American Speech-Language-Hearing Association

SPECIAL INTEREST GROUP 5
Craniofacial and Velopharyngeal Disorders

# EVALUATION OF SPEECH DISORDERS ASSOCIATED WITH CLEFT PALATE AND VELOPHARYNGEAL DYSFUNCTION

**Handout to Accompany Poster**
**Developed by Special Interest Group 5 (2014, Updated 2018, 2025)**

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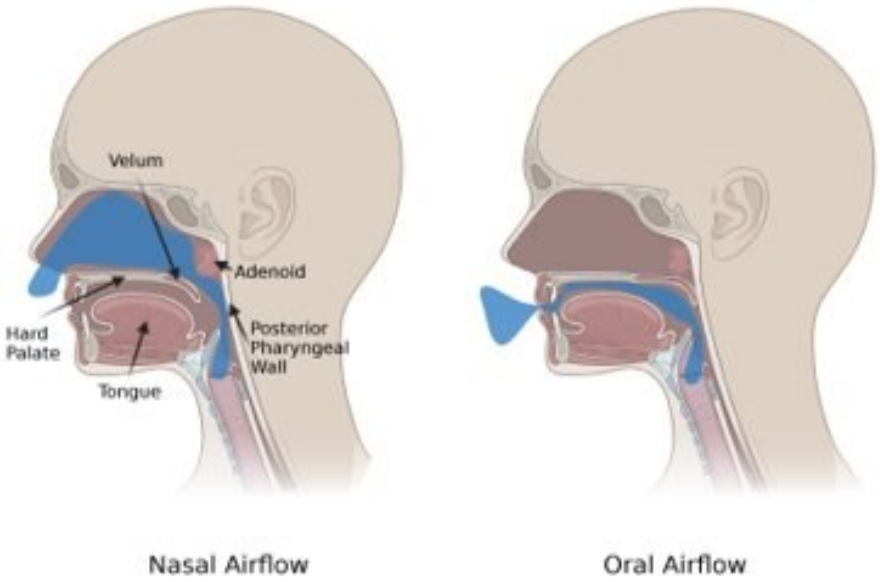
## WHAT IS VELOPHARYNGEAL FUNCTION AND DYSFUNCTION?

The velopharyngeal mechanism is a muscular valve that is made up of the soft palate (velum), the lateral and posterior pharyngeal walls. Contraction of the muscles within these structures provide velopharyngeal closure that is needed for speech and swallowing. At rest and during production of nasal consonants (e.g. /m, n/, etc.), the velum is maintained in a lowered position (Nasal Airflow). When a speaker produces oral pressure consonants (e.g., [p, t, s] etc.), the velum elevates to create a tight seal to close off the nasal cavity above, thus directing airflow out of the mouth (Oral Airflow).

**Velopharyngeal dysfunction (VPD)** is failure of the velopharyngeal mechanism to achieve consistent and complete closure during oral speech tasks. If the velum does NOT elevate properly, hypernasality and/or nasal air emission can occur.



**Velopharyngeal dysfunction may look different at different ages. Some symptoms of VPD at different ages include:**

- **Perinatal/Infancy:** Nasal regurgitation or difficulty feeding, as a precursor to speech difficulties
- **12 months/First Words:** Uses only nasal sounds (m, n, ŋ) and vowels; limited consonant inventory
- **School age/Connected Speech:** Hypernasality, nasal air emission; and/or possibly compensatory (AKA "active" articulation errors)

## CATEGORIES OF VELOPHARYNGEAL DYSFUNCTION

1. **VP Insufficiency**: The VP mechanism does not fully close due to structural differences. It is generally managed with physical alterations (i.e. surgery or prosthetic device). Potential diagnoses include cleft palate, residual VPI following cleft palate repair, adenoidectomy, nasopharyngeal tumor removal, and idiopathic causes.
2. **VP Incompetency**: The VP mechanism does not function properly during speech due to neuromotor and/or motor speech disorders. Diagnoses include traumatic brain injury, cerebral vascular accident (AKA: stroke), cerebral palsy, dysarthria, and/or apraxia of speech. It may be treated surgically, with prosthetic device, speech therapy, or a combination.
3. **VP Mislearning**: This describes a learned speech pattern. Examples of VP mislearning include: phoneme-specific nasal emission, compensatory articulation errors (e.g. glottal stops), and profound hearing loss. This is typically managed through speech therapy.

## RESONANCE CHARACTERISTICS ASSOCIATED WITH VPD

**Normal resonance** is based on having an appropriate balance of sound in the oral and nasal cavities during speech. When there is an imbalance in resonance, this results in a **resonance disorder**. The following are features associated with resonance disorders.

### Types of Resonance Qualities:

- **Hypernasality**: Excessive nasal resonance on vowels and voiced sounds; associated with VPD.
- **Hyponasality**: Too little nasal resonance on /m/, /n/, and /ŋ /; associated with nasal obstruction.
- **Cul-De-Sac resonance**: A muffled quality resulting from anatomic differences in the vocal tract, such as enlarged tonsils
- **Mixed resonance**: A combination of hyper- and hyponasality.

**Obligatory Errors (i.e. "passive" errors) –** are characteristics of a resonance disorder and should be addressed by a cleft palate or VPD team with potential surgery or prosthetic device

- **Hypernasality and/or Hyponasality**
- **Audible or Inaudible nasal air emission**: Abnormal escape of airflow through the nose during speech, which can be secondary to an oronasal fistula or VPD.

- **Weak pressure consonants**: High pressure consonants have reduced intraoral pressure and intensity.

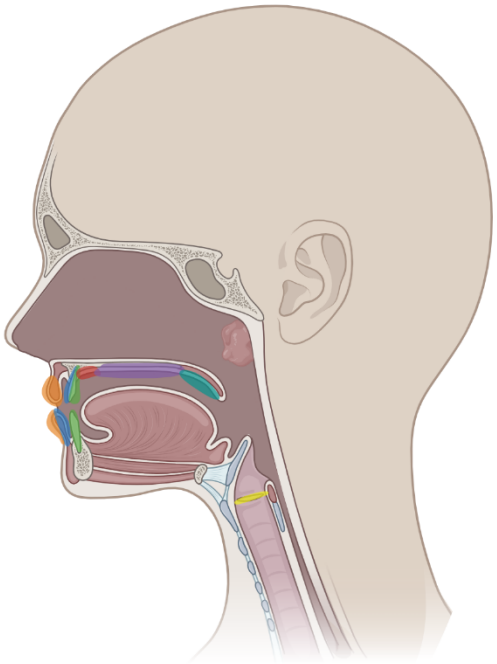
**<u>Compensatory Articulation Errors: (i.e. "active" errors)</u> –** is a speech sound disorder and should be addressed with speech therapy

- These errors involve using the velopharyngeal mechanism in an atypical way by valving airflow outside of the oral cavity.
- They are learned placement errors and usually persist after surgery. Speech therapy is needed to correct them.
- Other types of articulation or phonological errors may also be present, as well as distortions secondary to any malocclusion.

******Obligatory and Compensatory articulation errors CAN co-occur, requiring a **** combination of surgical/prosthetic management and speech therapy to address.**

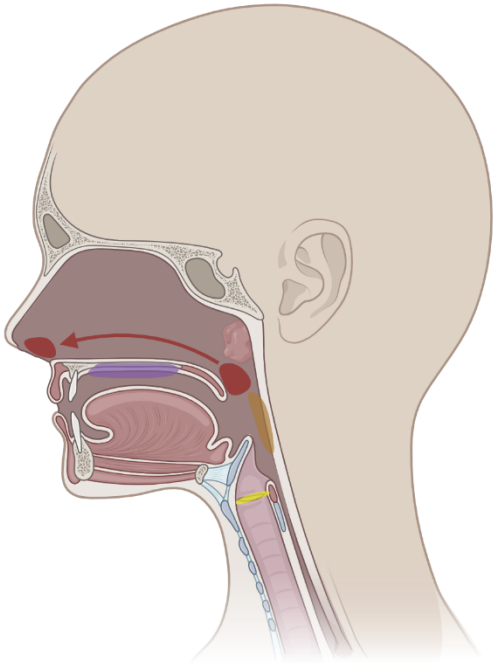
## Commonly used Compensatory Articulation Errors:

1. **<u>Glottal stops</u>** /ʔ/ generally substitute oral stop consonants [p, b, t, d, k, ɡ] and sometimes /h/, but can also replace fricatives and affricates. Glottal stops can be co-produced with any oral placement, meaning the child postures the tongue or lips so that it looks like they are producing the consonant accurately, but is co-producing the glottal stop. Listen closely and be careful not to reinforce co-productions, because these are still errors.
2. **<u>Pharyngeal stops</u>** are usually substituted for velar stops /k/ and /ɡ/. The place of articulation is the base of the tongue against the posterior pharyngeal wall.
3. **<u>Pharyngeal fricatives</u>** often substitute oral fricatives or affricates [f, s, ʃ, ʧ, ʤ] and, less often, stop/plosive consonants. The place of articulation is in the pharynx, with the base of tongue approximating the posterior pharyngeal wall.
4. **<u>Nasal fricatives</u>** are commonly substituted for fricatives or affricates [f, v, s, z, ʃ, ʧ, ʤ] but may also replace other high-pressure consonants. The nasal fricative is a voiceless nasal, articulated with simultaneous exclusive audible nasal air emission (meaning the sound will completely stop if the nares are occluded). The velopharyngeal (VP) port is open, and airflow is directed through the nasal cavity. It can be articulated in any of the three placements for nasals (bilabial, alveolar or velar) or with labiodental placement (like /f/ or /v/). Any of these can be made with co-produced turbulence (snorting sound). Turbulent nasal fricatives are usually produced more posteriorly in the nasal cavity while non-turbulent nasal fricatives are usually produced more anteriorly in the nasal cavity.



Normal Place of Articulation

- Bilabial: /p, b/
- Labiodental: /f, v/
- Interdental: /θ, ð/
- Alveolar: /t, d, s, z/
- Palatal: /ʃ, ʒ, tʃ, dʒ/
- Velar: /k, g/
- Glottal: /h/



Altered Place of Articulation

- Glottal Stops
- Nasal Fricatives
- Pharyngeal Fricatives & Stops
- Mid-Dorsum Palatal Fricatives & Stops

## COMPONENTS OF THE EVALUATION

1. **Perceptual Judgment**: Uses perceptual scales to rate hypernasality, nasal air emission, oral pressure, speech acceptability/intelligibility, etc.
2. **Clinical Assessment of VP Function**: Uses low-tech tools to assess nasal air escape and velopharyngeal closure (e.g. straw/listening tube, nasal mirror, nasal occlusion, or See-Scape).

3. **Articulation Evaluation**: Uses spontaneous connected speech and a structured speech sample to identify and transcribe compensatory errors, developmental errors, and obligatory errors related to anatomy/structure.
4. **Oral Exam**: Evaluates the lips, tongue, jaw, palate, and dentition. Checks for presence of fistulae, malocclusion, submucous cleft palate (features may include: bifid uvula, bony notch at the junction of the hard and soft palate, blue-grey line along velum's midline, or tenting during phonation). Note that scarring related to surgical history may be present.
5. **Instrumentation**: * Uses the nasometer to measure the relative amount of oral and nasal sound intensity during speech. Pressure flow techniques can also quantify air leakage through the nose with high pressure consonants.
6. **Imaging**: * Uses nasopharyngoscopy, videofluroscopy, and/or MRI to quantify and visualize velopharyngeal closure, size of velopharyngeal opening/nasopharynx, pattern of closure, consistency of velopharyngeal closure, and adenoid/tonsillar tissue. An MRI can assess integrity of palate musculature and provide measurements on specific velopharyngeal dimensions.

*delineates procedures in which specialized equipment from the cleft or VPD team is needed

**Bottom Line:**
**No single measure provides all necessary information. Instrumentation and imaging selection should be completed as needed for treatment planning. Refer to a Cleft Palate or VPD team for full evaluation of velopharyngeal function.**

## SPECIFIC EVALUATION TECHNIQUES FOR DIFFERENTIATING VP INSUFFICIENCY AND VP MISLEARNING

**Velopharyngeal Insufficiency**: Speech characteristics are consistent across phonemes and articulator placement is accurate. Surgical intervention or prosthetic device is needed.

- Vowels – listen for hypernasality on all vowels. High vowels /i/ and /u/ are more prone to hypernasality
    - Use nasal flutter testing – have child sustain vowels while opening and closing the nose to listen for resonance shifts.
- Oral pressure consonants – listen for hypernasality (voiced consonants), nasal air emissions, weak oral pressure build-up
    - Use nasal mirror to look for consistent "fogging" or air on the mirror during production of oral pressure phonemes
    - Listen with straw placed by the child's nose for leakage of air or increased nasal resonance during oral productions (e.g. "Buy baby a bib" or "A fly fell off a leaf")
    - Nasal occlusion – plug the nose to listen for improved intraoral pressure; sounds will be more clear with nares occluded if VPI is present
- Nasal phonemes – listen for hyponasality with nasal loaded sentences (e.g. "Mama made lemonade")

**Velopharyngeal Mislearning**: Speech characteristics are inconsistent across phonemes (i.e. phoneme specific nasal emissions) and articulator placement is NOT accurate. Speech therapy is needed.

- Child is producing sounds in the throat or pushing air through the nose (see compensatory articulation error descriptions).
- "Fogging" of a nasal mirror or air heard through listening tube only present during errored oral phonemes and NOT present for other correctly articulated phonemes
- Nasal occlusion results in sound "stopping" or becoming trapped in the nasal cavity

******Velopharyngeal Insufficiency and Velopharyngeal Mislearning CAN co-occur******

DIAGNOSTIC CONSIDERATIONS

- Nasal congestion and/or dysphonia can mask VPD
- Child must be behaviorally mature enough and have an adequate speech sample of correctly articulated pressure sounds to participate in VPD imaging (if indicated) - typically at least 3 years of age.
- Limited correctly articulated speech or low spoken output may inhibit differential diagnosis. Progress in speech therapy may be necessary before re-evaluation.
- Some compensatory articulation errors such as glottal stops will not sound different with nares occluded.

## MANAGEMENT ROUTES: SURGICAL, PROSTHETIC, AND THERAPEUTIC

**Considerations for Physical Management of Velopharyngeal Dysfunction:**

1. Manage VPD as soon as it is diagnosed and a treatment plan is developed.
2. Management may involve physical and/or behavioral treatments.
3. The best gains in behavioral management typically come after physical management. HOWEVER, initiation of behavioral management should not be dependent on completing physical management.

### Surgical Management:

- **Pharyngeal Flap**: Creates a bridge of tissue and muscle from the midline of the velum to the posterior pharyngeal wall. Surgery results in two openings (i.e. "ports") on either side of the flap to allow nasal airflow.
- **Sphincter Pharyngoplasty**: Uses muscle and tissue in the throat to narrow the space in the velopharynx in a sphincter-like (circular) fashion. Surgery results in approximating the lateral pharyngeal walls centrally and posterior pharyngeal wall anteriorly to create one smaller velopharyngeal opening.
- **Palatal re-repair**: Several different types of re-repairs may be used to lengthen the palate and re-orient the levator muscles in a child with a repaired cleft. One example is a Furlow palatoplasty (i.e. "Z-plasty").

- **Buccal Myomucosal Flaps**: Lengthens the palate by interposing buccal myomucosal tissue between the hard and soft palate. This brings the palate closer to the posterior pharyngeal wall, making contact more likely.
- **Posterior pharyngeal wall fat grafting**: Autologous fat grafting to the posterior pharynx to approximate it anteriorly (toward the velum).

### Prosthetic Management:

**Speech Bulb/Obturator**: Makes up for tissue deficiency
**Palatal Lift**: Makes up for palatal movement deficiency

### Therapeutic Management:

- Is both diagnostic and therapeutic.
- Establishes oral articulation prior to management of VPD (oral airflow and resonance can sometimes improve with improved place of articulation).
- Goals of speech therapy in this population are to normalize articulatory placement and/or airflow direction.
- Therapy tasks using non-speech oral motor exercises (NSOMEs) are inappropriate and ineffective.

### Refer to a Cleft Palate or VPD Team, if...

- Obligatory Features are present (ie hypernasality, weak pressure consonants, and/or audible nasal emission) with age-appropriate articulation
- Hypernasality, audible nasal emission, and articulation errors are present
- Phoneme-specific nasal emission or other compensatory articulation errors are present with lack of progress in speech therapy

If you suspect **ANY** hypernasality (even without evidence of a cleft palate), **refer the patient to a local cleft or VPD team!** Delayed identification and delayed management results in decreased outcomes.

**Use of this Handout, or information it contains, should be cited as follows:**

ASHA Special Interest Group 5. Evaluation and Management Techniques for Speech Sound Disorders Associated with Cleft Palate and Velopharyngeal Dysfunction. Handout to accompany poster. Developed in 2014, updated in 2018 & 2025.

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