and quality-adjusted life years (QALYs). Costs (€ for 2019) were estimated from the Spanish National Health Service (NHS) perspective. SCS had a 79% of probability of being cost-effective. SCS+CMM offers improved pain relief, physical functioning, and HRQoL in FBSS patients in comparison with CMM. SCS +CMM could be cost-effective during a longer time span.

Another Systematic Review of the Cost-Utility of Spinal Cord Stimulation for Persistent Low Back Pain in Patients with Failed Back Surgery Syndrome which was published in 2021. It includes all publications in the Medline database and Cochrane CENTRAL trials register within the last 10 years assessing the cost-effectiveness of SCS in patients with previous lumbar fusion surgery. This study suggests SCS is likely more expensive in the short term when compared to CMM or re-operation for patients with FBSS. This initial expense is likely negated by the improvements in quality of life SCS provides when compared to CMM or reoperation. The literature reported the cost/QALY for SCS to be lower than even the conservative estimate of $25 000/QALY for an insurer's willingness to pay. The break-even point for the initial up-front costs seems to be 24 months; there is more than a 50% reduction in overall medical cost-savings with SCS compared to CMM and/or re-operation. Using the GRADE approach, the studies reviewed provide a moderate quality of evidence. We believe the strong likelihood of confounders being present greatly reduces the quality. However, this is partially offset by the striking consistency and large magnitude of effect on lower ICERs found across FBSS patients receiving SCS devices across different settings and time frames compared to FBSS patients who received CMM or secondary operations.

In the past four decades, SCS therapy has achieved good results in reducing the pain of patients with chronic low back pain and improving the functional status of patients. In addition, this type of treatment has shown great promise in treating patients who are not eligible for surgery. However, the increasing prevalence and economic burden should be addressed appropriately to make it easier for patients to obtain SCS treatment. Furthermore, spinal cord stimulation may significantly affect refractory low back pain treatment and benefit clinically considering its technology and mechanism of action. Thus, this therapy will occupy a special place in future, in multidisciplinary neuropathic pain management.

Nowadays the technology powering these devices continues to evolve and improve, as well with refining Patient Selection and the integration of new large scale, multicenter, randomized controlled trials currently ongoing, it is likely we will see much more robust and applicable cost-effectiveness analyses that would have greatly diminished if not absent confounders published in the coming years. These studies are also likely to include and differentiate the more novel high-frequency and burst devices as well as provide more encompassing costs of SCS compared to alternative treatments.

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001 RF BEYOND THE SPINE

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Radiofrequency Neurotomy (RFN), also known as Radiofrequency Ablation (RFA), is a common interventional procedure used to treat pain from an innervated structure. RFN has been used for the first time in the early 1930s by Kirschner who demonstrated the first known utilization of RFN with thermocoagulation of the Gasserian ganglion for trigeminal neuralgia. This initial work expounded that continuous radiofrequency (CRF) current created a focal thermal lesion in a neural pathway with the goal to interrupt nociception. In the 1950s, Aronow and Cosman created the first commercially available radiofrequency (RF) systems. Shealy and Bogduk would later refine percutaneous medial branch RF neurotomy techniques, a procedure that essentially replaced surgical neurotomy. Initially, limitations in technology only allowed for the treatment of cervical and lumbar facet disease. However, CRF has now been studied in the treatment of numerous pain pathologies and its use has more recently expanded beyond facet-joint mediated pain to peripherally innervated targets. The use of RFN has been particularly important where conservative and/or surgical measures have failed to provide pain relief.

Despite the technological advances, the risk of motor deficit remains a concern. Pulsed RF(PRF) technology first produced in Austria in 1995, was developed to reduce the risk of motor deficit which CRF could provoke, as it does not create a destructive thermal lesion. Ayrapetyan proposed that PRF efficacy may be secondary to magnetic field exposure as opposed published.

A recent novel modality for ablation of neural pathways is cooled radiofrequency (CRFN) thermal neurotomy. Despite the name, this technique allows for a larger thermal lesion to be formed than traditional RFN. This method has been increasingly utilized for the interruption of nociceptive pathways after its initial use in cardiac electrophysiology and tumor ablation. Since 2010, there has been emerging evidence supporting the use of CRFN for chronic pain of the knee, hip and back pain.

As with conventional thermal RF, there are a multitude of pain generators that have been targeted with pulsed RF for the treatment of pain. Some of these targets are more ideal for pulsed RF as compared to thermal RF due to the fact that tissue destruction occurs with PRF in nerves with mixed sensory and motor components. So PRF offers a potential treatment without the sequela of nerve distruction. However the literature is limited to case reports and case series and therefore data are limited to support durable efficacy.

The following table contains PRF : targets beyond the use in spine:

Treatment of joint pain
Shoulder
Hip joint
Knee joint
Foot and Ankle
Treatment of head and neck pain
Trigeminal
Glossopharyngeal
Treatment of headache pain
Occipital
Atlantoaxial joint
C_2DRG
Sphenopalatine
Treatment of pelvic pain
Pudendal
Ganglion Impar
Treatment of peripheral nerves
Anterior cutaneous nerve (abdominal
Lateral femoral cutaneous nerve
Ilioinguinal-Iliohypogastric nerve
Brachial plexus
Median nerve
Lumbar sympathetic chain
Neurinoma Pain (stump pain, fantom pain)
Splachnic nerves
Stellate ganglion

In 2021 David W Lee et al published an article entitled:'Latest Evidence-Based Application for Radiofrequency Neurotomy (LEARN): Best Practice Guidelines from the American Society of Pain and Neuroscience (ASPN)'where the American Society of Pain and Neuroscience (ASPN) identified the need for formal evidence-based guidance. The authors formed a multidisciplinary work group tasked to examine the latest evidence-based medicine for the various applications of RFN, including cervical, thoracic, lumbar spine; posterior sacroiliac joint pain; hip and knee joints; and occipital neuralgia. Best practice guidelines, evidence and consensus grading were provided for each anatomical target. The consensus statement for other targets except spine was:

1. Genicular nerve radiofrequency neurotomy may be used for the treatment of knee osteoarthritis related and post-surgical knee joint pain. GRADE II–1 B.
2. Hip joint radiofrequency neurotomy targeting the obturator and femoral nerve branches may be used for the treatment of hip joint pain following diagnostic blocks. GRADE II–1 B.
3. Occipital neurotomy may be selectively offered for the treatment of occipital neuralgia pain when greater or lesser nerves have been identified as the etiology of pain via diagnostic blocevidenceks. GRADE II–2 C.

The use of radiofrequency ablation to treat pain is an established therapy that continues to evolve. This best practice document gives an evaluation as to the current evidence and recommendations. Going forward, these recommendations must be updated as new data is produced by either high-level studies or from large registries. Future guidelines will be modified as evidence is built, innovations arrive at the technology, and new ideas are presented to continue to improve patient safety and efficacy.

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