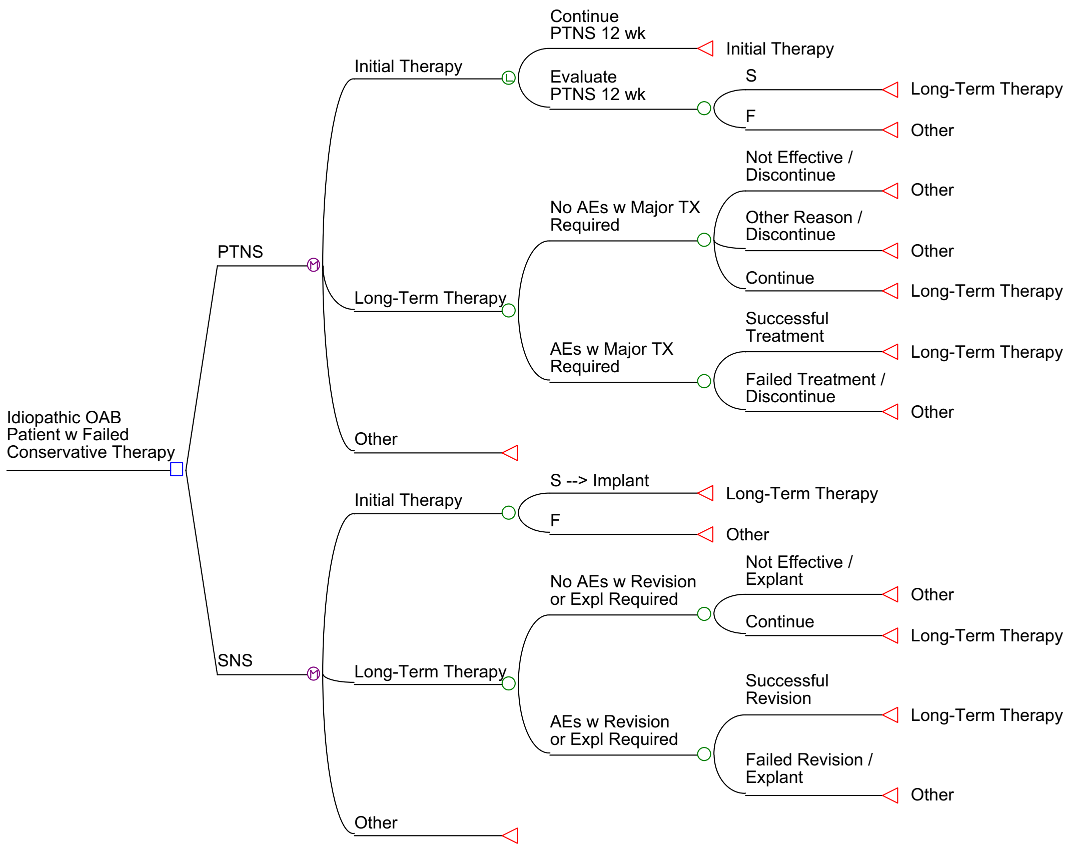


Markov model of neuromodulation therapies. *S*, success. *F*, failure. *w*, with. *TX*, treatment. *Expl*, explant.

ical activity. Comorbidities associated with OAB include fracture, urinary tract infection and depression.[2] The prevalence of OAB in American adults was estimated at 34 million with a total cost burden of $66 billion annually.[3]

Neuromodulation is effective therapy in patients with OAB who do not respond adequately to conservative therapy, including behavior modification and antimuscarinic agents.[4] The 2 Food and Drug Administration cleared neuromodulation therapies for OAB are PTNS and SNS. Following successful SNS test stimulation, a generator and lead are implanted. PTNS therapy is delivered in the office via a temporary 34 gauge needle electrode attached to a hand held generator. During initial therapy, treatment is delivered for 30 minutes weekly for 12 weeks and less frequently as needed thereafter.

PTNS and SNS are effective and safe, although to our knowledge no published studies have compared them directly. We performed a simulation cost-effectiveness analysis of patients with OAB in whom conservative therapy failed to compare the cost and cost-effectiveness of PTNS and SNS as second line therapies from the perspective of a health care payer.

# METHODS

## Model Description

A Markov model was used to compare the PTNS and SNS treatment strategies (see figure).[5–8] The model simulated 100,000 patients moving from initial therapy (PTNS) or testing (SNS) to long-term therapy as long as treatment was effective. The simulation ran in 1-month cycles for 2 years. We chose 2 years because long-term data on PTNS are limited to 2 years.

For SNS patients started with test therapy. If effective, they received an implanted system and, if not, they moved to other treatment. Patients in whom SNS was initially effective continued on SNS until the therapy was no longer effective, an AE required explantation or the patient elected to discontinue for another reason. Other adverse AEs, such as lead dislodgment, were only included in analysis if they required surgical revision. As soon as therapy was discontinued for any reason, the patient moved to other treatment.

For PTNS patients started with 12 weeks of therapy received once per week. If effective, they moved to long-term treatment, which meant decreasing the frequency of therapy visits. If not effective, they moved to other therapy. Patients on long-term treatment continued until therapy was no longer effective, an AE made continuation impossible or the patient elected to discontinue for another reason. Other AEs were only included in analysis if