

## Orofacial Myofunctional Disorders

### Indexing Metadata/Description

- › **Title/condition:** Orofacial Myofunctional Disorders
- › **Synonyms:** Anterior tongue posture; tongue thrust
- › **Anatomical location/body part affected:** Any or all aspects of oral and orofacial anatomy might be involved, including but not limited to the cheeks, hard and/or soft palates, lips, tongue, teeth
- › **Area(s) of specialty:** Child Speech and Language Disorders, Swallowing and Swallowing Disorders, Pediatric Genetic and/or Neurological Disorders, Infant Feeding and Feeding Disorders, Craniofacial and/or Oral Motor Abnormalities
- › **Description:** Orofacial myofunctional disorders (OMDs) is a term used to describe a group of conditions involving oral and/or orofacial musculature that interfere with normal growth, development, or function of these structures, or that create a cosmetic problem.<sup>(1,2)</sup> These disorders include atypical resting posture of the orofacial muscles; abnormal chewing, swallowing, or speech patterns; dental malocclusions; and obstructed nasal passages.<sup>(1)</sup> An OMD can occur at any age<sup>(1)</sup>
- › **ICD-9 codes**
  - 524 dentofacial anomalies, including malocclusion
  - 524.21 malocclusion, Angle's class I
  - 524.22 malocclusion, Angle's class II
  - 524.23 malocclusion, Angle's class III
  - 524.4 malocclusion, unspecified
  - 524.5 dentofacial functional abnormalities
  - 524.60 temporomandibular joint disorders, unspecified
  - 529.8 other specified conditions of the tongue
- › **ICD-10 codes**
  - M26.30 unspecified anomaly of tooth position of fully erupted tooth or teeth
  - M26.31 crowding of fully erupted teeth
  - M26.32 excessive spacing of fully erupted teeth
  - M26.33 horizontal displacement of fully erupted tooth or teeth
  - M26.34 vertical displacement of fully erupted tooth or teeth
  - M26.35 rotation of fully erupted tooth or teeth
  - M26.36 insufficient interocclusal distance of fully erupted teeth (ridge)
  - M26.37 excessive interocclusal distance of fully erupted teeth
  - M26.39 other anomalies of tooth position of fully erupted tooth or teeth
  - M26.4 malocclusion, unspecified
  - M26.50 dentofacial functional abnormalities, unspecified
  - M26.51 abnormal jaw closure
  - M26.52 limited mandibular range of motion
  - M26.53 deviation in opening and closing of the mandible
  - M26.54 insufficient anterior guidance
  - M26.55 centric occlusion maximum intercuspation discrepancy
  - M26.56 non-working side interference
  - M26.57 lack of posterior occlusal support
  - M26.59 other dentofacial functional abnormalities

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- M26.60 temporomandibular joint disorder, unspecified
- M26.61 adhesions and ankylosis of temporomandibular joint
- M26.62 arthralgia of temporomandibular joint
- M26.63 articular disc disorder of temporomandibular joint
- M26.69 other specified disorders of temporomandibular joint
- M26.89 other dentofacial anomalies
- M26.9 dentofacial anomaly, unspecified
- Q67.4 other congenital deformities of skull, face and jaw
- Q75.8 other specified congenital malformations of skull and face bones
- Q75.9 congenital malformation of skull and face bones, unspecified

(ICD codes are provided for the readers' reference, not for billing purposes)

› **G-Codes**

• **Swallowing G-code set**

- G8996, Swallowing functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
- G8997, Swallowing functional limitation, projected goal status, at initial therapy treatment/outset and at discharge from therapy
- G8998, Swallowing functional limitation, discharge status, at discharge from therapy/end of reporting on limitation

• **Motor Speech G-code set**

- G8999, Motor speech functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
- G9186, Motor speech functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
- G9158, Motor speech functional limitation, discharge status at discharge from therapy/end of reporting on limitation

• **Other Speech Language Pathology G-code set**

- G9174, Other speech language pathology functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
- G9175, Other speech language pathology functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
- G9176, Other speech language pathology functional limitation, discharge status at discharge from therapy/end of reporting on limitation

›

<b>G-code Modifier</b>	<b>Impairment Limitation Restriction</b>
CH	0 percent impaired, limited or restricted
CI	At least 1 percent but less than 20 percent impaired, limited or restricted
CJ	At least 20 percent but less than 40 percent impaired, limited or restricted
CK	At least 40 percent but less than 60 percent impaired, limited or restricted
CL	At least 60 percent but less than 80 percent impaired, limited or restricted
CM	At least 80 percent but less than 100 percent impaired, limited or restricted
CN	100 percent impaired, limited or restricted

Source: <http://www.cms.gov>

› **Reimbursement:** Reimbursement for therapy will depend on insurance contract coverage; no specific issues or information regarding reimbursement have been identified

› **Presentation/signs and symptoms:** A patient with an OMD will present with any or all of the following signs or symptoms:

- Articulation errors<sup>(1)</sup>
- Burning mouth<sup>(1)</sup>
- Drooling<sup>(1,7,12,28)</sup>
- Facial pain<sup>(1)</sup>
- Jaw joint pain<sup>(1)</sup>
- Mouth breathing/open mouth resting position<sup>(3,4,28)</sup>
- Open bite posture<sup>(3)</sup>
- Reduced lip tone<sup>(1)</sup>
- Low, forward tongue resting position<sup>(28)</sup>
- Abnormal bite pattern/crowded teeth<sup>(28)</sup>
- Snoring<sup>(28)</sup>
- Tooth pain<sup>(1)</sup>
- Ankyloglossia (tongue-tie)<sup>(24)</sup>
- Tongue thrust (a pattern typically observed in infants in which the tongue moves forward during the swallow; this pattern should decrease and then disappear over the first year of life)<sup>(2,5)</sup>
  - Researchers in India conducted a prospective study on 21 children with tongue thrusting habits compared to age-matched controls (10-14 years of age) to assess soft tissue, dental, and skeletal characteristics<sup>(25)</sup>
    - A significantly higher number of children with tongue thrusting showed lip incompetency (86% vs. 14%), mouth-breathing habit (38% vs. none), hyperactive mentalis muscle activity (24% vs. none), open-bite(52% vs. none), and lisping (86% vs. none) when compared to children without tongue thrust
    - No differences were found in angulation of mandibular incisors, interpremolar or intermolar widths, and all the skeletal parameters studied

## Causes, Pathogenesis, & Risk Factors

› **Causes:** While the exact cause of an OMD is usually unknown, several features have been identified that are thought to contribute to the development of OMDs. These features include but are not limited to:

- Allergies<sup>(2)</sup>
- Anterior open bite<sup>(6)</sup>
- Enlarged adenoids<sup>(1,2)</sup>
- Heredity<sup>(2)</sup>
- High posterior tongue position with a short mandibular ramus<sup>(1)</sup>
- Long soft palate<sup>(1)</sup>
- Nasal blockage<sup>(1)</sup>
- Posterior airway obstruction (such as enlarged tonsils)<sup>(1)</sup>
- Prolonged nonnutritive sucking behaviors (e.g., thumb or pacifier sucking)<sup>(3,6)</sup>
- Ankyloglossia can limit tongue movement, which can impair normal growth and development of the oral and nasal cavities and impact intrinsic and extrinsic muscle patterns and function<sup>(24)</sup>

– For detailed information about ankyloglossia, see *Clinical Review...Akyloglossia*; Topic ID Number: T709024

› **Pathogenesis:** OMDs arise from morphological impairments in the lips, tongue, teeth, skeleton, or soft tissue; oral habits; mouth breathing; and lip resting postures<sup>(5)</sup>

› **Risk factors:** Risk factors for OMD include:

- Advanced age (65+ due to aging of the facial muscles)<sup>(1)</sup>
- Atrophy of the alveolar bone<sup>(1)</sup>
- Atrophy of the tongue<sup>(1)</sup>

- Bell's palsy<sup>(1)</sup>
- Caries (loss of tooth substance)<sup>(1)</sup>
- Condylar hyperplasia/hypoplasia (deformity of the mandible bone)<sup>(1)</sup>
- Dementia<sup>(1)</sup>
  - For detailed information on speech therapy for patients with dementia, see the series of Clinical Reviews on this topic
- Denture granuloma<sup>(1)</sup> (inflammation of the oral mucosa that develops as a result of chronic irritation produced by poorly fitting dentures)
- Down syndrome<sup>(1)</sup>
  - For detailed information on speech therapy for patients with Down syndrome, see *Clinical Review... Down Syndrome: Communication Disorders*; Topic ID Number: T708772
- Extremely poor oral hygiene<sup>(1)</sup>
- Facial swelling<sup>(1)</sup>
- Glossitis (acute or chronic inflammation of the tongue)<sup>(1)</sup>
- Hemangioma (benign vascular anomalies)<sup>(1)</sup>
- Hypertrophy of masseter muscles<sup>(1)</sup>
- Oral Crohn's disease<sup>(1)</sup>
- Thrush<sup>(1)</sup>
- Parkinson disease<sup>(1)</sup>
  - For detailed information on speech therapy for patients with Parkinson disease, see *Clinical Review... Parkinson Disease (Speech)*; Topic ID Number: T708751
- Parotid gland swelling<sup>(1)</sup>
- Psychiatric disorders<sup>(1)</sup>
- Stroke<sup>(1)</sup>
  - For detailed information on speech therapy for patients who have had a stroke, see *Clinical Review... Stroke Rehabilitation: Speech Therapy*; Topic ID Number: T708774
- Submandibular duct obstructions<sup>(1)</sup>
- Teeth attritions or abrasions<sup>(1)</sup>
- Torus palatinus (benign hard palate tumor)<sup>(1)</sup>
- Trauma<sup>(1)</sup>

## Overall Contraindications/Precautions

- › See specific **Contraindications/precautions to examination** and **Contraindications/precautions** under Assessment/Plan of Care

## Examination

- › **Contraindications/precautions to examination**
  - Patients with an OMD must be evaluated by a multidisciplinary team that should include a speech-language pathologist (SLP), an orthodontist, and a dentist.<sup>(2,3,4,7,8)</sup> For certain patients, the team might also include an otolaryngologist, a pediatrician, or an allergist<sup>(2)</sup>
  - Observe universal precautions during examination, including handwashing and wearing gloves
  - SLPs must be sensitive to various cultural, economic, and social backgrounds as well as the emotional needs of patients<sup>(4)</sup>
  - Family members/caregivers should be involved in both assessment and treatment of pediatric patients as they have a unique perspective and can provide information on the child that cannot be obtained through formal or informal measures
  - Development of an individualized family services plan (IFSP; ages 0-3years) or individualized education plan (IEP) in collaboration with the parents/caregivers and school personnel for school-aged individuals with OMD is essential to address communication and/or swallowing problems in the school environment

## › History

### • History of present illness/injury

- **Mechanism of injury or etiology of illness:** The etiology of OMDs varies widely
  - At what age did symptoms begin? What symptoms does the patient currently exhibit?
  - Does the patient still have his or her tonsils and adenoids in place? If not, at what age(s) did he or she have a tonsillectomy or adenoidectomy?<sup>(4)</sup>
  - In the case of a pediatric patient, did the child have chronic ear infections? If so, how often and at what age(s)? Did the child have frequent nasal congestion?<sup>(4)</sup> If so, how often and at what age(s)?
- **History of the pregnancy and delivery:** For pediatric patients:
  - Did the child's mother have any illnesses, accidents, or complications while pregnant with the child?
  - Did the mother take any medications during the pregnancy?
  - What was the length of the pregnancy with the child?
  - What was the duration of the delivery?
  - What was the child's weight at birth?
  - Were there any complications or unusual circumstances during birth or shortly after?
  - What was the Apgar score?
- **Course of treatment**
  - **Medical management:** Is the patient receiving medical treatments for his or her OMD? Has the patient had surgical or orthodontic corrections for the OMD in the past?
  - **Medications for current illness/injury:** Determine what medications the physician has prescribed; are they being taken?
    - As drooling is a common occurrence in patients with OMDs, medicines are sometimes prescribed to reduce amount of drooling
    - For detailed information about medical and behavioral treatments for drooling, see *Clinical Review...Drooling*; Topic ID Number: T708632
  - **Diagnostic tests completed:** Usual tests for this condition are the following (some tests might not be appropriate for young children):<sup>(6)</sup>
    - Cine-magnetic resonance imaging<sup>(6)</sup>
    - Cineradiography<sup>(6)</sup>
    - Electromyography (EMG)<sup>(6)</sup>
    - Electropalatography<sup>(6)</sup>
    - Dental models<sup>(4)</sup>
    - Transducers<sup>(6)</sup>
    - Ultrasound<sup>(6)</sup>
    - X-ray studies<sup>(4)</sup>
  - **Home remedies/alternative therapies:** Document any use of home remedies (e.g., ice or heating pack) or alternative therapies (e.g., acupuncture) and whether or not they help
  - **Previous therapy:** Document whether the patient has had speech, occupational, or physical therapy for this or other conditions and what specific treatments were helpful or not helpful
- **Aggravating/easing factors:** Such as fatigue or allergies that exacerbate or alleviate symptoms (and length of time each item is performed before the symptoms come on or are eased)
  - Signs of allergies of which to be aware include dark area under the eyes (“allergic shiners”), stuffy nose, runny nose, and red eyes<sup>(22)</sup>
- **Body chart:** Use a body chart to document location and nature of symptoms
- **Nature of symptoms:** Document nature of symptoms (e.g., constant vs. intermittent, sharp, dull, aching, burning, numbness, tingling)
- **Rating of symptoms:** Use a visual analog scale (VAS) or 0-10 scale to assess symptoms at their best, at their worst, and at the moment (specifically address if pain is present now and how much). Orofacial pain is a common symptom of Temporomandibular disorder (TMD)<sup>(26)</sup>

- **Pattern of symptoms:** Document changes in symptoms throughout the day and night, if any (A.M., mid-day, P.M., night); also document changes in symptoms due to weather or other external variables; inquire about mouth resting posture while awake vs. while sleeping<sup>(3)</sup>
- **Sleep disturbance:** Document number of wakings/night
  - OMDs and sleep apnea often co-occur<sup>(1,4,9)</sup>
- **Other symptoms:** Document other symptoms the patient is experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to a physician (e.g., seasonal allergies, dental abscesses, ear infections)
- **Respiratory status:** OMDs are sometimes associated with blockage of the airway.<sup>(1,4)</sup> Does the patient require supplemental oxygen? Nasal cannula? Does the patient have a tracheostomy tube? Does the patient require ventilator support?
- **Psychosocial status:** Document psychosocial status and/or behavioral problems
  - Frustration on the part of a child and his or her parents often exists in cases of prolonged thumb- or finger-sucking<sup>(10)</sup>
  - If the patient or patient's family reports symptoms of depression, anxiety, or other psychosocial or behavioral disturbance, refer to a mental health professional for additional assessment
- **Hearing:** Document hearing ability as well as need for/use of hearing aid(s)
- **Barriers to learning**
  - **Are there any barriers to learning? Yes\_\_ No\_\_**
  - **If Yes, describe \_\_\_\_\_**
- **Medical history**
  - **Past medical history**
    - **Previous history of same/similar diagnosis:** Is there a history of speech problems, swallowing disorders, neurological disorders, cleft lip or palate, dental issues, temporomandibular joint (TMJ) dysfunction, or orthodontia? TMJ dysfunction can sometimes occur in combination with OMDs<sup>(1)</sup>
    - **Comorbid diagnoses:** Ask the patient about other diagnoses, including diabetes, cancer, heart disease, complications of pregnancy, psychiatric disorders, and orthopedic disorders
      - For patients with cancer who have received radiation therapy of the throat and mouth, xerostomia (dry mouth) might develop,<sup>(1)</sup> this may exacerbate the symptoms of a concomitant OMD
    - **Habit history:** Does the patient have a history of negative oral habits, including prolonged pacifier or thumb sucking, and nail biting<sup>(7,10)</sup>
    - **Medications previously prescribed:** Obtain a comprehensive list of medications prescribed and/or being taken (including over-the-counter drugs)
    - **Other symptoms:** Ask the patient about other symptoms he or she is experiencing
  - **Social/occupational history**
    - **Patient's goals:** Document what the patient and/or family hopes to accomplish with therapy and in general
    - **Vocation/avocation and associated repetitive behaviors, if any:** Things to consider include:
      - If the patient is employed, document his or her occupation; document the patient's hobbies and extracurricular activities
        - Especially note if the patient is a musician
          - In a review of the literature performed by researchers in Spain, authors found that musicians (including those who played woodwinds, brass, and/or violin/violas, as well as vocalists) have an increased prevalence of orofacial problems<sup>(11)</sup>
          - Common problems among musicians included buccofacial problems, herpes simplex, focal dystonia, lingual and/or vestibular teeth displacement, TMJ disorders, and bruxism<sup>(11)</sup>
      - Does the patient currently receive intervention services? If so, are they home, school, or clinic based?
      - Does a feeding/swallowing impairment interfere with progress in school, work, community, or the ability to function in the home setting?
      - If age-appropriate, does the patient socialize with peers? Does the patient attend daycare or school?
    - **Functional limitations/assistance with ADLs/adaptive equipment**
      - Adaptive feeding devices?
      - Does the patient require use of a communication device?
      - Does the patient require hearing aids? If so, are the hearing aids in good working order?

- Does the patient wear glasses?
  - Does the patient require a wheelchair for mobility? Does the patient require a cane or walker?
  - **Living environment:** With whom patient lives (e.g., caregivers, family members). Identify if there are barriers to independence in the home; are there any modifications necessary?
  - Inquire about eating routines/rituals? Does OMD affect the patient's ability to participate in social eating routines/family/school meals? Where/with whom does patient eat?
  - Are there sources of stress in the living environment (which might lead to nail biting/thumb sucking)? Inquire about family's cultural beliefs regarding bottle feeding into toddlerhood
- › **Relevant tests and measures: (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting)**
- **Assistive and adaptive devices:** Document the use of alternative or augmentative communication (AAC) devices; depending on the severity of speech and language deficits, it may be appropriate to assess the patient's ability to use an AAC device. For information regarding the use of AAC devices in speech-language therapy, see the series of Clinical Reviews on this topic
  - **Cranial/peripheral nerve integrity:** For those patients with known or suspected neuromuscular involvement, perform a quick screening of cranial nerve (CN) integrity<sup>(22)</sup>
    - Inquire about the sense of smell (CN I)<sup>(22)</sup>
    - Document ability to react to a light (CN II)<sup>(22)</sup>
    - Document ability to track a finger or light (CN III, IV, VI)<sup>(22)</sup>
    - Document facial sensitivity/sensation and bite strength (CN V)<sup>(22)</sup>
    - Document strength and ROM of the face through facial expressions/movements (CN VII)<sup>(22)</sup>
    - Document hearing ability (CN VIII)<sup>(22)</sup>
    - Document soft palate (velar) movement and symmetry (CN IX)<sup>(22)</sup>
    - Document vocal quality and any impairments of the voice (CN X)<sup>(22)</sup>
    - Document ability to shrug the shoulders/turn and hold the head (CN XI)<sup>(22)</sup>
    - Document lingual ROM and strength (CN XII)<sup>(22)</sup>
  - **Muscle strength:** Impaired oral motor function might be associated with reduced muscle bulk and/or orofacial muscle imbalance.<sup>(1,12)</sup> Observe tongue and facial muscles noting asymmetries, reduced strength, or atrophy
  - **Oral mechanism exam and related tests:** An extensive oral mechanism examination should be completed with all patients with a known or suspected OMD.<sup>(1,3,4,7,8)</sup> An oral mechanism exam should assess:
    - **Facial muscles:** Is the face symmetrical at rest? Is the face symmetrical while making movements (smiling, raising the eyebrows, closing the eyes)? Are there any abnormal movements (twitching, spasms, grimacing)?<sup>(3,8)</sup>
      - Do the cheeks have adequate muscle tone?<sup>(6)</sup>
      - Is the patient drooling or mouth breathing?<sup>(1,7,12)</sup>
    - **Lips:** Are the lips symmetrical at rest? Do the lips close at rest? Are the lips symmetrical during movements? Is ROM normal? Is the strength normal? Is the lip tissue healthy? Is there any scarring or cleft?<sup>(3,6,7)</sup>
      - Have the patient alternately smile and pucker; teeth should show during smile<sup>(13)</sup>
      - Lip gauge:<sup>(8)</sup> An instrument that estimates strength of perioral muscles and orbicularis oris
    - **Tongue:** Is the tongue normal in appearance and size? Any atrophy? Any discolorations? Any bleeding? Is ROM normal? Is the strength normal? Is the frenum restricted?<sup>(7,13)</sup>
      - Have the patient lateralize tongue side to side; the jaw should stay still and only the tongue should move<sup>(13)</sup>
      - What is the tongue posture at rest? For patients who are mouth breathers, the tongue rests in a low/forward posture<sup>(4)</sup>
      - What is the tongue posture during swallowing? Does the tongue press forward through the teeth during swallowing?
    - **Hard palate:** Is the hard palate intact? Any signs of fistulas, fissures, scarring? Are height and width normal? Any prostheses? Is the coloration normal?
    - **Soft palate:** Is the coloration normal (should be pink and white)? Any signs of cleft or bifid uvula? Does the patient sound hyper- or hyponasal during conversational speech?

- Place a small mirror under the patient's nose during production of nonnasal sounds; fogging or clouding may indicate nasal emission, which necessitates referral to the otolaryngologist<sup>(8)</sup>
- Tonsil grading: Based on the percentage of the oropharyngeal cavity occupied by the tonsils<sup>(8)</sup>
  - Subjective grading
  - Grade 0 (removed tonsils); Grade 1 (< 25%); Grade 2 (25-50%); Grade 3 (50-75%); Grade 4 (75%+)
- **Teeth:** Is there a significant over- or underbite? Are there any missing teeth? Does the patient have dentures?<sup>(1,14)</sup> Are the teeth in good repair? Does the patient wear braces or retainers? Did the patient have orthodontia in the past? Tongue thrust can develop if previous orthodontic corrections begin to shift over time or with age<sup>(1,7)</sup>
- Bruxism: Habitual, nonfunctional, forceful clenching of the teeth is referred to as bruxism.<sup>(1)</sup> Does the patient present with bruxism? Does the parent, family member, or caregiver report teeth clenching or grinding?
- Occlusal evaluation: To evaluate bite; can use a small millimetric ruler as well as a vernier caliper<sup>(3,8)</sup>
  - Bite down early ruler: An instrument that identifies overjet of upper teeth; if the upper incisors fall in the green portion of the ruler, the bite is within normal limits; if the upper incisor edges fall within the red portion of the ruler, the child should be referred to an orthodontist<sup>(8)</sup>
  - Freeway space: The natural separation between the upper dental arch and lower dental arch at rest<sup>(8)</sup>
    - Teeth should only come together during chewing, swallowing, and clenching/smiling
    - At rest, upper and lower teeth should not touch
    - Normal distance between teeth at rest should be 2-3 mm posteriorly and 3-5 mm anteriorly
  - A Therabite range of motion ruler measures oral aperture.<sup>(8)</sup> Typical oral aperture for an adult is between 35 mm and 50 mm.<sup>(22)</sup> In children, there is a wide range of oral aperture measurements, and typically the size of mouth opening increases as the child ages. In a study of typically developing school-aged children (average age ~10 years) in Switzerland, researchers found that the mean maximal mouth opening was 45 mm (range of 25-69 mm) for girls and 45 mm (range of 25-70 mm) for boys<sup>(23)</sup>
- **Palpation:** Included as part of the oral mechanism evaluation; palpation can be used to evaluate lip, cheek, and tongue tone<sup>(3)</sup>
- **Posture:** There is a high prevalence of postural impairments in children with OMDs<sup>(7)</sup>
  - Briefly note posture and function of cervical spine by having child stand and bend forward; note any curvature of the spine<sup>(7)</sup>
  - Refer to physician, physical therapy, or occupational therapy reports for descriptions of any known postural deficits
  - Patient may require radiological evaluation of spine<sup>(7)</sup>
- **Speech/language evaluation (including reading):** An OMD sometimes interferes with normal speech production, but in many cases speech is unaffected<sup>(1,5)</sup>
  - **Speech:** Assess articulation, phonology, and motor speech with formal and informal measures
    - If articulation errors are observed, proceed with a full speech/language evaluation to include standardized tests of speech, articulation, and language<sup>(3,6,7,8)</sup>
    - For detailed information on organic articulation disorders, see *Clinical Review...Speech Sound Disorders: Articulation Disorder, Organic*; Topic ID Number: T708924
  - **Language:** Assess receptive and expressive language skills if indicated
    - For detailed information on developmental language disorders, see the series of Clinical Reviews on this topic
  - **Voice:** Assess vocal function, including vocal quality, loudness, pitch, and endurance; if there are specific concerns regarding voice, refer to an otolaryngologist for complete workup to rule out laryngeal pathologies prior to completing a full evaluation
    - For detailed information on voice disorders, see the series of Clinical Reviews on this topic
  - **Fluency:** Rule out or identify atypical speech disfluencies (stuttering)
    - For detailed information on disorders of fluency, see the series of Clinical Reviews on this topic
  - **Reading:** If indicated, complete an assessment of reading skills, including letter identification, single word reading, and reading comprehension skills as indicated based on the individual's age and developmental level
- **Swallow evaluation:** Patients with an OMD might require an examination of their swallowing function.<sup>(3,6,7,12)</sup> A bedside (or "chairside") swallowing evaluation can be performed by the SLP initially; however, a modified barium swallow



study might be required per therapist discretion. Additionally, oral phase dysphagia may be examined by palatography.<sup>(7)</sup> Common swallow problems associated with OMDs include impaired mastication, tongue thrusting, and anterior bolus loss.<sup>(1,2,3, 12)</sup> (For detailed information on assessment and treatment of dysphagia, see the series of Clinical Reviews on this topic)

- **Tracheostomy examination:** If present, assess tracheostomy tube and document date of placement, current respiratory status, and use of speaking valve. For detailed information on assessment of patients with tracheostomies, see *Clinical Review...Dysphagia: Children with Tracheostomy*; Topic ID Number: T709082 and *Clinical Review...Dysphagia: Adults with Tracheostomy*; Topic ID Number: T709084. For detailed information on assessment of a tracheostomy tube and use of a speaking valve, see *Clinical Review...Passy-Muir Tracheostomy & Ventilator Swallowing and Speaking Valve*; Topic ID Number: T708919
- **Special tests specific to diagnosis**
  - Diadochokinetic rates: Also known as alternating motion rates (AMRs) and sequential motion rates (SMRs); refer to the speed and regularity with which the patient can produce repetitive articulatory movements; rates assess the functional integrity of the patient’s lips, tongue, and jaw<sup>(8,13)</sup>
    - Patient is asked to repeat each of the syllables /pə/, /tə/, and /kə/ as fast and accurately as possible for a predetermined number of seconds (usually 5)
    - Patient is asked to repeat the string of syllables /pə-tə-kə/ (or say the word “buttercup”) as fast and accurately as possible for a predetermined number of seconds (usually 5)
    - Rates are compared to the norms developed by Fletcher<sup>(15)</sup>
    - Patient should be able to produce one cycle of /pə-tə-kə/ within 1 second<sup>(8)</sup>
  - Dworkin-Culatta Oral Mechanism Examination: A standardized oral mechanism examination for children and adults; includes screening test as well as a comprehensive battery of “deep tests” to document the potential relationship between articulation errors and oral anatomic and physiologic deficiencies<sup>(5)</sup>
  - Iowa Oral Performance Instrument (IOPI): An instrument that can objectively measure:
    - Tongue strength<sup>(8)</sup>
    - Lip compression strength<sup>(8)</sup>
    - Fatigability of the tongue and lips<sup>(8)</sup>
  - Mallampati score: A subjective score that describes what oral structures and what percentage of the pharyngeal wall are visible in a patient’s open mouth<sup>(8)</sup>
    - Used by anesthesiologists to estimate the complexity of an impending intubation
    - Scoring system from class 1-4
    - Class 1 refers to a mouth in which all structures are visible; in class 4, only the tongue is visible. A high Mallampati score is associated with OMDs<sup>(28)</sup>
  - Nordic Orofacial Test-Screening (NOT-S): A test developed and validated in order to assess the orofacial function in people aged 3 years or older; consists of a structured interview and a clinical exam with 12 domains<sup>(21)</sup>
  - Tongue Thrust Rating Scale (TTRS): a valid and reliable assessment to measure the severity of tongue thrust during swallowing in children<sup>(31)</sup>

## Assessment/Plan of Care

### › **Contraindications/precautions**

- **Only those contraindications/precautions applicable to this diagnosis are mentioned below, including with regard to modalities. Rehabilitation professionals should always use their professional judgment**
- **Patients with this diagnosis may be at risk for falls; follow facility protocols for fall prevention and post fall prevention instructions at bedside, if inpatient. Ensure that patient and family/caregivers are aware of the potential for falls and educated about fall prevention strategies. Discharge criteria should include independence with fall prevention strategies**
- Clinicians should follow the guidelines of their clinic/hospital and what is ordered by the patient’s physician. The summary below is meant to serve as a guide, not to replace orders from a physician or a clinic’s specific protocols

- Patients with this diagnosis are at risk for dysphagia; follow recommended protocols for swallowing safety and post feeding instructions at bedside, if inpatient. Ensure that the patient and family/caregivers are aware of the potential for dysphagia and educated about safe feeding strategies
  - If the patient’s airways are blocked secondary to enlarged adenoids, tonsils, and/or allergies, speech therapy should be postponed until medical treatment for the airway blockage is complete<sup>(2)</sup>
- › **Diagnosis/need for treatment:** Patients with OMDs are candidates for speech therapy if they present with articulation errors, dysphagia, pain or tenderness of the orofacial musculature, and/or cosmetic issues.<sup>(2)</sup> The need for treatment as well as the specific goals of therapy will be determined following the results of the complete speech and swallowing evaluation
- › **Rule out:** Rule out functional articulation disorders in which speech sound production is affected without any known anatomical basis (for detailed information on assessment and treatment of functional articulation disorders, see *Clinical Review... Speech Sound Disorders: Articulation, Functional*; Topic ID Number: T708858)
- › **Prognosis:** The prognosis for resolution of an OMD varies depending on the underlying cause. The prognosis for tongue thrust (anterior tongue interposition) is typically favorable.<sup>(6)</sup> Prognosis is improved when patients receive therapy soon after diagnosis. Participation in home program, when appropriate, typically improves prognosis
- › **Referral to other disciplines:** The following referrals might be appropriate for patients with OMDs:
- Refer to an orthodontist if the patient has not already been evaluated by one<sup>(28,30)</sup>
  - Refer to physical and occupational therapy if postural deficits are noted<sup>(7)</sup>
  - Refer for a sleep study if the patient reports difficulty falling or staying asleep<sup>(9)</sup>
  - Refer to allergist if the patient reports allergies resulting in difficulty breathing through mouth or nose
  - Refer to social worker/psychologist in cases of high stress or maladaptive oral behaviors
- › **Other considerations:** A complete oral assessment should occur shortly after birth. If deemed medically necessary, a physician will perform a labial or lingual frenectomy prior to the newborn being discharged from the hospital 24 to 72 hours after birth. Nursing within 90 minutes after the procedure facilitates the healing process, promotes optimal oromotor functional development, and promotes successful infant feeding while reducing the risk factors related to sleep-disordered breathing and sleep apnea<sup>(24)</sup>
- › **Treatment summary:** Orofacial myofunctional therapy (OMT) is a specialized treatment program used to correct orofacial structures and function.<sup>(5)</sup> OMT includes exercises that differ between patients depending on individual deficits and goals. The goal of OMT is “to establish NOMF: normal oral muscle function.”<sup>(13)</sup> OMT has been demonstrated to be an effective treatment for improvement of the following:
- Orofacial muscles in mouth-breathers without nasal obstruction
    - In a study of 13 children in Brazil aged 5-10 years, researchers demonstrated that OMT was successful in improving the morphology and function of lower lip and chin muscles<sup>(16)</sup>
      - Children were divided into four groups
      - Weekly sessions of 30 minutes each, over a period of 9 months
      - Muscles improved subjectively and objectively as measured by EMG
  - Abnormal dental occlusion
    - Case study involving 2 teenaged Japanese patients with skeletal class III open bite (“underbite”) as well as nasal airway blockage<sup>(17)</sup>
      - OMT was performed in conjunction with orthognathic surgery
      - Use of palate expander and tooth positioner along with oral motor exercises corrected abnormal occlusion resulting in a normal nasal breathing pattern
  - Abnormal articulation
    - In a study conducted in the United States involving 6 adults with persistent articulation errors and coexisting OMDs, researchers found that OMT increased speech intelligibility<sup>(5)</sup>
      - No subjects had ever had OMT in the past
      - Subjects participated in therapy once a week for 6 weeks, 45 minutes per session
      - Treatment goals included teaching correct tongue resting postures and improved lip seal
      - Following therapy, all subjects were able to maintain appropriate lip and tongue postures 70% of the time with self-cueing strategies
      - Additionally, 5 of 6 subjects demonstrated increased speech intelligibility (12% increase at spontaneous speech level)

- Researchers in Austria compiled cases of patients with an OMD for a total of 103 patients aged 3-30 years<sup>(18)</sup>
  - Forty-five patients completed an OMT regimen
  - Researchers noted significant improvements in lip strength and closure, breathing, tongue placement, swallowing, and orofacial muscle balance
  - 66% of these patients achieved normal articulation along the course of therapy for their OMD
- Reduced lip strength
  - In a study conducted in Japan of the “button-pull” exercise to improve lip posture and lip strength, researchers found some improvement of lip strength with exercise<sup>(19)</sup>
    - Ninety-one patients with poor labial seal
    - Researchers compared patients’ lip strength before and after OMT
    - No significant difference noted between the button-pull group and the non-button-pull group immediately at the conclusion of the study
    - Lip strength of the button-pull group increased twice as much 6 months after study had concluded and decreased after that time
    - 25% of the button-pull group acquired complete labial seal following OMT
- Temporomandibular disorder (TMD)
  - In a study conducted in Brazil with 20 subjects who had articular TMD, researchers documented a positive effect on orofacial and otologic symptoms<sup>(20)</sup>
    - Ten were treated with OMT; 10 were on the waiting list and were used as controls
    - Specific goals and therapies chosen by the therapist were based upon an initial evaluation
    - Subjects participated in a minimum of 9, maximum of 13, 45-minute sessions, once a week for 30 days; once every 2 weeks thereafter
    - Patients treated with OMT reported a reduction in severity of TMD symptoms and tenderness to palpation as compared with the control group; positive effect on orofacial and otologic symptoms
  - In a second study conducted in Brazil by the same researchers, OMT was found to improve pain and range of motion for some patients with TMD
    - In this study, there were 30 subjects with TMD and 10 subjects with no symptoms or history of TMD to be an asymptomatic control group
    - The 30 subjects with TMD were randomly divided into an experimental group to receive OMT (n = 10), a group to be fitted for an occlusal splint (a mouth guard to be worn at night to prevent teeth grinding; n = 10), or to be the symptomatic control group (n = 10)
    - For the OMT experimental group, pain to palpation was significantly reduced in all of the muscles assessed, but not in the temporomandibular joint itself. Additionally, severity and frequency of TMD symptoms decreased and mandibular range of motion significantly increased in the OMT group
- Case study of a 49-year-old Brazilian man with TMD<sup>(14)</sup>
  - OMT treatment was initiated 60 days after an occlusal splint was installed
  - Treatment took place during 50-minute sessions every 15 days for a total of 9 sessions
  - Following treatment, the patient demonstrated improved posture, labial seal, and symmetrical mandibular movements and almost full remission of muscle pain and fatigue
- Electropalatography (EPG): EPG is used in speech therapy and research studies as a visual biofeedback device. The device is placed inside the patient’s mouth and provides a visual representation of the lingual-palatal contact and timing on a computer screen.<sup>(27,29)</sup> In a study conducted in the United States with 3 individuals with OMDs affecting the oral phase of swallowing, researchers found that treatment using EPG improved lingual placement and function during swallowing. All participants were seen for 30-minute individual sessions 2 times per week for a total of 8, 6, and 4 sessions per participant. In each session, the participants were given feedback about how to adjust their tongue to improve swallowing and were also provided with visual feedback from the EPG. At the conclusion of therapy, outcome EPG measurements indicated that postintervention performance was improved from baseline for all probes except one for one patient. Researchers concluded that EPG is a promising biofeedback tool for use in speech therapy for OMDs and larger studies should be conducted<sup>(27)</sup>

Problem	Goal	Intervention	Expected Progression	Home Program
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<p>Reduced lip strength; reduced lip closure</p>	<p>Improve strength and function of lips at rest and during speech and swallowing</p>	<p><b><u>Therapeutic modalities</u></b></p> <p>The following exercises can be used to increase lip strength, ROM, and function:</p> <ul style="list-style-type: none"> <li>•Have the patient hold a tongue depressor between lips for 30-45 minutes each day<sup>(5)</sup></li> <li>•Alternate smiling widely (with lips held tightly against the teeth) and rounding the lips as if for whistling or puckering<sup>(13)</sup></li> <li>•Lip gauge:<sup>(8)</sup> Held between the lips; allows patients to receive visual feedback regarding the improvement in their relative lip strength; may begin at 1/2 lb and increase resistance during each subsequent session</li> <li>•Button-pull exercise:<sup>(19)</sup> String a large flat button with a 24-inch piece of dental floss and tie the ends of the floss together. Place the button flat against the patient's teeth and instruct patient to close lips around button. The therapist pulls the string on the button while cueing the patient to hold the button firmly in place with his or her lips</li> </ul>	<p>Progression of the intensity and frequency of each exercise will vary according to individual patient deficits, plan of care, and goals</p>	<p>Home program will vary with respect to the goals of the patient</p>
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Mouth breathing	For the patient to breathe through his or her nose	<p><b><u>Therapeutic modalities</u></b></p> <p>The following exercises can be used to reduce mouth breathing and improve orofacial muscle strength and ROM:</p> <ul style="list-style-type: none"> <li>•Educate patient regarding mouth breathing; improve patient awareness<sup>(16)</sup></li> <li>•Exercises for the lips, tongue, chin region, and chewing muscles, especially resistance exercises<sup>(16)</sup></li> <li>•Facial massage, especially in the chin/lower lip<sup>(16)</sup></li> <li>•Feeding reeducation<sup>(16)</sup></li> </ul>	Progression of the intensity and frequency of each exercise will vary according to individual patient deficits, plan of care, and goals	Home program will vary with respect to the goals of the patient
Tongue thrust; abnormal tongue resting posture	Correct tongue resting posture	<p><b><u>Therapeutic modalities</u></b></p> <p>The following exercise can be used to improve tongue resting posture:</p> <ul style="list-style-type: none"> <li>•Patient to hold a sugarless mint on the alveolar ridge with his or her tongue for 15 minutes, 3 times per day<sup>(5)</sup></li> </ul>	Progression of the intensity and frequency of each exercise will vary according to individual patient deficits, plan of care, and goals	Home program will vary with respect to the goals of the patient

<p>Reduced tongue, lip, and jaw differentiation<sup>(13)</sup></p>	<p>Improve tongue, lip, and jaw differentiation</p>	<p><b><u>Therapeutic modalities</u></b></p> <p>The following exercises can be used to improve tongue, lip, and jaw differentiation:</p> <ul style="list-style-type: none"> <li>•Oral tactile stimulation: use of oral toothette swabs along the sides, tip, and center of the tongue<sup>(13)</sup></li> <li>•Tap the alveolar ridge repeatedly with the tongue without moving the jaw; initially patients may require manual stabilization of the jaw<sup>(13)</sup></li> <li>•“Skinny-Fat”: To develop ability to protrude the tongue without using lip or jaw assistance; instruct the patient to open mouth wide, stick out his or her tongue without touching the lips or teeth, and point the tongue, then relax<sup>(13)</sup></li> <li>•Click the tongue against the hard palate<sup>(13)</sup></li> <li>•“Frog”: The patient is instructed to open the mouth wide and say “guh” without moving the jaw or chin<sup>(13)</sup></li> </ul>	<p>Exercises should be repeated 10-12 times each,<sup>(13)</sup> the therapist will increase sets and repetitions as the patient’s strength, ROM, and function begin to improve</p>	<p>Home program will vary with respect to the goals of the patient</p>
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TMJ pain	Reduce pain and tenderness of the TMJ	<p><b><u>Therapeutic modalities</u></b></p> <p>The following exercises can be used to improve TMJ function and reduce pain:</p> <ul style="list-style-type: none"> <li>•Relaxation of jaw, neck, and shoulder muscles via thermotherapy and circular massage<sup>(14)</sup></li> <li>•Instruct the patient to pass anterior/upper portion of tongue along the alveolar ridges in a back-and-forth motion to relax elevator muscles<sup>(14)</sup></li> <li>•Opening and closing of the mouth in a slow, controlled manner while maintaining tongue to palate contact<sup>(14)</sup></li> <li>•Instruct the patient to chew equally on both sides to divide masticatory load evenly<sup>(14)</sup></li> </ul>	Exercises should be repeated 10-12 times each; therapist will increase sets and repetitions as the patient's strength, ROM, and function begin to improve	Home program will vary with respect to the goals of the patient
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## Desired Outcomes/Outcome Measures

- › Correct tongue resting posture<sup>(2,16)</sup>
  - NOT-S<sup>(21)</sup>
  - Mallampati score<sup>(8)</sup>
  - Dworkin-Culatta Oral Mechanism Examination<sup>(5)</sup>
  - Repeat clinical evaluation<sup>(20)</sup>
  - TTRS<sup>(31)</sup>
- › Elimination of mouth breathing while awake and during sleep<sup>(16)</sup>
  - Repeat clinical evaluation<sup>(20)</sup>
- › Normal articulatory patterns<sup>(2)</sup>
  - Dworkin-Culatta Oral Mechanism Examination<sup>(5)</sup>
  - Diadochokinetic rates<sup>(8,13)</sup>
  - Repeat clinical evaluation<sup>(20)</sup>
- › Improved speed and efficiency of mastication<sup>(1)</sup>
  - NOT-S<sup>(21)</sup>
  - Repeat clinical evaluation<sup>(20)</sup>

- › Improved strength and function of tongue and lips at rest and during speech and swallowing<sup>(8,19)</sup>
  - NOT-S<sup>(21)</sup>
  - IOPI<sup>(8)</sup>
  - Dworkin-Culatta Oral Mechanism Examination<sup>(5)</sup>
  - Diadochokinetic rates<sup>(8,13)</sup>
  - Repeat clinical evaluation<sup>(20)</sup>
- › Improved tongue, lip, and jaw differentiation<sup>(13)</sup>
  - Repeat clinical evaluation<sup>(20)</sup>
  - NOT-S<sup>(21)</sup>
- › Increased awareness of mouth and tongue postures<sup>(2)</sup>
  - Self-assessment of symptoms<sup>(20)</sup>

## Maintenance or Prevention

- › According to the findings of one research study conducted in Brazil assessing 69 children, those children with prolonged pacifier use had an increased incidence of OMDs as compared to a control group<sup>(3)</sup>
  - Parents should be alerted to the risk of prolonged pacifier use and attempt to curb this behavior as early as possible, preferably before the age of 3<sup>(3,6,18)</sup>
- › Due to the high prevalence of OMDs in children with orthopedic disorders, early multidisciplinary screening measures should be used in children with posture or gait disturbances to initiate OMT and prevent further progression of an OMD<sup>(7)</sup>

## Patient Education

- › International Association of Orofacial Myology (IAOM) provides information for therapists, parents and patients at the following Web site: <http://www.iaom.com/>
- › The American Speech-Language-Hearing Association (ASHA) is dedicated to the mission of helping people with speech, language, and hearing disorders receive services to help them communicate successfully. Resources for parents about OMDs are located at <http://www.asha.org/public/speech/disorders/OMD.htm>

## Coding Matrix

References are rated using the following codes, listed in order of strength:

<b>M</b> Published meta-analysis	<b>RV</b> Published review of the literature	<b>PP</b> Policies, procedures, protocols
<b>SR</b> Published systematic or integrative literature review	<b>RU</b> Published research utilization report	<b>X</b> Practice exemplars, stories, opinions
<b>RCT</b> Published research (randomized controlled trial)	<b>QI</b> Published quality improvement report	<b>GI</b> General or background information/texts/reports
<b>R</b> Published research (not randomized controlled trial)	<b>L</b> Legislation	<b>U</b> Unpublished research, reviews, poster presentations or other such materials
<b>C</b> Case histories, case studies	<b>PGR</b> Published government report	<b>CP</b> Conference proceedings, abstracts, presentation
<b>G</b> Published guidelines	<b>PFR</b> Published funded report	

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