# Medical Coverage Policy

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# Peripheral Nerve Destruction for Pain Conditions

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## Overview

This Coverage Policy addresses destruction of a peripheral nerve using cryoablation, or electrical, laser, chemical or radiofrequency ablation, alone or in combination, for treatment of trigeminal neuralgia, chronic sacroiliac joint, knee, and/or foot pain, headache and/or occipital neuralgia, and pain resulting from conditions such as complex regional pain syndrome, peripheral nerve entrapment/compression, or peripheral neuropathies.

## Coverage Policy

**Peripheral nerve destruction using radiofrequency ablation or glycerol rhizotomy is considered medically necessary for treatment of trigeminal neuralgia refractory to other alternative treatments (e.g., medication, microdecompression).**

**Peripheral nerve destruction using cryoablation or laser, electrical, chemical or radiofrequency ablation is considered experimental, investigational, or unproven for treatment of ANY of the following conditions:**

- sacroiliac joint pain
- knee pain
- foot/heel pain

- headache
- occipital neuralgia
- lower extremity pain resulting from any of the following:

  - complex regional pain syndrome
  - peripheral nerve entrapment/compression (e.g., tarsal tunnel syndrome, sciatica)
  - peripheral neuropathy

## General Background

Nerves transmit electrochemical impulses between the central nervous system and muscles and organs within the body. When nerves transmit pain signals in the presence of injury or disease, various methods to interrupt the pain signals may be utilized to alleviate the pain. Peripheral nerve blocks, which involve the injection of anesthetics and/or chemicals such as glycerol into the tissue surrounding the nerve, are used to temporarily disrupt the transmission of pain, as either a diagnostic or therapeutic modality. As a diagnostic modality it is used to isolate the cause of pain; as a therapeutic modality it is used to temporarily relieve pain. If the block is successful in providing pain relief, ablation of the peripheral nerve may be recommended.

Peripheral nerve destruction is an ablative modality employed for treatment of acute or chronic pain conditions. With this method of treatment peripheral nerve fibers are ablated (i.e., destroyed) using chemical, thermal, radiofrequency or other modalities in order to block the transmission of pain signals. The intended goal is to produce a limited, but precise lesion to disrupt the nerves ability to send pain signals, without resultant damage to the other structures.

Various techniques may be employed to destroy the nerve. Chemical ablative agents generally include the application of alcohol, phenol or glycerol to destroy nerve tissue involved in the perception of pain. These agents are typically used for nerve blocks but may also be used as a local neurolytic injection. These substances have been shown to inhibit nerve function, damages the cells via dehydration and necrosis leading to neuritis and a pattern of Wallerian degeneration. Cryoablative/cryodenervation techniques involve the use of a cryoprobe and administration of a freezing agent into the nerve causing the formation of a lesion and thereby interrupting the transmission of pain impulses. Thermal/laser ablation involves the use of a laser beam to induce a targeted lesion. Radiofrequency (RF) ablation (RFA), also referred to as radiofrequency lesioning, radiofrequency neurotomy, denervation, or rhizotomy, is a method of treatment more frequently employed and performed under imaging guidance that involves the use of various types of probes or needles to transmit energy and produce heat to burn tissue. During continuous RF ablation the tissue temperatures typically range from 60°C - 90°C and are maintained for 90-120 secs (Choi, et al., 2016). The high frequency electrical current is produced by a radio wave and creates a spherical shaped thermal lesion when the energy is applied through the probe. One challenge to the use of RFA reported in the medical literature includes the need to place the probe parallel to the targeted nerve resulting in lesions on a single side, although it is suggested the thermal temperature reaches the entire nerve (Choi, et al, 2016). In contrast, pulsed RF energy involves the application of heat applied in short bursts, allowing the tissue to cool between applications and a resulting tissue temperature of approximately 42°C. Lower tissue temperatures and short bursts of application are thought to reduce the risk of destruction to nearby tissue, however it is purported pulsed RF does not destroy the targeted nerve. Another RF modality, cooled RF, is a technology similar to thermal RF that utilizes a cooled RF probe. With this technology circulating water is used to cool the probe tip at the probe/tissue interface. It is purported this method allows continuous thermal energy to be delivered, creating tissue temperatures exceeding 80° C adjacent to the probe, and thereby creating a larger lesion (to interrupt pain signals) distal to the probe tip.

Complications that may be associated with peripheral nerve ablation are dependent on the type of modality used, however complications may include necrosis of the skin and other non-target tissues and neuritis. Additionally, methods such as alcohol and phenol injections which destroy the nerve may be associated with formation of a neuroma (Trescot, 2003). Nerve regeneration occurs following treatment although how long it takes to regenerate and whether or not pain recurs varies with each type of treatment and each individual.

The Association of Extremity Nerve Surgeons published clinical practice guidelines in 2014. Within these guidelines the panel notes denervation procedures include cryoablation, radiofrequency ablation, alcohol injections and surgical resection (Barrett, et al, 2014). With the exception of surgical resection, the authors note these methods destroy tissue in a blind manner without complete control and may not result in permanent resolution of symptoms. Procedures such as cryoablation and radiofrequency ablation should be used with caution. Within the guidelines the authors note based on their clinical experience there is some efficacy for RF ablation of the lower extremity however further research of the technique is needed. Ablation as a primary treatment of Morton's neuroma is not recommended nor is the use of alcohol injections.

Evidence in the peer-reviewed published scientific literature evaluating peripheral nerve destruction for treatment of pain conditions is primarily in the form of case reports and prospective and retrospective case series with few randomized controlled clinical trials. Although evidence is limited for peripheral nerve destruction targeting the trigeminal ganglion, chemically or by percutaneous radiofrequency, there is some support it is clinically effective for treatment of trigeminal neuralgia when medical therapy and/or invasive treatment has failed to relieve symptoms. For other conditions such as headache, occipital neuralgia, sacroiliac joint pain, knee pain, and foot pain evidence supporting safety and efficacy is lacking. Much of the evidence for these indications is limited by small sample populations, lack of control groups, and lack of long term clinical outcomes and therefore strong evidence based conclusions regarding safety and efficacy cannot be made.

**U.S. Food and Drug Administration (FDA)**
Peripheral nerve ablation is a procedure and as such is not regulated by the FDA. Injectable medications require FDA approval and a number of radiofrequency (RF) generators and probes have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. According to the FDA there are two product codes dedicated to these devices, one is for radiofrequency lesion generators (GXD) and the second one is for radiofrequency lesion probes (GXI) (FDA, 2016).

**Trigeminal Neuralgia**
Trigeminal neuralgia is a facial pain syndrome characterized by sharp stabbing pain that involves the sensory division of the fifth cranial (trigeminal) nerve. Pain is generally confined to the distribution of one or more of the three branches of the trigeminal nerve: the ophthalmic (V1), maxillary (V2), and mandibular (V3) divisions (Hayes, 2004). The sensory root of the trigeminal nerve supplies the face, teeth, mouth and nasal cavity. Following stimulation of trigger zones by movement or touch sudden and excruciating, unilateral (one-sided) facial pain arises. In addition to paroxysmal pain some individuals have continuous pain (Maarbjerg, et al., 2017). The goal of treatment is relief of pain and prevention of recurrences. First line therapy includes medication and if there is no relief, either invasive procedures such as micro decompression or percutaneous procedures, such as radiofrequency nerve destruction or glycerol rhizotomy may be recommended.

**Literature Review:** There are a number of studies in the published peer reviewed scientific literature evaluating the safety and efficacy of peripheral nerve destruction for trigeminal neuralgia refractory to medical and/or invasive therapies. A majority of the evidence focuses on using percutaneous radiofrequency or glycerol rhizotomy techniques, is retrospective or prospective in design, and lacks controls. Few trials have been published comparing radiofrequency methods to other treatment alternatives such as microdecompression, glycerol rhizotomy, neurectomy or alcohol blocks. Placebo controlled trials are lacking. Although evidence is limited there is some evidence to support high initial rates of pain relief, prolonged time to recurrence for some individuals, and lack of high risk complications (Hayes, 2004).

The 2008 American Academy of Neurology/European Federation of Neurological Societies (AAN/EFNS) practice parameter (Gronseth, et al., 2008) identified four uncontrolled case series that used independent outcome assessment of Gasserian ganglion percutaneous techniques, including two reports of radiofrequency thermocoagulation, one report of glycerol rhizolysis , and one of balloon compression. The AAN/EFNS found that initial pain relief was achieved in 90 percent of patients, but that pain-free rates declined by one year to 68 to 85%, by three years to 54 to 64% and by five years to approximately 50%. According to the evidence-based review, for patients with trigeminal neuralgia refractory to medical therapy Gasserian ganglion percutaneous techniques may be considered (Level C recommendation).

**The American Board of Internal Medicine's (ABIM) Foundation Choosing Wisely® Initiative**: No relevant statements.

**Sacroiliac (SI) Joint Pain**
The SI joint lies between the sacrum and the ileum, and functions more for stability than for movement. The joint's stability is maintained in part by several large ligaments and muscle groups. Pain may arise in this highly innervated joint or in the related muscles and ligaments. Pain may be felt in the lower back or may radiate to one or both hips and/or one or both legs. RF ablation of the SI joint theoretically destroys the sensory nerves to the SI joint thereby alleviating pain. The sensory innervation of the SI joint has not been defined as definitively as that of the lumbar facet joints, however. Most of the posterior sensory innervation is thought to be transmitted from the S1, S2, and S3 dorsal rami via the lateral branches, as well as through medial branches from the L4 and L5 dorsal rami (Ayden, 2010).

**Literature Review:** Thermal RFA as well as cooled RF have been explored for the treatment of SI joint pain. Several pilot studies, retrospective case series and prospective case series have been published evaluating RF ablation as treatment of SI joint pain (Bellini and Barbieri, 2016; Romero, et al., 2015; Ho, et al., 2013; Karaman, et al, 2011; Buijs, et al., 2004; Cohen et al., 2003; Gevargez, et al., 2002). In addition two comparative trials have been published comparing cooled RF to conventional RF (Cheng, et al., 2013) and cooled RF to a new bipolar RF technique (Cheng, et al., 2016) for treatment of SI joint pain. Within these trials however sample populations are small, follow-up ranged from 12 weeks to two years, patient selection criteria varied, technique varied, and controls are lacking.

Bhatia et al. (2018) completed an evidence-based narrative review regarding radiofrequency procedures to relieve chronic hip pain. Fourteen publications (case reports, case series) involving 90 subjects who underwent ablative RF treatments of innervation of the hip joint were included in the review. A high success rate of these procedures in relieving chronic pain of the hip joint was reported at 8 days to 36 months after the procedures, however none of the publications were randomized controlled trials. There was evidence for improvement in function and a lack of serious adverse events of RF treatments. The authors concluded radiofrequency treatments for the sensory innervation of the hip joint have the potential to reduce pain secondary to degenerative conditions although concerns remain regarding the anatomic targets, as well as quality, procedural aspects, and monitoring outcomes in publications on this topic. Randomized controlled trials of high methodological quality are required to further elaborate the role of these interventions in this population.

Sun and colleagues (2018) published a meta-analysis evaluating the efficacy and safety of cooled RF for treatment of SI joint pain. A total of seven studies (4 retrospective observational, 2 RCTs, and one prospective observational study) involving 240 subjects met inclusion criteria consisting of subjects with chronic SI joint pain, cooled RF as the intervention, and outcomes measured to three months. Overall pooled results demonstrated a decrease in pain intensity when compared with pain measured prior to treatment using VAS and Numerical Rating Scale (3.78, 3.81 respectively), improved disability scores using ODI, and that 72% of subjects presented positive results as measured using Global Perceived Effect. No severe complications were reported in the studies (Sun, et al, 2018). Limitations noted by the authors include small number of subjects within studies, potential for placebo effect due to inclusion of observational studies, differences in cutoff value for diagnostic block (50% vs 75%), and difference in overall patient selection. The authors concluded although variations exist in the studies the analysis supports safety and efficacy of cooled RF for treatment of SI joint pain.

Juch et al. (2017) reported the results of three multicenter, nonblinded, randomized trials (Mint Study) evaluating the effectiveness of RF denervation added to a standardized exercise program for subjects with chronic low back pain (n=681). Included subjects had chronic low back pain, a positive prior diagnostic block of the facet (n=251), sacroiliac (n=228), or a combination of joints (n=202), and were unresponsive to conservative care. All subjects received a three months standard exercise program and psychological support if needed, the experimental group also underwent RF denervation (1-3 treatments were allowed). The primary outcome was pain intensity three months following treatment with final follow-up one year post treatment. A total of 599 subjects (88%) completed the three month follow-up and 521 subjects (77%) completed 12 months follow-up. The mean difference in pain intensity scores at three months for the facet , SI joint and combination group were -.18, -.71, and -.99, respectively. The authors concluded RF denervation combined with a standard exercise program resulted in

either no improvement or no clinically important improvement in low back pain when compared with a standard exercise program alone.

Two randomized controlled trials evaluating cooled RF as a treatment of SI pain were found in the literature (Patel, et al., 2012; Cohen, et al., 2008). Patel et al. (2012) reported on their results of 51 subjects randomized to receive either cooled RF denervation at S1-3 lateral branch and L5 dorsal rami or sham. Follow-up was conducted at one, three, six and nine months post procedure. Both subjects and coordinators were blinded to randomization until three months. Subjects were allowed to crossover to the treatment group after three months. Using outcome measures that included SF-36BP (pain), SF-36PF (function), Oswestry Disability Index (ODI quality of life and treatment success the authors reported statistically significant changes in pain, physical function, disability, and quality of life were found at three month follow-up. Treatment success was documented for 47% of the experimental group compared to 12% in the sham group at three months, at six and nine months 38% and 59% of treated subjects achieved treatment success. The study is limited by small sample population and short-term outcomes. Cohen and colleagues (2008) reported on 28 subjects with SI joint pain confirmed by injection block resulting in 75% or greater pain relief. Subjects were randomized to receive either RF using a cooled probe after a local anesthetic block (n=14) or local anesthetic block followed by placebo denervation (n=14) of L4-5 primary dorsal rami and S1-3 lateral branch. Subjects who did not respond were allowed to crossover to the treatment group using conventional RF. At one, three and six months following treatment 11 (79%), 9 (64%), and 8 (57%) RF treated subjects experienced pain relief of 50% or greater and significant functional improvement. Only two subjects in the placebo group experienced relief at one month following treatment; and none experienced pain relief at the three month follow-up. Eleven subjects crossed over and experienced pain relief at one, three and six months following treatment respectively: 7(64%), 6(55%), and 4(36%). Only two subjects (14%) at one year follow-up continued to experience pain relief. In the author's opinion RF denervation for treatment of SI joint pain was effective in the intermediate term although studies with larger populations are needed to confirm results. The study is limited by small sample population and short-term outcomes.

Systematic reviews evaluating RF ablation as treatment of SI pain have been published (King, et al., 2015; Leggett, et al., 2014; Hansen, et al., 2012). Hansen et al (2012) evaluated radiofrequency neurotomy in a systematic review of the therapeutic effectiveness of SI joint interventions. The authors concluded that the evidence was fair for cooled radiofrequency neurotomy. Leggett et al. (2014) published a systematic review evaluating RF ablation as treatment of chronic back pain associated with lumbar facet joints, SI joints, discogenic back pain and the coccyx. The review consisted of 11 sham controlled RCTs; three involved discogenic pain, six involved lumbar facet, two involved SI joint and none were found evaluating coccyx pain. The authors concluded RF ablation is effective for lumbar facet joint pain and SI pain, the efficacy of RF ablation for discogenic pain remains unclear. In 2015 King and associates published their results of a systematic review (King, et al., 2015). This group of authors evaluated sacral branch block and sacral branch thermal RF neurotomy for SI pain. The review included two RCTs evaluating sacral branch blocks graded as moderate quality, and 15 publications evaluating RF ablation (13 observation studies, two RCTs). The authors concluded there is moderate evidence on RF ablation although it is insufficient to determine indications and effectiveness, more research is needed. Overall, limitations of these reviews include a paucity of literature on therapeutic interventions, variations in technique, and variable diagnostic standards and patient selection criteria for SI joint pain.

Aydin et al. (2010) conducted a meta-analysis to assess the effectiveness of RFA of the SI joint for pain relief at three and six months. Ten articles were included in the analysis. Different techniques and combinations of different nerve lesions were used in the included studies. The authors noted that no standards have been established for the specific nerves to ablate, the type of technique, or the type of RFA. The primary outcome measure was a reduction in pain by ≥ 50%. Analysis was conducted on seven groups from six studies. At three and six month follow-up, half or greater of the patients treated with RFA of the SI joint met the outcome measure of ≥ 50% reduction in pain. The authors concluded that RFA of the SI joint appears to have a role in the treatment of patients with SI joint pain refractory to more conservative measures. The analysis is limited, however, by the available literature and lack of randomized controlled trials.

A Cochrane review (Maas, et al., 2015) assessed the evidence for RF denervation as a treatment of chronic low back pain and concluded the results were conflicting for disc pain, low quality evidence revealed no differences from placebo in effects on pain and function for SI joint pain over the short-term. One study showed a small

effect on both pain and function over the intermediate term for SI joint pain, no high-quality evidence indicates RF denervation provides pain relief in patients with back pain.

Hayes, Inc. published a Medical Directory Technology Report evaluating radiofrequency ablation for SI joint denervation as treatment of chronic back pain (Hayes, 2017c). A total of 12 studies met inclusion criteria and were included in the review (seven studies evaluated thermal RF [3 RCTs, 4 NonRCTs], four evaluated cooled RF [two RCTs, 2 NonRCTs], and one evaluated both types of RF ablation [one retrospective cohort]). The results of the review illustrate there is low to moderate quality evidence conventional and cooled RF ablation is safe and may decrease patient-reported pain and increase functional outcomes in the short-to intermediate term, although it was noted the results are somewhat conflicting. Most complications reported in the review were transient. A lack of standard RF technique prevents firm conclusions regarding safety and efficacy. In 2019 Hayes updated the report and included five newly published studies however the review of the study abstracts did not change the Hayes conclusion (Hayes, 2019c).

The Institute of Clinical Systems Improvement (ICSI) published a guideline title “Pain: Assessment, Non-Opioid Treatment Approaches and Opioid Management” (Hooten, 2017). Within the report the authors acknowledge there is mixed evidence regarding the efficacy of percutaneous RF neurotomy for both medial and lateral branch nerves supplying the target joints.

The American Society of Interventional Pain Physicians “Interventional Pain Management” guidelines for the diagnosis and treatment of chronic spinal pain were updated in 2013 (Manchikanti, et al., 2013). Within these guidelines for lumbar spine the authors report for sacroiliac joint interventions the evidence for cooled RF neurotomy is fair (based on two RCTS, 2 observational trials and one case report]) and limited for conventional RF or pulsed radiofrequency neurotomy (based on two observational studies]). An update to the report has not been found.

American Society of Anesthesiologists (ASA) / American Society of Regional Anesthesia and Pain Medicine (ASRA) published a statement in 2010 by the ASA Task Force on Chronic Pain Management and the ASRA on the management of chronic pain. Within this publication it is noted the medical literature is insufficient to evaluate the efficacy of RFA for SIJ pain although the guideline states that water-cooled RFA may be used for chronic SIJ pain. The task force recommended that neuroablative procedures be used as part of a comprehensive pain management regimen, performed only as a last resort when pain is refractory to other therapies. An update to the report has not been found.

**The American Board of Internal Medicine’s (ABIM) Foundation Choosing Wisely® Initiative:** No relevant statements.

The clinical effectiveness and duration of effect of SI RF ablation has not been consistently demonstrated in well-designed studies. Evidence in the form of RCTs is limited, involves small sample populations and evaluates short-term outcomes following treatment with RF ablation. In addition, there is an overlap of studies reviewed within the published systematic reviews, Cochrane review, and technology assessment. The evidence in the medical literature is insufficient to demonstrate safety and efficacy of SI joint radiofrequency (RF) ablation or ablation of lumbar or sacral dorsal rami for the treatment of SI joint and other lumbar-related pain. In addition, there is insufficient evidence in the peer-reviewed scientific literature to determine safety and efficacy for other ablative modalities (e.g., laser, chemical, electrical) when employed for treatment of sacroiliac joint and other similar type pain.

**Foot Pain (e.g., Plantar fasciitis)**
Pain can occur in any number of areas of the foot but most commonly occurs in the heel or near the toes. Symptoms involving the nerves of the foot /ankle typically involve burning, tingling, numbness, and/or pain that radiates along a nerve.

Plantar fasciitis is a common cause of heel pain. Symptoms usually start gradually with mild pain located at the heel which occurs following exercise and/or with standing first thing in the morning. First-line nonsurgical treatment includes a program of stretching exercises, ice, activity modification, weight loss in overweight patients, adaptive footwear, arch taping, nonsteroidal anti-inflammatory medications, shock-absorbing shoe

inserts or orthoses, and iontophoresis. When first-line treatment fails to relieve symptoms, second line therapy may be recommended and includes night splints, steroidal anti-inflammatory injections, and/or a walking cast. Surgical intervention (plantar fasciotomy) and ablative methods may be recommended for intractable pain following 6-12 months of first and second line therapies.

**Literature Review:** There is a paucity of evidence evaluating the safety and efficacy of neuro-ablative procedures for treatment of plantar fasciitis in the peer-reviewed medical literature. One group of authors, Cavazos et al. (2009), evaluated cryoablation for plantar fasciitis. Within this retrospective case series (n=137) the authors reported success and failure rates of 77.4% and 22.6% (respectively). The mean pain score decreased from 7.6 before cryosurgery to 1.1 ($p < 0.0005$) at 24 months of follow-up. The study is limited by the retrospective and uncontrolled design. Allen and colleagues (2007) utilized cryosurgery for 59 consecutive patients (61 heels) who had failed prior conservative therapy and were considered surgical candidates. These study results suggested that pain decreased significantly after the procedure ($p<.0001$). However, the nonrandomized design and small sample size of this study decrease its generalizability**.**

Radiofrequency lesioning has been investigated as a treatment of plantar fasciitis. The results of mainly retrospective case series (Arslan, et al., 2016; Erken, et al., 2014; Cozzarelli, et al., 2010; Cione, et al., 2009; Liden, et al., 2009**;** Solitto, et al., 1997) suggests RF reduces pain resulting from plantar fasciitis. A majority of these studies are flawed by retrospective design, lack of controls, short-term outcomes, and use of various outcome measures making comparisons across studies difficult.

Authors of two comparative trials (Ozan, et al., 2017; Osman, et al., 2016) evaluated RF ablation for treatment of plantar fasciitis. Ozan et al. (2017) compared RF (n=16) to extracorporeal shockwave therapy (n=40). Subjects were followed for six months using VAS and modified Roles-Maudsley (RM) scores at one, three and six months following treatment. There was no significant difference in baseline and post-treatment scores between groups. Both VAS and RM scores were significantly decreased in both groups ($p<.05$) at all follow-up periods, although the RM at one month was significantly different in the RF group compared to the ESWT group. In a second trial, Osman et al (2016) compared continuous RF to pulsed RF ablation for treatment of refractory plantar fasciitis (n=20). This group of authors used a numeric verbal rating scale and satisfaction score for assessment of outcomes up to 24 weeks following treatment. All subjects demonstrated significant improvement in pain scales following treatment; the pulsed RF group achieved pain relief more rapidly. The authors concluded randomized trials are necessary to confirm the therapeutic effects and optimal dose of RF. Both studies are limited by small sample population, short term outcomes and a variety of outcome measures precluding generalization of results.

In a randomized controlled trial (Landsman, et al., 2013) the authors evaluated RF ablation as a treatment of plantar fasciitis (n=8) compared with sham (n=9).The study was a multicenter, randomized, prospective trial using a crossover design if no improvement was observed four weeks following treatment. Outcome measures included a weekly Visual Analogue Scale (VAS) score, average pain level, and peak pain level. The study demonstrated a statistically significant improvement in symptoms for the RF group and lack of significant improvement in the sham group. Following crossover to the treatment group the sham group also demonstrated statistically significant improvement of symptoms. This study is limited by a small sample population and short term outcomes.

Hayes published a Search and Summary report titled “Radiofrequency Ablation for Treatment of Plantar Fasciitis”. The review included 7 abstracts (including prospective comparison studies, prospective uncontrolled studies, and retrospective uncontrolled studies). Hayes concluded there is sufficient published evidence to assess the technology and that conflicting findings are presented in the abstracts (Hayes, 2017a) Hayes updated the report December 2018 with no change to the conclusion (Hayes, 2018c).

In 2010, the American College of Foot and Ankle Surgeons (ACFAS) issued a guideline on the treatment of heel pain. Bipolar radiofrequency is listed as a third tier option for patients who have failed other treatments. It was given a grade C recommendation, meaning that this treatment option is supported by either conflicting or level IV expert opinion evidence (Thomas, et al., 2010). In an updated clinical consensus statement published by ACFAS for diagnosis and treatment of adult acquired infracalcaneal heel pain (Schneider, et al., 2018) a recommendation is not made on bipolar RF treatment, the authors concluded the evidence is uncertain, neither appropriate or inappropriate.

**The American Board of Internal Medicine's (ABIM) Foundation Choosing Wisely® Initiative:** The American Orthopaedic Foot and Ankle Surgeons Choosing Wisely® (2014) list does not support surgery for plantar fasciitis before trying six months of non-operative care. With six months of consistent, non-operative treatment, plantar fasciitis will resolve up to 97% of the time. Surgery has a much lower rate of success and has the added possibility of post-operative complications.

Overall, many of the published studies are flawed by retrospective design, small sample populations, lack of controls, short-term outcomes, and use of various outcome measures making comparisons across studies difficult. Based on the lack of well-designed clinical trials, neuroablative procedures are considered unproven for the treatment of plantar fasciitis.

**Foot Pain (e.g., peripheral neuroma, Morton's Neuroma)**
In the toe area, interdigital spaces of the foot are common sites for the development of neuromas. These occur most often between the third and fourth digits of the foot where the medial and lateral plantar nerves combine, usually from repetitive trauma or stress, with resultant pain in the ball of the foot often described as a lump on the bottom of the foot. It may also develop in the second and fourth interdigital space (Fields, 2017). Morton's neuroma is a compression neuropathy of the common digital nerve (Thomas, et al., 2009). Initial treatment includes adaptive footwear, orthotics, and injections of anesthetics, corticosteroids, alcohol or phenol (Thomas, et al., 2009). When conservative therapy fails surgical treatment may be recommended and involves resection of a portion of the nerve or release of the tissue surrounding the nerve. (American Orthopaedic Foot and Ankle Society [AOFAS], 2012). Ablative approaches, such as alcohol injections and RF ablation using imaging guidance have also been employed as treatment of refractory Morton's neuroma.

**Literature Review:** Evidence in the peer reviewed literature evaluating ablative techniques for peripheral neuromas focus primarily on Morton's neuroma using alcohol injections, radiofrequency ablation and cryoablation. Several case series have been published evaluating ultrasound guided alcohol ablation as treatment of Morton's neuroma with some evidence supporting relief of pain and patient satisfaction (Perini, et al, 2016; Pasquali, et al., 2015**;** Musson, et al., 2012**;** Hughes, et al., 2007; Mozena, et al., 2007**;** Fanucci, et al., 2004). A majority of these studies involve small sample populations and evaluate short term outcomes. Long-term outcomes of US guided alcohol injection (n=45) reported by Gurdezi et al. (2013) illustrated alcohol injection did not result in permanent resolution of symptoms. At an average follow-up of five years 13/45 subjects had return of symptoms, 16/45 subjects underwent surgical excision at an average of 24 months follow-up, and 13/45 subjects maintained complete resolution of symptoms**.** In general the body of evidence evaluating alcohol ablation is insufficient and lacks well-designed controlled trials comparing outcomes with well-established alternative treatments, such as surgical decompression. A recently published systematic review continues to support short term outcomes and low level evidence open to methodological bias and interpretation (Santos, et al., 2018).

Evidence evaluating cryoablation for Morton's neuroma is limited. One group of authors reported on the technical aspects of magnetic resonance guided cryoablation and included retrospective results of their preliminary clinical experience (Cazzato, et al., 2016)**.** Measured procedural outcomes included technical success, procedural time, and complications; clinical outcomes included patient satisfaction, residual pain using the VAS scale, and instances of stump neuroma. A total of 20 subjects (24 neuromas) were included in the trial. Follow-up (mean 19.7 months) was available for 18/24 neuromas. Regarding clinical outcomes the authors reported 77.7% of subjects were completely satisfied, 16.6% were satisfied with mild reservations, and 5.7% were satisfied with major reservations. Mean pain score was 3.0 post procedure and there were no instances of stump neuroma. A second group of authors evaluated clinical outcomes associated with ultrasound guided cryoneurolysis (n=20) as treatment of Morton's neuroma (Friedman, et al., 2012). Five subjects had a painful neuroma, 12 had a stump neuroma secondary to surgery or trauma, and three had peripheral neuritis without a visible anatomic lesion. Outcomes were measured four to eight months following treatment with cryoablation. At follow-up, a total of 15 subjects had pain relief (11 subjects had marked or total relief, three had moderate relief, one had mild relief), five subjects had no relief, three of which went on to have surgical treatment. The study is limited by sample size, short-term follow-up and lack of controls.

Evidence evaluating radiofrequency ablation as a treatment of Morton's neuroma in the medical literature is limited to primarily retrospective reviews (Masala, et al 2018; Chuter, et al., 2013; Moore, et al., 2012).

Hayes published a Search and Summary report titled" Peripheral Nerve Ablation for Treatment of Morton's Neuroma". The review included 3 abstracts (2 retrospective studies and 1 review article). Hayes concluded there is insufficient published evidence to assess the safety and/or impact on health outcomes or patient management regarding peripheral nerve ablation for the treatment of Morton's neuroma (Hayes, 2017b).

The National Institute for Care and Health Excellence (NICE) published interventional procedural guidance for radiofrequency ablation for symptomatic interdigital (Morton's) neuroma (NICE, 2015). According to the guidance the current evidence on radiofrequency ablation for symptomatic interdigital (Morton's) neuroma raises no major safety concerns. The evidence on efficacy is limited in quantity and quality. Therefore, this procedure should only be used with special arrangements for clinical governance, consent and audit or research.

Within clinical practice guidelines published by the Association of Extremity Nerve Surgeons (Barrett, et al., 2014) the authors note ablation as a primary treatment of Morton's neuroma is not recommended nor is the use of alcohol injections.

Within practice guidelines developed by the Clinical Practice Guideline Forefoot Disorders Panel of the American College of Foot and Ankle Surgeons (ACFAS) for Morton's Neuroma the panel reported cryogenic neuroablation may be performed as a treatment although it was further noted cryoablation is limited by lack of permanent results and decreased efficacy when employed for treatment of large neuromas or in the presence of thick fibrosis. In addition, the consensus statement reports that 3 to 7 dilute alcohol injections of 4% alcohol injected at 5 to 10 day intervals has been associated with an 89% success rate with 82% of individuals achieving complete relief of symptoms. However, overuse of corticosteroid injections was cautioned as it may result in atrophy of the plantar fat pad as well as joint subluxation (Thomas, et al., 2009).

A Cochrane review evaluating the effectiveness of surgical and non-surgical interventions for Morton's neuroma was published by Thompson and colleagues in 2004. Insoles, corticosteroid injections, excision of nerve, transposition of nerve, and neurolysis are commonly used treatments although their effectiveness is poorly understood. According to the authors the review included one randomized controlled trial that evaluated surgical treatment, little evidence from randomized trials supporting the use of insoles, and no randomized trials evaluating corticosteroid injections. Cochrane concluded there was insufficient evidence to evaluate the effectiveness of surgical and non-surgical interventions for Morton's neuroma and well-designed trials are needed to guide clinical practice.

The American Podiatric Sports Medicine (APSM) provides information about Morton's Neuroma, although it is not a formal position statement or clinical recommendation the information available supports orthotics, steroid injection and surgical removal as treatment of Morton's neuroma, occasionally injection of other substances to ablate the neuroma are effective.

**The American Board of Internal Medicine's (ABIM) Foundation Choosing Wisely® Initiative:** The American Orthopaedic Foot and Ankle Surgeons Choosing Wisely® (2014) list does not support alcohol injections for Morton's neuromas. The AOFAS reports alcohol can permanently damage the nerve, but without effective pain relief. At five year follow-up, alcohol injection for Morton's neuroma has both a high recurrence rate and a high rate of complications, including bruising, scar formation, dysesthesia, severe pain and infection.

There is insufficient evidence to support the safety and efficacy of neuroablative treatment for a peripheral neuromas (e.g., Morton's neuroma). Treatments such as alcohol injections and radiofrequency ablation of the neuroma have shown promise in observational case series, these treatments should however be considered research treatments until further study clarifies their efficacy (Fields, 2017).

**Knee Pain (e.g., osteoarthritis, degenerative)**
Chronic osteoarthritis of the knee occurs commonly with advanced age and is the most common form of arthritis (AAOS, 2014). Rheumatoid and posttraumatic arthritis are less common forms of arthritis affecting the knee joint

however all forms result in inflammation and pain. Treatment generally includes lifestyle modifications, exercise, weight loss, physical therapy, assistive devices, and pharmacologic agents (e.g., corticosteroids, NSAIDs, intra-articular viscosupplements). Surgical methods are recommended when conservative measures fail to relieve symptoms and include arthroscopy and knee replacement procedures. Recently, neuroablative destruction of the genicular (and other nerves) have been investigated as a method of treatment for knee pain and disability caused by osteoarthritis of the knee. Anatomically genicular nerves are in close proximity to the genicular arteries and vascular injury is a potential complication of RF of the genicular nerve (Kim, et al., 2016).

**Literature Review:** Evidence evaluating neuroablative methods as treatment of chronic knee pain focuses primarily on RF techniques and consists mainly of case reports, observational case series (Iannaccone, et al., 2017; Santana Pineda, et al., 2017; Bellini, et al., 2015), a systematic review (Gupta, et al., 2017), narrative review (Bhatia, et al., 2016), and few controlled trials (McCormick, et al., 2018; El-Hakeim, et al., 2018; Davis, et al., 2018; Qudsi, et al., 2017; Sari et al., 2016; Choi, et al., 2011; Ikeuchi, et al., 2011).

In December of 2018 the Washington State Healthcare Authority published an evidence report evaluating peripheral nerve ablation for the treatment of limb pain. As part of the review, the authors collected and evaluated 13 RCTs which met their inclusion criteria; seven focused on osteoarthritic knee pain. A total of five studies evaluated conventional RF; most outcomes were measured at 6 months with one study reporting 12 month outcomes. One study evaluated cooled RFA (6 month outcomes) and one evaluated cryoablation for knee pain (6 month outcomes). Although there was some improvement in function and pain scores, according to the authors the studies had significant limitations and/or high risk of biased assessments. Using the GRADE system the group reported there was low quality evidence in favor of peripheral nerve ablation to improve some short-term functional and pain measures for moderate to severe pain resulting from chronic knee OA. The evidence demonstrated some improvement that was both statistically significant and likely to be clinically meaningful, although improvements were small in magnitude and not consistent.

A number of RCTs have been published recently evaluating RF for treatment of OA knee pain. Davis and colleagues (2018) evaluated cooled RF as treatment of subjects with chronic knee pain (n=151) unresponsive to conservative modalities. The primary endpoint was the proportion of subjects with 50% or greater reduction of treatment effect, and analgesic use. Patients were randomized to receive either cooled RF (n=76) or intraarticular steroid injection (IAS) (n=75), subjects were allowed to cross over at 6 months follow-up. A total of 138 subjects underwent treatment, the remaining were either lost to follow-up (n=2), withdrew (n=9), or were protocol deviations (n=2), 126 subjects were available for six month follow-up. Both study groups had reduction of pain from baseline at six months. The cooled RF group had a greater reduction in numeric rating scale (NRS) from baseline at all follow-ups, with 74% meeting successful outcome criteria (greater than 50% relief) compared to the IAS group (10%). Additionally the cooled RF group had better improvement of Oxford Knee Scores and Global Perceived Effect as well as a greater mean change in nonopioid medication use. The authors reported at six month follow-up 22% of the cooled RF group and 4% of the IAS group reported complete reduction of pain. Limitations include varying doses of medication with duration of effect for IASs, differential loss to follow-up, and lack of blinding.

El-Hakeim et al. (2018) published results of RCT fluoroscopic-guided RFA for treatment of chronic knee OA (n=60). Subjects were randomized to undergo RF of the genicular nerve (n=30) or receive conventional analgesics (acetaminophen, diclofenac, and physical therapy) (n=30). RF was accomplished using three 90 seconds cycles at 80° C. Outcome measures included VAS, WOMAC, and Likert scale for patient satisfaction. At six months follow-up VAS values were significantly lower in the RF group. WOMAC function values improved in both groups, however at six months there was a significant difference with lower scores in the RF group. Patient satisfaction according to Likert scales favored RF in the third and six month. Limitations noted by the author include lack of blinding and lack of diagnostic nerve block prior to RF treatment.

Qudsi et al. (2017) published the results of a double-blinded randomized controlled trial comparing traditional RF neurolysis (n=14) to local anesthetic and corticosteroid block (n=14) of the genicular nerves for treatment of persistent pain following total knee arthroplasty. Subjects were followed for one year following treatment. At three and six months both groups demonstrated a reduction in pain and significant joint function improvement, results were similar in both groups, as well as improvement in quality of life and disability and a reduced need for

analgesics The study is limited by small sample population and short term outcomes, further clinical trials are needed to establish safety and efficacy.

Sari et al. (2016) compared the efficacy of intra-articular injection (n=36) and RF neurotomy of genicular nerves (n=37) in subjects with chronic knee OA. The main outcome was pain intensity with functional status as a secondary outcome compared at baseline, one and three months follow-up. The authors reported for the RF group there was a significant reduction in VAS pain (P <0.001) at both the first months and three month follow-up in comparison to subject who received intra-articular injections. In addition the RF group had a significant reduction in WOMAC score sin the first month (P<0.001). The study is limited by small sample and short term outcomes.

A randomized controlled trial evaluating RF of the genicular nerves for treatment of chronic knee pain was published by Choi and associates (2011). This study involved 38 subjects with chronic knee pain unresponsive to other treatments (physical therapy, oral analgesics, and intra-articular injections) who were randomized to receive percutaneous RF neurotomy (n=19) or the same procedure without neurotomy (n=19). Outcomes were measured at 1, 4, and 12 weeks post procedure and included VAS scores, Oxford Knee scores, and global assessment. The authors reported VAS scores and Oxford Knee scores showed the RF group had less knee joint pain at four and 12 weeks follow-up when compared to the control group. RF of the genicular nerves resulted in significant reduction of pain and improved function in the experimental group. Ten subjects in the RF group experienced at least 50% reduction of pain at 12 weeks versus none in the control group. Limitations of the study include small sample population and measurement of short term outcomes. In the authors opinion further trials with larger sample size and longer follow-up are needed.

In a nonrandomized controlled study Ikeuchi and colleagues (2011) compared RF ablation (n=18) to nerve block (n=17) for treatment of refractory knee pain. RF current or local anesthetic was applied to the medial retinacular nerve and the infrapatellar branch of the saphenous nerve. Outcome measures included Western Ontario McMaster Universities Osteoarthritis Index (WOMAC) score, pain VAS, and patient global assessment with a minimum follow-up of six months. Differences in pain VAS scores were statistically significant at four, eight and 12 weeks with the RF group scores averaging lower than the control group. Percentage of responders in the RF at four weeks, 12 weeks and six months was 50%, 30% and less than 10% (respectively); for the control group the percentage of responders were less than 12% at four and 12 weeks, and 0% at six months. There was no significant difference in patients global assessment (p=0.126) and no serious adverse events. Limitations noted by the authors include uncertain placebo effects and differences in baseline characteristics of each group.

Hayes, Inc. published a Search and Summary Report (May, 2018) evaluating Coolief Cooled RF for hip and knee pain. A total of 11 abstracts were reviewed by Hates, 8 involved subjects with knee pain. Hayes concluded there is insufficient evidence to assess the safety and/or impact of the Coolief Cooled RF on health outcomes or patient management for treatment of hip and/or knee pain.

In September 2017 Hayes published a Health Technology Brief “Peripheral Nerve Ablation for Treatment of Osteoarthritic Knee Pain”. A total of eight studies were included in the review to evaluate traditional PNA techniques for the treatment of chronic, conservative treatment-refractory knee pain related to OA. Based on the evidence reviewed Hayes concluded there is some published evidence safety and impact on health outcomes are at least comparable to standard treatment, however substantial uncertainty remains due to poor quality data and conflicting results (Hayes, 2017e). Hayes updated the report October 2019 (Hayes, 2019a) with no change to the conclusion or Hayes rating of C.

**The American Board of Internal Medicine’s (ABIM) Foundation Choosing Wisely® Initiative:** No relevant statements.

Few studies in the published peer reviewed literature lend support to improvement in pain after ablative treatment although these studies are limited by variability in RF technique, small sample populations, and differences in patient selection criteria. Both controlled trials reported lower pain scores in the RF treatment group, although Ikeuchi et al. (2011) showed pain scores increased at six months follow-up in the RF treatment group. In addition, professional society guidelines addressing neuroablative techniques as treatment of knee pain were not found in the scientific literature. At present there is insufficient evidence in the peer-reviewed

scientific literature evaluating RF ablative treatment for chronic knee pain and strong evidenced based conclusions regarding the effects of the technology on health outcomes cannot be made. Additional well-designed studies involving larger populations, and long-term outcomes are needed to support safety and efficacy.

**Headache/Occipital Neuralgia**
Cervicogenic headache and occipital neuralgia refers to specific types of headache thought to arise from impingement or entrapment of the occipital nerves and/or the upper spinal cervical vertebrae (Dinakar, 2016; Evans, 2004; Biondi, 2001; Vincent, et al., 1998; Bogduk, 2001). The clinical features of cervicogenic headache may mimic those associated with primary headache disorders (e.g., tension-type headache, migraine, or hemicrania continua), making it difficult to distinguish among headache types (Biondi, 2005; Martelletti, 2004; Peters, 2004).

Cervicogenic headache and occipital neuralgia are syndromes whose diagnosis and treatment have been reported as controversial in the medical literature due to lack of expert consensus regarding their etiology and treatment. A consensus on standard treatment does not exist because of the variability in patient selection and clinical outcomes. Numerous treatments or procedures for headaches (e.g., chronic migraine, chronic cluster or cervicogenic headache) and occipital neuralgia have been proposed, with varying levels of success. Pharmacological treatment generally includes oral analgesics, anti-inflammatory medications, tricyclic antidepressants, and anticonvulsant medications, used alone or in combination with other treatment modalities. Other suggested treatments include the use of a cervical collar during the acute phase; physical therapy with stretching and strengthening exercises; postural training; relaxation exercises; transcutaneous nerve stimulation (TENS); and manual therapy, including spinal manipulation and spinal mobilization (Bogduk, et al., 2009; Biondi, 2005, 2001; Martelletti, et al., 2004).

In a review of medical textbooks, commonly used treatments for pain relief from cervicogenic headache and occipital neuralgia include the use of local injected anesthetics, with or without the addition of corticosteroid preparation, to block the affected nerve(s). It is noted that these injections can be used as therapeutic treatment measures for pain relief, although the duration of pain relief varies from hours to months. The scientific evidence supporting injection therapy or percutaneous nerve block for occipital neuralgia and cervicogenic headache has been limited (Dinakar, 2016; Peters, 2004; Chavin, 2003). Ablative treatments (e.g., pulsed radiofrequency ablation, radiofrequency ablation, radiofrequency neurotomy, radiofrequency denervation, neurolysis, cryodenervation, nerve root rhizotomy) have also been investigated as an attempt to denervate the occipital and/or upper cervical nerve. Nevertheless, evidence in the medical literature evaluating ablative techniques is limited and improvement in clinical outcomes has not been consistently demonstrated in well-designed clinical studies.

**Literature Review:** In a retrospective study, Lee et al. (2007) studied the clinical efficacy of radiofrequency cervical zygapophyseal joint neurotomy in patients with cervicogenic headache. A total of thirty patients suffering from chronic cervicogenic headaches for longer than six months and showing a pain relief by greater than 50% from diagnostic/prognostic blocks were included in the study. These patients were treated with radiofrequency neurotomy of the cervical zygapophyseal joints and were subsequently assessed at one week, one month, six months, and at 12 months following the treatment. The results of this study showed that radiofrequency neurotomy of the cervical zygapophyseal joints significantly reduced the headache severity in 22 patients (73.3%) at 12 months after the treatment. The limitations of this study include the lack of a control group and small sample size.

In a randomized controlled study, Haspeslagh et al. (2006) compared the efficacy of a radiofrequency treatment with treatment by local injection of the greater occipital nerve in patients with cervicogenic headache (n=30). Fifteen patients received a sequence of radiofrequency treatments (cervical facet joint denervation, followed by cervical dorsal root ganglion lesions when necessary), and the other 15 patients underwent local injections with steroid and anesthetic at the greater occipital nerve, followed by TENS when necessary. Visual analogue scores for pain, global perceived effects scores, quality of life scores were assessed at 8, 16, 24 and 48 weeks. Patients also kept a headache diary. There were no statistically significant differences between the two treatment groups at any time point in the trial. The authors reported that they did not find evidence that radiofrequency treatment of cervical facet joints and dorsal root ganglion is an effective treatment for patients fulfilling the clinical criteria of

cervicogenic headache. The authors reported that many patients in clinical practice are treated with neurotomies despite the lack of evidence for positive outcomes.

In a randomized, double-blind, placebo-controlled study, Stovner et al. (2004) studied radiofrequency denervation of facet joints C2 through C6 in cervicogenic headache (n=12). The patients had some improvement three months after treatment, but there were no marked differences between the two groups, concluding that the procedure is probably not beneficial for cervicogenic headaches.

Govind et al. (2003) studied 49 patients with occipital headaches who underwent percutaneous radiofrequency neurotomy. Eighty-eight percent of the patients achieved a successful outcome (complete relief of pain for at least 90 days). The median duration of relief in these patients was 297 days. While the results were promising in this study, it lacked a control group which leads to difficulties in interpretation of the findings.

Nagar et al. (2015) published the results of a systematic review to evaluate the effectiveness of RF and pulsed RF for the treatment of cervicogenic headache. A total of nine studies met inclusion criteria and consisted of four randomized controlled trials (RCTs) (two high quality) and five non randomized controlled trials. In the selected studies there were inconsistencies between randomized trials, flaws in trial design, and gaps in the chain of evidence. The primary outcome measures were headache relief and improved quality of life. The authors reported none of the four RCTs provided strong evidence that radiofrequency ablation or pulsed radiofrequency therapy was effective for cervicogenic headache and only three of the five non RCTs suggested RF was effective. There were not enough homogenous studies to conduct a meta-analysis. The authors concluded there is limited evidence to support RF and pulsed RFA therapies for management of cervicogenic headache and there is a need for high quality randomized controlled trials (RCTs) and/or multiple consistent non-RCTs without methodological flaws to evaluate the efficacy of RF and pulsed RF ablative therapies for cervicogenic headache.

Within a Hayes Medical Directory Technology report evaluating local injection therapy and neurosurgery for cervicogenic headache and occipital neuralgia, (Hayes, 2011, re- reviewed 2015, 2018) in reference to surgical procedures (i.e., RF ablation, discectomy) Hayes noted these procedures may provide effective pain relief for some patients. However, the effects of RF ablation may not be superior to those of anesthetic injection, and studies on discectomy did not include a control group. Hayes concluded there is insufficient published evidence to assess the safety and/or impact on health outcomes or patient management for cervical radiofrequency lesions as a treatment of cervicogenic headache and occipital neuralgia. In 2018 Hayes updated the report acknowledging there are no relevant newly published studies on the technology that met the inclusion criteria set out in the report.

Hayes published a Health Technology Brief (Hayes, 2004, reviewed 2016) evaluating non pulsed thermal RF ablation as a treatment for cervicogenic headache. A total of 6 studies, including 2 randomized controlled trials (RCTs), 1 prospective cohort study, and 3 uncontrolled retrospective case series that evaluated the efficacy and safety of RF ablation of cervical nerves for treating cervicogenic headache, which involved 11 to 49 adult patients and a mean follow-up duration of 6 months to 2 years were included in the review. Measured clinical outcomes included intensity or frequency of pain reported by the patient and assessed by established instruments, medication use, and complications. Hayes reported RF ablation appeared to be safe in the short-term but evidence supporting efficacy was limited. Studies were limited by methodological flaws and differences in interstudy variables hindered comparisons across studies. Hayes concluded additional well-designed studies are needed to support safety and efficacy.

The American Academy of Neurology (AAN) evidence based guideline: NSAIDS and other complementary treatments for episodic migraine prevention in adults does not mention local injection therapies, ablative treatments, electrical stimulation or neurosurgeries as complimentary treatments for migraine (Holland, et al., 2012).

The American Association of Neurological Surgeons (AANS) website provides the following information: “Often, occipital neuralgia symptoms will improve or disappear with heat, rest, physical therapy including massage, anti-inflammatory medications, and muscle relaxants. Oral anticonvulsant medications such as carbamazepine and gabapentin may also help alleviate pain. Percutaneous nerve blocks may not only be helpful in diagnosing occipital neuralgia, but can also help alleviate pain. Nerve blocks involve either the occipital nerves or in some

patients, the C2 and/or C3 ganglion nerves. It is important to keep in mind that repeat blocks using steroids may cause serious adverse effects." Surgical intervention (i.e., microvascular decompression, occipital nerve stimulation) may be considered when the pain is chronic, severe and does not respond to conservative treatment" (AANS, 2013).

**The American Board of Internal Medicine's (ABIM) Foundation Choosing Wisely® Initiative**: No relevant statements.

There is insufficient evidence in the published medical literature to demonstrate the safety and efficacy of peripheral nerve ablation, using any method, for treatment of cervicogenic headache and/or occipital neuralgia.

**Other Pain Related Conditions**
There is a paucity of evidence evaluating neuroablative procedures as treatment of pain resulting from chronic regional pain syndrome (Straube, et al., 2013; Manjunath, et al., 2008), peripheral nerve compression/entrapment conditions (McSweeney, Cichero, 2015), and peripheral neuropathic conditions (Hayes, 2017d) in the peer-reviewed literature. Evidence is mainly in the form of published reviews and few case reports with an emphasis of lower extremity pain. At present the evidence is insufficient to support safety and efficacy of peripheral nerve destruction when performed for treatment of pain related to these conditions.

**Professional Societies/Organizations**
As noted above, several professional societies (ASIPP [Manchikanti, et al., 2013]; ANA [Holland, et al., 2012]; ACFAS [Thomas, et al., 2010; Thomas, et al., 2009]) have published position statements or clinical recommendations for various medical conditions which include recommendations for or against peripheral nerve ablative modalities. In addition, the American Society of Anesthesiologists (ASA) Task Force on Chronic Pain Management and the American Society of Regional Anesthesia and Pain Medicine Practice (ASRA) updated their guidelines for chronic pain management. The guideline was based on scientific evidence, opinion-based evidence (i.e., expert opinion, membership opinion, and informed opinion), the level of evidence for individual recommendations however is not specified. Regarding ablative methods specifically, the Task Force concluded the following:

- Other treatment modalities should be attempted before consideration of the use of ablative techniques.
- Chemical denervation (e.g., alcohol, phenol, or high-concentration local anesthetics) should *not* be used in the routine care of patients with chronic noncancer pain.
- Cryoablation may be used in the care of selected patients (e.g., post-thoracotomy pain syndrome, low back pain [medial branch], and peripheral nerve pain).
- Conventional radiofrequency ablation may be performed for neck pain, and water-cooled radiofrequency ablation may be used for chronic sacroiliac joint pain.
- Conventional or thermal radiofrequency ablation of the dorsal root ganglion should not be routinely used for the treatment of lumbar radicular pain.

**The American Board of Internal Medicine's (ABIM) Foundation Choosing Wisely® Initiative:** The American Society of Anesthesiologists Choosing Wisely® (2014) recommendations do not support irreversible interventions for non-cancer pain that carry significant costs and/or risks. Irreversible interventions for non-cancer pain, such as peripheral chemical neurolytic blocks or peripheral radiofrequency ablation, should be avoided because they may carry significant long-term risks of weakness, numbness or increased pain.

**Centers for Medicare & Medicaid Services (CMS)**

- National Coverage Determinations (NCDs): CMS NCD Induced Lesions of Nerve Tracts (160.1) addresses destruction of nerve tissue for controlling acute or chronic pain from conditions such as terminal cancer of lumbar degenerative arthritis. According to CMS the NCD is a longstanding national coverage determination. The effective date has not been posted. Refer to the CMS NCD table of contents link in the reference section.
- Local Coverage Determinations (LCDs): Not found.

**Outside of the US**

In 2015 the National Institute for Health and Care Excellence (NICE) published an interventional procedures guidance for radiofrequency ablation for symptomatic interdigital (Morton's) neuroma. According to the guidance recommendations there are no safety issues but the procedure should only be used with special arrangements for clinical governance, consent and audit or research (NICE, 2015).

In 2013 The Health Information and Quality Authority (Ireland) published a health technology assessment evaluating radiofrequency lesioning as treatment for chronic spinal pain. Currently there is limited evidence to support the use of classical RF ablation (i.e., non-pulsed) for thoracic or SI facet joint pain, use is recommended only in the context of special arrangements and clinical audit. Classical RF is not recommended for early management of persistent non-specific low back pain.

## Coding/Billing Information

**Note:** 1) This list of codes may not be all-inclusive.
2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

**Considered Medically Necessary when criteria in the applicable policy statements listed above are met:**

| CPT®* Codes | Description |
|---|---|
| 61790 | Creation of lesion by stereotactic method, percutaneous, by neurolytic agent (eg, alcohol, thermal, electrical, radiofrequency); gasserian ganglion |
| 61791 | Creation of lesion by stereotactic method, percutaneous, by neurolytic agent (eg, alcohol, thermal, electrical, radiofrequency); trigeminal medullary tract |
| 64600 | Destruction by neurolytic agent, trigeminal nerve; supraorbital, infraorbital, mental, or inferior alveolar branch |
| 64605 | Destruction by neurolytic agent, trigeminal nerve; second and third division branches at foramen ovale |
| 64610 | Destruction by neurolytic agent, trigeminal nerve; second and third division branches at foramen ovale under radiologic monitoring |

**Considered Experimental/Investigational/Unproven when used for the treatment of pain conditions as outlined in the above coverage policy statement:**

| CPT®* Codes | Description |
|---|---|
| 64624 | Destruction by neurolytic agent, genicular nerve branches including imaging guidance, when performed |
| 64632 | Destruction by neurolytic agent, plantar common digital nerve |
| 64640 | Destruction by neurolytic agent; other peripheral nerve or branch |
| 0441T | Ablation, percutaneous, cryoablation, includes imaging guidance; lower extremity distal/peripheral nerve |

| ICD-10-CM Diagnosis Codes | Description |
|---|---|
| G43.001 | Migraine without aura, not intractable, with status migrainosus |
| G43.009 | Migraine without aura, not intractable, without status migrainosus |
| G43.011 | Migraine without aura, intractable, with status migrainosus |
| G43.019 | Migraine without aura, intractable, without status migrainosus |
| G43.101 | Migraine with aura, not intractable, with status migrainosus |
| G43.109 | Migraine with aura, not intractable, without status migrainosus |
| G43.111 | Migraine with aura, intractable, with status migrainosus |
| G43.119 | Migraine with aura, intractable, without status migrainosus |
| G43.401 | Hemiplegic migraine, not intractable, with status migrainosus |

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|---|---|
| G43.409 | Hemiplegic migraine, not intractable, without status migrainosus |
| G43.411 | Hemiplegic migraine, intractable, with status migrainosus |
| G43.419 | Hemiplegic migraine, intractable, without status migrainosus |
| G43.501 | Persistent migraine aura without cerebral infarction, not intractable, with status migrainosus |
| G43.509 | Persistent migraine aura without cerebral infarction, not intractable, without status migrainosus |
| G43.511 | Persistent migraine aura without cerebral infarction, intractable, with status migrainosus |
| G43.519 | Persistent migraine aura without cerebral infarction, intractable, without status migrainosus |
| G43.601 | Persistent migraine aura with cerebral infarction, not intractable, with status migrainosus |
| G43.609 | Persistent migraine aura with cerebral infarction, not intractable, without status migrainosus |
| G43.611 | Persistent migraine aura with cerebral infarction, intractable, with status migrainosus |
| G43.619 | Persistent migraine aura with cerebral infarction, intractable, without status migrainosus |
| G43.701 | Chronic migraine without aura, not intractable, with status migrainosus |
| G43.709 | Chronic migraine without aura, not intractable, without status migrainosus |
| G43.711 | Chronic migraine without aura, intractable, with status migrainosus |
| G43.719 | Chronic migraine without aura, intractable, without status migrainosus |
| G43.801 | Other migraine, not intractable, with status migrainosus |
| G43.809 | Other migraine, not intractable, without status migrainosus |
| G43.811 | Other migraine, intractable, with status migrainosus |
| G43.819 | Other migraine, intractable, without status migrainosus |
| G43.821 | Menstrual migraine, not intractable, with status migrainosus |
| G43.829 | Menstrual migraine, not intractable, without status migrainosus |
| G43.831 | Menstrual migraine, intractable, with status migrainosus |
| G43.839 | Menstrual migraine, intractable, without status migrainosus |
| G43.901 | Migraine, unspecified, not intractable, with status migrainosus |
| G43.909 | Migraine, unspecified, not intractable, without status migrainosus |
| G43.911 | Migraine, unspecified, intractable, with status migrainosus |
| G43.919 | Migraine, unspecified, intractable, without status migrainosus |
| G44.001-G44.89 | Other headache syndromes |
| G54.1 | Lumbosacral plexus disorders |
| G54.4 | Lumbosacral root disorders, not elsewhere classified |
| G57.00 | Lesion of sciatic nerve, unspecified lower limb |
| G57.01 | Lesion of sciatic nerve, right lower limb |
| G57.02 | Lesion of sciatic nerve, left lower limb |
| G57.03 | Lesion of sciatic nerve, bilateral lower limbs |
| G57.10 | Meralgia paresthetica, unspecified lower limb |
| G57.11 | Meralgia paresthetica, right lower limb |
| G57.12 | Meralgia paresthetica, left lower limb |
| G57.13 | Meralgia paresthetica, bilateral lower limbs |
| G57.30 | Lesion of lateral popliteal nerve, unspecified lower limb |
| G57.31 | Lesion of lateral popliteal nerve, right lower limb |
| G57.32 | Lesion of lateral popliteal nerve, left lower limb |
| G57.33 | Lesion of lateral popliteal nerve, bilateral lower limbs |
| G57.40 | Lesion of medial popliteal nerve, unspecified lower limb |
| G57.41 | Lesion of medial popliteal nerve, right lower limb |
| G57.42 | Lesion of medial popliteal nerve, left lower limb |
| G57.43 | Lesion of medial popliteal nerve, bilateral lower limbs |
| G57.50 | Tarsal tunnel syndrome, unspecified lower limb |
| G57.51 | Tarsal tunnel syndrome, right lower limb |
| G57.52 | Tarsal tunnel syndrome, left lower limb |
| G57.53 | Tarsal tunnel syndrome, bilateral lower limbs |
| G57.60 | Lesion of plantar nerve, unspecified lower limb |
| G57.61 | Lesion of plantar nerve, right lower limb |

| | |
|---|---|
| G57.62 | Lesion of plantar nerve, left lower limb |
| G57.63 | Lesion of plantar nerve, bilateral lower limbs |
| G57.70 | Causalgia of unspecified lower limb |
| G57.71 | Causalgia of right lower limb |
| G57.72 | Causalgia of left lower limb |
| G57.73 | Causalgia of bilateral lower limbs |
| G57.80 | Other specified mononeuropathies of unspecified lower limb |
| G57.81 | Other specified mononeuropathies of right lower limb |
| G57.82 | Other specified mononeuropathies of left lower limb |
| G57.83 | Other specified mononeuropathies of bilateral lower limbs |
| G57.90 | Unspecified mononeuropathy of unspecified lower limb |
| G57.91 | Unspecified mononeuropathy of right lower limb |
| G57.92 | Unspecified mononeuropathy of left lower limb |
| G57.93 | Unspecified mononeuropathy of bilateral lower limbs |
| G89.29 | Other chronic pain |
| G89.4 | Chronic pain syndrome |
| G90.521 | Complex regional pain syndrome I of right lower limb |
| G90.522 | Complex regional pain syndrome I of left lower limb |
| G90.523 | Complex regional pain syndrome I of lower limb, bilateral |
| G90.529 | Complex regional pain syndrome I of unspecified lower limb |
| M05.151 | Rheumatoid lung disease with rheumatoid arthritis of right hip |
| M05.152 | Rheumatoid lung disease with rheumatoid arthritis of left hip |
| M05.159 | Rheumatoid lung disease with rheumatoid arthritis of unspecified hip |
| M05.161 | Rheumatoid lung disease with rheumatoid arthritis of right knee |
| M05.162 | Rheumatoid lung disease with rheumatoid arthritis of left knee |
| M05.169 | Rheumatoid lung disease with rheumatoid arthritis of unspecified knee |
| M05.171 | Rheumatoid lung disease with rheumatoid arthritis of right ankle and foot |
| M05.172 | Rheumatoid lung disease with rheumatoid arthritis of left ankle and foot |
| M05.179 | Rheumatoid lung disease with rheumatoid arthritis of unspecified ankle and foot |
| M05.251 | Rheumatoid vasculitis with rheumatoid arthritis of right hip |
| M05.252 | Rheumatoid vasculitis with rheumatoid arthritis of left hip |
| M05.259 | Rheumatoid vasculitis with rheumatoid arthritis of unspecified hip |
| M05.261 | Rheumatoid vasculitis with rheumatoid arthritis of right knee |
| M05.262 | Rheumatoid vasculitis with rheumatoid arthritis of left knee |
| M05.269 | Rheumatoid vasculitis with rheumatoid arthritis of unspecified knee |
| M05.271 | Rheumatoid vasculitis with rheumatoid arthritis of right ankle and foot |
| M05.272 | Rheumatoid vasculitis with rheumatoid arthritis of left ankle and foot |
| M05.279 | Rheumatoid vasculitis with rheumatoid arthritis of unspecified ankle and foot |
| M05.351 | Rheumatoid heart disease with rheumatoid arthritis of right hip |
| M05.352 | Rheumatoid heart disease with rheumatoid arthritis of left hip |
| M05.359 | Rheumatoid heart disease with rheumatoid arthritis of unspecified hip |
| M05.361 | Rheumatoid heart disease with rheumatoid arthritis of right knee |
| M05.362 | Rheumatoid heart disease with rheumatoid arthritis of left knee |
| M05.369 | Rheumatoid heart disease with rheumatoid arthritis of unspecified knee |
| M05.371 | Rheumatoid heart disease with rheumatoid arthritis of right ankle and foot |
| M05.372 | Rheumatoid heart disease with rheumatoid arthritis of left ankle and foot |
| M05.379 | Rheumatoid heart disease with rheumatoid arthritis of unspecified ankle and foot |
| M05.451 | Rheumatoid myopathy with rheumatoid arthritis of right hip |
| M05.452 | Rheumatoid myopathy with rheumatoid arthritis of left hip |
| M05.459 | Rheumatoid myopathy with rheumatoid arthritis of unspecified hip |
| M05.461 | Rheumatoid myopathy with rheumatoid arthritis of right knee |
| M05.462 | Rheumatoid myopathy with rheumatoid arthritis of left knee |
| M05.469 | Rheumatoid myopathy with rheumatoid arthritis of unspecified knee |

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| M05.471 | Rheumatoid myopathy with rheumatoid arthritis of right ankle and foot |
| M05.472 | Rheumatoid myopathy with rheumatoid arthritis of left ankle and foot |
| M05.479 | Rheumatoid myopathy with rheumatoid arthritis of unspecified ankle and foot |
| M05.551 | Rheumatoid polyneuropathy with rheumatoid arthritis of right hip |
| M05.552 | Rheumatoid polyneuropathy with rheumatoid arthritis of left hip |
| M05.559 | Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified hip |
| M05.561 | Rheumatoid polyneuropathy with rheumatoid arthritis of right knee |
| M05.562 | Rheumatoid polyneuropathy with rheumatoid arthritis of left knee |
| M05.569 | Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified knee |
| M05.571 | Rheumatoid polyneuropathy with rheumatoid arthritis of right ankle and foot |
| M05.572 | Rheumatoid polyneuropathy with rheumatoid arthritis of left ankle and foot |
| M05.579 | Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified ankle and foot |
| M05.651 | Rheumatoid arthritis of right hip with involvement of other organs and systems |
| M05.652 | Rheumatoid arthritis of left hip with involvement of other organs and systems |
| M05.659 | Rheumatoid arthritis of unspecified hip with involvement of other organs and systems |
| M05.661 | Rheumatoid arthritis of right knee with involvement of other organs and systems |
| M05.662 | Rheumatoid arthritis of left knee with involvement of other organs and systems |
| M05.669 | Rheumatoid arthritis of unspecified knee with involvement of other organs and systems |
| M05.671 | Rheumatoid arthritis of right ankle and foot with involvement of other organs and systems |
| M05.672 | Rheumatoid arthritis of left ankle and foot with involvement of other organs and systems |
| M05.679 | Rheumatoid arthritis of unspecified ankle and foot with involvement of other organs and systems |
| M05.751 | Rheumatoid arthritis with rheumatoid factor of right hip without organ or systems involvement |
| M05.752 | Rheumatoid arthritis with rheumatoid factor of left hip without organ or systems involvement |
| M05.759 | Rheumatoid arthritis with rheumatoid factor of unspecified hip without organ or systems involvement |
| M05.761 | Rheumatoid arthritis with rheumatoid factor of right knee without organ or systems involvement |
| M05.762 | Rheumatoid arthritis with rheumatoid factor of left knee without organ or systems involvement |
| M05.769 | Rheumatoid arthritis with rheumatoid factor of unspecified knee without organ or systems involvement |
| M05.771 | Rheumatoid arthritis with rheumatoid factor of right ankle and foot without organ or systems involvement |
| M05.772 | Rheumatoid arthritis with rheumatoid factor of left ankle and foot without organ or systems involvement |
| M05.779 | Rheumatoid arthritis with rheumatoid factor of unspecified ankle and foot without organ or systems involvement |
| M05.851 | Other rheumatoid arthritis with rheumatoid factor of right hip |
| M05.852 | Other rheumatoid arthritis with rheumatoid factor of left hip |
| M05.859 | Other rheumatoid arthritis with rheumatoid factor of unspecified hip |
| M05.861 | Other rheumatoid arthritis with rheumatoid factor of right knee |
| M05.862 | Other rheumatoid arthritis with rheumatoid factor of left knee |
| M05.869 | Other rheumatoid arthritis with rheumatoid factor of unspecified knee |
| M05.871 | Other rheumatoid arthritis with rheumatoid factor of right ankle and foot |
| M05.872 | Other rheumatoid arthritis with rheumatoid factor of left ankle and foot |
| M05.879 | Other rheumatoid arthritis with rheumatoid factor of unspecified ankle and foot |
| M06.051 | Rheumatoid arthritis without rheumatoid factor, right hip |
| M06.052 | Rheumatoid arthritis without rheumatoid factor, left hip |
| M06.059 | Rheumatoid arthritis without rheumatoid factor, unspecified hip |
| M06.061 | Rheumatoid arthritis without rheumatoid factor, right knee |
| M06.062 | Rheumatoid arthritis without rheumatoid factor, left knee |
| M06.069 | Rheumatoid arthritis without rheumatoid factor, unspecified knee |

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| M06.071 | Rheumatoid arthritis without rheumatoid factor, right ankle and foot |
| M06.072 | Rheumatoid arthritis without rheumatoid factor, left ankle and foot |
| M06.079 | Rheumatoid arthritis without rheumatoid factor, unspecified ankle and foot |
| M07.651 | Enteropathic arthropathies, right hip |
| M07.652 | Enteropathic arthropathies, left hip |
| M07.659 | Enteropathic arthropathies, unspecified hip |
| M07.661 | Enteropathic arthropathies, right knee |
| M07.662 | Enteropathic arthropathies, left knee |
| M07.669 | Enteropathic arthropathies, unspecified knee |
| M07.671 | Enteropathic arthropathies, right ankle and foot |
| M07.672 | Enteropathic arthropathies, left ankle and foot |
| M07.679 | Enteropathic arthropathies, unspecified ankle and foot |
| M12.551 | Traumatic arthropathy, right hip |
| M12.552 | Traumatic arthropathy, left hip |
| M12.559 | Traumatic arthropathy, unspecified hip |
| M12.561 | Traumatic arthropathy, right knee |
| M12.562 | Traumatic arthropathy, left knee |
| M12.569 | Traumatic arthropathy, unspecified knee |
| M12.571 | Traumatic arthropathy, right ankle and foot |
| M12.572 | Traumatic arthropathy, left ankle and foot |
| M12.579 | Traumatic arthropathy, unspecified ankle and foot |
| M12.851 | Other specific arthropathies, not elsewhere classified, right hip |
| M12.852 | Other specific arthropathies, not elsewhere classified, left hip |
| M12.859 | Other specific arthropathies, not elsewhere classified, unspecified hip |
| M12.861 | Other specific arthropathies, not elsewhere classified, right knee |
| M12.862 | Other specific arthropathies, not elsewhere classified, left knee |
| M12.869 | Other specific arthropathies, not elsewhere classified, unspecified knee |
| M12.871 | Other specific arthropathies, not elsewhere classified, right ankle and foot |
| M12.872 | Other specific arthropathies, not elsewhere classified, left ankle and foot |
| M12.879 | Other specific arthropathies, not elsewhere classified, unspecified ankle and foot |
| M13.151 | Monoarthritis, not elsewhere classified, right hip |
| M13.152 | Monoarthritis, not elsewhere classified, left hip |
| M13.159 | Monoarthritis, not elsewhere classified, unspecified hip |
| M13.161 | Monoarthritis, not elsewhere classified, right knee |
| M13.162 | Monoarthritis, not elsewhere classified, left knee |
| M13.169 | Monoarthritis, not elsewhere classified, unspecified knee |
| M13.171 | Monoarthritis, not elsewhere classified, right ankle and foot |
| M13.172 | Monoarthritis, not elsewhere classified, left ankle and foot |
| M13.179 | Monoarthritis, not elsewhere classified, unspecified ankle and foot |
| M13.851 | Other specified arthritis, right hip |
| M13.852 | Other specified arthritis, left hip |
| M13.859 | Other specified arthritis, unspecified hip |
| M13.861 | Other specified arthritis, right knee |
| M13.862 | Other specified arthritis, left knee |
| M13.869 | Other specified arthritis, unspecified knee |
| M13.871 | Other specified arthritis, right ankle and foot |
| M13.872 | Other specified arthritis, left ankle and foot |
| M13.879 | Other specified arthritis, unspecified ankle and foot |
| M14.651 | Charcot's joint, right hip |
| M14.652 | Charcot's joint, left hip |
| M14.659 | Charcot's joint, unspecified hip |
| M14.661 | Charcot's joint, right knee |
| M14.662 | Charcot's joint, left knee |

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| M14.669 | Charcot's joint, unspecified knee |
| M14.671 | Charcot's joint, right ankle and foot |
| M14.672 | Charcot's joint, left ankle and foot |
| M14.679 | Charcot's joint, unspecified ankle and foot |
| M14.851 | Arthropathies in other specified diseases classified elsewhere, right hip |
| M14.852 | Arthropathies in other specified diseases classified elsewhere, left hip |
| M14.859 | Arthropathies in other specified diseases classified elsewhere, unspecified hip |
| M14.861 | Arthropathies in other specified diseases classified elsewhere, right knee |
| M14.862 | Arthropathies in other specified diseases classified elsewhere, left knee |
| M14.869 | Arthropathies in other specified diseases classified elsewhere, unspecified knee |
| M14.871 | Arthropathies in other specified diseases classified elsewhere, right ankle and foot |
| M14.872 | Arthropathies in other specified diseases classified elsewhere, left ankle and foot |
| M14.879 | Arthropathies in other specified diseases classified elsewhere, unspecified ankle and foot |
| M16.0 | Bilateral primary osteoarthritis of hip |
| M16.10 | Unilateral primary osteoarthritis, unspecified hip |
| M16.11 | Unilateral primary osteoarthritis, right hip |
| M16.12 | Unilateral primary osteoarthritis, left hip |
| M16.2 | Bilateral osteoarthritis resulting from hip dysplasia |
| M16.30 | Unilateral osteoarthritis resulting from hip dysplasia, unspecified hip |
| M16.31 | Unilateral osteoarthritis resulting from hip dysplasia, right hip |
| M16.32 | Unilateral osteoarthritis resulting from hip dysplasia, left hip |
| M16.4 | Bilateral post-traumatic osteoarthritis of hip |
| M16.50 | Unilateral post-traumatic osteoarthritis, unspecified hip |
| M16.51 | Unilateral post-traumatic osteoarthritis, right hip |
| M16.52 | Unilateral post-traumatic osteoarthritis, left hip |
| M16.6 | Other bilateral secondary osteoarthritis of hip |
| M16.7 | Other unilateral secondary osteoarthritis of hip |
| M16.9 | Osteoarthritis of hip, unspecified |
| M17.0 | Bilateral primary osteoarthritis of knee |
| M17.10 | Unilateral primary osteoarthritis, unspecified knee |
| M17.11 | Unilateral primary osteoarthritis, right knee |
| M17.12 | Unilateral primary osteoarthritis, left knee |
| M17.2 | Bilateral post-traumatic osteoarthritis of knee |
| M17.30 | Unilateral post-traumatic osteoarthritis, unspecified knee |
| M17.31 | Unilateral post-traumatic osteoarthritis, right knee |
| M17.32 | Unilateral post-traumatic osteoarthritis, left knee |
| M17.4 | Other bilateral secondary osteoarthritis of knee |
| M17.5 | Other unilateral secondary osteoarthritis of knee |
| M17.9 | Osteoarthritis of knee, unspecified |
| M19.071 | Primary osteoarthritis, right ankle and foot |
| M19.072 | Primary osteoarthritis, left ankle and foot |
| M19.079 | Primary osteoarthritis, unspecified ankle and foot |
| M19.271 | Secondary osteoarthritis, right ankle and foot |
| M19.272 | Secondary osteoarthritis, left ankle and foot |
| M19.279 | Secondary osteoarthritis, unspecified ankle and foot |
| M23.321 | Other meniscus derangements, posterior horn of medial meniscus, right knee |
| M23.322 | Other meniscus derangements, posterior horn of medial meniscus, left knee |
| M23.329 | Other meniscus derangements, posterior horn of medial meniscus, unspecified knee |
| M23.90 | Unspecified internal derangement of unspecified knee |
| M23.91 | Unspecified internal derangement of right knee |
| M23.92 | Unspecified internal derangement of left knee |
| M24.871 | Other specific joint derangements of right ankle, not elsewhere classified |
| M24.872 | Other specific joint derangements of left ankle, not elsewhere classified |

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| M24.873 | Other specific joint derangements of unspecified ankle, not elsewhere classified |
| M24.874 | Other specific joint derangements of right foot, not elsewhere classified |
| M24.875 | Other specific joint derangements left foot, not elsewhere classified |
| M24.876 | Other specific joint derangements of unspecified foot, not elsewhere classified |
| M25.551 | Pain in right hip |
| M25.552 | Pain in left hip |
| M25.559 | Pain in unspecified hip |
| M25.561 | Pain in right knee |
| M25.562 | Pain in left knee |
| M25.569 | Pain in unspecified knee |
| M25.571 | Pain in right ankle and joints of right foot |
| M25.572 | Pain in left ankle and joints of left foot |
| M25.579 | Pain in unspecified ankle and joints of unspecified foot |
| M43.07 | Spondylolysis, lumbosacral region |
| M43.08 | Spondylolysis, sacral and sacrococcygeal region |
| M43.17 | Spondylolisthesis, lumbosacral region |
| M43.18 | Spondylolisthesis, sacral and sacrococcygeal region |
| M43.27 | Fusion of spine, lumbosacral region |
| M43.28 | Fusion of spine, sacral and sacrococcygeal region |
| M45.7 | Ankylosing spondylitis of lumbosacral region |
| M45.8 | Ankylosing spondylitis sacral and sacrococcygeal region |
| M46.07 | Spinal enthesopathy, lumbosacral region |
| M46.08 | Spinal enthesopathy, sacral and sacrococcygeal region |
| M46.1 | Sacroiliitis, not elsewhere classified |
| M46.47 | Discitis, unspecified, lumbosacral region |
| M46.48 | Discitis, unspecified, sacral and sacrococcygeal region |
| M46.57 | Other infective spondylopathies, lumbosacral region |
| M46.58 | Other infective spondylopathies, sacral and sacrococcygeal region |
| M46.87 | Other specified inflammatory spondylopathies, lumbosacral region |
| M46.88 | Other specified inflammatory spondylopathies, sacral and sacrococcygeal region |
| M46.97 | Unspecified inflammatory spondylopathy, lumbosacral region |
| M46.98 | Unspecified inflammatory spondylopathy, sacral and sacrococcygeal region |
| M47.27 | Other spondylosis with radiculopathy, lumbosacral region |
| M47.28 | Other spondylosis with radiculopathy, sacral and sacrococcygeal region |
| M47.817 | Spondylosis without myelopathy or radiculopathy, lumbosacral region |
| M47.818 | Spondylosis without myelopathy or radiculopathy, sacral and sacrococcygeal region |
| M47.897 | Other spondylosis, lumbosacral region |
| M47.898 | Other spondylosis, sacral and sacrococcygeal region |
| M48.07 | Spinal stenosis, lumbosacral region |
| M48.08 | Spinal stenosis, sacral and sacrococcygeal region |
| M48.17 | Ankylosing hyperostosis [Forestier], lumbosacral region |
| M48.18 | Ankylosing hyperostosis [Forestier], sacral and sacrococcygeal region |
| M48.27 | Kissing spine, lumbosacral region |
| M48.37 | Traumatic spondylopathy, lumbosacral region |
| M48.38 | Traumatic spondylopathy, sacral and sacrococcygeal region |
| M48.8X7 | Other specified spondylopathies, lumbosacral region |
| M48.8X8 | Other specified spondylopathies, sacral and sacrococcygeal region |
| M49.87 | Spondylopathy in diseases classified elsewhere, lumbosacral region |
| M49.88 | Spondylopathy in diseases classified elsewhere, sacral and sacrococcygeal region |
| M50.20 | Other cervical disc displacement, unspecified cervical region |
| M51.17 | Intervertebral disc disorders with radiculopathy, lumbosacral region |
| M51.27 | Other intervertebral disc displacement, lumbosacral region |
| M51.37 | Other intervertebral disc degeneration, lumbosacral region |

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| M51.47 | Schmorl's nodes, lumbosacral region |
| M51.87 | Other intervertebral disc disorders, lumbosacral region |
| M51.9 | Unspecified thoracic, thoracolumbar and lumbosacral intervertebral disc disorder |
| M53.2X7 | Spinal instabilities, lumbosacral region |
| M53.2X8 | Spinal instabilities, sacral and sacrococcygeal region |
| M53.3 | Sacrococcygeal disorders, not elsewhere classified |
| M53.87 | Other specified dorsopathies, lumbosacral region |
| M53.88 | Other specified dorsopathies, sacral and sacrococcygeal region |
| M54.17 | Radiculopathy, lumbosacral region |
| M54.18 | Radiculopathy, sacral and sacrococcygeal region |
| M54.30 | Sciatica, unspecified side |
| M54.31 | Sciatica, right side |
| M54.32 | Sciatica, left side |
| M54.5 | Low back pain |
| M54.81 | Occipital neuralgia |
| M54.89 | Other dorsalgia |
| M54.9 | Dorsalgia, unspecified |
| M70.60 | Trochanteric bursitis, unspecified hip |
| M70.61 | Trochanteric bursitis, right hip |
| M70.62 | Trochanteric bursitis, left hip |
| M70.70 | Other bursitis of hip, unspecified hip |
| M70.71 | Other bursitis of hip, right hip |
| M70.72 | Other bursitis of hip, left hip |
| M71.20 | Synovial cyst of popliteal space [Baker], unspecified knee |
| M71.21 | Synovial cyst of popliteal space [Baker], right knee |
| M71.22 | Synovial cyst of popliteal space [Baker], left knee |
| M71.351 | Other bursal cyst, right hip |
| M71.352 | Other bursal cyst, left hip |
| M71.359 | Other bursal cyst, unspecified hip |
| M71.371 | Other bursal cyst, right ankle and foot |
| M71.372 | Other bursal cyst, left ankle and foot |
| M71.379 | Other bursal cyst, unspecified ankle and foot |
| M71.551 | Other bursitis, not elsewhere classified, right hip |
| M71.552 | Other bursitis, not elsewhere classified, left hip |
| M71.559 | Other bursitis, not elsewhere classified, unspecified hip |
| M71.561 | Other bursitis, not elsewhere classified, right knee |
| M71.562 | Other bursitis, not elsewhere classified, left knee |
| M71.569 | Other bursitis, not elsewhere classified, unspecified knee |
| M71.571 | Other bursitis, not elsewhere classified, right ankle and foot |
| M71.572 | Other bursitis, not elsewhere classified, left ankle and foot |
| M71.579 | Other bursitis, not elsewhere classified, unspecified ankle and foot |
| M71.851 | Other specified bursopathies, right hip |
| M71.852 | Other specified bursopathies, left hip |
| M71.859 | Other specified bursopathies, unspecified hip |
| M71.861 | Other specified bursopathies, right knee |
| M71.862 | Other specified bursopathies, left knee |
| M71.869 | Other specified bursopathies, unspecified knee |
| M71.871 | Other specified bursopathies, right ankle and foot |
| M71.872 | Other specified bursopathies, left ankle and foot |
| M71.879 | Other specified bursopathies, unspecified ankle and foot |
| M72.2 | Plantar fascial fibromatosis |
| M76.20 | Iliac crest spur, unspecified hip |
| M76.21 | Iliac crest spur, right hip |

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| M76.22 | Iliac crest spur, left hip |
| M77.30 | Calcaneal spur, unspecified foot |
| M77.31 | Calcaneal spur, right foot |
| M77.32 | Calcaneal spur, left foot |
| M79.671 | Pain in right foot |
| M79.672 | Pain in left foot |
| M79.673 | Pain in unspecified foot |
| M79.674 | Pain in right toe(s) |
| M79.675 | Pain in left toe(s) |
| M79.676 | Pain in unspecified toe(s) |
| M99.04 | Segmental and somatic dysfunction of sacral region |
| R51 | Headache |
| S34.22XA | Injury of nerve root of sacral spine, initial encounter |
| S34.22XD | Injury of nerve root of sacral spine, subsequent encounter |
| S34.22XS | Injury of nerve root of sacral spine, sequela |
| Z96.651 | Presence of right artificial knee joint |
| Z96.652 | Presence of left artificial knee joint |
| Z96.653 | Presence of artificial knee joint, bilateral |
| Z96.659 | Presence of unspecified artificial knee joint |



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