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# Knowledge and Skills for Speech-Language Pathologists With Respect to Vocal Tract Visualization and Imaging

*ASHA Special Interest Division 3, Working Group on Voice and Voice Disorders*

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## About This Document

This knowledge and skills document is an official statement of the American Speech-Language-Hearing Association (ASHA). This knowledge and skills document was prepared by the ASHA-Special Interest Division 3: Working Group on Voice and Voice Disorders. Members of the working group were Julie Barkmeier (Chair), Glenn W. Bunting, Douglas M. Hicks, Michael P. Karnell, Stephen C. McFarlane, Robert E. Stone, Shelley Von Berg, and Thomas L. Watterson. Alex F. Johnson served as monitoring vice president. Amy Knapp and Diane R. Paul served as ex officio members. ASHA's Legislative Council approved the document as official policy of the Association in March 2003.

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## Introduction

The ASHA Scope of Practice (2001) states that the practice of speech-language pathology includes providing services using videoendoscopy/stroboscopy (VES). The Preferred Practice Patterns (ASHA, 1997) are statements that define universally applicable characteristics of practice. It is required that individuals who practice independently in this area hold the Certificate of Clinical Competence in Speech-Language Pathology and abide by the ASHA Code of Ethics, including Principle of Ethics II Rule B, which states: "Individuals shall engage in only those aspects of the professions that are within the scope of their competence, considering their level of education, training, and experience" (ASHA, 2003). ASHA Certification in speech-language pathology is necessary, but meeting certification requirements is not sufficient to qualify a person to perform the specific clinical procedure(s) discussed in this document.

Education and training for implementation of VES may be obtained by a variety of means. Some of the training should take place in a clinical setting allowing the speech-language pathologist (SLP) to work with more experienced professionals and a number of patients. The SLPs who intend to perform VES must ensure that they have acquired the knowledge and skills necessary to provide a continuum of service. These knowledge and skill areas form the basis for assessing clinical competency in this specialized area of practice.

The following educational modalities can play an important role in preparing the interested and motivated clinician to perform VES:

- I. Didactic/classroom: Traditional classroom learning provided in the context of accredited training programs;
- II. Mentoring: Extended one-on-one work with an SLP or otolaryngologist who has had extensive experience with all aspects of VES in an interdisciplinary environment;
- III. Supervised clinical experience: Extended performance of VES clinical services under the supervision of an SLP and otolaryngologist who has had extensive experience with all aspects of the procedure;
- IV. Continuing education experience: Organized training provided outside established educational degree programs;
- V. Videotape review: Review and interpretation of previously recorded endoscopic examination;

VI. Experience: Experience leading to expertise in performing and interpreting VES in the clinical environment.

Outlined below are the objectives to be met, the recommended proficiencies, and the knowledge and skills recommended to become proficient in the tasks and accomplish each objective.

A. **Objective:** To qualify the patient for the procedure.

**Proficiency in:** Recognition of voice and resonance disorders and identification of patient qualifications for specific procedures.

Knowledge/skills needed:

1. Understanding of photographic principles of VES and its use as a diagnostic tool.
2. Knowledge of how to assess patient physiology.
3. Knowledge of particular patient physiology.
4. Skills in the performance of VES and clinical interpretation.
5. Understanding the patient's physical and emotional receptivity to the procedure.
6. Knowledge of the physiology of voice and resonance production.

B. **Objective:** To obtain informed consent for the procedure.

**Proficiency in:** Discussing all aspects of VES with the patient and/or significant others, as that procedure relates to voice disorders.

Knowledge/skills needed:

1. Knowledge of VES's role in the context of other objective functional measures of the voice and subjective judgement of voice quality.
2. Knowledge of vocal-tract anatomy and physiology relative to normal and disordered voice and resonance production.
3. Knowledge of the advantages and disadvantages of VES.
4. Knowledge of specific patient safety if topical anesthetic is required, and of the setting and/or circumstances in which administration of a topical anesthetic is appropriate (ASHA, 1992).
5. Knowledge relative to the significance and interpretation of structure or function deviation to voice and resonance production.
6. Knowledge of vocal and resonance characteristic interpretation relative to visualization of pathology.
7. Knowledge of the emotional impact that visual feedback may have on a specific patient.

C. **Objective:** To perform the procedure alone or with others.

**Proficiency in:** Using various tools and procedures that are needed to perform VES.

Knowledge/skills needed:

1. Knowledge of laryngeal and velopharyngeal anatomy and physiology.
2. Skill in the technique of rigid fiberoptic oral endoscopy, flexible fiberoptic video nasoendoscopy, or stroboscopic light used to image the vocal tract in a manner that yields maximum quality recordings.
3. Skill in the techniques of obtaining a videotape of the viewed image.
4. Knowledge of potential risks to the patient.
5. Knowledge of various approaches to becoming trained to perform VES.

6. Knowledge/skill of administration of topical anesthetic to accomplish VES with maximal safety and minimal discomfort to the patient (ASHA, 1992).
  7. Knowledge of universal precaution procedures that protect both clinician and patient from accidental exposure to disease.
  8. Knowledge of the clinical significance of obtained image to make appropriate referrals when necessary.  
This requires additional understanding of the visual image dependence on:
    - a. Elicited tasks, and
    - b. The examiner and patient response to the obtained images.
  9. Knowledge of the ability to organize, store, retrieve VES data for quality assurance and treatment efficacy purposes, and medical-legal documentation.
- D. **Objective:** To interpret the effects of vocal behavior on the laryngeal anatomy as well as the laryngeal anatomy effects on laryngeal physiology in conjunction with medical colleagues and concisely describe VES findings and interpretations for professional communication purposes.
- Proficiency in:** Understanding the clinical significance of the image obtained by the VES procedure.
- Knowledge/skills needed:
1. Knowledge of laryngeal physiology.
  2. Knowledge of pathology of the larynx.
  3. Knowledge of the relative effectiveness of therapy, surgery, or medication in the management of specific disorders or diseases of the larynx.
  4. Knowledge of professional communication skills in describing/interpreting VES findings.
  5. Reporting effectively and clearly.
- E. **Objective:** To interpret the effects of velopharyngeal behavior on resonance as well as the velopharyngeal function effects on voice physiology in conjunction with medical colleagues and concisely describe VES findings and interpretations for professional communication purposes.
- Proficiency in:** Understanding the clinical significance of the image obtained by the VES procedure.
- Knowledge/skills needed:
1. Knowledge of velopharyngeal physiology.
  2. Knowledge of the impaired function of the velopharynx.
  3. Knowledge of the relative effectiveness of therapy, surgery, or medication in the management of specific disorders involving the velopharynx.
  4. Knowledge of professional communication skills in describing/interpreting VES findings.
  5. Reporting effectively and clearly.
- F. **Objective:** To design and implement appropriate treatment or response to diagnostic procedure.
- Proficiency in:** Management of voice and resonance disorders with the use of visual biofeedback from obtained laryngeal and velopharyngeal images.
- Knowledge/skills needed:
1. Skill in the technique of laryngeal and velopharyngeal imaging that provides guided real-time patient visual biofeedback.

**Model curriculum  
for knowledge and  
skills:**

2. Skill necessary to obtain laryngeal and velopharyngeal images during conversational speech.
3. Knowledge in interpretation of obtained images and application to management techniques.
4. Knowledge of vocal tract compensatory adjustments.
5. Knowledge of biofeedback reinforcement strategies.
6. Knowledge of appropriate medical/behavioral management techniques to observed behaviors and laryngeal and velopharyngeal status.

The following is a model curriculum for VES with possible appropriate modes of training that might be pursued for acquiring the knowledge and skills to meet the objectives listed above.

***I. Rationale for performing videoendoscopy***

Suggested training approaches: didactic/classroom, mentoring, supervised clinical experience, continuing education

- A. Evaluating vocal tract anatomy/physiology
- B. Assessment of treatment outcomes
- C. Interdisciplinary communication/collaboration
- D. Patient education
- E. Biofeedback

***II. Normal and disordered anatomy and physiology***

Suggested training approaches for learning the following components: didactic/classroom, mentoring, supervised clinical experience, continuing education, videotape review, experience

- A. Normal anatomy and physiology of voice production
  1. Normal anatomy.
    - a. Respiratory system anatomy.
      1. Skeletal framework.
      2. Muscular components.
    - b. Phonatory system anatomy.
      1. Skeletal framework.
      2. Muscular components.
      3. Vocal fold histology.
    - c. Vocal tract anatomy.
      1. Pharyngeal.
      2. Oral.
      3. Nasal
  2. Normal physiology.
    - a. Aerodynamic principles.
      1. Aerodynamic-myoelectric theory.
      2. Continuity law of incompressible fluids.
      3. Bernoulli's law of conservation of energy.
    - b. Source-filter theory.
    - c. Vocal parameters and relation to physiology
      1. Pitch/frequency.

2. Loudness/intensity.
3. Quality/spectral energy.
3. Pathophysiology
  - a. Organic.
    1. Neurogenic.
    2. Cancer or malignant growths.
    3. Benign mass lesions.
    4. Inflammation.
    5. Irritation.
    6. Trauma.
    7. Presbyphonia.
  - b. Non-organic.
    1. Muscle tension dysphonia (MTD).
    2. Psychogenic.
    3. Maladaptive phonatory habits.
    4. Phonotraumatic vocal behaviors.
  - c. Congenital.
    1. Laryngeal webbing.
    2. Laryngomalacia.
    3. Laryngofissure.
    4. Cleft palate.
    5. Submucosal cleft.

### ***III. Endoscopic equipment and technique***

Suggested training approaches: didactic/classroom, mentoring, supervised clinical experience, continuing education

- A. Equipment and supplies.
  1. Endoscope.
    - a. Rigid.
    - b. Flexible.
      1. Pediatric.
      2. Adult.
      3. Clarity/brightness.
  2. Light Sources.
    - a. Continuous (halogen).
    - b. Stroboscopic (xenon).
  3. Cameras/adapters/lenses.
  4. Video cassette recorders (VHS, SVHS, and digital).
  5. Printers.
  6. Computer assisted systems.
  7. Defogging.
    - a. Warming methods (caution—may damage scope).
      1. Warm water (less than 150° F).
      2. Warm bead sterilizer (rigid scope only, approximately 1 second only).
    - b. Endoscopic soaps.
    - c. Endoscopic waxes.
  8. Miscellaneous supplies.
    - a. Gloves.

- b. Glasses.
  - c. 4 × 4 gauze pads.
  - d. Water-based lubricant (flexible scopes only).
  - e. Decongestants/anesthetic sprays.
  - f. Alcohol wipes.
  - g. Masks.
- B. Technique.
- 1. Infection control.
    - a. Endoscope storage.
    - b. Endoscope handling.
    - c. Endoscope cleansing.
    - d. Endoscope sterilization.
    - e. Use of barriers.
      - 1. Gloves.
      - 2. Glasses.
      - 3. Masks.
  - 2. Oral.
    - a. Preparation.
      - 1. Patient preparation.
        - a. Instructions.
        - b. Phonatory capability.
        - c. Anxiety reduction.
      - 2. Patient posture/positioning.
      - 3. Examiner positioning.
      - 4. Defogging.
    - b. Procedures.
      - 1. Scope insertion technique.
      - 2. Scope maneuvering.
      - 3. Gag management.
        - a. Anesthesia.
        - b. Distraction.
        - c. Repositioning scope/patient.
      - 4. Tongue anchor technique.
      - 5. Vocal maneuvers.
        - a. Vegetative functions such as cough, laugh, and throat clearing.
        - b. Sustained phonation /i/ and /u/.
        - c. Pitch variation.
        - d. Loudness variation.
        - e. Adductor/abductor maneuvers.
      - 6. Stroboscopy modes.
        - a. Slow motion mode.
        - b. Stop action mode.
  - 3. Flexible
    - a. Preparation
      - 1. Patient preparation.
        - a. Instruction.
        - b. Phonatory capability.
        - c. Anxiety reduction.
      - 2. Patient posture/positioning.
      - 3. Examiner positioning.
      - 4. Defogging.

- b. Procedures.
  - 1. Scope insertion technique.
  - 2. Scope maneuvering.
  - 3. Nasal desensitization.
    - a. Anesthesia.
    - b. Vasoconstriction.
  - 4. Gag management (anesthesia).
    - a. Anesthesia.
    - b. Distraction.
  - 5. Speech and voice maneuvers.
    - a. Vegetative functions.
    - b. Sustained phonation /i/, /u/, /s/.
    - c. Pitch variation.
    - d. Loudness variation.
    - e. Adductor/abductor maneuvers.
    - f. Word, phrase, sentence repetition.
  - 6. Stroboscopy modes (for laryngeal viewing).
    - a. Slow motion mode.
    - b. Stop action mode.

#### ***IV. Patient safety***

Suggested training approaches: didactic/classroom, mentoring, supervised clinical experience, continuing education, videotape review, experience

- A. Universal precautions.
  - 1. Differences between techniques.
  - 2. Targeted microbes.
    - a. Varieties of hepatitis.
    - b. HIV.
    - c. TB.
    - d. Methocillin-resistant staph aureus (MRSA).
    - e. Vancomycin-resistant enterococcus (VRE).
    - f. Other.
- B. Cleaning agents.
  - 1. Various agents.
    - a. Cold sterilization agents.
    - b. Gluteraldehyde.
    - c. Bleach.
  - 2. Deleterious effects of hot sterilization.
- C. General patient and clinician safety.
  - 1. Control of transmission of disease via
    - a. Eyeglasses.
    - b. Gloves.
    - c. Biohazard recepticals.
- D. Anesthetics.
  - 1. Various agents.
    - a. Hurricane.
    - b. Lidocaine.
    - c. Xylocaine.
    - d. Astra.
    - e. Cetacaine.

- f. Others.
- 2. Pharmacological effects of the above agents.
- 3. Dosage and side effects.
- 4. Indications and contraindications.
- E. Decongestants.
  - 1. Various agents.
    - a. Afrin.
    - b. Neosinefrin.
  - 2. Pharmacological effects of above agents.
  - 3. Dosage and side effects.
  - 4. Indications and contraindications.
- F. Patient-specific concerns.
  - 1. Informed/photographic consent.
    - a. Patient benefits (see Section D).
    - b. Patient risks.
  - 2. Precautions.
    - a. Adverse/allergic reactions to topical agents.
      - 1. Runny nose following topical anesthetic in nasendoscopy in performers on day of performance.
      - 2. NPO until anesthetic effects abate.
      - 3. Tachycardia associated with epinephrine.
      - 4. Dosage.
    - b. Vasovagal response.
      - a. Signs/symptoms.
      - b. Treatment.
    - c. Minimizing nasal irritation.
      - 1. Nasal inflammation.
      - 2. Nasal turbinate hypertrophy.
      - 3. Implications of blood thinners and hemophilia.

### ***V. Interpreting/reviewing videostroboscopic images***

Suggested training approaches: didactic/classroom, mentoring, supervised clinical experience, continuing education, videotape review, experience

- A. Symmetry of vocal fold movement.
  - 1. Vertical phase difference (phase asymmetry).
  - 2. Abnormal modes of vibration.
- B. Amplitude of vocal fold movement.
  - 1. Symmetrical.
  - 2. Normal/diminished/great.
- C. Periodicity of vocal fold movement.
  - 1. Always periodic.
  - 2. Usually periodic.
  - 3. Sometimes periodic.
  - 4. Never periodic.
  - 5. Segments of vocal fold that are aperiodic.
- D. Vocal fold mucosal wave.
  - 1. Normal.
  - 2. Diminished (full vs. partial fold segment).
  - 3. Great.

4. Symmetrical (R/L).
5. Absent.
- E. Vocal fold closure.
  1. Complete.
    - a. Open quotient normal.
    - b. Open quotient increased.
    - c. Open quotient decreased.
  2. Incomplete.
    - a. Posterior glottal gap.
    - b. Anterior glottal gap.
    - c. Elliptical (bowed).
    - d. Hourglass.
    - e. Slit.
    - f. Incomplete.
- F. Vocal fold appearance.
  1. Malmovement.
  2. Malposition.
  3. Excrescence.
  4. Inflammation.
  5. Edema.
  6. Erythema.
- G. Supraglottal appearance.
  1. Erythema.
  2. Edema.
- H. Supraglottal behavior.
  1. Medial compression.
  2. Anterior-posterior compression.
  3. Arytenoid movement.
    - a. Normal mobility.
      1. Bilateral.
      2. Unilateral.
    - b. Immobility.
      1. Bilateral.
      2. Unilateral.
- I. Velopharyngeal behavior.
  1. Soft palate to pharynx contact.
    - a. Sustained sound.
    - b. Syllable repetition.
    - c. Multi-syllabic words.
    - d. Sentence or spontaneous speech.
  2. Lateral pharyngeal wall movement.
    - a. Sustained sound.
    - b. Syllable repetition.
    - c. Multi-syllabic words.
    - d. Sentence or spontaneous speech.

#### ***VI. Interpretation***

- A. Voice quality abnormal, larynx normal -> behavioral disorder.
- B. Phase asymmetry -> mass, compliance, neurogenic difference.
- C. Amplitude asymmetry -> mass, compliance, neurogenic difference, scarring, granuloma.

- D. Mucosal wave adynamic segment -> cover scarring, intracordal cyst, fibrosis, neurogenic disorder, edema.
- E. Inadequate closure -> intervening mass, neurogenic disorder (paralysis), hypofunctional disorder.
- F. Supraglottic compression -> hyperfunction, compensatory hyperfunction.
- G. Function of velopharynx -> degree of closure, contextrelevant behaviors.

### ***VII. Reporting***

- A. Patient identification.
- B. Patient history.
  - 1. Medical history.
  - 2. History of presenting problem.
  - 3. Previous treatment.
  - 4. Vocal use inventory.
- C. Perceptual judgement of current voice quality.
- D. Phonatory function measures.
  - 1. Acoustic.
  - 2. Aerodynamic.
  - 3. Electromyography.
  - 4. Electroglottography.
  - 5. Maximum phonation time.
  - 6. s/z ratio.
  - 7. Laryngeal diadochokinetic rates.
- E. Velopharyngeal competence measures.
  - 1. Acoustic.
  - 2. Aerodynamic.
  - 3. Electromyography.
- F. Stroboscopic examination.
  - 1. Description of procedure.
  - 2. Description of findings.
    - a. Laryngeal tissue appearance.
      - 1. Tissue appearance.
      - 2. Vocal fold edge.
    - b. Gross laryngeal movement.
      - 1. Arytenoid movement.
      - 2. Supraglottic compression.
    - c. Vibratory characteristics.
      - 1. Vocal fold closure (glottal configuration).
      - 2. Vibratory amplitude.
      - 3. Vibratory symmetry.
      - 4. Mucosal wave.
    - d. Description of clinical impressions.
      - 1. Appearance of laryngeal anatomy and physiology is consistent with that of (describe).
      - 2. Description of vocal use.
    - e. Recommendations.
      - 1. Medical/surgical follow-up.
      - 2. Vocal conservation.
      - 3. Vocal hygiene.
      - 4. Voice or resonance treatment.
      - 5. Repeat examination.

## Glossary

6. Vocal pedagogy.
7. Other medical referrals.
8. Other.

**Rigid fiberoptic oral endoscopy:** (RFOE) is performed with a rigid tube inserted into the oral or pharyngeal cavity. The RFOE has a prism optic system that projects high-intensity light at a predetermined angle illuminating the structures to be observed and recorded. The advantages are high illumination, wide field of view, and excellent image reproduction. The disadvantages are interference with normal speech production and minor patient discomfort.

**Flexible fiberoptic nasendoscopy:** (FFN) is performed with a flexible nasendoscope inserted through the nasal passage. High-intensity light, transmitted by a fiberoptic bundle, illuminates structures to be viewed by the clinician and/or recorded. The advantages are an excellent image of the vocal folds and velopharyngeal structures during voicing, conversation, or singing, and the potential for image recording and instant replay. The disadvantages are equipment expense and possible patient discomfort.

**Stroboscopy:** is performed with any of the above instrumentation, when combined with a strobe light correlated to vocal-fold vibration, which permits vocal tract structures to be visualized in an apparent slow motion format. The advantages are an extensive body of information relative to the effect of pathology on the process of voicing, and the potential for providing information about the neuromuscular and physiological integrity of the vocal folds and supraglottic structures. Disadvantages are patient discomfort related to the use of FFN or RFOE and an image restricted to isolated vowel production when the strobe light is used in conjunction with a laryngeal mirror or RFOE.

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