Clinical policy title: Smell and taste dysfunction testing

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Policy contains: Chemosensory impairment, electrogustometry, smell disorder, smell testing, taste disorders, and taste testing

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Coverage policy

Smell and taste dysfunction testing is clinically proven and, therefore, medically necessary for the evaluation of unexplained olfactory or gustatory dysfunction using any of the following tests:

- Smell testing: Taste identification, taste threshold, taste suprathreshold, or unilateral taste testing (CPT 92700).
- Taste testing: Taste threshold, taste suprathreshold, or taste quadrant (regional) testing (CPT 41599).

Limitations

All other uses of smell and taste dysfunction testing are not medically necessary, including identifying members at risk for neurodegenerative diseases (e.g., Alzheimer's dementia).

Smell and taste dysfunction testing is limited to an initial visit and one follow-up visit. A total of five tests (a combination of codes 92700 and 41599) per visit are eligible for reimbursement. Approval for additional testing will be considered on a case by case basis.

Electrophysical chemosensory tests for unexplained smell and taste dysfunction (e.g., electrogustometry or evoked potential testing) are not medically necessary for routine screening but may be considered on a case by case basis for the differential diagnosis as part of a specialty examination.

Alternative covered services

- Allergy testing.
- Drug assays and chemical analyses for suspected medication or nutritional etiologies.
- Electroencephalography for members with a history of seizures.
- Hematological tests.
- Nasal endoscopy.
- Nerve blocks.
- Neuroimaging (e.g., computed tomography or magnetic resonance imaging) to rule out intra-cranial or peripheral nerve abnormalities.
- Neurological, otolaryngological, or psychiatric consultation.

**Background**

Chemosensory disorders of smell and taste can adversely impact a patient’s quality of life and safety but are often overlooked as potential contributors by both patients and providers (Doty, 2008). Altered smell and taste can decrease appetite, impair enjoyment of eating, and lead to unintended weight loss, depression, and, in children, consequences to overall physical growth and development. Causes of chemosensory disorders are numerous and include illness (e.g., sinus, oral, or upper respiratory infection), toxic exposures, nasal or oral surgeries, central nervous system injury or disease, psychiatric disorders, endocrine and metabolic diseases, medications, and radiation exposure (Doty, 2008).

Among Americans over the age of 40, approximately 12.5 percent have measurable smell dysfunction (Hoffman, 2016), and 20 percent report some alteration in their sense of taste (Rawal, 2016). The prevalence of smell and taste dysfunctions increases with age (Hoffman, 2016; Rawal, 2016). Smell dysfunction is more common in men, ethnic minorities (non-Hispanic Black and Mexican American), and in those with lower educational attainment or family income. Studies of the prevalence of chemosensory disorders in pediatric populations are rare, and their detection present several challenges, particularly among children age 3 to 5 years (Dalton, 2009).

In adults, the main risk factors for smell alterations include sinonasal symptoms, heavy drinking, and head injury; for taste alterations, risk factors include xerostomia and facial injury (Rawal, 2016). In children, otorhinolaryngologic conditions, traumatic brain injury, oncology, psychiatric diseases, environmental factors, and other diseases are main risk factors, but the influence of psychiatric disorders remains less clear (Schriever, 2018).

Taste dysfunction may have primary causes but is often a result of retronasal olfactory dysfunction. Retronasal olfaction is the perception of odors emanating from the oral cavity during eating and drinking, rather than sniffing (orthonasal olfaction) (Landis, 2005). The distinction between true gustatory loss and olfactory loss lies in the inability to detect bitter, sweet, salty, sour, or umami (gustatory dysfunction) from the inability to perceive complex food flavors (olfactory dysfunction).

Some altered sensation may appear without any apparent stimulus (Doty, 2008). Patients may not recognize partial chemosensory impairment or may mistake the magnitude of the problem, which limits self-reporting of symptoms as a reliable source for detecting chemosensory disorders.

Olfactory testing comprises electrophysiological tests and psychophysical testing to determine the nature and severity of impairment (Doty, 2015). Electrophysical testing measures cortical neural responses to an odor stimulus (odor event-related potentials) and olfaction detection thresholds (the electro-olfactogram). Psychophysical smell testing uses a patient’s response to unilateral or bilateral olfactory stimuli via orthonasal and retronasal routes to quantify odor detection, identification, discrimination, memory, and suprathreshold intensity perception. Structural and functional imaging may be used to clarify the etiology of functional loss.
Taste testing is more challenging to perform and interpret than smell testing, as multiple nerves are involved, taste receptors are variably distributed over the tongue and oral cavity, and taste thresholds are sensitive to a number of factors (Doty, 2008). Taste threshold testing comprises electrogustometry (passing anodal current to the tongue to generate a taste perception) of tongue regions and direct application of liquid stimuli or taste strips to the tongue using the whole mouth taste threshold, taste suprathreshold, and taste-quadrant tests. Gustatory evoked potentials may also be used.

**Findings**

We included two guidelines (Malaty, 2013; Suchoworsky, 2006), six systematic reviews and meta-analyses (Gamper, 2012; Jung, 2019; Kotecha, 2018; Moura, 2015; Silva, 2018; Ozay, 2019), four narrative overviews (Doty, 2008, 2015; Stillman, 2000; Tomita, 2002), and 11 individual studies (Cain, 1988; Doty, 1984; Ellegard, 2007; Gellrich, 2019; Hummel, 1997; Lobb, 2000; Oleszkiewicz, 2019; Pingel, 2010; Schriever, 2014; van Spronsen, 2013; Veysseller, 2014) in the policy. Smell and taste dysfunction tests are well-established clinical tools for assessing chemosensory identification and threshold impairment following the completion of a standard history and physical examination. They can determine the nature and degree of chemosensory dysfunction, detect malingering, monitor functional changes over time, and assess treatment efficacy.

The scientific evidence supporting the reliability and validity of smell testing is more robust than that of taste testing. The main limitations of the overall literature are the absence of normative data by age and gender and standardized testing methods. Reliability assessment is not always possible, although the individual may serve as his or her own control. Developing normative data for pediatric and elderly populations (Gellrich, 2019; Oleszkiewicz, 2019; Pingel, 2010; van Spronsen, 2013; Veysseller, 2014) is an area of active research.

Electrophysical testing of smell and taste were introduced as early as the 1950s. For smell testing, there is longer clinical experience but less definitive research supporting electrophysical testing than that of psychophysical testing. Electrophysical smell testing is less practical for routine clinical use because of intolerance to the electrodes, technical issues that lower test sensitivity and reliability, and its high costs and length of testing (Doty, 2015). Results of early studies of electrogustometry suggested a role in increasing the understanding of the mechanisms of taste transduction (Stillman, 2000). Its value relative to aqueous methods for taste threshold assessment is less clear, and professional consensus regarding the routine use of electrogustometry is lacking.

The optimal psychophysical tests are highly sensitive, reliable, relatively inexpensive, and practical for routine use. Several tests meet these requirements and are commercially available for screening gross dysfunction or more detailed examination.

**Smell testing:**

The strongest evidence supports orthonasal olfaction tests with psychometric properties of high sensitivity, test-retest reliability, and validity in adult populations. Examples of the most widely examined psychophysical smell tests are: the 40-item University of Pennsylvania Smell Identification Test (Doty, 1984) for odor identification; the “Sniffin’ sticks” tests (Gellrich, 2017; Hummel, 1997; Schriever, 2014) for odor threshold, odor discrimination, and identification; and the University of Connecticut Test Battery (Cain, 1988) for odor threshold and odor identification. They have sex- and age-related normative data that enable determination of a patient’s percentile rank relative to peers.
Several shorter iterations of these tests have been validated for screening gross olfaction loss in adult and pediatric populations. Screening tests are quick, relatively inexpensive, and easy to administer across a variety of settings. They typically include three- and four-odor versions that can be self-administered using “scratch and sniff” technology, e.g., the Quick Smell Identification Test (Hummel, 2010; Jackman, 2005) and the three-item quick sticks (Q-sticks) (Malaty, 2013). Screening tests are highly sensitive for detecting anosmia but are less sensitive than the longer versions for detecting hyposmia and cannot be relied upon for detecting malingering (Doty, 2008; Malaty, 2013). Comprehensive testing with the longer-item tests is generally reserved for specialized smell and taste centers or specialists when a patient’s quality of life is significantly impaired by a persistent chemosensory disorder that has no easily treatable cause (Malaty, 2013).

A systematic review of 30 studies (Ozay, 2019) identified the retronasal smell test, the candy smell test, and odorant presentation containers as the three most widely used and accepted retronasal olfaction test methods. Significant shortcomings in the literature limit their routine use in clinical practice. These limitations are a lack of established optimal concentrations and test agents and the absence of a procedure to detect threshold sensation tests, because retronasal testing had been conducted within the supra-threshold zone.

Several meta-analyses examined smell identification tests as a potential biomarker of prodromal disease in Alzheimer’s dementia (Jung, 2019; Kotecha, 2018; Silva, 2018). The most commonly used tests for this purpose included the University of Pennsylvania Smell Identification Test and the Sniffin’ Sticks Odor Identification Test. All three meta-analyses found a large effect size of mild cognitive impairment and Alzheimer’s disease on olfaction, which increased with disease progression. These results suggest that olfactory dysfunction may occur in the preclinical stages. Limitations of the research were high clinical and methodological heterogeneity, and all authors highlighted the need for longitudinal studies, improving test specificity (i.e., distinguish Alzheimer’s disease from other neurodegenerative diseases), and identifying other potentially influencing factors to reliably identify persons at risk for neurodegenerative diseases.

The American Academy of Neurology (Suchowersky, 2006) supports smell testing using University of Pennsylvania Smell Identification Test and the Sniffin’ Sticks Odor Identification Test to differentiate Parkinson’s disease from progressive supranuclear palsy or corticobasal degeneration, but not from multiple system atrophy. However, they stressed the added value of smell testing to clinical diagnostic criteria and the optimal testing sequence were unclear.

**Taste testing:**

The most widely used tests for taste dysfunction are electrogustometry, the whole mouth taste threshold test, the taste supra threshold test, and the taste quadrant test (Doty, 2008). Normative data have been developed for electrogustometry threshold testing in adult populations and more recently in pediatric populations. Normative data exist for some psychophysical threshold tests, but not for the more practical and popular psychophysical supra-threshold tests.

Electrogustometry assesses taste detection thresholds rather than recognition thresholds and is not applicable for measuring basic taste qualities (Gamper, 2012). The advantages of electrogustometry include the ability to control the range of measurements and stimulation intensity, short testing period relative to tests involving aqueous solutions, its sensitivity to detect slight taste disorders in the absence of subjective symptoms, and its ability to identify gross neural deficit (Tomita, 2002). However, variability in sensitivity and specificity limits its value as a screening method for taste
disturbance (Ellegard, 2007), and variable test-retest reliability limits the ability to monitor the progress of taste disorders (Lobb, 2000). Electrogustometry is not useful for determining or diagnosing dissociated taste disorder, heterogeusia, and spontaneous dysgeusia (Tomita, 2002).

A systematic review (Moura, 2015) of nine studies found quantitative taste testing in children was feasible as long as the tests are condition- and age-specific. The authors were unable to perform a meta-analysis due to variations in sample size (range 34 to 432 participants), age of the population (ages 0 to 12 years), evaluation methods, and study objectives. All but two of the studies enrolled populations of healthy children. The other two studies enrolled children with specific taste-limiting conditions—chronic otitis media with effusion and invasive developmental disorders. The taste testing methods were psychophysical (six studies), electrogustometry (two studies), and a four-point questionnaire (one study). Despite the limitations in the literature, psychophysical taste testing and electrogustometry are recognized diagnostic tools in pediatric clinical practice and specialized clinics.

**Billing and coding**

Below are National Coverage Determinations, Local Coverage Determinations, and the most commonly submitted codes subject to this policy. This is not an exhaustive list of codes. Providers are expected to consult the appropriate Centers for Medicare & Medicaid Services references and coding manuals, and bill accordingly.

**National coverage determinations**

No National Coverage Determinations were identified as of the writing of this policy.

**Local coverage determinations**

No Local Coverage Determinations were identified as of the writing of this policy.

**ICD-10 diagnosis codes**

R43.0-R43.9 Disturbances of smell and taste

**CPT procedure codes**

41599 Unlisted procedure, tongue, floor of mouth
92700 Unlisted otorhinolaryngological service or procedure

**HCPCS level II codes**

No applicable codes.

**References**

On June 14, 2019, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “Olfaction Disorders” (MeSH), “Smell” (MeSH), “Taste Disorders” (MeSH), “olfactory testing,” “gustometry,” “smell test,” “anosmia,” “hyposmia,” “dysosmia,” and “taste test.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.


Appendix

No additional information was identified for this section during the writing of this policy.