EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT VOICE AND RESONANCE DISORDERS BUT WERE AFRAID TO ASK... (I.E. THE MARY AND MARC VELUM AND LARYNX SHOW)

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So where do we start?
Anatomy

- **Structures**
  - Hard palate
  - Palatine raphe/posterior nasal spine
  - Soft palate/velum
  - Uvula/musculus uvulae
  - Anterior faucial arches (palatoglossus)
  - Posterior faucial arches (palatopharyngeus)
  - Palatine tonsils
Anatomy

- Nasal Cavity
- Palate
- Oral Cavity
- Lips
- Tongue
- Pharynx
- Epiglottis
- Larynx
- Esophagus
- Larynx opening into pharynx

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Muscles
- Palatine aponeurosis
- Tensor veli palatini
- Levator veli palatini - muscle repaired at the time of surgery
- Palatoglossus
- Palatopharyngeus (palatothyroideus)
- Musculus uvulae
- Superior constrictor - lateral wall movement
Perceptual exam

- Performed by a Speech Pathologist
- The Gold Standard for the diagnosis of velopharyngeal dysfunction
- Need imaging to determine intervention.
Oral motor exam

- Head/neck: ears, torticollis, cranial vault
- Face: structures, symmetry, sensation
- Mandible: structure, ROM, strength testing
- Dentition: occlusion, missing teeth, dentures
- Tongue: structure, strength, ROM, RAM
- Palate: uvula, fistula, length, distance to posterior pharyngeal wall, Passavant’s ridge, mesial movement of lateral pharyngeal walls, gag response.
Left unilateral cleft lip and palate
Bilateral cleft lip and palate
Cleft palate only
Oronasal fistula

Communication between the oral and nasal cavities

- Can complain of nasal regurgitation
- May be difficult to see or tell if truly communicates
- Often no effect on speech resonance
- Gum test
Submucous cleft palate

- bifid uvula
- zona pellucida (thin, blue-tinged mucosa)
- posterior nasal spine notching
- lateral levator muscle bulges
- +/- hypernasality
- nasal regurgitation with liquids
- Occult cleft-absent musculus uvulae
Velopharyngeal valve

Soft palate (velum) contacts posterior pharyngeal wall to transmit air pressure and sound energy into the oral cavity for oral consonant and vowel productions. Normal valving allows adequate intra-oral air pressure, normal oral resonance and sufficient breath support for normal length of utterance. Structural defect MAY interfere with closure.
Speech perceptual exam

- Articulation-place and manner, compensatory misarticulations
- Resonance-nasality
- Phonation-quality, consistency
- Prosody-inflection, timing, rate
- Speech intelligibility rating (4 point scale)
- Speech acceptability rating (4 point scale)
Velopharyngeal dysfunction (VPD) or Velopharyngeal Inadequacy (VPI) - absence of closure of velopharyngeal port with hypernasality, nasal air emission. Variety of causes. Average 5%-25% of cleft children have resonance disorder. Needs further workup.
Hypernasality

- If normal resonance, all consonants and vowels produced orally except m and n. Velopharynx closed with no air into nasal cavity. All breath support for speech directed orally.

- If air leak into nose results in hypernasality, nasal emission, nasal turbulence and/or nasal grimace.

- Impaired velopharyngeal closure most common etiology for hypernasality; oronasal fistula MAY cause hypernasality/nasal air emission.
Velopharyngeal dysfunction (VPD) or velopharyngeal inadequacy (VPI) without presence of a cleft:
- R/o submucous or occult cleft
- Articulation disorder
- S/p adenoidectomy
- Velocardiofacial syndrome (DiGeorge syndrome, 22q11 deletion) “the black hole”
Velopharyngeal insufficiency

- Palate too short
- Structural problem
- Not enough tissue at time of initial cleft repair
- Submucous cleft (SMC)
- Deep pharynx due to cranial base anomalies
- Following adenoidectomy

Needs surgery to correct.
Velopharyngeal closure using adenoid
Velopharyngeal incompetence

- Reduced movement of soft palate
- Physiological cause
- Poor muscle function
- Pharyngeal hypotonia
- Velar paralysis or paresis
- Dysarthria
- Apraxia
## Manifestations of VPD

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Resonance disorders

- Resonance descriptors (don’t say “nasally speech”)
  - Hypernasality—especially on vowels and voiced oral consonants
  - Hyponasality/denasality—too nasal resonance /m, n, ng/
  - Cul de sac resonance (hypertrophied tonsils/adenoids)
  - Mixed resonance-hyper- and hyponasality (congestions, deviated/deflected septum)
  - Audible nasal turbulence; nasal rustle
  - Phoneme specific VPD
Hypernasality

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Oral consonants

- High pressure consonants:
  \[ p, b, t, d, k, g, s, z, sh, ch, j \]

- Low pressure consonants:
  \[ r, l, w, h, y \] and vowels

High pressure consonants may be weakened or nasalized with VPD.
Hyponasality

Nasal consonants /m/ /n/ /ng/

- Velopharynx open allowing consonant to resonate through nose
- Sensitive to nasal obstruction
- Only nasal consonants effected by hyponasality
- Causes /m/ to sound like /b/, /n/ to sound like /d/ and /ng/ to sound like /g/.
- Reduced nasal emission with mirror on nasal productions
Mixed resonance

- Evidence for both hypernasality due to velopharyngeal dysfunction and hyponasality due to often nasal obstruction
- Often reduced nasal air emission from one naris on mirror exam
Phoneme specific nasal emission (PSNAE)

- Hypernasality or nasal air emission due to articulation error pattern
- Not physical etiology; otherwise normal resonance; competent VP mechanism
- Causes phoneme-specific nasal emission (usually sibilant sounds).

**Never surgery-always speech tx**
Assessing resonance with oral consonants

- Cul de sac testing (Bzoch, 1979) produce the oral words/sentences with the nose open then with the nose closed. If normal resonance, will be identical productions.

- Nasal mirror testing under nares for nasal emission (speech and non speech tasks).
Assessing resonance

- Modified tongue anchor technique: puff cheeks around protruded tongue (Dalston, 1990).
- See-scape
- Nasal tubing/stethoscope
- Assess for presence of compensatory misarticulations
- **Repeat standardized words, sentences, serial counting and spontaneous speech sampling .**

**See word/sentences lists at end of presentation**
Articulation issues and clefting

- Cleft lip/ alveolus only-normal incidence of articulation errors unless untreated hearing deficits
- Hearing impairment
- Incidence of developmental articulation errors similar
- Compensatory misarticulation errors (generally backing of place of articulation in vocal tract with nasal air flow for oral productions)
- Abnormal dentition/occlusion
- Due to inability to achieve velopharyngeal closure
- Mislearning errors (structural or unrelated to cleft)
- Substitutions and omissions more common than distortions
Compensatory misarticulations

Maladaptive articulation pattern that occurs in individuals who have velopharyngeal dysfunction. Articulation valving occurs more posterior in the vocal tract to compensate for reduced intraoral air pressure.

- Glottal stop
- Pharyngeal stop
- Pharyngeal fricative
- Laryngeal fricative
- Velar fricative
- Mid-dorsum palatal stop
- Posterior nasal fricative/nasal turbulence

Often accompanied by a nasal grimace.
Compensatory misarticulations

- Glottal stop
- Pharyngeal fricative
- Pharyngeal stop
- Velar fricative
- Mid-dorsum palatal stop
Active vs. passive errors

- Obligatory vs. compensatory
- Both have structural origins (esp. VPD)
- **Passive/obligatory errors**: hypernasality, nasalized oral consonants, weak pressure consonants. **Disappear when structure corrected.**

- **Active/compensatory errors**: e.g. glottal stops. Active attempt to compensate for structural deficit. **Persist when structure corrected.**

Phonation and VPD

- Hoarseness associated with hyperfunction of the larynx = vocal abuse, check for nodules
- Hypophonia - due to nasal emission have reduced loudness or may be masking audible nasal turbulence/emission
- Periods of aphonia
Decision time...

Speech Perceptual Exam

- Sound-specific VPI
  - Speech Therapy
- VP Insufficiency
  - Surgery
- VP incompetence
  - Almost but not quite closed/Inconsistently closed
    - Speech Therapy
  - Moderate to large gap/never closes
    - Palatal Lift or surgery
Medical interventions for resonance disorders

- Surgical Management is indicated when:
  - hypernasality is caused by structural or physiological abnormality
  - moderate to large velopharyngeal gap
  - velopharyngeal insufficiency
  - hyponasality.
Velopharyngeal Insufficiency: needs surgery
Velopharyngeal Insufficiency: needs surgery
VPD: Needs resonance therapy
(pre- and post-tx example)
Speech language pathology management

- Hypernasal resonance is associated with oral-motor dysfunction/dysarthria
- Hypernasality occurs primarily when the child is tired
- The child is status-post secondary palatal surgery and needs therapy to increase lateral wall motion, closure of DSP port or increase elevation of the palate during speech
- Cooperative with adequate cognitive skills
Resonance therapy techniques

- **Don’t blow it!**
  - Blowing and sucking exercises help blowing and sucking
  - Blowing exercises do not improve velopharyngeal strengthening
  - Blowing can be used to assist with the idea of oral air stream that can then be valved with articulators
  - Blowing bubbles to stimulate for bilabials and oral air flow
Resonance therapy techniques

- Auditory discrimination-
  - hypernasality
  - audible nasal turbulence
  - nasal snort
  - hyponasality
Resonance therapy techniques

- **Exaggerated articulation** -
  - increasing ROM of the articulators may assist with increasing palatal closure with increased muscle recruitment
  - generally slow down rate of speech to improve velopharyngeal closure and coordination
Resonance therapy techniques

- **Visual feedback**
  - See-Scape (AliMed, SuperDuper, Pro-Ed) or nasal mirror for monitoring nasal air emission
  - tissue, tissue paper or paper paddle for oral air flow with plosives
  - feather for oral air flow with fricatives
  - Nasometer (acoustic measurement with visual feedback-Kay Pentax)
  - biofeedback nasoendoscopy (direct visual feedback of velopharyngeal closure).
Resonance therapy techniques

**Auditory training:**
- listening tube (fish tank tubing or flexible straw)
- microphone VU meter or feedback via the speakers (microphone by the mouth or the nose)
- audible nasal turbulence
- negative practice (purposeful hypernasal speech then purposeful oral production)
- cul-de-sac training - match oral productions with and without the nares pinched off
Resonance therapy techniques

- **Tactile training:**
  - feel airflow on hands
  - feel nasal air flow from nares
  - feel vibration on side of nose with audible nasal turbulence only with voiced consonants
  - yawning followed by vowel-target consonant (flattens base of tongue and elevations soft palate)
Resonance therapy techniques

- **Awareness training:**
  
  Teach concepts that child can understand to describe oral/nasal airflow for example:
  
  - Mr. Mouth/Mr. Nose
  - Mouth and nose sound
  - ”Make the wind come out of your mouth”
  - Throat sound or voice box sound
Resonance therapy

- **Therapy note:** If persisting hypernasality or nasal emission after a few months of tx, child should be referred to a specialist for further assessment and consideration of physical management. Don’t keep in tx and continually asked to perform a speech task that is impossible to do.
Compensatory misarticulation therapy

- Articulation therapy note: Articulation therapy can be effective for place of articulation even if a surgery is still needed to reduce velopharyngeal dysfunction or a oronasal fistula.
Compensatory misarticulation therapy

- **Accuracy training:**
  - Reinforcing place of articulation with exaggerated articulation, may recruit palatal musculature to increase ROM. Has potential to achieve velopharyngeal closure ONLY if competent.
Compensatory misarticulation therapy

- **Phoneme hierarchy in therapy:**
  - Train front sounds prior to back sounds
  - Voiceless before voiced phonemes
  - Basic articulation therapy rules apply too (introduce sounds in developmental hierarchy, begin with sounds in isolation then C-V, V-C and C-V-C contexts, etc)

**Note:** work with sounds the child can produce to identify target sound selection
Compensatory misarticulation therapy

- **Techniques:**
  - Whispering (eliminates glottal stops)
  - Forward tongue placement (eliminate pharyngeal fricatives)
  - Pair /h/ with target phonemes
  - Introduce new sound that changes one feature of sound child can produce (t→d, m→b)
  - OK to use nonsense words briefly for early practice
Compensatory misarticulation therapy

- Techniques-continued
  - Build list of short words with correctly produced sounds to practice as warm up and to “remind” child of correct productions
  - Target at least 50 correct productions in a 30 minute session with toddlers; 100 correct productions with school aged children
Compensatory misarticulation therapy

- **Glottal stops**
  - Whisper with over aspiration
  - Emphasize fronted productions
  - Voicing at the end of syllable with gradual VOT
  - /h/ plus target labial or lingual oral placement
  - Produce nasal counterpart then plug nose (m→b, n→d, ng→g); then use partial nares occlusion
  - Use awareness training and be specific where to place tongue/lips and how to direct air stream
Home program

- Parent(s) need training to hear correct productions for reinforcing
- Daily practice
- Short practice sessions (30-60 seconds) several times per day
- Reinforcing for self-monitoring/corrections
Craniofacial Team

- Plastic Surgery
- Maxillofacial Surgery
- Orthodontics
- Pediatric Dentistry
- Prosthodontics
- Speech Pathology
- Audiology
- Social Work
- Psychology
- Genetics
- Dietitian
- Nursing
- Neurosurgery
- Otolaryngology
- Coordinator
- Community Professionals
Larynx

- **Cartilaginous tube**
  - Connects inferiorly to respiratory system
    - Trachea, lungs
  - Connects superiorly to vocal tract
    - Pharynx, oropharynx, nasopharynx

- **Anatomic orientation important**
  - Highlights interactive relationship between vocal subsystems
    - Pulmonary mechanism
    - Laryngeal valve
    - Supraglottic vocal tract resonator
Larynx

- Communicative function of larynx relies heavily on integration of these vocal subsystems
  - Lungs
    - Provides aerodynamic tracheal pressure that blows vocal folds apart and sets them into vibration
  - Vocal folds
    - Provide sound source for phonation as vocal folds repeatedly oscillate during vibration
  - Vocal tract
    - Shapes and filters acoustic energy to produce sound recognized as human voice
Larynx

- Differential dx of voice disorders requires assessment of these parameters
  - Laryngeal health/function will influence quality of voice production
  - Compromised respiratory support will decrease potential for adequate VF vibration
  - Alteration in shape/size of vocal tract will affect resonance

- Compromise in any area will adversely affect optimal production of voice and increase risk for development of voice problem
Schema of Vocal Subsystems
Larynx

- Complex arrangement of cartilages, muscles, mucous membranes, and connective tissues
  - Allows for wide degrees of variation in position, movement, and tension to support three basic functions
    - Airway preservation for ventilation
    - Airway protection to block/repel environmental infiltrates
    - Phonation for communication or singing
  - Cartilage housing serves as columnar protective shield for laryngeal valve
Larynx

- Laryngeal valve achieves these functions through three levels of “folds”
  - Aryepiglottic
  - False vocal folds
  - True vocal folds
Neurologic Supply

- Cranial nerve X innervates larynx peripherally
  - Vagus = “wanderer”
  - Innervates sites from skull to abdomen

- Innervates larynx through two important branches
  - Superior laryngeal nerve (SLN)
    - Branches off vagus near nodose ganglia in neck
    - Courses alongside carotid arteries
    - Forms internal/external branches
      - Internal branch provides all sensory information to larynx
      - External branch is motor nerve to cricothyroid (CT) muscle
  - Recurrent laryngeal nerve (RLN)
    - Extends to thorax
    - Forms long loop under heart before coursing superiorly under thyroid gland and into larynx
    - Different on right/left sides of body
    - Nerves (especially left) susceptible to injury
    - Supplies all sensory information to area below VFs and all motor innervation to PCA, TA, LCA, and IA muscles
Schema of Laryngeal Innervation

- Vagus (CN X) Nerve
- Right
- Left
- Nodose ganglion
- Pharyngeal branch
- Superior laryngeal nerve (SLN)
- Internal branch (SLN)
- External branch (SLN)
- Cricothyroid membrane
- Common carotid artery
- Left recurrent laryngeal nerve
- Right recurrent laryngeal nerve
- Subclavian artery
- Aorta
- Hyoid bone
- Thyrohyoid membrane
- Thyroid cartilage
- Thyroid gland
Respiration for Phonation

- VF vibration is sound source for phonation
- Phonation dependent on respiratory power provided by lungs and abdominal/thoracic musculature
  - Inferior border of lungs attached to diaphragm by double-walled pleural lining
  - During inhalation, diaphragm contracts thus compressing viscera and pulling lungs inferiorly allowing for expanded lung volume
  - As lung volume expands, air passively drawn into lungs
  - During exhalation, passive elastic recoil/other musculature forces air out of lungs
  - Air moved superiorly through VFs/vocal tract
  - During exhalation for voice/speech, VFs adduct to midline thus constricting outgoing airflow
  - Resulting aerodynamic energy sets VFs into oscillation creating vibratory sound that comprises phonation
Vocal Tract Resonance

- Sound waves from larynx pass through supraglottic air passage into pharynx, oropharynx, and nasopharynx
- Also move articulators including velum, hard palate, tongue, and teeth
- Excitation of air molecules within these spaces creates a phenomenon called resonance
Etiologies of Voice Disorders

- Etiology: the science that deals with the causes or origin of diseases or conditions
  - e.g., "the etiology is unknown" translates into we don’t know the cause

Medicine.net. Accessed 2/8/10
Etiologies of Voice Disorders

West, Kennedy, and Carr (1937)

There is always a reason for a voice disorder

- SLP’s job is to find cause(s)
  - Sometimes easy
    - VF nodules in a screamer
  - Sometimes hard
    - Differential Dx of ADSD vs. Functional dysphonia vs. subtle VF motion disorder

Successful outcome dependent on clinician’s ability to determine cause(s) based on number of reference points
Major Categories of Etiologic Correlates

- **Voice misuse**
  - Phonotrauma
  - Inappropriate vocal components
- **Medically related disorders**
  - Direct surgery
  - Indirect surgery
  - Chronic illnesses and disorders
- **Primary disorder etiologies**
- **Personality-related disorders**
Medically related disorders

- Direct surgery
  - Laryngectomy
    - Total, hemi-, supraglottic, supracricoid
  - Glossectomy
    - Hemi-, anterior, posterior, total
  - Mandibulectomy
    - Total, partial
  - Maxillectomy
    - Total, partial
- Other head and neck surgeries
  - Composite resection, Radical neck dissection
Medically related disorders

- Indirect surgery
  - Thyroidectomy
    - Partial versus total
  - Hysterectomy
    - May result in temporary/permanent lowering of pitch secondary to hormonal changes
  - General anesthesia/endotracheal tube
    - Can result in mechanical trauma to VFs/trauma to posterior larynx
- Cardiac Surgery
  - Emergent versus planned
- Cervical spine surgery
- Carotid endarterectomy
- Skull base surgery
Chronic illnesses and disorders

- Sinusitis/URIs
- Asthma, COPD, lung CA
- Allergies
- Laryngopharyngeal reflux disease
- Emotional Disorders
- Endocrine Dysfunction
- Smoking, alcohol, and drug abuse
Personality-related Disorders

- Environmental stress
  - Dysphonia secondary to occurrences that cause emotional/physical stresses
    - Loss of employment
    - Death of spouse/significant other
    - Family conflict

- Conversion behaviors
  - Dysphonia as psychological reaction to stressful situation
    - Avoidance behavior(s) developed to counteract stressful situation(s)
      - Whispering, muteness, unusual dysphonias

- Identity conflict
  - Dysphonia secondary to difficulty in establishing individual’s personality
    - High-pitched falsetto in post-pubescent adolescent
    - Weak, juvenile, thin-sounding voice of adult female
    - Increase in fundamental frequency in male-to-female transsexual patient
Pathologies of the Laryngeal Mechanism

- Voice disorder present when perceptual attributes of individual’s voice differ from those of similar age, geographical location, and cultural background.
- Range of etiologies of voice disorders large; differences may arise from variety of factors:
  - Structural, medical, or neurological changes in respiratory, laryngeal, and vocal tract mechanisms
  - Maladaptive or inappropriate voice use
  - Psychogenic factors
Complimentary relationship among various physical, voice use, and psychogenic influences ensures that . .

- Most voice disorders/laryngeal pathologies will have contributions from more than one etiologic factor
- There is considerable overlap among these three groupings
Pathologies of the Laryngeal Mechanism

- Inappropriate vocal behaviors/excessive vocal demands may generate organic pathology
- Psychological trauma/excessive emotional stress may accompany onset of laryngeal dystonia (ADSD/ABSD)
- Voice/laryngeal disorders emerging after URI may persist long after same has resolved
Pathologies of the Laryngeal Mechanism

- Previous examples highlight overlap of original etiologic factor with secondary behaviors that maintain voice problem
- Because of the above, intervention strategies are also eclectic and can include:
  - Medical/surgical management
  - Voice rehabilitation
  - Psychological intervention
  - Combination of the above
Pathology Classifications

- Structural changes in the vocal fold
- Neurogenic voice disorders
- Systemic disease contributors to laryngeal pathologies
- Disorders of voice use
- Idiopathic voice disorders
Structural Changes in the Vocal Folds

- Pathologies of the VFVs include any that cause alteration in histological structure of VFVs.
- Changes in mucosal layers or vocal fold muscle body will affect:
  - Mass, size, stiffness, flexibility, and tension of vibrating mechanism
  - Glottic closure pattern during vibration
- Any one of these vocal fold changes has potential to alter:
  - Vocal quality
  - Pitch
  - Intensity
Structural changes of the vocal folds

- **Nodules**
- Polyps
- Vocal fold hemorrhage/varix
- **Reinke’s edema/polypoid degeneration**
- Laryngitis: acute/chronic
- Granuloma/contact ulcer
- Congenital/acquired cysts
- Papilloma
- Congenital/acquired webs
- **Sulcus vocalis**
- **Presbylaryngeus**
- Leukoplakia and hyperkeratosis
- VF carcinoma

** Voice therapy primary intervention
Vocal Fold Nodules
Vocal Fold Polyps
Vocal Fold Varix/Hemorrhage
Reinke’s Edema
Laryngitis
Contact Granuloma/Ulcers
Congenital/Acquired Cysts
Laryngeal Papilloma
Congenital/Acquired Webs
Sulcus Vocalis

Freq: --
Amp: 75 dB.
Presbylaryngeus/Vocal Fold Bowing
Leukoplakia/Hyperkeratosis
Laryngeal Carcinoma
Pathology Classifications

- Neurogenic voice disorders
  - **Unilateral vocal fold paralysis
  - Bilateral vocal fold paralysis
  - Adductor spasmodic dysphonia
  - Abductor spasmodic dysphonia
  - **Essential vocal tremor
  - **Myasthenia gravis
  - Multiple sclerosis
  - Huntington’s chorea
  - **Parkinson’s disease
  - Amyotrophic lateral sclerosis

** Voice therapy primary intervention
Pathology Classifications

- Systemic disease influences on the larynx and voice
  - Pharmaceutical effects
  - Growth hormone influences
  - Thyroid function influences
  - Sex hormonal imbalances
  - Rheumatoid arthritis
  - Allergies
  - Candida
  - Respiratory diseases
  - Reflux disease
Pathology Classifications

- Disorders of voice use
  - Muscle tension dysphonia
  - Vocal Fatigue
  - Vocal abuse/misuse
  - Ventricular phonation
  - Puberphonia/mutational falsetto
  - Transgender voice
  - Conversion aphonia
Pathology Classifications

- Idiopathic voice disorders
  - Paradoxical vocal fold motion
  - Chronic cough
    - Above are components of Irritable Larynx Syndrome along with Muscle Tension Dysphonia and Globus sensation
- Subglottic stenosis
- Laryngomalacia
The Voice Evaluation

- Primary objectives:
  - Discover etiologic factors associated with development of voice problem
  - Describe deviant vocal symptoms
The Voice Evaluation

Components of the diagnostic voice evaluation

- Medical examination
- Patient interview
- Perceptual evaluation of voice
- Instrumental analysis
  - Acoustic/aerodynamic analyses
- Functional evaluation of vocal fold movement
The Voice Evaluation

- Team members
  - Otolaryngologist
  - Voice pathologist
  - Singing voice specialist
  - Neurologist
  - Allergist
  - Endocrinologist
  - Pulmonologist
The Voice Evaluation

- **Otolaryngologist**
  - Examines larynx for pathology
  - Provide Dx for voice problem
  - Determines mode of treatment

- **Voice pathologist**
  - Identifies cause(s) of voice disorder
  - Evaluates vocal symptoms
  - Establishes improved voice through use of various therapeutic techniques

- **Singing voice specialist**
  - Evaluates efficiency/correctness of performance technique
  - Suggests modifications as needed
The Voice Evaluation

- Neurologist
- Endocrinologist
- Allergist
- Pulmonologist

- Above medical professionals consulted as needed to aid in diagnosis/management of vocal issues
Medical Examination

- Detailed history of problem
- Head and neck examination
  - Otoscopic evaluation
  - Examination of oral/nasal cavities
  - Palpation of salivary/thyroid glands and lymph nodes
  - Visual examination of larynx
    - Indirect laryngoscopy
    - Fiberoptic laryngoscopy
    - Direct laryngoscopy
- Pertinent medical history
- Other tests as indicated
  - Radiographs, CT, MRI of head/neck
  - Blood analyses
  - Swallowing studies
Voice Pathology Evaluation

- Patient interview
- Questionnaire/QOL Survey
- History of problem
- Medical history
- Social history
- Oral mechanism examination
- Evaluation of voice components
  - Respiration, phonation, resonance, pitch, intensity, rate
- Instrumental analysis
  - Acoustic/aerodynamic analyses
- Functional evaluation of vocal fold movement
  - Flexible endoscopy
  - Videostroboscopy
- Impressions
- Prognosis
- Recommendations
History

- History of Problem
  - Place all of the information obtained during your patient interview into chronological order

- Medical History
  - Patient interview
  - Medical chart review
  - Information from physician consult
  - Review of outside records

- Social History
  - Obtain information from social/work spheres that may have adverse impact on vocal/laryngeal function
    - Change in family dynamics
    - Change in employment status
    - Death in family
  - Levels of stress secondary to above?
Evaluation of Vocal Components

- **Respiration**
  - Diaphragmatic versus clavicular/thoracic focus
  - Degree of upper chest/shoulder/neck tension

- **Phonation**
  - Qualitative disturbances
  - Ability to maintain steady pitch
  - Consistent versus inconsistent

- **Resonance**
  - Hypo/hypernasal, cul-de-sac, etc.

- **Pitch**
  - Too high/too low
  - Limited in range?
  - Can patient vary the same?
  - Does the voice change with changes in pitch?

- **Intensity**
  - Too loud/too soft
  - Patient’s ability to vary intensity
  - Any associated vocal changes with variation?

- **Rate**
  - Too fast/too slow, changes prior to evaluation, coordination w/respiration
Case Study

- 64-year-old male
- Medical dx of acute necrotic pancreatitis
  - 2-month hospitalization
- Subsequently underwent elective cholecystectomy
  - Multiple complications
  - Extended second hospitalization
  - Multiple intubations/extubations
- Decline in voice subsequent to hospital discharge
- Seen by Otolaryngology/Head and Neck Surgery
  - Dx of right vocal fold granuloma
  - Tx’d with anti-reflux measures
  - Referral to Speech Pathology for videostroboscopy
Videostroboscopy

- Vocal fold mobility within functional limits bilaterally
- Right vocal fold markedly erythematous
- Irregular configuration to body of right vocal fold
- Edge of right vocal fold irregular
- Glottic closure incomplete given edge irregularity of right vocal fold
- Amplitudes of vibration/mucosal waves absent on right vocal fold
- Vocal fold vibration asymmetric
Marc’s Fab Video Clip
Recommendations

- Follow-up with Otolaryngology/Head and Neck Surgery given concerning appearance of right vocal fold
  - Biopsy right vocal fold
- Continue with anti-reflux measures per physician orders
- Follow-up with Speech Pathology per Otolaryngology
Results

- Biopsy positive for T1a N0 M0 moderately differentiated squamous cell carcinoma of the right vocal fold
- Underwent definitive XRT using IMRT
- Post-tx, seen by Speech Pathology X2 for voice therapy
  - Vocal warm-ups/cool downs
    - Lip trills
    - Pitch glides/steps on /oo/
  - Vocal Function Exercises (Stemple)
References


Golding-Kushner, K. Therapy Techniques for Cleft palate Speech & Related Disorders, Singular Thomas Learning, San Diego, 2001


Peterson-Falzone, S., Hardin-Jones, M., Karnell, M., Cleft Palate Speech, 3rd Ed., Mosby, St. Louis, 2001


www.cleftline.org (Cleft Palate Foundation)
Nasal words and sentence stimuli

- Mama, me me, new new, no no, inga inga
- Mama made some lemon jam.
- Nancy is a nurse.
- The monkey had a banana.
- Hand the mean dog some meat.
- The swing is neat and clean.
- Many men walked many miles.
- Amanda came from Maine.
- Santa came when the snow fell.
- Jane came in when the phone rang.
Oral sentences

- Buy a baby bib.
- Pop a bubble.
- Purple paper
- Daddy did it.
- It’s too tight.
- Go get it.
- Cookie and cake
- Chocolate chip cookies
- Dick took Patty.
- Peter had a puppy.
- Buy a baby bib.
- Tell Dad to do it.
- Katy had a cookie.
- Go get a big egg.
- I see a black dog.
- Zippers are easy.
Sissy sees the sky.
Shoes and socks
Stop the bus.
Should I wash the dishes?
Zippers are easy to close.
Jack had a magic badge.
Chad’s teacher was at church.
Check your watch.
Chocolate chip cookies are delicious.
Go get a big egg.
Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V)

The following parameters of voice quality will be rated upon completion of the following tasks:

1. Sustained vowels, /a/ and /i/ for 3-5 seconds duration each.

2. Sentence production:
   a. The blue spot is on the wall.
   b. How hard did he hit him?
   c. We were away a year ago.
   d. We eat eggs every Easter.
   e. My mama makes lemon muffins.
   f. Peter will keep at the peak.

3. Spontaneous speech in response to: "Tell me about your voice problem." or "Tell me how your voice is functioning."

Legend: C = Consistent I = Intermittent
M1 = Mildly Deviant
M0 = Moderately Deviant
S0 = Severely Deviant

<table>
<thead>
<tr>
<th>Overall Severity</th>
<th>C</th>
<th>I</th>
<th>/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roughness</td>
<td>C</td>
<td>I</td>
<td>/100</td>
</tr>
<tr>
<td>Breathiness</td>
<td>C</td>
<td>I</td>
<td>/100</td>
</tr>
<tr>
<td>Strain</td>
<td>C</td>
<td>I</td>
<td>/100</td>
</tr>
<tr>
<td>Pitch</td>
<td>C</td>
<td>I</td>
<td>/100</td>
</tr>
<tr>
<td>Loudness</td>
<td>C</td>
<td>I</td>
<td>/100</td>
</tr>
</tbody>
</table>

COMMENTS ABOUT RESONANCE: NORMAL OTHER (Provide description):____________________

ADDITIONAL FEATURES (for example, diplophonia, fry, falsaeno, asthenia, aphonia, pitch instability, tremor, wax/gurgly, or other relevant terms):____________________

Clinician:____________________

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Appendix 5-D
Vocal Component Checklist

Breathing Pattern
Clavicular
Thoracic
Abdominal-diaphragmatic
Supportive  Non-supportive
/s/  /z/

Phonation
Voice onset:
  hard glottal attack
  aspirate attack
  static attack
Registration:
  glottal fry
  lof
  modal

Resonance
Hypernasal
Denaal
Cul-de-sac
Assimilative
Normal

Pitch
High
Low
Poor variability
Normal

Loudness
Too loud
Too soft
Poor variability
Normal
Ability to shout  □ yes  □ no

Rate
Too fast
Too slow
Poor variability
Normal
Appendix 5-E
Voice Handicap Index (VHI), Henry Ford Hospital

Instructions: These are statements that many people have used to describe their voices and the effects of their voices on their lives. Circle the response that indicates how frequently you have the same experience.

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Almost Always</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>My voice makes it difficult for people to hear me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P2</td>
<td>I run out of air when I talk.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F3</td>
<td>People have difficulty understanding me in a noisy room.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P4</td>
<td>The sound of my voice varies throughout the day.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F5</td>
<td>My family has difficulty hearing me when I call them throughout the house.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F6</td>
<td>I use the phone less often than I would like.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E7</td>
<td>I'm tense when talking with others because of my voice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F8</td>
<td>I tend to avoid groups of people because of my voice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E9</td>
<td>People seem irritated with my voice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P10</td>
<td>People ask, “What’s wrong with your voice?”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F11</td>
<td>I speak with friends, neighbors, or relatives less often because of my voice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F12</td>
<td>People ask me to repeat myself when speaking face-to-face.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P13</td>
<td>My voice sounds creaky and dry.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P14</td>
<td>I feel as though I have to strain to produce voice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E15</td>
<td>I find other people don’t understand my voice problem.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Never</td>
<td>Almost Never</td>
<td>Sometimes</td>
<td>Almost Always</td>
<td>Always</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>-------</td>
<td>--------------</td>
<td>-----------</td>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td>F16</td>
<td>My voice difficulties restrict my personal and social life.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P17</td>
<td>The clarity of my voice is unpredictable.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P18</td>
<td>I try to change my voice to sound different.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F19</td>
<td>I feel left out of conversations because of my voice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P20</td>
<td>I use a great deal of effort to speak.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P21</td>
<td>My voice is worse in the evening.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>F22</td>
<td>My voice problem causes me to lose income.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E23</td>
<td>My voice problem upsets me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E24</td>
<td>I am less outgoing because of my voice problem.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E25</td>
<td>My voice makes me feel handicapped.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P26</td>
<td>My voice &quot;gives out&quot; on me in the middle of speaking.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E27</td>
<td>I feel annoyed when people ask me to repeat.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E28</td>
<td>I feel embarrassed when people ask me to repeat.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E29</td>
<td>My voice makes me feel incompetent.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>E30</td>
<td>I'm ashamed of my voice problem.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
VOICE-RELATED QUALITY OF LIFE (V-RQOL) MEASURE
UNIVERSITY OF MICHIGAN

NAME: ___________________________ DATE: _______________________

We are trying to learn more about how a voice problem can interfere with your day to day activities. On this paper you will find a list of possible voice-related problems. Please answer all questions based upon what your voice has been like over the past two weeks. There are no “right” or “wrong” answers.

Considering both how severe the problem is when you get it, and how frequently it happens, please rate each item below on how “bad” it is (that is, the amount of each problem that you have). Use the following scale for rating the amount of the problem:

1 = None, not a problem
2 = A small amount
3 = A moderate (medium) amount
4 = A lot
5 = Problem is as “bad as it can be”

Because of my voice,

1. I have trouble speaking loudly or being heard in noisy situations. 1 2 3 4 5
2. I run out of air and need to take frequent breaths when talking. 1 2 3 4 5
3. I sometimes do not know what will come out when I begin speaking. 1 2 3 4 5
4. I am sometimes anxious or frustrated (because of my voice). 1 2 3 4 5
5. I sometimes get depressed (because of my voice). 1 2 3 4 5
6. I have trouble using the telephone (because of my voice). 1 2 3 4 5
7. I have trouble doing my job or practicing my profession (because of my voice). 1 2 3 4 5
8. I avoid going out socially (because of my voice). 1 2 3 4 5
9. I have to repeat myself to be understood. 1 2 3 4 5
10. I have become less outgoing (because of my voice). 1 2 3 4 5

The overall quality of my voice during the last 2 weeks has been (please circle):

Poor    Fair    Good    Very Good    Excellent