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Treatment of Hyperhidrosis

Audience
Medical Management

Purpose
Medical policies provide general support for applying Mountain Health Co-Op member policy document coverage decisions and must reference the member-specific benefit plan document. The terms of the member-specific Policy document may differ from the standard benefit plan on which this medical policy is based. If there is a conflict between a member-specific policy document and the Mountain Health Co-Op medical policy, the member-specific policy document supersedes this medical policy. Any person(s) applying this medical policy must identify member eligibility, the member-specific policy document, and related policies or guidelines before applying this medical policy, including the existence of any state or federal guidance. Mountain Health Co-Op medical policies are designed for informational purposes only and are not an authorization, explanation of benefits, or contract. Receipt of benefits is subject to satisfaction of all terms and conditions of the member-specific policy document coverage. Mountain Health Co-Op reserves the sole discretionary right to modify all policies and guidelines at any time.

Definition
N/A

Policy/Procedure

Policy Statement and Criteria

1. Commercial Plans

Mountain health Co-Op considers treatment of primary focal hyperhidrosis using aluminum chloride 20% solution, botulinum toxin for severe primary axillary hyperhidrosis inadequately managed with topical agents, in individuals ≥18 y, OR ETS and surgical excision of axillary sweat glands, if conservative treatment (i.e., aluminum chloride or botulinum toxin, individually and in combination) has failed may be considered medically necessary with any of the following medical conditions:

- acrocyanosis of the hands; or
- history of recurrent skin maceration with bacterial or fungal infections; or • history of recurrent secondary infections; or
- history of persistent eczematous dermatitis despite medical treatments with topical dermatologic or systemic anticholinergic agents.

Treatment of hyperhidrosis is considered not medically necessary in the absence of functional impairment or any of the above medical conditions.

The following treatments may be considered medically necessary for the treatment of severe secondary gustatory hyperhidrosis:

- aluminum chloride 20% solution
- surgical options (i.e., tympanic neurectomy) if conservative treatment has failed.
- botulinum toxin
- iontophoresis.

Treatments that may be considered medically necessary by focal region include:

- Axillary
- Aluminum chloride 20% solution
- Botulinum toxin for severe primary axillary hyperhidrosis inadequately managed with topical agents, in individuals ≥18 y
- Endoscopic Transthoracic Sympathectomy (ETS) and surgical excision of axillary sweat glands, if conservative treatment (i.e., aluminum chloride or botulinum toxin, individually and in combination) has failed;
- Palmar
- Aluminum chloride 20% solution
- Botulinum toxin type A products for severe primary palmar hyperhidrosis inadequately managed with topical agents, in individuals ≥18 y
- ETS, if conservative treatment (i.e., aluminum chloride or botulinum toxin type A, individually and in combination) has failed;
- Plantar
- Aluminum chloride 20% solution
- Craniofacial

- Aluminum chloride 20% solution
- ETS, if conservative treatment (i.e., aluminum chloride) has failed.

Treatments that are considered investigational by focal region include:

- Axillary
- Axillary liposuction
- Iontophoresis
- Microwave treatment
- Radiofrequency ablation;
- Palmer
- RimabotulinumtoxinB
- Iontophoresis
- Microwave treatment
- Radiofrequency ablation;
- Plantar
- Botulinum toxin
- Iontophoresis
- Lumbar sympathectomy
- Microwave treatment
- Radiofrequency ablation;
- Craniofacial
- Botulinum toxin
- Iontophoresis
- Microwave treatment
- Radiofrequency ablation.

Other treatments are considered investigational as a treatment for severe secondary gustatory hyperhidrosis including, but not limited to:

Section 1862(a)(1)(A) of the Social Security Act is the basis for denying payment for types of care, specific items, services, or procedures, not excluded by any other statutory clause, meeting all technical requirements for coverage, but are determined to be any of the following:

- Not generally accepted in the medical community as safe and effective in the setting and for the condition for which it is used,
- Not proven to be safe and effective based on peer review or scientific literature
- Experimental
- Not medically necessary in the particular case
- Furnished at a level, duration or frequency that is not medically appropriate
- Not furnished in accordance with accepted standards of medical practice, or
- Not furnished in a setting appropriate to the patient's medical needs and condition.

Items and services must be established as safe and effective to be considered medically necessary. That is, the items and services must be:

- Consistent with the symptoms or diagnosis of the illness or injury under treatment; and
- Necessary for, and consistent with, generally accepted professional medical standards of care (e.g., not experimental or investigational);and
- Not furnished primarily for the convenience of the patient, the provider or supplier; and
- Furnished at the most appropriate level that can be provided safely and effectively to the patient.

Medical devices that are not approved for marketing by the Food and Drug Administration (FDA) are considered investigational by Medicare and are not considered reasonable and necessary for the diagnosis or treatment of illness or injury, or to improve functioning of a malformed body member. Mountain Health Co-Op payments, therefore, may not be made for medical procedures and services performed using devices that have not been approved for marketing by the FDA or for those not included in an FDA-approved investigational (IDE) trial.

Policy Guidelines

Absent evidence to the contrary, botulinum toxin products are considered to have a class effect. This approach is consistent with evidence review 5.01.05 (botulinum toxin).

A multispecialty working group has defined primary focal hyperhidrosis as a condition characterized by visible, excessive sweating of at least 6 months in duration without apparent cause and with at least 2 of the following features: bilateral and relatively symmetric sweating, impairment of daily activities, frequency of at least once per week, age at onset younger than 25 years, positive family history, and cessation of focal sweating during sleep.

The Hyperhidrosis Disease Severity Scale is used by individuals to rate the severity of their symptoms on a scale of 1 to 4 (Table PG1):

Table PG1. The Hyperhidrosis Disease Severity Scale

Score	Definition
1	My underarm sweating is never noticeable and never interferes with my daily activities
2	My underarm sweating is tolerable but sometimes interferes with my daily activities
3	My underarm sweating is barely tolerable and frequently interferes with my daily activities
4	My underarm sweating is intolerable and always interferes with my daily activities

Background

Hyperhidrosis

Hyperhidrosis has been defined as excessive sweating, beyond a level required to maintain normal body temperature, in response to heat exposure or exercise. It can be classified as primary or

secondary. Primary focal hyperhidrosis is idiopathic, typically involving the hands (palmar), feet (plantar), or axillae (underarms). Secondary hyperhidrosis can result from a variety of drugs (e.g., tricyclic antidepressants, selective serotonin reuptake inhibitors) or underlying diseases/conditions (e.g., febrile diseases, diabetes, menopause). Secondary hyperhidrosis is usually generalized or craniofacial sweating.

Secondary gustatory hyperhidrosis is excessive sweating on ingesting highly spiced foods. This trigeminovascular reflex typically occurs symmetrically on the scalp or face and predominately over the forehead, lips, and nose. Secondary facial gustatory hyperhidrosis occurs independently of the nature of the ingested food. This phenomenon frequently occurs after injury or surgery in the region of the parotid gland. Frey syndrome is an uncommon type of secondary gustatory hyperhidrosis that arises from injury to or surgery near the parotid gland resulting in damage to the secretory parasympathetic fibers of the facial nerve. After the injury, these fibers regenerate, and miscommunication occurs between them and the severed postganglionic sympathetic fibers that supply the cutaneous sweat glands and blood vessels.
The aberrant connection results in gustatory sweating and facial flushing with mastication. Aberrant secondary gustatory sweating follows up to 73% of surgical sympathectomies and is particularly common after bilateral procedures.

The consequences of hyperhidrosis are primarily psychosocial. Symptoms such as fever, night sweats, or weight loss require further investigation to rule out secondary causes. Sweat production can be assessed with the Minor starch-iodine test, which is a simple qualitative measure to identify specific sites of involvement.

Treatment

A variety of therapies have been investigated for primary hyperhidrosis, including topical therapy with aluminum chloride, topical anticholinergic medications, oral anticholinergic medications, iontophoresis, intradermal injections of botulinum toxin, endoscopic transthoracic sympathectomy, and surgical excision of axillary sweat glands. Treatment of secondary hyperhidrosis focuses on treatment of the underlying cause, such as discontinuing certain drugs or hormone replacement therapy as a treatment for menopausal symptoms.

Iontophoresis uses electrical current to deliver medication transdermally. A charged ionic drug is placed on the skin with an electrode of the same charge, which drives the drug into the skin, with the purpose of achieving better penetration of the drug into underlying tissue. The benefits of this method would be an enhancement of treatment effects and a reduction in adverse events associated with systemic administration of the drug.

Botulinum toxin is a potent neurotoxin that blocks cholinergic nerve terminals, which prevents hyperstimulation of eccrine sweat glands that lead to excessive sweating. Therefore, intracutaneous injections have been investigated as a treatment of gustatory hyperhidrosis and focal primary hyperhidrosis, most frequently involving the axillae or palms. The drawback of this approach is the need for repeated injections, which have led some to consider surgical approaches.

Surgical treatment options include removal of the eccrine glands and/or interruption of the sympathetic nerves. Eccrine sweat glands produce an aqueous secretion, the overproduction of which is primarily responsible for hyperhidrosis. These glands are innervated by the sympathetic nervous system. Surgical removal has been performed in patients with severe isolated axillary hyperhidrosis.

Various surgical techniques of sympathectomy have been tested. The second (T2) and third (T3) thoracic ganglia are responsible for palmar hyperhidrosis, the fourth (T4) thoracic ganglion controls axillary hyperhidrosis, and the first (T1) thoracic ganglion controls craniofacial hyperhidrosis. Thoracic sympathectomy has been investigated as a potentially curative procedure, primarily for combined palmar and axillary hyperhidrosis unresponsive to nonsurgical treatments. While accepted as an effective treatment, sympathectomy is not without complications. In addition to the immediate surgical complications of pneumothorax or temporary Horner syndrome, compensatory sweating on the trunk generally occurs in most patients, with different degrees of severity. Medical researchers have investigated whether certain approaches (e.g., T3 sympathectomy vs. T4 sympathectomy) result in less compensatory sweating, but there remains a lack of consensus about which approach best minimizes the risk of this adverse event. Also, with lumbar sympathectomy for plantar hyperhidrosis, there has been concern about the risk of postoperative sexual dysfunction in both men and women.

Outcome Measures

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the Hyperhidrosis Disease Severity Scale (Appendix Table 1) has had a good correlation to other assessment tools and is practical in the clinical setting.

Regulatory Status

In 2004, botulinum toxin type A (Botox®; Allergan Pharmaceuticals Ireland) was approved by the Food and Drug Administration (FDA) through the biologic license application process for use to treat primary axillary hyperhidrosis (severe underarm sweating) that cannot be managed by topical agents. In 2009, this product was renamed onabotulinumtoxinA. Other botulinum toxin products approved by FDA for non-cosmetic indications, but not specifically approved for treatment of hyperhidrosis, include:

2000: RimabotulinumtoxinB (Myobloc®; Solstice Neurosciences)

2009: AbobotulinumtoxinA (Dysport®; Medicis Pharmaceutical)

2010: IncobotulinumtoxinA (Xeomin®; Merz Pharmaceuticals).

In 2009, the FDA approved the following revisions to the prescribing information of botulinum toxin products:

- "A Boxed Warning highlighting the possibility of experiencing potentially life-threatening distant spread of toxin effect from injection site after local injection.
- A Risk Evaluation and Mitigation Strategy (REMS) that includes a Medication Guide to help patients understand the risk and benefits of botulinum toxin products.
- Changes to the established drug names to reinforce individual potencies and prevent medication errors. The potency units are specific to each botulinum toxin product, and the doses or units of biological activity cannot be compared or converted from 1 product to another botulinum toxin product. The new established names reinforce these differences and the lack of interchangeability among products."

The REMS requirement, provision of the medication guide, has since been removed and there are no current REMS requirements for botulinum toxin products.[1,]

In 2011, the miraDry® System (Miramar Labs) was cleared for marketing by FDA through the 510(k) process for treating primary axillary hyperhidrosis. This microwave device is designed to heat tissue at the dermal-hypodermal interface, the location of the sweat glands. Treatment consists of 2 sessions for a total duration of approximately 1 hour. Sessions occur in a physician's office, and a local anesthetic is used. The device is currently not approved for the treatment of palmar or plantar hyperhidrosis.

Rationale

This evidence review was created in July 1999 and has been updated regularly with searches of the PubMed database. The most recent literature update was performed through May 3, 2023.

Evidence reviews assess the clinical evidence to determine whether the use of a technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life, and ability to function including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be relevant, studies must represent 1 or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. Randomized controlled trials are rarely large enough or long enough to capture less common adverse events and long-term effects.

Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

Promotion of greater diversity and inclusion in clinical research of historically marginalized groups (e.g., People of Color [African-American, Asian, Black, Latino and Native American]; LGBTQIA (Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Asexual); Women; and People with Disabilities [Physical and Invisible]) allows policy populations to be more reflective of and findings more applicable to our diverse members. While we also strive to use inclusive language related to these groups in our policies, use of gender-specific nouns (e.g., women, men, sisters, etc.) will continue when reflective of language used in publications describing study populations.

Iontophoresis for Primary Focal Hyperhidrosis (i.e., Axillary, Palmar, Plantar, Craniofacial)

Clinical Context and Therapy Purpose

The purpose of iontophoresis of sweat glands in individuals who have primary focal hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary focal hyperhidrosis. Primary focal hyperhidrosis is idiopathic, typically involving the hands (palmar), feet (plantar), or axillae (underarms). Topical antiperspirant treatment is typically tried first.

Interventions
The therapy being considered is iontophoresis of sweat glands.

Comparators

A variety of therapies have been investigated for primary hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, intradermal injections of botulinum toxin, microwave treatment, endoscopic transthoracic sympathectomy, and surgical excision of axillary sweat glands.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the Hyperhidrosis Disease Severity Scale (HDSS, see Appendix Table 1) has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- • To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- • In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- • To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- • Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Systematic Reviews

Wade et al (2017) published a comprehensive systematic review and meta-analysis, sponsored by the National Institute for Health Research, evaluating the following therapies for hyperhidrosis: iontophoresis, topical botulinum and botulinum injections, anticholinergic medications, curettage, and energy-based technologies that damage sweat glands (laser, microwave).[2,] Because endoscopic thoracic sympathectomy is accepted as a last-line treatment, it was not evaluated. The literature search, conducted through July 2016, identified 50 studies for inclusion: 32 RCTs, 17 nonrandomized comparative studies, and a large prospective case series. Study quality was assessed using the Cochrane risk of bias tool. Reviewers concluded that the evidence for the clinical effectiveness and safety of second-line treatment for primary hyperhidrosis was limited due to a large number of studies with a high risk of bias, mostly due to poorly reported methods. Assessments from this review for botulinum injections and microwave treatment appear in their respective sections below.

The Wade et al (2017) systematic review identified 10 studies using iontophoresis: 4 RCTs, 5 nonrandomized comparative studies, and a case series.[2,] All studies were rated as having a high or unclear risk of bias. Comparators differed across studies: placebo (3 studies), botulinum (2 studies), no treatment (2 studies), and iontophoresis plus anticholinergic therapy (2 studies). Sample sizes ranged from 10 to 112, with the case series having the sample size of 112. Most studies treated hands, with some studies treating hands and feet. A meta-analysis could not be conducted due to the heterogeneity across studies. Reviewers concluded that the evidence was low quality but consistent, showing a potential benefit of iontophoresis compared with no treatment or placebo; however, when compared with botulinum injections, iontophoresis appeared less effective and had a short duration of effect.

Randomized Controlled Trials

A RCT by Rajagopal et al (2014) compared iontophoresis plus topical aluminum chloride hexahydrate with botulinum toxin injection but did not provide data on the efficacy of this therapy compared with placebo.[3,] The trial included 60 patients with a baseline HDSS score of 3 or 4.[4,]

Patients were randomized to treatment with iontophoresis 3 times weekly or to 1 botulinum toxin injection in each hand, with 2 weeks between treatments. HDSS scores were recorded at 4 weeks; nonresponders were permitted to crossover to the other treatment arm.

At the end of the initial 4 weeks, improvement (defined as a decrease of at least 1 point in HDSS score) was identified in 24 (80%) of 30 patients in the botulinum toxin group and 14 (47%) of 30 patients in the iontophoresis group (p=.007). Sixteen patients in the iontophoresis arm crossed over to the botulinum toxin arm, with 12 showing excellent improvement after an additional 4 weeks. In contrast, only 1 of the 6 patients who crossed over to the iontophoresis arm showed improvement after a second 4-week treatment period. In this relatively small sample with a relatively short intervention period, iontophoresis was less effective than botulinum toxin.

Case Series

Among the case series is a retrospective study, Dogruk Kacar et al (2014) from Turkey, which included 21 pediatric patients under age 18.[5] Most patients (n=16) had palmoplantar hyperhidrosis. Nineteen patients completed the course of 21 tap water iontophoresis sessions. Among study completers, the mean self-report treatment effectiveness score, rated on a 0-to10 visual analog scale, was 6.36 at the end of treatment. Seventeen (89.5%) of 19 patients reported a 50% or more decrease in sweating at the end of treatment. Another representative series is the McAleer and Collins (2014) study from Ireland, which included 28 patients.[6] Patients received a minimum of 9 treatments over 21 days in a clinical setting. Twenty (80%) of the 25 patients for whom data were available after hospital administration of tap water iontophoresis reported a moderate or great amount of improvement in symptoms and a moderate or great improvement in quality of life.

Section Summary: Iontophoresis for Primary Focal Hyperhidrosis

There is insufficient evidence that iontophoresis is an effective treatment of primary focal hyperhidrosis. A systematic review of 10 studies suggested a potential benefit of iontophoresis; however, the studies had either low or unclear risk of bias. The single RCT among the 10 studies found iontophoresis less effective than botulinum toxin in the short-term treatment of palmar hyperhidrosis. Randomized controlled trials are needed to show that iontophoresis is more effective than placebo treatment or at least as effective as alternative therapies.

Primary Axillary Hyperhidrosis Treated With Botulinum Toxin Type A or B

Clinical Context and Therapy Purpose

The purpose of intradermal injections of botulinum toxin type A or B into axillary sweat glands in individuals who have primary axillary hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary axillary hyperhidrosis. Primary axillary hyperhidrosis is idiopathic and involves the axillae (underarms).

Interventions

The therapy being considered is intradermal injections of botulinum toxin type A or B into axillary sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, iontophoresis, microwave treatment, and surgical excision of axillary sweat glands.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Systematic Reviews

The previously discussed Wade et al (2017) systematic review identified 23 studies evaluating botulinum injections for the treatment of primary hyperhidrosis, 13 were RCTs, and 10 were nonrandomized comparative studies.[2,] Fourteen studies were considered high risk of bias, 8 studies unclear risk, and 1 study low risk. Twenty-one studies used botulinum type A (usually 50

U, though some studies used up to 250 U) and 2 studies used botulinum type B (2500 U or 5000 U). Comparators differed across studies: placebo (12 studies), no treatment (4 studies), curettage (4 studies), iontophoresis (2 studies), and topical glycopyrrolate (1 study). Sixteen studies treated axillary hyperhidrosis, 5 palmar hyperhidrosis, and 2 studies reported on treating axillary and/or palmar hyperhidrosis. Meta-analyses were conducted on studies comparing botulinum type A or B with placebo for the treatment of axillary hyperhidrosis (9 studies) and all estimates favored the botulinum injections: reduction in HDSS score of 2 or more points: relative risk, 3.3 (95% confidence interval [CI], 2.5 to 4.4); reduction in sweating by 50% or more at 2 to 4 weeks (relative risk, 3.3; 95% CI, 1.9 to 5.5); reduction in sweating by 75% or more at 2 to 4 weeks (relative risk, 6.7; 95% CI, 2.8 to 16.0); and reduction in sweating by 50% or more at 16 weeks (2.9; 95% CI, 1.9 to 4.3). The studies comparing botulinum injections with curettage (4 studies) were of very low quality, precluding meaningful conclusions. There is low-quality evidence for botulinum type A and B for treating palmar hyperhidrosis suggesting a positive effect (7 studies); however, there was a high incidence of adverse events reported with botulinum type B.

Obed et al (2021) conducted a systematic review and meta-analysis assessing botulinum injections for the treatment of focal hyperhidrosis in adults.[7] The review incorporated only placebo-controlled RCTs, as opposed to any comparator in the Wade et al (2017) systematic review. Eight (N=937) were identified, 6 evaluated axillary hyperhidrosis, 1 evaluated craniofacial hyperhidrosis, and 1 evaluated lower limb hyperhidrosis. Six studies used botulinum type A (most often onabotulinumtoxinA 50 U) and 2 studies used botulinum type B (rimabotulinumtoxinB 2250 U or 2500 U). The quality of the included studies was mixed, with only 5 of the studies at low risk of bias for attrition. Further, only 5 studies included enough information to assess blinding of personnel and patients, and the majority of trials had an unclear risk of selection and reporting bias. Reduction in sweating by 50% or more from baseline to weeks 2 to 6 was more likely with botulinum injections as compared to placebo for axillary hyperhidrosis (risk difference, 0.62; 95% CI, 0.51 to 0.76). Improvements in reducing HDSS score by at least 2 points (risk difference, 0.56; 95% CI, 0.42 to 0.69) and mean change in the Dermatology Life Quality Index (mean difference, -5.55; 95% CI, -7.11 to -3.98) also favored botulinum injections over placebo. The analysis was limited by the availability of predominately short-term (8 weeks) trials.

Randomized Controlled Trials

Systematic reviews assessing the efficacy of botulinum toxin have pooled together results from a heterogenous group of studies with different botulinum toxins used. The vast majority of the available RCTs in the systematic reviews evaluated botulinum toxin type A; the largest, longterm US-based trial assessing botulinum toxin A was published by Lowe et al (2007), which is summarized below. Only 1 trial, Baumann et al (2005), in the systematic reviews evaluated botulinum toxin type B in axillary hyperhidrosis. Additionally, RCTs that compared different botulinum toxin regimens are summarized below, as the systematic reviews focused on comparisons against placebo.

Botulinum Toxin versus Placebo

The largest RCT conducted in the US that evaluated botulinum toxin type A was published by Lowe et al (2007).[8] This industry-sponsored, multicenter, double-blind, placebo-controlled trial evaluated the efficacy and safety study of botulinum toxin type A (onabotulinumtoxinA) in patients with

persistent bilateral primary axillary hyperhidrosis. Enrollment criteria included a resting sweat production of at least 50 mg per axilla in 5 minutes and an HDSS score of 3 or 4. A total of 322 patients were randomized to onabotulinumtoxinA 50 U or 75 U or placebo. Retreatment after 4 weeks was allowed in patients with at least 50 mg of sweat (per axilla) over 5 minutes and an HDSS score of 3 or 4. Following the first injection, 75% of patients in the botulinum toxin type A groups showed at least a 2-point improvement in HDSS score, compared with 25% of patients in the placebo group. Sweat production decreased by 87% (75 U), 82% (50 U), and 33% (placebo). Similar results were obtained in patients requiring a second treatment. The median duration of effect was 197 (75 U), 205 (50 U), and 96 (placebo) days. Seventy-eight percent (n=252) of patients completed the 52-week trial: 96 (87%) of 110 in the 75-U group, 83 (80%) of 104 in the 50-U group, and 73 (68%) of 108 in the control group. An intention-to-treat analysis at 52 weeks showed more than 2-point improvement on HDSS score in 54 (49%) patients in the 75-U group, 57 (55%) in the 50-U group, and 6 (6%) in the placebo group. Injection-site pain was reported in approximately 10% of all groups, with a mean pain duration of 2.4 days (10-day maximum).

Baumann et al (2005) reported on a placebo-controlled randomized trial evaluating the use of botulinum toxin type B for axillary hyperhidrosis.[9,] Like another Baumann trial (reported below), this RCT did not address whether patients had failed previous treatments. The axillary hyperhidrosis trial included 20 patients who received subcutaneous injections of rimabotulinumtoxinB 2500 U or 0.5 mL per axilla (n=15) or placebo (n=5). Patients who received placebo were offered botulinum toxin type B at subsequent injections. Data were available on efficacy for 18 patients (15 in the initial botulinum toxin B group and 3 crossovers). There was a statistically significant reduction in axillary hyperhidrosis from baseline (before receiving an active injection) to day 30, according to the patient and physician assessment. Details on efficacy outcomes were not reported. The mean length of time to return to baseline sweating levels in the 18 patients was 151 days (range, 66 to 243 days). Sixteen patients reported 61 adverse events during the study. Five (8%) of 61 adverse events were determined to be trialrelated (4 axillary bruising events, 1 instance of injection-site pain). Eleven (18%) adverse events were determined to be probably related to the trial (dry eyes [n=3], dry mouth [n=5], indigestion [n=3]). Flu-like symptoms were reported by 6 (30%) of 20 patients; however, the trial period coincided with flu season.

Comparison of Types of Botulinum Toxin Type A

Dressler (2010) reported on an RCT that assessed 46 patients with bilateral axillary hyperhidrosis and a previously stable onabotulinumtoxinA treatment for at least 2 years.10, Patients received onabotulinumtoxinA 50 U in randomly selected axilla and incobotulinumtoxinA 50 mouse units in the other axilla. All patients completed the trial. According to patient self-report in structured interviews, there were no between-group differences in therapeutic effect, including onset latency, extent, and duration, and no differences in injection-site pain. Moreover, clinical examination did not identify any differences between the 2 sides in the diffuse sweating pattern.

A small, double-blind RCT, published by Talarico-Filho et al (2007), included 20 patients with primary axillary hyperhidrosis who had sweat production greater than 50 mg/min.11, Patients received injections of 2 types of botulinum toxin A: onabotulinumtoxinA 50 U in 1 axilla and abobotulinumtoxinA 150 U in the other. Outcomes did not differ significantly between groups (e.g.,

sweat rate was reduced by a mean of 98% in the onabotulinumtoxinA group and 99% in the abobotulinumtoxinA group; p>.05).

Comparison of Botulinum Toxin Type A With Type B

A few RCTs have compared botulinum toxin types A with B in patients who had primary axillary hyperhidrosis. Frasson et al (2011) conducted a small randomized trial of axillary hyperhidrosis treated with botulinum toxin type A and type B.12, This trial included 10 patients with idiopathic focal axillary hyperhidrosis unresponsive to other nonsurgical treatments. Patients received onabotulinumtoxinA 50 U in 1 axilla and rimabotulinumtoxinB 2500 U in the contralateral axilla. Gravimetry was performed at baseline and follow-up as an objective measure of sweat production. At each follow-up point, the decrease in sweat weight from baseline was significantly greater on the type B side than on the type A side. For example, after 1 month, the sweat weight in 5 minutes was 13% of the baseline value on the type A side and 4% of the baseline value on the type B side (p=.049). By 6 months, the sweat weight returned to 91% of baseline on the type A side and to 56% of baseline weight on the type B side (p=.02). Findings were similar for the sweating area. All patients tolerated injections of types A and B well, and none reported systemic adverse events. This trial did use a higher dosage of botulinum toxin type B than previous studies.

An RCT by An et al (2015) randomized 24 patients with symmetrical axillary hyperhidrosis to injections of onabotulinumtoxinA 50 U in 1 axilla and rimabotulinumtoxinB 1500 U in the other (i.e., a conversion rate of 1:30 was used).13, Baseline HDSS scores were 2 (n=9), 3 (n=14), and 4 (n=1); those who scored 3 or 4 were categorized as having severe axillary hyperhidrosis. The primary efficacy outcome (the proportion of patients with an HDSS score of 1 or 2 at the 2-week follow-up) was 100% in each group (p=1.00). At 12 weeks, all patients maintained a score of 1 or 2 on the HDSS (p=1.00), and at 20 weeks, 80% in each group had an HDSS score of 1 or 2 (p=1.00). A decrease of 2 or more points from baseline on the HDSS was reported at week 2 in 86.7% in each group (p=1.00). At week 12, the same decrease was reported in 80.0% in the botulinum toxin type A group and 86.7% in the botulinum toxin type B group (p=.64); and at week 20, the same decrease was only reported in 13.3% of the botulinum toxin type A group and 6.7% of the botulinum toxin type B group (p=.56). No major systemic adverse events were reported in any patients.

Observational Studies

A retrospective chart review by Mirkovic et al (2018) focused on children receiving botulinum toxin for hyperhidrosis.14, Children receiving at least 1 botulinum treatment were included (N=323); mean age was 15 years (range, 5 to 17 years). The most common focal locations of hyperhidrosis were palms, axillae, and feet. Sixty percent of the children received more than 1 treatment of botulinum. Of 183 who completed a follow-up Global Assessment of Therapy scale at a subsequent visit, 176 (96%) reported that sweating disappeared completely between 2 to 4 months posttreatment. No severe adverse events were reported.

Section Summary: Primary Axillary Hyperhidrosis Treated With Botulinum Toxin Type A or B
Evidence from systematic reviews and RCTs supports the efficacy and safety of botulinum toxin for treating axillary hyperhidrosis. Meta-analyses for botulinum toxin have demonstrated a positive effect for reduction of sweating in the short (2 to 4 weeks) and long (16 weeks) term, and improved

HDSS scores by 2 or more points. Most studies evaluated botulinum toxin type A for axillary hyperhidrosis. Comparative RCTs have found similar outcomes among different botulinum type A formulations and between botulinum type A and B for axillary hyperhidrosis.

Primary Palmar Hyperhidrosis Treated With Botulinum Toxin Type A

Clinical Context and Therapy Purpose

The purpose of intradermal injections of botulinum toxin type A into palmar sweat glands in individuals who have primary palmar hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary palmar hyperhidrosis. Primary palmar hyperhidrosis is idiopathic and involves the hands. Topical antiperspirant treatment is typically tried first.

Interventions

The therapy being considered is intradermal injections of botulinum toxin type A into palmar sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary palmar hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, iontophoresis, and endoscopic transthoracic sympathectomy.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded

Review of Evidence

Randomized Controlled Trials

Comparison of Botulinum Toxin Type A With Placebo

Lowe et al (2002) conducted an RCT of 19 patients who received injections of botulinum toxin type A in 1 palm and placebo in the other.[15] The mean percentage of sweat reduction in the toxin-treated palms was significant compared with baseline. The sweat reduction in the placebo-injected palms did not differ statistically from baseline. Both physician and patient assessments showed significant improvements in the botulinum-injected palms compared with the placebo-injected palms.

Comparison of Different Doses of Botulinum Toxin Type A

Saadia et al (2001) conducted a single-blind (patients) randomized trial in which 24 patients received botulinum toxin type A 50 U or 100 U injected intradermally in 20 sites in each palm.[16] Patients were evaluated every 2 weeks during the first month, then once every month up to month 6. Both groups experienced significant improvements in sweat reduction by month 1 of follow-up, lasting through 6 months. Temporary adverse events included pain and soreness. No significant adverse events were associated with the treatment by the end of 6 months.

Comparison of Types of Botulinum Toxin Type A

Two double-blind, randomized trials compared onabotulinumtoxinA with incobotulinumtoxinA. Campanati et al (2014) included 25 patients with moderate-to-severe primary palmar hyperhidrosis resistant to aluminum chloride or iontophoresis.[17] Patients received injections of incobotulinumtoxinA in a randomly selected hand and onabotulinumtoxinA in the other hand. Botulinum toxin was given at a fixed dosage per square centimeter of the hand. There were no statistically significant differences in outcomes between groups, including changes in HDSS score (mean values significantly decreased by 2 points from baseline in each group), and the extent of sweating assessed using the Minor test (at both 4 weeks and 12 weeks).

Section Summary: Primary Palmar Hyperhidrosis Treated With Botulinum Toxin Type A For palmar hyperhidrosis, evidence from RCTs supports the efficacy and safety of botulinum toxin type A for treating palmar hyperhidrosis. An additional RCT comparing types of botulinum type A reported similar effectiveness.
Primary Palmar Hyperhidrosis Treated With Botulinum Toxin Type B

Clinical Context and Therapy Purpose

The purpose of intradermal injections of botulinum toxin type B into palmar sweat glands in individuals who have primary palmar hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary palmar hyperhidrosis. Primary palmar hyperhidrosis is idiopathic and involves the hands.

Interventions

The therapy being considered is intradermal injections of botulinum toxin type B into palmar sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary palmar hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, iontophoresis, and endoscopic transthoracic sympathectomy.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Randomized Controlled Trials

In a placebo-controlled, randomized trial, Baumann et al (2005) evaluated botulinum toxin type B for palmar hyperhidrosis.[18,] Like the Baumann trial (2005), this RCT did not discuss whether patients had failed previous treatments for hyperhidrosis. This RCT included 20 patients with excessive palmar sweating. Fifteen patients received rimabotulinumtoxinB injections 50,000 U per palm, and 5 received placebo. Nonresponders were offered an injection of botulinum toxin type B at day 30. At day 30, the 2 quality-of-life measures were significantly better in the botulinum toxin group than in the control group. However, the difference was not statistically significant for efficacy in physician analysis of the palmar iodine-starch test at day 30 (p=.56). No further details were provided on the efficacy outcome measures. Mean duration of action according to self-report in 17 patients (15 in the initial treatment group, 2 who crossed over from the placebo group) was 3.8 months (range, 2.3 to 4.9 months). Patients were asked about specific adverse events: 18 (90%) of 20 reported dry mouth/throat, 12 (60%) reported indigestion, 12 (60%) reported excessively dry hands, 12 (60%) reported muscle weakness, and 10 (50%) reported decreased grip strength.

Section Summary: Primary Palmar Hyperhidrosis Treated With Botulinum Toxin Type B

One small RCT did not demonstrate the efficacy of botulinum toxin type B for the treatment of palmar hyperhidrosis. Also, a high rate of adverse events were reported.

Primary Plantar Hyperhidrosis Treated With Botulinum Toxin Type A or B

Clinical Context and Therapy Purpose

The purpose of intradermal injections of botulinum toxin type A or B into plantar sweat glands in individuals who have primary plantar hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary plantar hyperhidrosis. Primary plantar hyperhidrosis is idiopathic and involves the feet.

Interventions

The therapy being considered is intradermal injections of botulinum toxin type A or B into plantar sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary plantar hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, and iontophoresis.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;

- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

No relevant evidence has been identified.

Section Summary: Primary Plantar Hyperhidrosis Treated With Botulinum Toxin Type A or B

There is insufficient evidence to assess the use of any botulinum toxin formulation for plantar hyperhidrosis.

Microwave Treatment for Primary Focal Hyperhidrosis (i.e., Axillary, Palmar, Plantar, Craniofacial)

Clinical Context and Therapy Purpose

The purpose of microwave treatment of sweat glands in individuals who have primary focal hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary focal hyperhidrosis. Primary focal hyperhidrosis is idiopathic, typically involving the hands (palmar), feet (plantar), or axillae (underarms).

Interventions

The therapy being considered is microwave treatment of sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, intradermal injections of botulinum toxin, endoscopic transthoracic sympathectomy, and surgical excision of axillary sweat glands.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Systematic Reviews

Hsu et al (2017) conducted a systematic review of studies investigating the use of microwavebased therapies for the treatment of axillary hyperhidrosis.[19] The literature search, conducted through June 2016, identified an RCT (described below) and 4 single-arm observational studies (one of which is described below). Studies were published between 2012 and 2016. The total number of patients in the 5 tudies was 189 (range, 7 to 120). Administration of microwave therapy differed by frequency (1 to 3 times) and length of treatment intervals (2 weeks to 3 months) among the studies. Follow-up extended to 1 year in 4 of the studies. All studies reported HDSS scores. Additional outcomes included osmidrosis evaluation (3 studies), gravimetric assessments (2 studies), and the Dermatologic Life Quality Index (1 study). All studies reported that microwave therapy was effective in reducing sweating in patients with axillary hyperhidrosis, with HDSS scores decreasing by at least 1 point throughout follow-up. The most common adverse events reported were swelling, pain, edema, hair loss, altered sensation, and palpable bumps. Reviewers concluded that while efficacy was indicated and side effects were mild, additional RCTs with larger sample sizes and longer follow-up would be needed.

The Wade (2017)[2] systematic review included only a single RCT in its evaluation (the same RCT included in the Hsu systematic review described above) and detailed below in the RCT section. While the RCT results suggested a benefit of microwave compared with placebo, the evidence was of low quality. Also, evidence of safety was insufficient.

Randomized Controlled Trials

An RCT by Glaser et al (2012) evaluated a microwave device for treating primary focal hyperhidrosis.[20] This device applied microwave energy to superficial skin structures with the intent of inducing thermolysis of the eccrine and apocrine sweat glands. This industrysponsored, double-blind trial randomized 120 adults with primary axillary hyperhidrosis 2:1 to active (n=81) or sham (n=39) treatment. Treatment consisted of 2 sessions, separated by approximately 2 weeks. Patients who responded adequately after 1 session or declined further treatment did not undergo the second session; a third procedure was allowed within 30 days for patients who still had a high level

of sweating after 2 sessions. All patients in the sham group had 2 sessions. In the active treatment group, 11 (9%) patients had 1 session, 60 (74%) had 2 sessions, and 10 (8%) patients had 3 sessions. The primary efficacy end point was an HDSS score of 1 or 2 at the 30-day follow-up; HDSS score at 6 months was a secondary outcome. A total of 101 (84%) of 120 patients completed the study. At 30 days, 89% of the active treatment group and 54% of the sham group had an HDSS score of 1 or 2 ($p<.001$). At 6 months, 67% of the active treatment group versus 44% of the sham group had an HDSS score of 1 or 2 ($p=.02$).

Unblinding occurred at 6 months. Twelve-month data were available for the active treatment group only; 69% reported an HDSS score of 1 or 2. There were 45 procedure-related adverse events in 23 (28%) of the active treatment group versus 5 (13%) of the sham group. The most frequently reported adverse event was altered sensation; no serious adverse events were reported. Compensatory sweating was reported by 2 patients in each group (mean duration, 52 days). The authors noted that study data provided an opportunity to identify areas for improvement in the treatment protocol including waiting longer between treatments and using a higher dose of energy at the second session.

Observational Studies

Hong et al (2012) conducted an industry-sponsored case series of 31 patients with primary axillary hyperhidrosis treated with microwave therapy using the miraDry system.[21] All patients had an HDSS score of 3 or 4 at baseline. The primary efficacy outcome (the proportion of patients whose HDSS score decreased to 1 or 2) was 28 (90%) at 6 and 12 months posttreatment. Longer term skin-related adverse events (that all resolved over time) were altered sensation in the skin of the axillae (65% of patients; median duration, 37 days) and palpable bumps under the skin of the axillae (71% of patients; median duration, 41 days).

Section Summary: Microwave Treatment for Primary Focal Hyperhidrosis

A systematic review and RCT found a short-term benefit of microwave treatment in reducing hyperhidrosis but also reported skin-related adverse events (e.g., pain, altered sensation). A case series also reported reductions in sweating, but sample sizes were small. Additional controlled trials with long-term follow-up in the treatment and control groups, a longer period of blinding, and a consistent treatment protocol would be needed to confirm the efficacy of this treatment and better define the risk-benefit ratio.

Radiofrequency Ablation for Primary Focal Hyperhidrosis (i.e., Axillary, Palmar, Plantar, Craniofacial)

Clinical Context and Therapy Purpose

The purpose of radiofrequency ablation (RFA) of sweat glands in individuals who have primary focal hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary focal hyperhidrosis. Primary focal hyperhidrosis is idiopathic, typically involving the hands (palmar), feet (plantar), or axillae (underarms).

Interventions

The therapy being considered is RFA of sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, intradermal injections of botulinum toxin, microwave treatment, endoscopic transthoracic sympathectomy, and surgical excision of axillary sweat glands.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Randomized Controlled Trials

Mostafa et al (2019) conducted a RCT of RFA compared to botulinum toxin type A in 80 patients with primary palmar hyperhidrosis.[22] Both groups showed improvements from baseline in HDSS scores at 1 week, 1 month, and 2 months after treatment, but scores in the RFA group were significantly lower (indicating more improvement with RFA) than in the botulinum toxin group at 1 week, 1 month, and 2, 6, and 12 months after treatment.

Rummaneethorn et al (2019) compared RFA to botulinum toxin A in 20 patients with primary axillary hyperhidrosis.[23] At the endpoint visit (week 12), the botulinum toxin A group had a significantly lower reduction of mean HDSS score than the RFA group with 1.60 (0.59) versus 2.05 (0.68), respectively (p=.0332).

Nonrandomized Comparative Studies

Purtuloglu et al (2013) evaluated RFA as a treatment for patients with severe bilateral palmar hyperhidrosis resistant to conservative treatment.[24] The study was conducted in Turkey and retrospectively reviewed outcomes after RFA (n=48) or transthoracic sympathectomy (n=46). Patients were not randomized to treatment group. After a mean follow-up of 15 months, palmar hydrosis was absent in 36 (75%) patients in the RFA group and 44 (96%) patients in the surgery group. The difference in outcomes between groups was statistically significant, favoring the surgical intervention (p<.01). Six patients in each group reported moderate or severe compensatory sweating (p=.78).

Section Summary: Radiofrequency Ablation

One nonrandomized comparative study found RFA inferior to surgical sympathectomy for patients with severe bilateral palmar hyperhidrosis resistant to conservative treatment. Two small RCTs that compared RFA to botulinum toxin A in patients with palmar or axillary hyperhidrosis had conflicting results. The body of evidence is insufficient to assess the use of RFA as a treatment for hyperhidrosis.

Primary Axillary Hyperhidrosis Treated With Surgical Excision of Axillary Sweat Glands Clinical Context and Therapy Purpose

The purpose of surgical excision of axillary sweat glands in individuals who have primary axillary hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary axillary hyperhidrosis. Primary axillary hyperhidrosis is idiopathic and involves the axillae (underarms).

Interventions

The therapy being considered is surgical excision of the axillary sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, and intradermal injections of botulinum toxin.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Surgical Excision of Axillary Sweat Glands

Surgery may involve removal of the subcutaneous axillary sweat glands without removal of any skin, limited excision of skin, and removal of surrounding subcutaneous sweat glands, or a more radical excision of skin and subcutaneous tissue en bloc.[25,] Depending on the completeness of surgical excision, treatment is effective in 50% to 95% of patients.

Section Summary: Surgical Excision of Axillary Sweat Glands

Sweat gland excision has been found to be effective in 50% to 95% of appropriately selected patients.

Endoscopic Transthoracic Sympathectomy for Primary Axillary, Palmar, and Craniofacial Hyperhidrosis

Clinical Context and Therapy Purpose

The purpose of endoscopic transthoracic sympathectomy of sweat glands in who have primary focal hyperhidrosis, within the axillary, palmar, or craniofacial area, is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary focal hyperhidrosis, within the axillary, palmar, or craniofacial area. Primary focal hyperhidrosis is idiopathic, typically involving the hands (palmar), head/face (craniofacial), or axillae (underarms).

Interventions

The therapy being considered is endoscopic transthoracic sympathectomy of sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, intradermal injections of botulinum toxin, microwave treatment, iontophoresis, and surgical excision of axillary sweat glands.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Systematic Reviews

Several RCTs and a meta-analysis have compared different surgical approaches; there were no sham-controlled randomized trials identified. Deng et al (2011) published a meta-analysis of data from RCTs and observational studies published through 2010 that evaluated endoscopic thoracoscopic sympathectomy for patients with palmar hyperhidrosis.[26] Reviewers pooled outcomes data from different approaches to sympathectomy (i.e., single-ganglia blockage [T2, T3, T4], multiganglia blockage [T2-3, T2-4, T3-4]). (Note that T refers to the rib.) Based on these analyses, reviewers concluded that T3 (11 studies) and T3-4 (2 studies) approaches had the "best"

clinical efficacy (i.e., postoperative resolution of symptoms). The T3 approach resulted in a 97.9% pooled efficacy rate, and the T3-4 approach resulted in a 100% pooled efficacy rate. In the studies for which data were available, the pooled rate of postoperative compensatory sweating was 40% after T3 surgery. Data on compensatory sweating after T3-4 surgery were available from only 1 study (60 patients); a pooled analysis could not be performed.

Randomized Controlled Trials

Subsequent RCTs have compared levels (rib location) of sympathectomy. These trials tended to have relatively small sample sizes (i.e., <100 patients). For example, Baumgartner et al (2011) in the United States studied 121 patients with disabling palmoplantar hyperhidrosis.27, Patients were randomized to bilateral sympathectomy over T2 (n=61 patients) or T3 (n=60 patients). Six (5%) of 121 patients (3 in each group) were considered treatment failures (i.e., had recurrent palmar sweating to a bothersome level). There were no significant differences between groups in the reported subjective change in plantar or axillary sweating after surgery. At 6 months, the mean level of compensatory sweating (0 to 10 severity scale) was 4.7 for the T2 group and 3.8 for the T3 group (p-value was not significant). Similarly, at 1 year, the mean severity rating of compensatory sweating was 4.7 in the T2 group and 3.7 in the T3 group (p=.09). Yuncu et al (2013) in Turkey randomized 60 patients with axillary hyperhidrosis to T3-4 surgery (n=17) or to T3 surgery (n=43).28, There were no significant differences between groups in postoperative satisfaction. At 1-year follow-up, the incidence of compensatory sweating was lower in the T3 group (79%) than in the T3-4 group (100%).

Case Series

There also are case series on transthoracic sympathectomy for treating primary focal hyperhidrosis.[29,30,31,32,] Case series have generally reported high success rates for palmar and axillary hyperhidrosis, although there are potential adverse events, most commonly compensatory sweating. For example, Karamustafouglu et al (2014) in Turkey reported on 80 patients with primary hyperhidrosis (axillary and/or palmar).[30,] All 80 patients responded to a questionnaire a mean of 35 months after surgery. Seventy-one (89%) of the 80 patients were very satisfied with the surgical outcome, and the other 11% were dissatisfied. Compensatory sweating was reported by 62 (78%) patients. Moreover, a series by de Andrade Filho et al (2013) reported on complications after thoracic sympathectomy in 1731 patients with palmar, axillary, or craniofacial hyperhidrosis.[29,] Thirty days after surgery, 1531 (88%) patients reported compensatory sweating. Among the 1531 patients, compensatory sweating was mild in 473 (31%), moderate in 642 (42%), and severe in 416 (27%). Gustatory sweating was reported by 334 (19%) of the 1731 patients.

Several retrospective chart reviews evaluated the effects of the procedure on subgroups of patients with hyperhidrosis. Lembranca et al (2017) reviewed the charts of patients with palmar or axillary hyperhidrosis who did not respond to oxybutynin chloride treatment who then underwent thoracic sympathectomy (n=167) and patients who were referred directly to surgical treatment (n=570).[33,] Both groups showed improvements in hyperhidrosis and quality of life (>90%). De Campos et al (2017) assessed the quality of life among 15 patients with palmar hyperhidrosis who were unresponsive following a thoracic sympathectomy and underwent a resympathectomy.[34,] Quality of life scores improved from "poor" or "very poor" to "excellent" or "very good" in 14 of the 15 patients. Fukuda et al (2018) reviewed charts of patients with craniofacial hyperhidrosis as a primary complaint (n=40) and patients with craniofacial hyperhidrosis as a secondary complaint

(n=136).[35] Over 90% of patients in both groups reported a moderate or great reduction in hyperhidrosis following the procedure. Greater improvements in quality of life were reported among the patients with craniofacial hyperhidrosis that was a secondary complaint, though both groups had improved quality of life. A large proportion of patients (92%) reported compensatory hyperhidrosis. Vasconcelos-Castro et al (2019) reported a case series of 23 pediatric patients (ages 11 to 19 years) with primary palmar hyperhidrosis who underwent bilateral thoracoscopic sympathectomy. Sweating severity improved in all patients, with a mean decrease from baseline of 1.95 on the HDSS
($p<.05$ compared to baseline). Compensatory sweating occurred in 47.8% of patients.[36]

Section Summary: Endoscopic Transthoracic Sympathectomy

Randomized controlled trials and a meta-analysis of RCTs have supported the efficacy of endoscopic transthoracic sympathectomy at various levels for palmar, axillary, and craniofacial hyperhidrosis. These data are complemented by case series, which have found high efficacy rates, but also high rates of compensatory sweating for these conditions.

Lumbar Sympathectomy for Primary Plantar Hyperhidrosis

Clinical Context and Therapy Purpose

The purpose of lumbar sympathectomy of plantar sweat glands in individuals who have primary plantar hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with primary plantar hyperhidrosis. Primary plantar hyperhidrosis is idiopathic and involves the feet.

Interventions

The therapy being considered is lumbar sympathectomy of plantar sweat glands. Topical antiperspirant treatment is typically tried first in these patients.

Comparators

A variety of therapies have been investigated for primary plantar hyperhidrosis that does not respond to topical antiperspirants, including topical therapy with anticholinergics (e.g., glycopyrronium), oral anticholinergic medications, iontophoresis, and intradermal injections of botulinum toxin.

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific

surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Systematic Reviews

Lima et al 2020 (2020) conducted a systematic review and meta-analysis of lumbar sympathectomy for plantar hyperhidrosis.[37] Eight studies were identified, including a total of 517 patients. One RCT met inclusion criteria; the other studies were case series. In all of the studies, lumbar sympathectomy was conducted following transthoracic sympathectomy. Resolution of symptoms occurred in 92% of patients when mechanical sympathectomy was used with clipping or resection of the lymph nodes between L2 and L5, with similar results regardless of resection level, Overall, 44% of patients had mild to severe compensatory sweating after a mean 6 months of follow-up. The RCT was conducted in 30 women at a single hospital in Brazil.[38] The primary outcome measure was a quality of life questionnaire that was developed for use in patients undergoing thoracic sympathectomy. After 6 months, patients in the intervention group had a greater improvement in quality of life relative to the control group patients; 53% reported worsening compensatory sweating. This study was limited by its small sample size, use of an unvalidated outcome measure, and lack of blinded outcome assessment. A 2004 review from a multispecialty working group on hyperhidrosis stated that lumbar sympathectomy is not recommended for plantar hyperhidrosis because of associated sexual dysfunction; this article did not cite any data documenting sexual dysfunction.[39] To date, there are very few studies on endoscopic lumbar sympathectomy for focal plantar hyperhidrosis and only 1 small comparative study with methodological limitations.

Section Summary: Lumbar Sympathectomy

There is insufficient evidence in support of lumbar sympathectomy for treating plantar hyperhidrosis; case series have found lower rates of efficacy for plantar compared with axillary or palmar hyperhidrosis, and there are concerns for adverse events in sexual functioning. One RCT conducted among 30 women at a single center in Brazil was limited by its small sample size and lack of blinded outcome assessment. There are insufficient data to conclude that any particular approach to surgery results in lower rates of compensatory sweating.

Iontophoresis and Botulinum Toxin for Severe Secondary Gustatory Hyperhidrosis

Clinical Context and Therapy Purpose

The purpose of iontophoresis and intradermal injections of botulinum toxin in individuals who have severe secondary gustatory hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with severe secondary gustatory hyperhidrosis.

Secondary gustatory hyperhidrosis is excessive sweating on ingesting highly spiced foods. Frey syndrome is an uncommon type of secondary gustatory hyperhidrosis that arises from injury to or surgery near the parotid gland resulting in damage to the secretory parasympathetic fibers of the facial nerve.

Interventions

The therapies being considered are iontophoresis and intradermal injections of botulinum toxin.

Treatment of secondary hyperhidrosis focuses on treatment of the underlying cause, such as discontinuing certain drugs or hormone replacement therapy as a treatment for menopausal symptoms.

Comparators

Alternatives for treatment of secondary gustatory hyperhidrosis include topical therapy (e.g., glycopyrronium, aluminum chloride) and treatment of the underlying cause (e.g., dietary changes).

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity. utcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Iontophoresis

A TEC Assessment (2003) assessing iontophoresis for a variety of medical conditions concluded that the evidence was insufficient to determine whether iontophoresis for the treatment of any hyperhidrosis improves outcomes.[40] Neither the TEC Assessment nor subsequent literature searches have identified any RCTs evaluating iontophoresis for gustatory hyperhidrosis.

Botulinum Toxin

A Cochrane review by Li et al (2015) did not identify any RCTs or quasi-randomized RCTs evaluating the efficacy of botulinum toxin injections for the treatment of gustatory hyperhidrosis as a result of Frey syndrome.[41] No RCTs were identified in literature searches.

Section Summary: Iontophoresis and Botulinum Toxin for Secondary Gustatory Hyperhidrosis
Systematic reviews for both iontophoresis and botulinum toxin for gustatory hyperhidrosis have not found evidence supporting these methods.

Tympanic Neurectomy for Severe Secondary Gustatory Hyperhidrosis

Clinical Context and Therapy Purpose

The purpose of tympanic neurectomy in individuals who have severe secondary gustatory hyperhidrosis is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with severe secondary gustatory hyperhidrosis.

Secondary gustatory hyperhidrosis is excessive sweating on ingesting highly spiced foods. Frey syndrome is an uncommon type of secondary gustatory hyperhidrosis that arises from injury to or surgery near the parotid gland resulting in damage to the secretory parasympathetic fibers of the facial nerve.

Interventions

The therapy being considered is tympanic neurectomy.

Treatment of secondary hyperhidrosis focuses on treatment of the underlying cause, such as discontinuing certain drugs or hormone replacement therapy as a treatment for menopausal symptoms.

Comparators

Alternatives for treatment of secondary gustatory hyperhidrosis include topical therapy (e.g., glycopyrronium, aluminum chloride) and treatment of the underlying cause (e.g., dietary changes).

Outcomes

The general outcomes of interest are symptoms, quality of life, and treatment-related morbidity.

Outcomes from different surgical and medical treatment modalities are best assessed using a combination of tools. Quantitative tools include gravimetry, evaporimetry, and the Minor starch-iodine test. Qualitative assessment tools include general health surveys and hyperhidrosis-specific surveys. Of these, the HDSS has had a good correlation to other assessment tools and is practical in the clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies;
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought;
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Review articles by Clayman et al (2006)[42], and de Bree et al (2007)[43], have described various medical and surgical treatments for Frey syndrome. Tympanic neurectomy has been described as a treatment, with satisfactory control reported in 82% of patients. Also, this surgical treatment is generally definitive without a need for repeated interventions.

Section Summary: Tympanic Neurectomy for Secondary Gustatory Hyperhidrosis Review articles have supported the use of tympanic neurectomy for patients with severe gustatory sweating.

Summary of Evidence
Primary Focal Hyperhidrosis

Iontophoresis

For individuals who have primary focal hyperhidrosis (i.e., axillary, palmar, plantar, craniofacial) who receive iontophoresis, the evidence includes a systematic review, a randomized controlled trial (RCT), and case series. Relevant outcomes are symptoms, quality of life, and treatmentrelated morbidity. The RCT found that iontophoresis was less effective than botulinum toxin in the short-term treatment of palmar hyperhidrosis. Additional RCTs are needed comparing iontophoresis with sham or active treatment in patients with various types of primary focal hyperhidrosis. The

evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Botulinum Toxins

For individuals who have primary axillary hyperhidrosis who receive botulinum toxin type A or B, the evidence includes systematic reviews and RCTs. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. Placebo-controlled randomized trials have generally found better outcomes in the botulinum toxin groups. Meta-analyses have showed that botulinum toxin injections significantly decreased sweating in the short (2 to 4 weeks) and long term (16 weeks), and significantly improved Hyperhidrosis Disease Severity Scale (HDSS) scores. Several RCTs have compared different botulinum toxin type A formulations with botulinum toxin type A and B formulations in patients with axillary hyperhidrosis. Although these studies had small sample sizes, their findings suggested that, with appropriate dosage adjustments, there are similar levels of efficacy and adverse events. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.
For individuals who have primary palmar hyperhidrosis who receive botulinum toxin type A, the evidence includes RCTs. Relevant outcomes are symptoms, quality of life, and treatmentrelated morbidity. Placebo-controlled randomized trials have generally found better outcomes in the botulinum toxin groups. Randomized controlled trials comparing botulinum toxin type A formulations in patients with primary palmar hyperhidrosis have generally found no significant differences in outcomes. Although these studies had small sample sizes, their findings suggested that, with appropriate dosage adjustments, there are similar levels of efficacy and adverse events. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have primary palmar hyperhidrosis who receive botulinum toxin type B, the evidence includes an RCT. Relevant outcomes are symptoms, quality of life, and treatmentrelated morbidity. One small placebo-controlled randomized trial did not clearly demonstrate the efficacy of botulinum toxin type B in patients with palmar hyperhidrosis. Also, a high rate of adverse events was reported. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have primary plantar hyperhidrosis who receive botulinum toxin type A or B, the evidence includes no RCTs. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. Randomized controlled trials are needed comparing botulinum toxin with placebo or active treatment in patients with primary plantar hyperhidrosis. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Microwave

For individuals who have primary focal hyperhidrosis (i.e., axillary, palmar, plantar, craniofacial) who receive microwave treatment, the evidence includes a systematic review, an RCT, and a case series. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. The systematic review and RCT found a short-term benefit of microwave treatment in reducing hyperhidrosis but also reported skin-related adverse events (e.g., pain, altered sensation). Additional RCTs are needed

comparing microwave treatment with sham or active treatment in patients with various types of primary focal hyperhidrosis. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Radiofrequency Ablation

For individuals who have primary focal hyperhidrosis (i.e., axillary, palmar, plantar, craniofacial) who receive radiofrequency ablation (RFA), the evidence includes 2 small RCTs and a nonrandomized cohort study. Relevant outcomes are symptoms, quality of life, and treatmentrelated morbidity. One nonrandomized comparative study found RFA inferior to surgical sympathectomy for patients with severe bilateral palmar hyperhidrosis resistant to conservative treatment. Two small RCTs that compared RFA to botulinum toxin A in patients with palmar or axillary hyperhidrosis had conflicting results. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Surgery

For individuals who have primary axillary hyperhidrosis who receive surgical excision of axillary sweat glands, the evidence includes review articles. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. The evidence has shown that excision is highly effective, and this treatment is considered standard of care for this indication. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have primary axillary and palmar hyperhidrosis who receive endoscopic transthoracic sympathectomy, the evidence includes several RCTs, a meta-analysis, and case series. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. The meta-analysis found a high rate of clinical efficacy after endoscopic transthoracic sympathectomy, although the rate of postoperative compensatory sweating was substantial. Subsequent studies have supported these findings. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have primary plantar hyperhidrosis who receive lumbar sympathectomy, the evidence includes 1 RCT conducted at a single center in Brazil, case series, and a systematic review. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. Case series have reported high rates of clinical efficacy, but findings are inconclusive due to lack of control groups. The RCT was limited by its small sample size and lack of blinded outcome assessment. Moreover, there have been substantial rates of compensatory sweating and concerns about adverse events on sexual functioning. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Secondary Gustatory Hyperhidrosis

For individuals who have severe secondary gustatory hyperhidrosis who receive iontophoresis or botulinum toxin, the evidence includes uncontrolled studies and systematic reviews. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. The systematic reviews did not identify any relevant RCTs. Randomized controlled trials are needed to evaluate the safety and efficacy of these treatments for severe secondary gustatory hyperhidrosis. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have severe secondary gustatory hyperhidrosis who receive tympanic neurectomy, the evidence includes uncontrolled studies and systematic reviews. Relevant outcomes are symptoms, quality of life, and treatment-related morbidity. This treatment has high success rates, without the need for repeated interventions, and is considered standard of care for this indication. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

Supplemental Information

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Practice Guidelines and Position Statements

Guidelines or position statements will be considered for inclusion in 'Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American Academy of Neurology

In 2008, the American Academy of Neurology issued guidelines on the use of botulinum toxin for the treatment of autonomic disorders and pain.[44] These guidelines were updated in 2013[45] and retired in 2017. Table 1 summarizes the recommendations for botulinum toxin injection as a treatment of hyperhidrosis, by site and type of toxin:

Table 1. Recommendation Levels[a] by Hyperhidrosis Site and Botulinum Toxin Type

Botulinum Toxin	Axillary	Palmar	Gustatory
Botulinum neurotoxin type A	A	B	U
AbobotulinumtoxinA	B	U	U
IncobotulinumtoxinA	U	U	U
OnabotulinumtoxinA	B	U	U
RimabotulinumtoxinB	U	U	U

[a] A: established as effective, has at least 2 consistent Class I studies; B: probably effective, has at least 1 class I study or at least 2 consistent class II studies; C: possibly effective, has at least 1 class II study or at least 2 consistent class II studies; U: inadequate or conflicting data, treatment is unproven.

National Institute for Health and Care Excellence

In 2014, NICE issued guidance stating that there was sufficient evidence for the efficacy and safety of endoscopic thoracic sympathectomy for primary facial blushing to support the use of the procedure.[46]

The Institute also issued guidance in 2014 on endoscopic thoracic sympathectomy for primary hyperhidrosis of the upper limb.[47] The guidance stated that "current evidence on the efficacy and

safety of endoscopic thoracic sympathectomy for primary hyperhidrosis of the upper limb is adequate to support the use of this procedure." Also: "Due to the risk of side effects, this procedure should only be considered in patients suffering from severe and debilitating primary hyperhidrosis that has been refractory to other treatments."

For severe primary axillary hyperhidrosis, NICE issued guidance in 2017 on the use of transcutaneous microwave ablation.[48] The guidance stated that there is inadequate evidence in both quantity and quality to evaluate the safety and efficacy of microwave ablation.

Society of Thoracic Surgeons

In 2011, the Society of Thoracic Surgeons published an expert consensus statement on the surgical treatment of hyperhidrosis.[49] The document stated that endoscopic thoracic sympathectomy is the treatment of choice for patients with primary hyperhidrosis. It further recommended the following treatment strategies (with R referring to rib and the number to which rib):

- R3 interruption for palmar hyperhidrosis; an R4 interruption is also reasonable. The authors note a slightly higher rate of compensatory sweating with R3, but R3 is also more effective at treating hyperhidrosis.
- R4 or R5 interruption for palmar-axillary, palmar-axillary-plantar, or axillary hyperhidrosis alone; R5 interruption is also an option for axillary hyperhidrosis alone.
- R3 Interruption for craniofacial hyperhidrosis without blushing; a R2 and R3 procedure is an option but may lead to a higher rate of compensatory sweating, and also increases the risk of Horner syndrome.

According to the statement, endoscopic thoracic sympathectomy has been recommended for patients with severe symptoms that cannot be managed with other therapies who meet the following criteria:

- Onset of hyperhidrosis at an early age (before 16 years)
- <25 years of age at time of surgery
- Body mass index <28 kg/m_2

- No sweating during sleep
- No significant comorbidities
- Resting heart rate <55 beats per minute

U.S. Preventive Services Task Force Recommendations Not applicable.

Medicare National Coverage

There is no national coverage determination. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

Ongoing and Unpublished Clinical Trials

Some currently ongoing and unpublished trials that might influence this review are listed in Table 2.

Table 2. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Unpublished			
NCT03433859	Prospective Multicentric Open Randomised Controlled Trial Comparing Topical Aluminium Chloride to OnabotulinumtoxinA Intradermal Injections in Residual Limb Hyperhidrosis (Lower Limbs)	54	Mar 2021
NCT01930604	Botulinum Toxin Treatment in Craniofacial, Inguinal, Palmar, Plantar and Truncal Hyperhidrosis, a Randomized, Double Blind, Placebo Controlled Study	588	Oct 2019 (status unknown)
NCT02854540	Management of Palmar Hyperhidrosis with Hydrogel-based Iontophoresis	13	Aug 2018
NCT03236012	Hyperhidrosis of the Residual Limb in Patients With Amputations: Developing a Treatment Approach	25	Feb 2022
Ongoing			
NCT02295891	Microwave Energy-induced Thermolysis of Axillary Apocrine Glands and Hair Follicles Will Result in Improvement of Secondary Psychopathology Related to Hyperhidrosis	24	Nov 2023 ~~Aug 2022~~
NCT03921320	Evaluation of Compensatory Sweating After Unilateral Videothoracoscopic Sympathectomy of the Dominant Side or Sequential Bilateral Videothoracoscopic Sympathectomy: a Multicentric Randomized Trial	200	Dec 2023
NCT05737914	Bilateral Endoscopic Thoracic T3 Sympathectomy Versus T3 Radiofrequency Ablation for Treatment of Primary Palmar Hyperhidrosis	68	Oct 2023
NCT05057117	Longevity of Microwave Thermolysis and Botulinum Toxin A for Treatment of Axillary Hyperhidrosis: a Randomized Intra-Individual Trial	30	Jul 2023

NCT: national clinical trial.

Essential Health Benefits

The Affordable Care Act (ACA) requires fully insured non-grandfathered individual and small group benefit plans to provide coverage for ten categories of Essential Health Benefits ("EHBs"), whether the benefit plans are offered through an Exchange or not. States can define EHBs for their respective state.

States vary on how they define the term small group. In Idaho, a small group employer is defined as an employer with at least two but no more than fifty eligible employees on the first day of the plan or contract year, the majority of whom are employed in Idaho. Large group employers, whether they are self-funded or fully insured, are not required to offer EHBs, but may voluntarily offer them.

The ACA requires any benefit plan offering EHBs to remove all dollar limits for EHBs.

Applicable Coding

The following codes and coding guidance are provided for general reference purposes only and may not be all-inclusive. The inclusion of a code does not guarantee or imply any right to member coverage or provider reimbursement, nor does its exclusion represent or imply that coverage or reimbursement is unavailable. All benefit coverage determinations are subject to the member-specific benefit plan documentation as well as additional terms and conditions, including but not limited to the written coverage position set forth in this medical policy, legal requirements, and other policies and guidelines, as applicable.

CPT	**11450**	Excision of skin and subcutaneous tissue for hidradenitis, axillary; with simple or intermediate repair
	11451	Excision of skin and subcutaneous tissue for hidradenitis, axillary; with complex repair
	32664	Thoracoscopy, surgical; with thoracic sympathectomy
	64650	Chemo denervation of eccrine glands; both axillae
	64653	; other area(s) (e.g., scalp, face, neck), per day
	64818	Sympathectomy, lumbar
	69676	Tympanic neurectomy
	97024	Application of a modality to 1 or more areas; diathermy (e.g., microwave)
	97033	Application of a modality to 1 or more areas; iontophoresis, each 15 minutes
HCPCS	**J0585**	Injection, onabotulinumtoxinA, 1 unit
	J0586	Injection, abobotulinumtoxinA, 5 units
	J0587	Injection, rimabotulinumtoxinB, 100 units
	J0588	Injection, incobotulinumtoxinA, 1 unit
ICD–10-CM	**L74.510-L74.519**	Focal hyperhidrosis code range

	L74.52	Secondary focal hyperhidrosis
	R61	Generalized hyperhidrosis
ICD-10-PCS		ICD-10-PCS codes are only used for inpatient services.
	015L4ZZ	Surgical, peripheral nervous system, destruction, sympathetic nerve, percutaneous endoscopic
	01BK3ZZ, 015L4ZZ	Surgical, peripheral nervous system, excision, head and neck sympathetic nerve, code by approach (percutaneous or percutaneous endoscopic)
Type of Service	Medicine, surgery	
Place of Service	Inpatient Outpatient	Thoracoscopic sympathectomy

Vendors

- **Personify**
- **Health Plan Services 9HPS0**

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Review/Revision/Approval History	
Date	Description
7/2/2024	**New**
5/11/2026	**Reviewed and Approved by the Policy Committee**

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