AMERICAN
SPEECH-LANGUAGE-
HEARING
ASSOCIATION

Speech-Language Pathology Medical Review Guidelines

American Speech-Language-Hearing Association

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General Information

The *Speech-Language Pathology Medical Review Guidelines*, published by the American Speech-Language-Hearing Association (ASHA), were created in accordance with ASHA Resolution BOD 35-2008 and adopted September 15, 2008. This resolution established the Ad Hoc Committee on Speech-Language Pathology Medical Review Guidelines, consisting of ASHA-certified speech-language pathologists Becky Cornett (chair), Diane Ross, Lynne F. Harmon, Gretchen Bebb, and Pat Ford, who developed this document in conjunction with Janet McCarty, private health plans advisor, and Neela Swanson, health care financing information coordinator. Vice President for Government Relations & Public Policy Thomas J. Hallahan served as the Board of Directors liaison and monitoring officer for the committee and Director of Health Care Economics and Advocacy Steven C. White served as consultants.

Copies may be obtained as follows:

- online: www.asha.org/practice/reimbursement/SLP-medical-review-guidelines/
- e-mail: reimbursement@asha.org
- phone: 800-498-2071 (ask to speak to a member of the Health Care Economics & Advocacy Team)

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Section I

Overview

Introduction

The purpose of the medical review guidelines for speech-language pathology is to serve as a resource for health plans to use in all facets of claims review and policy development. The guidelines provide an overview of the profession of speech-language pathology including speech-language pathologist qualifications, standard practices, descriptions of services, documentation of services, and treatment efficacy data.

The American Speech-Language-Hearing Association (ASHA) is the professional, scientific, and credentialing association for 145,000 members and affiliates who are audiologists, speech-language pathologists, and scientists in the fields of speech, language, and hearing. Speech-language pathology is the profession that provides clinical services and undertakes prevention, advocacy, education, administration, and research in the areas of communication and swallowing across the life span, from infancy through the geriatric stage.

Definition of Speech-Language Pathology

Speech-language pathology services are those services necessary for the diagnosis and treatment of swallowing (dysphagia), speech-language, and cognitive-communication disorders that result in communication disabilities. Speech-language pathologists treat disorders of speech sound production (e.g., articulation, apraxia, dysarthria), resonance (e.g., hypernasality, hyponasality), voice (e.g., phonation quality, pitch, respiration), fluency (e.g., stuttering), language (e.g., comprehension, expression, pragmatics, semantics, syntax), cognition (e.g., attention, memory, problem solving, executive functioning), and feeding and swallowing (e.g., oral, pharyngeal, and esophageal stages). (ASHA, 2007a)

Further detail is provided in ASHA's *Scope of Practice in Speech-Language Pathology* on the ASHA Web site at www.asha.org/docs/html/SP2007-00283.html.

Etiologies

Potential etiologies of communication and swallowing disorders include:

- neonatal problems (e.g., prematurity, low birth weight, substance exposure)
- developmental disabilities (e.g., specific language impairment, autism spectrum disorder, dyslexia, attention deficit disorder)
- auditory problems (e.g., hearing loss or deafness, central auditory processing disorders)
- oral anomalies (e.g., cleft lip/palate, dental malocclusion, macroglossia, oral-motor dysfunction)
- respiratory compromise (e.g., bronchopulmonary dysplasia, chronic obstructive pulmonary disease)
- pharyngeal anomalies (e.g., upper airway obstruction, velopharyngeal insufficiency/incompetence)
- laryngeal anomalies (e.g., vocal fold pathology, tracheal stenosis, tracheostomy)
- neurological disease/dysfunction (e.g., traumatic brain injury, cerebral palsy, cerebral vascular accident, dementia, Parkinson's disease, amyotrophic lateral sclerosis)
- psychiatric disorder (e.g., psychosis, schizophrenia)
- genetic disorders (e.g., Down syndrome, fragile X syndrome, Rett syndrome, velocardiofacial syndrome).

Assessment, Treatment, Referral

Speech-language pathology services can be grouped into two main categories: 1) diagnostic or evaluative services and 2) therapeutic services. Speech-language treatment is appropriate for deficits resulting from injury, illness, congenital anomaly, or developmental conditions, and may be habilitative or rehabilitative in nature.

ASHA's *Admission/Discharge Criteria in Speech-Language Pathology* (2004a) indicate that "individuals of all ages are eligible for speech-language pathology services when their ability to

communicate and/or swallow effectively is reduced or impaired or when there is reason to believe (e.g., risk factors) that treatment would prevent the development of a speech, language, communication, or feeding and swallowing disorder; reduce the degree of impairment; lead to improved functional communication skills and/or functional feeding and swallowing abilities; or prevent the decline of communication and/or swallowing abilities."

Eligibility for services or for evaluation is indicated if one or more of these factors are present:

1. Referral from the individual, family member, audiologist, physician, teacher, other speech-language pathologist, or interdisciplinary team because of a suspected speech, language, communication, or feeding and swallowing disorder.
2. Failure to pass a screening assessment for communication and/or swallowing function.
3. The individual is unable to communicate functionally or optimally across environments and communication partners.
4. The individual is unable to swallow to maintain adequate nutrition, hydration, and pulmonary status and/or the swallow is inadequate for management of oral and pharyngeal saliva accumulations.
5. The presence of a communication and/or swallowing disorder has been verified through an evaluation by an ASHA-certified speech-language pathologist.
6. The individual's communication abilities are not comparable to those of others of the same chronological age, gender, ethnicity, or cultural and linguistic background.
7. The individual's communication skills negatively affect health, safety, social, emotional, educational, or vocational status.
8. The individual's swallowing skills negatively affect his or her nutritional health or safety status.
9. The individual, family, and/or guardian seek services to achieve and/or maintain optimal communication (including alternative and augmentative means of communication) and/or swallowing skills.
10. The individual, family, and/or guardian seek services to enhance communication skills. (ASHA, 2004a, pp. 4–5)

Speech-Language Pathology Providers

A speech-language pathologist (SLP) has a master's or doctoral degree and is licensed, if applicable, as a speech-language pathologist by the state in which he or she is practicing. The SLP possesses a Certificate of Clinical Competence (CCC) from ASHA or has met all the educational requirements leading to the CCC, and is in the clinical fellowship (CF) year or is otherwise eligible for the CCC.

ASHA Certification

The Certificate of Clinical Competence (CCC) is granted by ASHA in both speech-language pathology and audiology. It is the only universally recognized credential for the professions. Speech-language pathologists and audiologists who possess a graduate degree are eligible to apply for voluntary certification, which requires the completion of a graduate (master's or PhD) degree, a supervised clinical fellowship, and a passing score on a national examination. Additionally, the candidate for certification must acquire the requisite knowledge and skills mandated by certification standards while enrolled in a program accredited by the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA; ASHA, 2010)

Additional certification information is available on ASHA's Web site at www.asha.org/certification/.

Clinical Documentation

Speech-language pathologists prepare, sign, and maintain documentation that describes the professional service. Pertinent background information, results and interpretation, prognosis, and recommendations should be included. Recommendations may include the need for further assessment, follow-up, or referral. When intervention is recommended, frequency, estimated duration, and type of service (e.g., individual, group) must be specified. Documentation should include:

- findings of the speech-language evaluation
- objective and subjective measurements of functioning
- short-term and long-term measurable goals, with expectations for progress
- expected frequency of treatment
- reasonable estimate of the time needed to reach the goals.

Types of Documentation

Assessment Documentation

The speech-language pathologist employs a variety of formal and informal speech-language assessment tests to ascertain the type, cause, factor(s), and severity of the speech-language disorders. The initial assessment establishes the baseline data necessary for evaluating expected habilitation or rehabilitation potential, setting realistic goals, and measuring communication status at periodic intervals. It should include objective or subjective baseline diagnostic testing (standardized or non-standardized), interpretation of test results, and clinical findings. If baseline testing cannot be accomplished for any reason, this should be noted in the initial assessment or progress notes, along with the reason(s). Reassessments are appropriate when the patient exhibits a change in functional speech and language communication skills.

Treatment Documentation

A treatment program relevant to the patient's disorder(s) is designed to include continued assessment of progress during treatment, including documentation and professional analysis of the patient's status at regular intervals. Short-term and long-term measurable goals are included. The speech-language pathologist may choose how to demonstrate progress; however, the method chosen as well as the measures used must generally remain the same for the duration of treatment. If the method used to document progress must be changed, the reasons should be documented, including how the new method relates to the previous method. During treatment, the speech-language pathologist assesses the patient's condition and adjusts treatment when appropriate.

The following three examples illustrate how goals may be documented:

1. A goal may reflect a small, but meaningful change that enables a patient to function more independently in a reasonable amount of time. For some patients, it may be the ability to give a consistent yes and no response; for others, it may be the ability to communicate functional needs using a single word utterance or short phrases. Alternatively, it may be the ability to return to employment and communicate effectively.
2. One underlying speech-language pathology goal might be to "reduce the apraxia sufficiently so the patient can initiate short intelligible phrases with a minimum of errors." Short-term goals might include the ability to initiate easier phonemes before other, more difficult, phonemes. Therefore, the speech-language pathologist would have a linguistically and neurologically sound basis for working on one phoneme production before initiating another.
3. The speech-language pathologist might work on a group of phonemes having a "feature" in common before working on another group. For example, working on all bilabials (since the patient can easily see the movement) might be desirable prior to working on sounds that are produced more intraorally.

Daily Notes

Documentation may include daily notes, such as in a SOAP (**S**ubjective, **O**bjective, **A**ssessment, and **P**lan) format that reports the activities for the noted session.

Progress Reports

Documentation may include a short narrative progress report with objective information presented in a clear, concise manner. This informs the reviewer of progress in meeting the plan of treatment, along with any changes in the goals or the treatment plan. Progress reports or a treatment summary may include:

- initial functional communication level of the patient
- present functional level of the patient and progress (or lack of progress) specific to the reporting period
- patient's expected rehabilitation potential
- changes in the plan of treatment.

Electronic documentation systems (paperless) are acceptable if supported with appropriate technology to ensure accessibility, usability, and privacy.

Medical Necessity of Speech-Language Pathology Services

Speech-language pathology services must be reasonable and necessary for the treatment of illness, injury, disease, disability, or developmental condition. Claims for speech-language services should be supported by providing the following basic elements of coverage. These elements are based on ASHA's *Model Medical Review Guidelines for Speech-Language Pathology Service* (ASHA, 2004b), which were refined from Medicare's original national review guidelines on the subject and can be found on ASHA's Web site at www.asha.org/uploadedFiles/practice/reimbursement/medicare/DynCorpSLPHCEC.pdf.

- **Reasonable:** appropriate amount, frequency, and duration of treatment in accordance with accepted standards of practice.
- **Necessary:** appropriate treatment for the patient's diagnosis and condition.
- **Specific:** targeted to particular treatment goals.
- **Effective:** expected to yield improvement within a reasonable time.
- **Skilled:** requiring the knowledge, skills, and judgment of a speech-language pathologist, that is, complex and sophisticated.

Relevant documentation for establishing medical necessity may include:

- **Medical history:** pertinent medical history that influences the speech-language treatment, brief description of functional status, and relevant prior speech-language treatment.
- **Speech, language, and related disorder:** diagnosis established by the speech-language pathologist, such as expressive aphasia or dysarthria.
- **Date of onset:** date of onset of speech, language, and/or related disorder diagnosis.
- **Physician referral**: if required.
- **Initial assessment and date:** the procedure used by the speech-language pathologist to diagnose speech, language, and related disorders, and the date the initial assessment is completed by the provider.
- **Plan of treatment or a treatment program and date established.**
- **Progress notes or reports:** updated patient status reports.

Why Speech-Language Pathology Services Meet the Definition of Medical Necessity

Speech-language pathology services are medically necessary to treat speech-language, swallowing, and cognitive-communication disorders. Many of these disorders have a neurological basis such as head injury, Parkinson's disease, stroke, autism, and cerebral palsy. Determining medical necessity takes into consideration whether a service is essential and appropriate to the diagnosis and/or treatment of an illness, injury, or disease, which *Stedman's medical dictionary* (2000) defines as an "interruption, cessation, or disorder of body function." Impaired speech and language, loss of hearing, and swallowing difficulties all reflect a loss of body functions and, therefore, services to treat such impairments meet the definition of medical necessity.

Developmental conditions refer to specific impairments that differ from the normal condition and also meet the definition of medical necessity. Developmental conditions may be referred to as developmental disorders, developmental disabilities, and developmental delays. *Stedman's medical dictionary* (2000) defines development as "the act or process of natural progression in physical and psychological maturation from previous, lower, or embryonic stage to a later, more complex, or adult stage." Development is a natural state, but when paired with disorder, disability, or delay, it indicates an abnormal state. A diagnosis of developmental impairment in a child indicates an abnormal state of function, and speech-language treatment services are as medically necessary for this patient as they are for an adult who has suffered a stroke and lost speech and language function.

ASHA's Treatment Efficacy Summaries

ASHA has developed a series of treatment efficacy summaries (ASHA, n.d.-a) that describe research findings about how well treatment works for different disorders. These summaries (covering 16 treatment/disorder areas) are useful not only to consumers but also to insurance companies considering payment for needed services for adults and children with communication and related disorders. The summaries are posted on ASHA's Web site at www.asha.org/public/EfficacySummaries.htm.

Prevalence and Incidence of Communication and Swallowing Disorders At-a-Glance (ASHA, 2008a, 2008b, 2008c)

- One out of every six Americans has a communication disorder.
- More than 2 million Americans, half of whom are children, stutter.
- Speech sound disorders affect 10% of children
- 6–10 million Americans suffer from dysphagia (swallowing disorder).
- 20 million adults over the age of 18 have a hearing loss.
- 18% of the U.S. population with hearing loss uses a hearing aid.
- More than 20 million Americans are regularly exposed to hazardous sound levels.
- The prevalence of Parkinson's disease in industrialized countries is 0.3% of the general population, and 1% of the population older than 60 years. It is estimated that 89% of individuals with Parkinson's have a speech or voice disorder, but only 3% to 4% receive speech or voice treatment
- 28 million workers in the U.S. experience daily voice problems.
- Reported occurrence of hoarseness ranges from 6% to 23% in school-aged children.
- About one million persons in the U.S. have aphasia.
- The prevalence of language difficulty in preschool children is estimated as between 2% and 19%.
- Specific language impairment is one of the most common childhood disorders, affecting 7% of children.
- Incidence estimates for children with cerebral palsy who have a swallowing disorder at some time in life range from 85% to 90% .
- Each year an estimated 1.7 million children and adults in the U.S. sustain a traumatic brain injury (TBI) and another 795,000 individuals sustain an acquired brain injury (ABI) from non-traumatic causes.

Additional information on incidence and prevalence of communication disorders can be found at www.asha.org/research/reports/.

Definition of a Communication Impairment

A communication disorder is an impairment in the ability to receive, send, process, and comprehend concepts of verbal, nonverbal, and graphic symbol systems (ASHA, 1993). A communication disorder may be evident in the processes of hearing, language, and/or speech. A communication disorder may range in severity from mild to profound. It may be organic or functional in nature. It may be congenital or acquired. Individuals may demonstrate one or any combination of communication disorders. A communication disorder may result in a primary disability or it may be secondary to other disabilities.

Clinical Coverage Concepts

Specific terms that relate to speech-language pathology services are outlined below.

Habilitative Services

Habilitative services and therapies are designed to develop new skills and maximize functioning, while rehabilitative services and therapies help a person recover skills that have been lost or impaired. New state laws are being passed (e.g., in Illinois, Maryland, and District of Columbia) specifying that health insurers must treat habilitative services for children with developmental disabilities in the same way as they treat rehabilitative services. In Maryland, for example, the law covers children with congenital and genetic disorders, including autism and cerebral palsy.

The Patient Protection and Affordable Care Act of 2010 (PPACA; 2010) requires uniform definitions of standard insurance terms and medical terms so that consumers may compare health insurance coverage and understand the terms of coverage, or exceptions to coverage. PPACA outlines “essential health benefits” and specifically includes habilitative and rehabilitative services.

Rehabilitative Services

Rehabilitative services help restore or improve abilities lost or impaired as a result of illness, disease, injury, or disability.

Developmental Conditions

Developmental disorders, developmental disabilities, and developmental delays refer to specific impairments that differ from the normal condition. *Stedman’s medical dictionary,* 27th edition (2000), defines development as “the act or process of natural progression in physical and psychological maturation from previous, lower, or embryonic stage to a later, more complex, or adult stage.” Development is a natural state, but when paired with disorder, disability, or delay, it indicates an abnormal state. In children a diagnosis of a developmental impairment indicates an abnormal state of function, and speech-language treatment services are as medically necessary for this patient as they are for an adult who has suffered a stroke and lost speech and language function.

The National Business Group on Health's *Investing in maternal and child health: An employer's tool kit* (Campbell, 2007) recommends, as minimum plan benefits, services for speech, hearing, and language disorders, and specifies that services may be used to "help people develop skills inhibited by a problem present at birth or a developmental delay."

For more information on the tool kit, go to www.businessgrouphealth.org/healthtopics/maternalchild/investing/docs/mch_toolkit.pdf.

Group Treatment

ASHA's *Model medical review guidelines for speech-language pathology services* (ASHA, 2004b) indicate that group treatment is generally a covered service if:

- group therapy services are rendered under an individualized plan of treatment and are integral to the achievement of the patient's individualized goals.
- the skills of a speech-language pathologist are required to safely and/or effectively carry out the group services.
- the group consists of four or fewer group members (Medicare recommendations).
- the group therapy satisfies all of the "reasonable and necessary criteria" listed under Indications and Limitations of Coverage.

Maintenance Programs

An appropriate functional maintenance program may be established after initial evaluation and a reasonable period of treatment determines that such a program would be suitable. A qualified speech-language pathologist designs the maintenance program and after the program has been established and instructions have been given for carrying out the program, the services of the speech-language pathologist are no longer covered (ASHA, 2004b).

Section II

Speech-Language Pathology Treatments & Procedures

Speech-Language Pathology Treatments and Procedures

The treatment procedures listed in Section 2 are typical interventions provided by speech-language pathologists and are a means of effecting change through the application of clinical skills or services to improve function.

Resources that offer more detail about the practice of speech-language pathology include:

- ASHA's *Preferred practice patterns* (ASHA, 2004c): www.asha.org/docs/html/PP2004-00191.html
- ASHA's *Compendium of evidence-based practice* (ASHA, n.d-b): www.asha.org/members/ebp/compendium/
- ASHA's Policy Documents: www.asha.org/policy/type.htm

Augmentative and Alternative Communication/Speech-Generating Devices

Intervention is provided to help individuals to understand and use personalized **augmentative and alternative communication (AAC) systems** to optimize communication activities and participation. Services are also provided to modify or repair AAC systems when necessary. An AAC system is any combination of devices, aids, techniques, symbols, and/or strategies to represent and/or augment spoken and/or written language or to provide an alternative mode of communication.

AAC and speech-generating device (SGD) assessment is provided to determine and recommend methods, devices, aids, techniques, symbols, and/or strategies to represent and/or augment spoken and/or written language in ways that optimize communication. Typically, insurers categorize AAC devices and SGDs as durable medical equipment (DME). The following criteria should be met:

1. Prior to the delivery of the AAC or SGD, the patient's cognitive and communication abilities must be formally evaluated by a speech-language pathologist. The evaluation must include, at a minimum, the following elements:
    a. current communication impairment, including type, severity, language skills, cognitive ability, and anticipated course of the impairment
    b. an assessment of whether the individual's daily communication needs could be met as effectively by using other, natural modes of communication
    c. a description of the functional communication goals expected to be achieved and treatment options
    d. rationale for selection of a specific device, accessories, or facilitating software

e. demonstration that a treatment plan is in place that includes a training schedule for the selected device

f. a statement that the individual has the cognitive and physical abilities to effectively use the selected device and any accessories or facilitating software to communicate

g. for a subsequent upgrade, change or replacement of a previously issued AAC or SGD, accessories, or facilitating software, information regarding the functional benefit to the patient of the upgrade, compared to the initially provided AAC or SGD.

2. The patient's medical condition results in a severe speech, voice, language or other communication impairment.
3. The patient's communication needs cannot be met as effectively by using natural communication methods.
4. Other forms of treatment have been considered and ruled out as less effective.
5. The recommended device will result in mitigation or improvement of the patient's speech, voice, language, or other communication.

Depending on assessment results and the age/stage and life circumstances of the client/patient, intervention may include the following tasks:

- Identify and educate the patient/client, family/caregivers, and relevant others in the AAC system's operation.
- Plan for optimum patient/client use, including education in maintaining the AAC system and programming updates and modifications for conversational, academic, and other uses.
- Use of the AAC system while targeting any other speech-language (spoken or written) and communication goals and objectives appropriate to activity/participation needs and age and abilities (e.g., vocabulary, sentence comprehension and production, reading and writing, conversational turn-taking and judging listener needs, natural speech and voicing).
- Use of the AAC system for multiple functions in multiple contexts (e.g., educational, vocational, social).

Software designed to facilitate communication by allowing a computer, personal digital assistant (PDA), or other device to operate as an SGD will also be considered under these criteria. Devices need not be dedicated speech devices; they can be devices that are capable of running software for purposes other than for speech generation (e.g., devices that can also run a word processing package, an accounting program, or perform other non-medical functions).

Laptop computers, desktop computers, PDAs, or other commercial products such as iPads that may be programmed to perform the same function as an SGD meet the definition of durable medical equipment and can be considered as SGDs for coverage purposes.

Audiologic Rehabilitation or Auditory Rehabilitation (See also Hearing Disorder)

Audiologic rehabilitation assessment is provided to evaluate the impact of a hearing loss on communication functioning (strengths and weaknesses), including the identification of speech-language-communication impairments.

Treatment

Treatment is provided to improve the communication abilities of an individual with a hearing loss. Treatment focuses on comprehension and production of language in oral, signed, or written modalities; speech and voice production; auditory training; speech reading; multimodal (e.g., visual, auditory-visual, and tactile) training; communication strategies; education; and counseling.

Audiological rehabilitation (AR) services include, for example, early intervention programs, auditory training, and speech reading.

AR services provided by an audiologist include all of the above plus the fitting of hearing aids and the programming of cochlear implants.

(Central) Auditory Processing Treatment [See also (Central) Auditory Processing Disorder]

Central auditory processing is the ability of the brain (i.e., the central nervous system) to process incoming auditory signals. The brain identifies sounds by analyzing their distinguishing physical characteristics (frequency, intensity, and temporal features). Both audiologists and speech-language pathologists play a role in (central) auditory processing evaluation and treatment. An audiologist will evaluate an individual's hearing acuity and identify possible auditory perception problems. A speech-language pathologist will evaluate an individual's perception of speech, as well as his/her receptive (understanding) and expressive (production) language use.

Treatment

Two general treatment approaches have been used for (central) auditory processing problems. One approach focuses on training certain auditory and listening skills such as auditory discrimination (e.g., telling the difference between *peas* and *bees*), localization of sound, sequencing sounds, or identifying a target sound in a noisy background. Another approach concentrates on teaching functional language skills (e.g., vocabulary, grammar, conversational skills) and uses strategies (e.g., visual aids and repeating directions) to facilitate the processing of language.

Cognitive-Communication Treatment (See also Cognitive-Communication Disorder)

Intervention services are provided to individuals with cognitive-communication disorders, including problems in the ability to perceive, attend to, organize, and remember information; to reason and to solve problems; and to exert executive or self-regulatory control over cognitive, language, and social skills functioning.

Treatment

Assessment identifies the specific deficits along with preserved abilities and areas of relative strength in order to maximize functional independence and safety, and to address the deficits that diminish the efficiency and effectiveness of communication. Intervention may focus on developing compensatory memory strategies, formal problem-solving strategies and their application to functional activities, and improving attention at various levels of complexity. Treatment may focus on improving the processing of varied types of information, including verbal, non-verbal, and social cues. Interventions for specific language impairments such as reading comprehension and language formation may also be addressed.

Fluency Treatment (Stuttering, Cluttering; See also Stuttering and Cluttering Disorder)

Fluency assessment is provided to evaluate aspects of speech fluency (strengths and weaknesses), including identification of impairments (e.g., sound, syllable, or word repetitions or prolongations disrupting the normal flow of speech, or for cluttering, a speech delivery rate that is abnormally fast and/or irregular), and associated activity and participation limitations. Standardized and/or non-standardized methods for describing the features of the individual's fluency or dysfluency are used and may address:

- stuttering severity, attitudes toward stuttering and speech, and avoidance behaviors
- categories of dysfluency and secondary stuttering behaviors
- speech rate
- instrumental measurements of oral, laryngeal, and respiratory behavior, if indicated
- muscular tension, emotional reaction to stuttering or speech, and coping behaviors.

Elicitation and use of prognostic information and information that optimizes treatment planning may be addressed.

Treatment

Fluency intervention is provided to improve aspects of speech fluency and concomitant features of fluency disorders in ways that optimize activity/participation. This may include:

- reducing the severity, duration, and abnormality of stuttering-like dysfluencies in multiple communication contexts
- reducing avoidance behaviors
- removing or reducing barriers that create, exacerbate, or maintain stuttering behaviors (e.g., parental reactions, listener reactions, client perceptions)
- assisting the person who stutters to communicate in educational, vocational, and social situations in ways that optimize activity/participation.

Treatment for cluttering should be tailored to the client's unique difficulties and may include goals such as slowing rate; heightening monitoring; using clear articulation; using acceptable, organized language; interacting with listeners; speaking naturally; and reducing excessive dysfluencies.

The type, frequency, and duration of treatment for fluency disorders vary with the individual's specific history and characteristics, communication goals, and clinical milestones achieved. Some individuals with fluency disorders participate in intensive residential treatment programs. More often, individual treatment sessions are offered by hospital and community outpatient clinics and private practitioners.

Language Treatment (Receptive, Expressive, Pragmatics, Reading, Writing; See also Language Disorder)

Individuals receive intervention services for **language impairment** when their ability to communicate effectively and to participate in social, educational, or vocational activities is impaired because of a spoken and/or written disorder.

Treatment

Language Intervention for **language impairment** addresses knowledge and use of language for listening, speaking, reading, writing, thinking, and reasoning including:

- phonology and print symbols (orthography) for recognizing and producing intelligible spoken and written words
- syntactic structures and semantic relationships for understanding and formulating complex spoken and written sentences
- discourse structures for comprehending and organizing spoken and written texts
- pragmatic conventions (verbal and nonverbal) for communicating appropriately in varied situations.

Myofunctional Treatment (Tongue Thrust; See also Myofunctional Disorder)

Myofunctional disorder *is a disorder of tongue and lip posture and movement. Treatment focuses on mod*ifying tongue and lip posture and movement. Speech misarticulations can co-occur with this condition in some patients and treatment would include correction of speech sound errors. Chewing and swallowing skills may also be affected.

Treatment

Depending on assessment results, intervention addresses the following:

- alteration of lingual and labial resting postures
- muscle retraining exercises
- modification of handling and swallowing of solids, liquids, and saliva
- speech sound production errors, if present.

Neurological Motor-Speech Treatment

Neurological motor speech assessment looks at the structure and function of the oral motor mechanism for non-speech and speech activities including assessment of muscle tone, muscle strength, motor steadiness and speech, range, and accuracy of motor movements. Speech characteristics of the phonatory-respiratory system (pitch, loudness, voice quality), resonance, articulation, and prosody are assessed. Typical neurological motor speech disorders include apraxia and dysarthria.

Treatment

Depending on assessment results, intervention addresses the following:

1. Improving the intelligibility of speech by—
    a. increasing respiratory support for speech
    b. improving laryngeal function and subsequent pitch, loudness, and voice quality
    c. managing velopharyngeal inadequacy
    d. normalizing muscle tone and increasing muscle strength of the oral motor structures.
2. Improving accuracy, precision, timing, and coordination of articulation.
3. Rate modification.
4. Improving prosody and naturalness of speech.
5. Including direct behavioral treatment techniques, use of prosthetics, or appropriate referral for medical-surgical or pharmacologic management.

6. Developing and using effective compensatory articulation strategies and/or communication strategies, or provide referral for augmentative and alternative communication (AAC) assessment, as appropriate.
7. Training others in the individual's environment to use communication strategies and cuing techniques to support improved speech production.

Speech Sound Disorders Treatment (Articulation Disorder Treatment, Phonological Process Disorder Treatment)

Speech sound disorders treatment focuses on correct speech sound production. Speech sound impairments may arise from problems with articulation (making sounds) and **phonological processes** (sound patterns).

Treatment

Articulation disorders treatment may involve demonstrating how to produce a sound correctly, learning to recognize which sounds are correct and incorrect, and practicing sounds in different words. Phonological process disorders treatment may involve teaching the rules of speech to individuals to help them say words correctly.

Depending on assessment results and age of the patient, intervention addresses the following:

- selection of intervention targets based on the results of an assessment of articulation and phonology
- improvement of speech sound discrimination and production
- general facilitation of newly acquired articulation and/or phonological abilities to a variety of speaking, listening, and literacy-learning contexts
- increased phonological awareness of sounds and sound sequences in words and relating them to print orthography (when age-appropriate).

Swallowing Treatment (See also Dysphagia, Swallowing Disorder)

Swallowing treatment is provided to prevent nutrition and hydration problems and pulmonary complications of aspiration and to improve functional feeding/swallowing skills. A swallowing evaluation assesses oral, pharyngeal, and related upper digestive structures and functions to determine swallowing functioning and oropharyngeal/respiratory coordination (strengths and weaknesses), including identification of impairments and assessment of the ability to eat safely and to sustain adequate nutrition and hydration.

Treatment

Interventions include:

1. Non-instrumental, clinical assessment, including:
    a. Structural assessment of face, jaw, lips, tongue, teeth, hard and soft palate, oral pharynx, and oral mucosa.
    b. Functional assessment of physiologic functioning of the muscles and structures used in swallowing, including observations of symmetry, sensation, strength, tone, range and rate of motion, and coordination or timing of movement. Also, observation of head-neck control, posture, developmental reflexes, and involuntary movements. *Note*: Direct observations of the pharynx (other than the oral pharynx) and larynx are not possible without instrumentation.
    c. Functional assessment of actual swallowing ability, including observation of sucking, mastication, oral containment and manipulation of the bolus; impression of the briskness of swallow initiation; impression of the extent of laryngeal elevation during the swallow; and signs of aspiration such as coughing or wet-gurgly voice quality after the swallow.
    d. Impression of adequacy of airway protection and coordination of respiration and swallowing.
    e. Assessment of saliva management including frequency and adequacy of spontaneous swallowing and ability to swallow voluntarily.
2. Instrumental assessment (e.g., videofluoroscopy, endoscopy, ultrasound, manometry, electromyography), including any or all of the following:
    a. Structural assessment, including observation of face, jaw, lips, tongue, teeth, hard palate, soft palate, larynx, pharynx, and oral mucosa.
    b. Functional assessment of physiologic functioning of all the muscles and structures used in swallowing, including observations and measures of symmetry, sensation, strength, tone, range and rate of motion, and coordination or timing of movement. Also, observation of head-neck control, posture, developmental reflexes, and involuntary movements.

c. Functional assessment of actual swallowing ability, including observation of sucking, mastication, oral containment and manipulation of the bolus; briskness of swallow initiation; lingual, velopharyngeal, laryngeal, and pharyngeal movement during swallowing; coordination and effectiveness of these movements (e.g., whether the bolus is swallowed briskly and completely without any bolus entering the airway).

d. Assessment of adequacy of airway protection; assessment of coordination of respiration and swallowing.

e. Assessment of the effect of intubation on oropharyngeal swallowing (feeding tube, tracheostomy) and the effect of mechanical ventilation on swallowing.

f. Assessment of the effect of changes in bolus size, consistency, or rate or method of delivery on the swallow.

g. Assessment of the effect of therapeutic postures or maneuvers on the swallow.

h. Screening of esophageal motility and gastroesophageal reflux.

Swallowing (Dysphagia) Instrumental Assessment

An instrumental evaluation is indicated for patients with suspected or who are at high risk for pharyngeal dysphagia. Oral stage dysphagia treatment may continue prior to the instrumental assessment. The final analysis and interpretation of an instrumental assessment should include a definitive diagnosis; identification of the swallowing phase(s) affected; and a recommended treatment plan, including compensatory swallowing techniques and/or postures and food and/or fluid texture modification. An instrumental assessment is not indicated if findings from the clinical evaluation fail to support a suspicion of dysphagia, or when findings from the clinical evaluation suggest dysphagia but include either of the following: (1) the patient is unable to cooperate or participate in an instrumental evaluation or (2) the instrumental examination would not change the clinical management of the patient.

Absence of instrumental evaluation does not preclude the patient from receiving dysphagia treatment.

Speech-language pathologists use instrumentation in assessment and treatment procedures for swallowing disorders, including but not limited to the following:

- videofluoroscopic swallowing study (VFSS) or motion fluoroscopic evaluation of swallowing by cine or video recording, also known as the modified barium swallow (MBS)
- endoscopic evaluation of swallowing by cine or video recording [also called flexible fiberoptic endoscopic evaluation of swallowing (FEES)]
- flexible fiberoptic endoscopic evaluation of swallowing with sensory testing (FEESST)

Videofluoroscopic Swallowing Study (VFSS), or Motion fluoroscopic evaluation of swallowing by cine or video recording, also known as the modified barium swallow (MBS) is a videofluoroscopic, radiographic test that differs from the traditional barium swallow procedure. The MBS incorporates a set of modifications in consistency, bolus size, texture, patient positioning, and radiographic focus to facilitate optimum visualization of the oral-pharyngeal-laryngeal structures and their function during swallowing. The effects of compensatory maneuvers and diet modification on aspiration prevention and/or bolus transport during swallowing can be studied radiographically to determine a safe diet and to maximize efficiency of the swallow.

Endoscopic evaluation of swallowing by cine or video recording (also called Flexible Fiberoptic Endoscopic Evaluation of Swallowing (FEES) utilizes the fiberoptic nasopharyngolaryngoscope to evaluate the pharyngeal swallow. Detailed information regarding swallowing function and related functions of structures within the upper aerodigestive tract are obtained. Therapeutic maneuvers are attempted during this examination to determine a safe diet and to maximize the efficiency of the swallow.

Flexible Fiberoptic Endoscopic Evaluation, of Swallowing with Sensory Testing (FEESST) is the performance of a FEES with the incorporation of laryngeal sensory testing. The sensory evaluation is completed by delivering pulses of air at sequential pressures to elicit the laryngeal adductor reflex. A sensory threshold is thus established.

This information has been adapted from ASHA's *Model Medical Review Guidelines for Dysphagia Services* and refined from Medicare's original guidelines (ASHA, 2004a). To view the model guidelines, go to www.asha.org/uploadedFiles/practice/reimbursement/medicare/DynCorpDysphHCEC.pdf.

Individuals of all ages are treated on the basis of swallowing function assessment. At the conclusion of the assessment, the presence, severity, and pattern of dysphagia should be determined, and recommendations made with collaboration among the therapist, physician, and patient/family.

Voice and/or Resonance Treatment (See also Voice and/or Resonance Disorder)

Voice treatment is provided for individuals with voice disorders, alaryngeal speech, and/or laryngeal disorder affecting respiration. Intervention is conducted to achieve improved voice production, coordination of respiration and laryngeal valving, and/or acquisition of alaryngeal speech sufficient to allow for functional oral communication. Resonance and nasal airflow assessment is provided to evaluate oral, nasal, and velopharyngeal function for speech production (strengths and weaknesses), including identification of impairments, associated activity, and participation limitations. Intervention is conducted to achieve improved resonance and nasal airflow and improved articulation sufficient to allow for functional oral communication.

Treatment

Research data and expert clinical experience support the use of voice therapy in the management of patients with acute and chronic voice disorders (for details on voice treatment, see Voice and/or Resonance Disorder).

Intervention focuses on proper use of respiratory, phonatory, and resonatory processes to achieve improved voice production and coordination of respiration and laryngeal valving, with appropriate treatment to enhance these behaviors.

Treatment is also provided for individuals with resonance or nasal airflow disorders, velopharyngeal incompetence, or articulation disorders caused by velopharyngeal incompetence and related disorders such as cleft lip/palate.

Additionally, treatment includes patient-directed selection of preferred alaryngeal speech communication means, including development of one or more of the following alaryngeal alternatives: esophageal speech, artificial larynx speech, or tracheoesophageal prosthesis speech.

Voice treatment can resolve a voice disorder when medical intervention (i.e., surgery) is not warranted and may reduce the need for laryngeal surgery or other medical intervention, when indicated, if initiated before any medical interventions.

Intensive Voice Treatment Model

For patients with voice and airway disorders, speech-language pathologists traditionally provide weekly or biweekly treatment. However, a different protocol may produce better results for patients who cannot adhere to that schedule or for whom traditional treatment has proven unsuccessful. In the voice and swallowing clinics at the University of Wisconsin-Madison, Division of Otolaryngology–Head and Neck Surgery, an intensive voice treatment approach has been successful. "Voice Boot Camp" was designed for patients who have been resistant to other treatments or who live considerable distances from the clinic and for whom traditional treatment is impossible. In the program's intensive treatment model, multiple speech-language pathologists treat patients with voice and airway disorders for four to six hours daily for one to seven days using a variety of techniques and approaches based on the patient's needs (Thibeault, Zelazny, & Cohen, 2009).

For more information on this intensive treatment model, see the *ASHA Leader* article, *Voice Boot Camp*, at www.asha.org/Publications/leader/2009/090526/090526b.htm.

Voice and Resonance Instrumentation

Speech-language pathologists use instrumentation in assessment and treatment procedures related to voice and resonance disorders, including but not limited to:

- electrolarynx
- laryngeal function studies
- videostroboscopy
- velopharyngeal dysfunction (VPD) instrumental assessment

An **electrolarynx** is a handheld device held against the throat region (or mouth with an oral adapter immediately post-op) to provide vibrations that allow speech sound. Electrolarynx training is generally required. An electrolarynx is a type of speech-substitute device for patients who have lost laryngeal function, for example, after a laryngectomy.

Laryngeal function studies (e.g., aerodynamic testing and acoustic testing) are important instrumental measures that may be used to assess voice production and/or laryngeal function. Aerodynamic testing assesses average airflow, peak airflow, vocal efficiency, and subglottal pressure. Acoustic tests include pitch, loudness, jitter, shimmer, signal-to-noise ratio, and spectral analysis. Instrumental techniques ensure the validity of signal processing, analysis routines, and elimination of task or signal artifacts. Computer analysis is used.

The *ASHA Scope of Practice* (ASHA, 2007a) states that the practice of speech-language pathology includes providing services using videoendoscopy/stroboscopy (VES);

Videostroboscopic laryngoscopy incorporates a stroboscope, laryngeal fiberscope, and a videoscope to produce a permanent image of the motion of the vocal folds. The slow motion effects of the stroboscope enable clinical observation of vocal fold vibrations. Videostroboscopy is a diagnostic procedure for examination of the vocal cords when pathology is suspected (based on persistent symptoms or other findings with suspected pathology such as carcinoma, vocal cord paralysis, or polyps) despite negative or unsatisfactory/inadequate mirror-image and endoscopic examinations. It is performed by an otolaryngologist or licensed speech-language pathologist.

Velopharyngeal Dysfunction (VPD) Instrumental Assessment – if VPD is suspected, instrumentation may be used to further assess the disorder. The type of instrumentation will vary with the age of the patient and the perceptual findings. If a cleft palate/craniofacial team is involved, for example, team members will have access to:

- a nasometer that analyzes acoustic energy emitted through the oral cavity and nasal cavity during the production of speech
- aerodynamic assessment, measuring oral pressure and oral airflow during speech, and estimating the size of the velopharyngeal gap/orifice
- nasopharyngoscopy (a procedure using a flexible fiberoptic nasopharyngealscope) to visualize the velopharyngeal mechanism and its function by viewing the nasal surface of the velum and the velopharyngeal port during connected speech
- videofluoroscopy and lateral cephalographs to assess velopharyngeal closure during speech and phonation, respectively.

Prosthetics

Intervention services are conducted to help individuals to understand, use, adjust, and restore their customized prosthetic/adaptive device (e.g., palatal lifts, obturators, artificial larynges, tracheoesophageal fistulization prostheses, and tracheostomy speaking valves). Prosthetic/adaptive device interventions include fitting, orientation, modification, and repair. (ASHA, 2004c)

Additional information can be found in the *Preferred Practice Patterns for the Profession of Speech-Language Pathology* at www.asha.org/docs/html/PP2004-00191.html#sec1.3.28.

Speech-language pathologists may use the following prosthetics, including but not limited to:

- tracheoesophageal prostheses (TEPs)
- tracheostomy speaking valves
- laryngeal implants.

A **tracheoesophageal prosthesis (TEP)** is a prosthetic device that is placed into a puncture or opening between the trachea and the esophagus to generate tracheoesophageal speech, prevent aspiration, and maintain the integrity of the opening. The TEP shunts pulmonary air to the esophagus and the residual tissue at the juncture of the pharynx and esophagus becomes a vibratory sound source for alaryngeal speech. TEPs are surgically placed to permit laryngectomized and other nonvocal (e.g., amyotrophic lateral sclerosis) patients' production of tracheoesophageal speech (Hoffman, Bolton, & Ferry, 2008).

Tracheostomy speaking valves such as the Passy-Muir valve are considered voice prosthetics that enable the wearer to produce speech. A clinician at a children's hospital in Philadelphia reports, "We treat many children requiring tracheostomy tube placement. With potential for a tracheostomy tube to be in place for an extended period of time, these children may be at risk for long-term disruption to normal speech development. As such, speaking valves that restore more normal phonation are often key tools in the effort to restore speech and promote more typical language development in this population." (Hoffman, Bolton, & Ferry, 2008). Tracheotomized patients, both adults and children, use tracheostomy speaking valves.

Laryngeal implants are devices used to restore voice when the larynx is damaged or paralyzed, precluding speech production. Implants are of various types and materials such as Gore-Tex, titanium, silastic material, collagen, or tubular expanded polytetrafluoroethylene (e-PTFE). They are implanted into a vocal fold or laryngeal vestibule to allow for precise, easily adjustable control of vocal cord medicalization to approximate a natural voice.

Section III

Speech-Language Pathology Diagnoses & Related Medical Conditions

Speech-Language Pathology Diagnoses & Related Medical Conditions

The following list of speech-language pathology disorders or diseases and medical conditions that affect speech-language, swallowing, and hearing is not all-inclusive.

Resources that offer more detail about the practice of speech-language pathology include:

- ASHA's *Preferred Practice Patterns*(ASHA, 2004c): www.asha.org/docs/html/PP2004-00191.html
- ASHA's *Compendium of Evidence-Based Practice* (ASHA, n.d.-b): www.asha.org/members/ebp/compendium/
- ASHA's Policy Documents: http://www.asha.org/policy/type.htm

Amyotrophic Lateral Sclerosis (ALS)

ALS is a neurological disease resulting in progressive muscle weakness and atropy and is commonly called Lou Gehrig disease.

Treatment

Speech-language pathologists treat patients with ALS by having them slow their speech rate and improve articulation to increase comprehension for caregivers. For patients with respiratory insufficiency, the speech-language pathologist can teach phrasing to promote energy conservation. Submaximal tongue strengthening exercises and diaphragmatic exercises also can be taught to help improve articulation and voice projection. Patients should be monitored, and as their speech declines, the speech-language pathologist may introduce augmentative communication devices, such as writing implements, communication boards, or computer-assistive technology. For those with severe bulbar and limb involvement, eye gaze and blink generally are preserved. Therefore, the speech-language pathologist can take advantage of these preserved functions by introducing blink controlled voice synthesizers, communication boards, and computer assistive devices that utilize eye gaze techniques (Shannon & Bockenek, 2009).

Aphasia

Aphasia is a language disorder that results from damage to portions of the brain that are responsible for language. All aspects of language (speaking, writing, reading, and understanding) may be affected to some degree. The common cause of aphasia is a cerebral vascular accident (CVA) or stroke. The disorder may impair the expression and understanding of language. Aphasia may co-occur with speech disorders such as dysarthria or apraxia of speech.

The nature and severity of aphasia will vary from individual-to-individual as will the treatment plan and approaches used.

Treatment

Aphasia therapy strives to improve an individual's ability to communicate by helping him or her to use remaining abilities, restore language abilities as much as possible, compensate for language problems, and learn other methods of communicating. Treatment may be offered in individual or group settings. Treatment intervention should begin as soon as is appropriate. Positive changes can occur long after the neurological injury or disease that produced the aphasia.

Apraxia (Including Childhood Apraxia of Speech)

Apraxia of speech is a motor speech disorder characterized by difficulty planning, sequencing, and organizing motor or muscle movements specifically for the production of speech. The patient may have trouble forming words or speaking despite the ability to use the oral and facial muscles to make sounds. Apraxia of speech is caused by damage to the parts of the brain that control muscle movement. There are two main types of speech apraxia: acquired apraxia of speech and childhood apraxia of speech (CAS).

Acquired apraxia of speech can affect a person at any age, although it most typically occurs in adults. It is caused by damage to the parts of the brain that are involved in speaking and involves the loss or impairment of existing speech abilities. The disorder may result from a stroke, head injury, tumor, or other illness affecting the brain. Acquired apraxia of speech may occur together with muscle weakness affecting speech production (dysarthria) or language difficulties caused by damage to the nervous system (aphasia).

Childhood apraxia of speech (CAS) is a neurological childhood (pediatric) speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (e.g., abnormal reflexes, abnormal tone). CAS may occur as a result of known neurological impairment, in association with complex neurobehavioral disorders of known or unknown origin, or as an idiopathic neurogenic speech sound disorder. The core impairment in planning and/or programming spatiotemporal parameters of movement sequences results in errors in speech sound production and prosody. (ASHA, 2007b)

Recent scientific findings shed light on the cause of childhood apraxia of speech. British neurogeneticists at the University of Oxford have identified a gene mutation that appears responsible for CAS, or pediatric verbal apraxia (Lai, Fisher, Hurst, Vargha-Khadem, & Monaco, 2001). Studies suggest that the basal ganglia, a region in the brain that controls movement, may be slightly different in individuals with CAS.

Childhood apraxia of speech is not a developmental delay and a child will not outgrow this disorder. It is not an educational issue, but rather an issue of health and normal physiological

function. Developmental delay describes a slower than normal rate of development, but CAS is a disorder.

Characteristics of CAS (ASHA, 2007b) include:

- increase in the number of movements (longer words, more syllables), resulting in a corresponding increase in the number of speech sound errors
- numerous omissions of sounds
- possible limits in the variety of sounds used or persistence in using the earliest and most simple sounds such as /p, b, m/
- distorted or inconsistent vowels or possibly some nasalization
- speech sound errors often considered unusual when compared to "normal" articulation errors.

For more information, see ASHA's *Position Statement: Childhood Apraxia of Speech* at www.asha.org/docs/html/PS2007-00277.html.

Treatment

Speech-language pathologists use different approaches to treat apraxia of speech. Therapy is tailored to the individual and may be designed to treat other speech or language problems that may occur together with apraxia. Each person responds differently to therapy, and some people will make more progress than others. People with apraxia of speech usually need frequent and intensive one-on-one therapy. Treatment approaches vary, but typically include developing speech imitation skills, working on speech/oral-motor sequences, increasing length and complexity of syllable patterns, teaching rules of speech sound patterns, using a multi-modality approach, and even using augmentative communication systems when needed concurrently with speech therapy. Focus may also be on word finding and language organization problems.

Autism Spectrum Disorders

Autism spectrum disorders (ASD) are a range of neurobiological disorders that impair an individual's ability to process and integrate ordinary information; are characterized by speech, language, and communication impairments; and affect social and cognitive abilities as well. As the term "spectrum" indicates, there can be a wide range of effects. ASD includes Asperger disorder, pervasive developmental disorder, and Rett disorder.

Treatment

Speech-language pathologists serve on interdisciplinary teams to conduct evaluations and work with individuals with ASD to treat specific speech-language deficits, such as impairments in motor speech, semantics, pragmatics (awareness of appropriate language in a situational

context, or a person's use and interpretation of verbal and non-verbal language in social interactions), and receptive and expressive language skills.(ASHA, 2006)

A wide range of augmentative and alternative communication (AAC) approaches is often used to improve the social and communication competence of individuals with ASD. Unaided AAC approaches include, but are not limited to, the use of gestures, sign language, and facial expressions. Aided AAC approaches include, but are not limited to, the use of tools such as pictures, graphic symbols, or written cues, and the use of tools such as speech-generating devices (SGDs).

For more information on ASD see *Principles for Speech-Language Pathologists in Diagnosis, Assessment, and Treatment of Autism Spectrum Disorders Across the Life Span: Technical Report* at www.asha.org/docs/html/TR2006-00143.html.

(Central) Auditory Processing Disorder [See also (Central) Auditory Processing Treatment]

The inability to understand spoken language in a meaningful way in the absence of what is commonly considered a hearing loss is called an **auditory processing problem**. More specifically, **(central) auditory processing disorder, or (C)APD**, is a deficit in neural processing of auditory stimuli that is not due to higher order language, cognitive, or related factors. However, (C)APD may lead to or be associated with difficulties in higher order language (attention to and memory of auditory information, auditory synthesis, comprehension and interpretation of auditorily presented information), learning, and communication functions.

(Central) auditory processing (CAP) refers to the efficiency and effectiveness by which the central nervous system (CNS) utilizes auditory information, and refers to the perceptual processing of auditory information in the CNS. CAP includes the auditory mechanisms that underlie the following abilities or skills: sound localization and lateralization; auditory discrimination; auditory pattern recognition; temporal aspects of audition, including temporal integration, temporal discrimination (e.g., temporal gap detection), temporal ordering, and temporal masking; auditory performance in competing acoustic signals (including dichotic listening); and auditory performance with degraded acoustic signals.

(Central) auditory processing is a term used to describe what happens when an individual's brain recognizes and interprets the sounds around her or him. The "disorder" part of (C)APD means that something is adversely affecting the processing or interpretation of the information (National Institute on Deafness and Other Communication Disorders, 2004).

For more information, go to www.nidcd.nih.gov/health/voice/auditory.asp.

Role of Audiologists and Speech-Language Pathologists

Evaluation by both an audiologist and a speech-language pathologist provides important information about the individual with auditory processing problems. An audiologist will

evaluate hearing acuity and identify possible auditory perception problems, as noted above. A speech-language pathologist will evaluate perception of speech and receptive (understanding) and expressive (production) language use.

Speech-language pathologists have a unique role in delineating cognitive-communicative and language-related factors that may be associated with (C)APD in some individuals, and in the differential diagnosis of language processing disorders from (C)APD.

Treatment

Two general treatment approaches have been used for (C)APD. One approach focuses on training certain auditory and listening skills such as auditory discrimination (e.g., telling the difference between *peas* and *bees*), localization of sound, sequencing sounds, or identifying a target sound in a noisy background. Training these skills in isolation, however, may not help a child to understand complex language. Therefore, another approach concentrates on teaching more functional language skills (e.g., vocabulary, grammar, conversational skills) and uses strategies (e.g., visual aids and repeating directions) to facilitate the processing of language.

Cerebral Palsy

Cerebral palsy (CP) is a movement disorder caused by damage to the brain before, during, or soon after birth. The ability of people with CP to communicate effectively is often impaired by problems with speech and gestures commonly used in communication. Communication difficulties associated with cerebral palsy can be multifactorial, arising from motor, intellectual, and/or sensory impairments, and children with this diagnosis can experience mild to severe difficulties in expressing themselves. They are often referred for speech and language therapy services to maximize their communication skills and help them to take a role that is as independent as possible in interaction.

Treatment

Intervention can focus on receptive and expressive language skills, articulation, and development of the proper breath support for speech and swallowing, as well as introducing augmentative and alternative communication (AAC) systems, such as symbol charts or speech synthesizers.

Cleft Lip and Palate

Oral-facial clefts, such as **cleft lip and palate**, are birth defects in which the tissues of the mouth or lip don't form properly during fetal development, resulting in speech characterized by a resonance disorder, articulatory/phonological disorder, swallowing problems, and hearing problems. A child with a cleft lip and palate is referred to a cleft palate/craniofacial team as a newborn for a comprehensive, transdisciplinary evaluation. The medical, dental, audiological, speech-language, and feeding needs of this population can be met only through a team approach. Due to facial growth and development and changes in anatomical and structural

relationships, this population is followed from birth through the late teenage years or into early adulthood. Surgery or multiple surgeries may be planned as well.

The speech-language pathologist evaluates the function of the velopharyngeal mechanism and articulation, and communication skills in general. The purpose of the velopharyngeal mechanism is to close off the nasal cavity from the oral cavity during speech, normalizing both resonance and articulation for pressure sensitive phonemes. Closure is accomplished by the action of the velum, the lateral pharyngeal walls, and the posterior pharyngeal walls. Failure of these muscles to close during speech tasks results in velopharyngeal dysfunction (VPD). Instrumentation may be used to assess this problem (see Speech-Language Pathology Instrumentation). VPD also allows for the leakage of air into the nasal cavity, thus causing nasal resonance and reduced oral pressure. Resonance can be assessed as normal, hypernasal, hyponasal, or mixed hyper/hyponasality. The presence of hypernasality (too much sound resonating in the nasal cavity during speech, usually on vowels and voiced oral consonants) is often prevalent in this disorder. Audible nasal emission of air through the nasal cavity during oral pressure consonants may also be a finding.

Treatment

Improving articulatory placement and eliminating compensatory errors to improve velopharyngeal function and to decrease the perception of hypernasality may be a focus of treatment. Initially, nasal occlusion may be used to prevent development of nasal snorting and to improve direction of air flow (on a temporary basis only). Eliminating erred velopharyngeal patterns by looking, listening, and feeling for nasal air flow using auditory feedback, tactile feedback, and visual feedback may also be a focus of treatment (LeDuc, 2008).

Related Instrumental Assessment for Cleft Palate

If **velopharyngeal dysfunction (VPD)** is suspected, instrumentation may be used to further assess the disorder. The type of instrumentation will vary with the age of the patient and the perceptual findings. If a cleft palate/craniofacial team is involved, for example, its members will have access to:

- a nasometer that analyzes acoustic energy emitted through the oral cavity and nasal cavity during the production of speech
- aerodynamic assessment, measuring oral pressure and oral airflow during speech, and estimating the size of the velopharyngeal gap/orifice
- nasopharyngoscopy (a procedure using a flexible fiberoptic nasopharyngealscope) to visualize the velopharyngeal mechanism and its function by viewing the nasal surface of the velum and the velopharyngeal port during connected speech
- videofluoroscopy and lateral cephalographs to assess velopharyngeal closure during speech and phonation, respectively.

Cognitive-Communication Disorder (See also Cognitive-Communication Treatment; Traumatic Brain Injury)

Communication requires a complex interplay between cognition, language, and speech. **Cognitive-communication disorders** are cognitive deficits that affect one or all of the following areas: attention (including visuospatial neglect), memory, problem solving, reasoning, organizing, and planning. These deficits impact communication by decreasing comprehension, expression, and pragmatics (the use and interpretation of verbal and nonverbal language in social interaction). People who have suffered a traumatic brain injury (TBI) frequently exhibit cognitive-communication disorders. Damage to the right hemisphere of the brain (RHD), often due to stroke, can result in deficits of cognition and communication, as can other neurological insult and diseases such as encephalopathy.

Treatment

Intervention services are provided to individuals with cognitive-communication disorders, including problems in the ability to perceive, attend to, organize, and remember information; to reason and to solve problems; and to exert executive or self-regulatory control over cognitive, language, and social skills functioning. Assessment identifies the specific deficits along with preserved abilities and areas of relative strength in order to maximize functional independence and safety and to address the deficits that diminish the ability to communicate efficiently and effectively. Intervention may focus on developing compensatory memory strategies, formal problem-solving strategies and their application to functional activities, and improving attention at various levels of complexity. Treatment may focus on improving the processing of varied types of information, including verbal, non-verbal, and social cues. Interventions for specific language impairments such as reading comprehension and language formation may also be addressed.

Dementia

Dementia comprises multiple cognitive deficits including short- and long-term memory impairment and at least one of the following: language impairment, apraxia, agnosia, and/or impaired executive functioning. The most common cause of dementia is Alzheimer's disease. Declines in memory and other cognitive functions affect the ability to comprehend and produce linguistic information. Individuals with dementia may have difficulty following a conversation or following simple directions. Often they lose the topic, miss the point, and repeat themselves. Verbal output is reduced and is less substantive, and they are less efficient in expressing needs. Verbal output of late stage individuals appears nonsensical, and many late stage patients are unable to communicate even basic needs. Difficulty in swallowing may be seen.

When the dementia is caused by a progressive disease, periodic reevaluation and adjustment of care plans becomes essential to meet changing needs. Many standardized instruments with demonstrated reliability for screening for dementia are available. These instruments typically contain items that enable the clinician to identify an episodic memory problem and disorientation with regard to time, place, and person. If screening reveals cognitive impairment,

a comprehensive evaluation of communicative function should follow. Assessment tools should evaluate cognitive-communication strengths and weaknesses, including language comprehension and expression and integrity of working, declarative, and nondeclarative/procedural memory systems.

Treatment

Intervention should focus on improving functional communication abilities of individuals with dementia. Clinicians may use written or verbal cues for completing tasks or to assist memory recall, or they may develop a "memory book" to help recall personal information. Use of large-print signs to indicate locations of importance, such as restrooms, bedrooms, and dining rooms and other environmental modifications may be used. For swallowing problems, the clinician can work with the person to ensure safe swallowing. This may include teaching compensatory strategies or altering the diet to allow eating without risk of choking or illness.

Caregiver training is essential to facilitating optimal outcomes for individuals with dementia. Most caregivers lack understanding of how communicative functioning will be affected in the different stages of dementia, and will profit from periodic counseling as the dementing disease progresses.

Dysarthria

Dysarthria represents a group of motor speech disorders characterized by weakness, slowness, and/or lack of coordination of the speech musculature as the result of damage to the central or peripheral nervous system. Phonation, respiration, resonance, articulation, and prosody are affected. Movements may be impaired in force, timing, endurance, direction, and range of motion. Symptoms may include slurred speech, weak or imprecise articulatory contacts, weak respiratory support, low volume, incoordination of the respiratory stream, hypernasality, and reduced intelligibility.

Treatment

Intervention focuses on specific components of the speech production process such as improving muscle strength and control, reducing consonant imprecision, and improving respiration for producing an adequate voice. For example, Parkinson's patients may focus on phonation and the production of sounds to increase speech intelligibility. A variety of augmentative/alternative communication systems may provide a means of functional communication when natural speech is not understandable.

Dysphagia (Swallowing Disorder), Adult and Pediatric (See also Swallowing Treatment)

Dysphagia, or difficulty in swallowing, can result in choking, pulmonary problems, inadequate nutrition and hydration, and weight loss. It can cause food to enter the airway that may lead to death from aspiration pneumonia. For children, difficulties in sucking and breathing, in addition to swallowing, severely compromise nutrition. For children, lack of weight gain is like weight

loss in adults. Children may refuse specific foods and textures because of reduced oral motor skills. Causes include TBI, stroke, central nervous system infection, head and neck cancer, effects of radiation, degenerative diseases, congenital conditions (e.g., cerebral palsy), anatomic and structural problems (e.g., cleft palate), and psychosocial and behavioral issues.

Treatment

Assessments may include clinical bedside and/or instrumental methods such as videofluoroscopy or fiberoptic endoscopy (FEES). (See Dysphagia Instrumental Assessment.) Intervention may involve postural changes, diet manipulation, and oral and pharyngeal muscle strengthening exercises and techniques for improving swallowing physiology. Oral sensorimotor treatments may be used, as well as intraoral appliance therapy that improves jaw stability leading to better lip closure, chewing, and oral manipulation of food.

Hearing Disorder

A **hearing disorder** is the result of impaired auditory sensitivity of the physiological auditory system that may limit the development, comprehension, production, and/or maintenance of speech and/or language. Hearing disorders are classified according to difficulties in detection, recognition, discrimination, comprehension, and perception of auditory information.

Hearing loss can be categorized by what part of the auditory system is damaged. There are **three basic types** of hearing loss: **conductive hearing loss**, **sensorineural hearing loss,** and **mixed hearing loss**. Conductive hearing loss occurs when sound is not conducted efficiently through the outer ear canal to the eardrum and the tiny bones, or ossicles, of the middle ear. Conductive hearing loss includes, for example, conditions associated with middle ear pathology such as fluid in the middle ear from colds, allergies (serous otitis media), poor eustachian tube function, ear infection (otitis media), perforated eardrum, and benign tumors. Sensorineural hearing loss occurs when there is damage to the inner ear (cochlea) or to the nerve pathways from the inner ear (retrocochlear) to the brain. Sensorineural hearing loss not only involves a reduction in sound level, or ability to hear faint sounds, but also affects speech understanding. Sensorineural hearing loss can be caused by diseases, birth injury, drugs that are toxic to the auditory system, and genetic syndromes. Mixed hearing loss is when a conductive hearing loss occurs in combination with a sensorineural hearing loss.

Ototoxic drugs can affect hearing by damaging the nerves involved in hearing. Usually this occurs with large or toxic doses but it may also occur with lower doses. Antibiotics, diuretics, salicylates, and antineoplastics are some ototoxic drugs.

Audiometry defines the extent and characteristics of hearing loss. Hearing loss is measured as a difference from the normal ability to detect sound relative to established standards.

Treatment

Audiologic rehabilitation assessment is provided to evaluate the impact of a hearing loss on communication functioning (strengths and weaknesses), including the identification of speech-

language-communication impairments. Audiologic rehabilitation provides intervention to address the impairments, activity limitations, participation restrictions, and possible environmental and personal factors that may affect the communication, functional health, and well-being of persons with hearing impairment. Treatment involves compensating for the hearing loss as much as possible, and may include the fitting of a hearing aid, or the recommendation of a cochlear implant.

Hearing Aids*:* Sound amplification with a hearing aid helps people who have either conductive or sensorineural hearing loss.

Cochlear Implants*:* Most profoundly deaf people who cannot hear sounds even with a hearing aid benefit from a cochlear implant. Cochlear implants provide electrical signals directly into the auditory nerve by means of multiple electrodes inserted into the cochlea, which is the inner ear structure containing the auditory nerve. An external microphone and processor pick up sound signals and convert them to electrical impulses. The impulses are transmitted electromagnetically by an external coil through the skin to an internal coil, which connects to the electrodes. The electrodes stimulate the auditory nerve.

For infants, early detection of hearing loss and intervention services reduces the consequences of the loss. When hearing loss occurs at birth or within the first few months of life ("prelingual" onset), the impact on communication development is usually significant because the loss occurs during the time considered critical for language development. Even mild hearing loss can delay speech and language development in a young child. For adults, audiologic rehabilitation improves communication.

The audiologist selects, fits, and evaluates all forms of amplification devices for infants, children, and adults. Both speech-language pathologists and audiologists are qualified to provide audiological rehabilitation services to individuals with hearing loss. Cochlear implant users must learn a new way of processing sound and maximizing the effectiveness of the device; they benefit from intensive audiologic rehabilitation services.

Language Disorder (Spoken Language Comprehension and Expression, Pragmatics; See also Language Treatment)

Language is the brain's use of symbols for communication. A **language disorder** is characterized by deficiencies in comprehension (understanding) and/or production (use) of spoken and written language. The impairment may involve the form of language (phonology, morphology, syntax), the content of language (semantics), or the function of language in communication (pragmatics). Language disorders in children can result from congenital syndromes (e.g., Down syndrome, fragile X syndrome), diseases (e.g., meningitis), hearing loss, or head injury. Language disorders in adults can result from head injury, stroke, and dementia.

Treatment

Intervention services are conducted for children and adults with spoken and/or written language disorders, including problems in areas of language form (phonology and alphabetic symbols, morphology and orthographic patterns, and syntax), content (semantics), and/or use (pragmatics) across spoken and written modalities. Knowledge and use of language for listening, speaking, reading, writing, and thinking may include work on print symbols, syntax, and semantics, for example. Understanding and formulating complex spoken and written sentences may be a goal of treatment, as well as developing self-regulatory strategies for handling complex language and literacy demands.

Laryngectomy

Laryngectomy, a surgical removal of all or part of the larynx, is usually indicated to treat cancer of the larynx or vocal cords and adjacent tissues. The patient must learn a new method of communicating after a laryngectomy.

Treatment

Speech-language pathology is consulted prior to the surgical procedure to assess the individual's communication and learning skills and plan an appropriate and realistic approach for the patient to regain speech production post-operatively.

Post-operative speech-language therapy visits and duration of visits will vary in relation to the physical and emotional status of the patient, as well as the selected speech production program that may include: electrolarynx training, esophageal speech training, or tracheoesophageal prosthetic speech training, via the tracheoesophageal puncture or tracheoesophageal prosthesis (TEP). *TEP* is a prosthetic device that is placed into a puncture or opening between the trachea and the esophagus that is employed to generate tracheoesophageal speech, prevent aspiration, and maintain the integrity of the opening. The TEP shunts pulmonary air to the esophagus and the residual tissue at the juncture of the pharynx and esophagus becomes a vibratory sound source for alaryngeal speech.

It is primarily the responsibility of the speech-language pathologist to participate in the selection and fitting of the TEP, to teach the care and use of the TEP, and to identify and facilitate resolution of problems related to sound generation, the effective use of the prosthesis for speaking, and the tracheoesophageal puncture site. The speech-language pathologist is also primarily responsible for evaluating and training the patient to use a tracheostomal valve for hands-free speech.

Laryngectomy Related Instrumentation

Speech-language pathologists use instrumentation in assessment and treatment procedures related to laryngectomy (including prosthetics) that include, but are not limited to:

- Electrolarynx
- Prosthetics

An **electrolarynx** is a handheld device held against the throat region (or mouth with an oral adapter immediately post-op) to provide vibrations that allow speech sound. Electrolarynx training is generally required. An electrolarynx is a type of speech-substitute device for patients who have lost laryngeal function, for example, after a laryngectomy.

Prosthetics - Intervention services are conducted to assist individuals to understand, use, adjust, and restore their customized prosthetic/adaptive device (e.g., palatal lifts, obturators, artificial larynges, tracheoesophageal fistulization prostheses, and tracheostomy speaking valves). Prosthetic/adaptive device interventions include fitting, orientation, modification, and repair (ASHA, 2004d). Speech-language pathologists may use the following prosthetics, including but not limited to:

- Tracheoesophageal prosthesis (TEP)
- Tracheostomy speaking valves

A **tracheoesophageal prosthesis (TEP)** is a prosthetic device that is placed into a puncture or opening between the trachea and the esophagus that is employed to generate tracheoesophageal speech, prevent aspiration, and maintain the integrity of the opening. The TEP shunts pulmonary air to the esophagus and the residual tissue at the juncture of the pharynx and esophagus becomes a vibratory sound source for alaryngeal speech. TEPs are surgically placed to permit laryngectomized and other nonvocal (e.g., Amyotrophic Lateral Sclerosis) patients' production of tracheoesophageal speech (Hoffman, Bolton, & Ferry, 2008).

Tracheostomy speaking valves such as the Passy-Muir valve are considered voice prosthetics that enable the wearer to produce speech. A clinician at a children's hospital in Philadelphia reports, "We treat many children requiring tracheostomy tube placement. With potential for a tracheostomy tube to be in place for an extended period of time, these children may be at risk for long-term disruption to normal speech development. As such, speaking valves that restore more normal phonation are often key tools in the effort to restore speech and promote more typical language development in this population." (Hoffman, Bolton, & Ferry, 2008). Tracheotomized patients, both adults and children, use tracheostomy speaking valves.

See also, *Preferred Practice Patterns for the Profession of Speech-Language Pathology* (ASHA, *2004c)* at www.asha.org/docs/html/PP2004-00191.html#sec1.3.28.

Multiple Sclerosis

Rehabilitation is considered a necessary component of comprehensive, quality health care for people with **multiple sclerosis (MS)**, at all stages of the disease (National Multiple Sclerosis Society, n.d.). People with MS often have swallowing difficulties as well as speech problems. Cognitive skills and memory can also be impaired. Dysarthria, in which speech patterns may be disrupted or words slurred, occurs in approximately 40% of all patients with MS (Merson & Rolnick, 1998). When speech and voice disturbances do occur, they usually present as a spastic-ataxic dysarthria with disorders of voice intensity, voice quality, articulation, and intonation.

Treating dysarthria, dysphagia, and cognitive deficits in MS patients is effective for reestablishing functional daily activities

For more information, go to www.nationalmssociety.org/about-multiple-sclerosis/what-we-know-about-ms/treatments/rehabilitation/index.aspx

Treatment

The speech-language pathologist evaluates and treats problems with speech and/or swallowing resulting from damage in the MS patient's central nervous system (CNS) that reduces control of the muscles used in these functions. The goal of therapy is to enhance ease and clarity of communication and promote safe swallowing and overall health. Speech-language pathologists also evaluate and treat cognitive and memory problems in the MS patient.

Myofunctional Disorder (Tongue Thrust; See also Myofunctional Treatment)

Myofunctional disorder, or orofacial myofunctional disorder, including abnormal fronting (tongue thrust) of the tongue at rest and during swallowing, lip incompetency, and sucking habits, can be identified reliably. These conditions co-occur with speech misarticulations in some individuals.

Treatment

Speech-language pathologists provide structural assessment including observation of face, jaw, lips, tongue, teeth, hard palate, soft palate, and pharynx, as well as perceptual and instrumental diagnostic procedures to assess oral and nasal airway functions as they pertain to orofacial myofunctional patterns, swallowing, and/or speech production (e.g., speech articulation testing, aerodynamic measures).

Neurological Motor Speech Disorder (See also Neurological Motor Speech Treatment; Apraxia; Dysarthria)

Neurological motor speech assessment looks at the structure and function of the oral motor mechanism for non-speech and speech activities including assessment of muscle tone, muscle strength, motor steadiness and speech, range, and accuracy of motor movements. Speech characteristics of the phonatory-respiratory system (pitch, loudness, voice quality), resonance, articulation, and prosody are assessed.

Treatment

Intelligibility of speech is improved by increasing respiratory support for speech; improving laryngeal function and subsequent pitch, loudness, and voice quality; managing velopharyngeal inadequacy; normalizing muscle tone; and increasing muscle strength of the oral motor structures. Treatment also focuses on improving accuracy, precision, timing, and coordination

of articulation; implementing rate modification; and improving prosody and naturalness of speech.

Parkinson's Disease

Many people with Parkinson's disease suffer from disorders of speech and voice. Cognitive skills and memory can also be impaired. These disorders are typically characterized by speech and voice that are monotonous, quiet, hoarse, and breathy. People with Parkinson's disease also tend to give fewer non-verbal cues, such as facial expressions and hand gestures. These disabilities tend to increase as the disease progresses and can lead to serious problems with communication.

Treatment

Patients with Parkinson's are referred for speech and language therapy to improve the intelligibility of their speech. Parkinson's patients primarily receive treatment for dysarthria, articulation, voice, and resonance problems. They may also need swallowing treatment. Specific treatment to address cognitive and memory skills may also be addressed.

Speech Sound Disorders Treatment (Articulation Disorder Treatment, Phonological Process Disorder Treatment)

Speech sound disorders treatment focuses on correct speech sound production. Speech sound impairments may arise from problems with articulation (making sounds) and **phonological processes** (sound patterns). **Articulation disorders** include problems with **articulation** and may involve sound substitutions, omissions, additions, or distortions. A **phonological process disorder** involves patterns of sound errors. For example, sounds made in the back of the mouth like "k" and "g" may be substituted for those in the front of the mouth like "t" and "d" (e.g., saying "tup" for "cup" or "das" for "gas").

Treatment

Treatment optimizes speech discrimination, speech sound production, and intelligibility in multiple communication contexts.

Stuttering and Cluttering Disorder (See also Fluency Treatment)

Stuttering (stammering) is a speech disorder in which sounds, syllables, or words are repeated or prolonged, disrupting the normal flow of speech. These speech disruptions may be accompanied by struggling behaviors, such as rapid eye blinks or tremors of the lips. Stuttered speech often includes repetitions of words or parts of words, as well as prolongations of speech sounds. Speech may become completely stopped or blocked, so that the mouth is positioned to say a sound, sometimes for several seconds, with little or no sound forthcoming. After some effort, the person may complete the word. Interjections such as "um" or "like" can occur as well.

In 2010, for the first time, National Institute on Deafness and Other Communication Disorders researchers isolated three genes that cause stuttering (National Institute on Deafness and Other Communication Disorders, 2010).

Cluttering is a syndrome characterized by a speech delivery rate that is abnormally fast and/or irregular. Cluttered speech is characterized by one or more of the following: (1) failure to maintain normally expected sound, syllable, phrase, and pausing patterns and/or (2) greater than expected incidents of dysfluency, the majority of which are unlike those typical of people who stutter. Examples of cluttered speech include compressed consonant clusters, unfinished words, and shortened vowels.

Treatment

Current therapies for individuals who stutter focus on learning ways to minimize stuttering that include speaking more slowly, regulating breathing, or gradually progressing from single-syllable responses to longer words and more complex sentences. Easy onset of voicing, light articulatory contacts, and use of computer-assisted feedback to train the patient in fluency are treatment methods designed to establish fluent speech. Muscle tension reduction may also be used.

Fluency intervention is provided to improve aspects of speech fluency and concomitant features of fluency disorders to optimize activity/participation, such as reduction of avoidance behaviors.

Treatment for cluttering should be tailored to the client's unique difficulties and may include goals such as slowing rate; heightening monitoring; using clear articulation; using acceptable, organized language; interacting with listeners; speaking naturally; and reducing excessive dysfluencies.

Traumatic Brain Injury (See also Cognitive-Communication Disorder; Cognitive-Communication Treatment)

Traumatic brain injury (TBI) can result in lifelong impairment of physical, cognitive, and psychosocial functioning. Adults and children who have experienced a TBI frequently exhibit cognitive-communication disorders. Communication requires a complex interplay between cognition, language, and speech, with cognitive processes ranging from basic to complex and includes attention, memory, reasoning, and executive functions. Communication involves listening, reading, writing, speaking, and gesturing at all levels of language. Speech-language pathologists provide cognitive-communication treatment to TBI patients through evaluation of specific language and cognitive deficits and development of an intervention program.

Evidence supports the use of cognitive and behavioral rehabilitation strategies for individuals with TBI (NIH Consensus Development Panel on Rehabilitation of Persons with Traumatic Brain Injury, 1999).

Treatment

Intervention is tailored to the unique needs of the individual and may focus on such skills as attention, memory, pragmatics, problem solving, and functional communication. The goal of cognitive-communication intervention is for the person to achieve the highest possible level of communicative participation in daily living.

Velopharyngeal Dysfunction (See also Cleft Lip and Palate; Voice and/or Resonance Treatment; Voice and/or Resonance Disorder)

The purpose of the velopharyngeal mechanism is to close off the nasal cavity from the oral cavity during speech, normalizing both resonance and articulation for pressure sensitive phonemes. Closure is accomplished by the action of the velum, the lateral pharyngeal walls, and the posterior pharyngeal walls. Failure of these muscles to close during speech tasks results in **velopharyngeal dysfunction (VPD)**. Instrumentation may be used to assess this problem (see Speech-Language Pathology Instrumentation). VPD also allows for the leakage of air into the nasal cavity, thus causing nasal resonance and reduced oral pressure. Resonance can be assessed as normal, hypernasal, hyponasal, or mixed hyper/hyponasal. The presence of hypernasality (too much sound resonating in the nasal cavity during speech, usually on vowels and voiced oral consonants) is often prevalent in this disorder. Audible nasal emission of air through the nasal cavity during oral pressure consonants may also be a finding.

Velopharyngeal Dysfunction Instrumental Assessment

If **VPD** is suspected, instrumentation may be used to further assess the disorder. The type of instrumentation will vary with the age of the patient and the perceptual findings. If a cleft palate/craniofacial team is involved, for example, team members will have access to:

- a nasometer that analyzes acoustic energy emitted through the oral cavity and nasal cavity during the production of speech
- aerodynamic assessment, measuring oral pressure and oral airflow during speech, and estimating the size of the velopharyngeal gap/orifice
- nasopharyngoscopy (a procedure using a flexible fiberoptic nasopharyngeal scope) to visualize the velopharyngeal mechanism and its function by viewing the nasal surface of the velum and the velopharyngeal port during connected speech
- videofluoroscopy and lateral cephalographs to assess velopharyngeal closure during speech and phonation, respectively.

Treatment

Improving articulatory placement and eliminating compensatory errors to improve velopharyngeal function and decrease the perception of hypernasality may be a focus of treatment. Initially, nasal occlusion may be used to prevent development of nasal snorting and to improve direction of air flow (on a temporary basis only). Eliminating inappropriate velopharyngeal patterns by looking, listening, and feeling for nasal air flow using auditory feedback, tactile feedback, and visual feedback may also be a focus of treatment.

Voice and/or Resonance Disorder (See also Velopharyngeal Dysfunction; Cleft Lip and Palate; Voice and/or Resonance Treatment; Laryngectomy)

***Voice disorder,* or dysphonia** (an impairment of the speaking voice), arises from an abnormality of the structures and or functions of the voice production system and can cause bodily pain, a personal communication disability, and an occupational or social handicap. Genetic factors may predispose an individual to voice disorders; chronic and acute variables such as occupational vocal demands, medications, health problems, environment, physical trauma, and lifestyle choices may precipitate dysphonia. A voice disorder involves problems with pitch, loudness, and quality. Pitch is the level of a sound based on the frequency of the sound waves. Loudness is the perceived volume (or amplitude) of the sound; quality refers to the distinctive attributes of a sound. Voice disorders are caused by a variety of etiologies, including vocal cord lesions (nodules, polyps, cysts), viral infections, trauma, vocal cord paralysis and paresis, surgical procedures, vocal cord hemorrhage, voice misuse and overuse, laryngeal cancer, laryngopharyngeal reflux disease (LPRD), and other diseases or conditions.

Treatment

Treatment focuses on improving voice quality. Treatment is provided for individuals with resonance or nasal airflow disorders, velopharyngeal incompetence, or articulation disorders caused by velopharyngeal incompetence and related disorders such as cleft lip/palate.

Research data and expert clinical experience support the use of voice therapy in the management of patients with acute and chronic voice disorders (ASHA & AAO-HNS, 2005). Voice therapy is the treatment of choice for muscle tension dysphonia. In complex disorders, such as paradoxical vocal fold motion, voice therapy helps to reduce long-term costs of treatment by minimizing expensive emergency room visits and hospitalizations. Benign vocal fold lesions are a common cause of dysphonia, and most laryngologists consider voice therapy, often together with medical management, the initial treatment of choice for benign lesions. Many studies have documented excellent outcomes after voice therapy in patients with a variety of benign lesions (Blood, 1994; Gordon, Pearson, Paton, & Montgomery, 1997; Holmberg, Hillman, Hammarberg, Sodersten, & Doyle, 2001; Lancer, Snyder, Jones, & Le Boutillier, 1988; McCrory, 2001; Murry & Woodson, 1992; Smith & Thyme, 1976; Speyer, Weineke, Hosseini, Kempen, Kersing, & DeJonckere, 2002.; Verdolini-Marston, Burke, Lessac, Glaze, & Caldwell, 1995; Ylitalo & Hammarberg, 2000). Increasingly, otolaryngologists are using response to voice therapy to help differentiate among benign mucosal lesions, inform the treatment decision for surgery, and optimize surgical outcome. When surgery is necessary, pre- and postoperative voice therapy may shorten the postoperative recovery time, allowing faster return to work and limiting scar tissue and permanent dysphonia.

Most otolaryngologists consider voice therapy essential as definitive treatment or as adjunctive to surgery for patients with unilateral vocal fold paralysis (Benninger et al., 1994). Evidence suggests that preoperative voice therapy improves voice outcomes for greater than 50% of

patients with unilateral vocal fold paralysis and may render surgery unnecessary (Heuer, et al., 1997). In other neurological-based dysphonia, such as Parkinson's disease, voice therapy has yielded significant improvement in overall communication.

See also **Voice and Resonance Instrumentation** under **Voice and/or Resonance Treatment**.

Section IV

Speech-Language Pathology Instrumentation & Prosthetics

Speech-Language Pathology Instrumentation

Speech-language pathologists use instrumentation in assessment and treatment procedures, including, but not limited to:

- dysphagia instrumental assessment
- electrolarynx
- laryngeal function studies
- velopharyngeal dysfunction instrumental assessment
- videostroboscopy

Dysphagia Instrumental Assessment

An instrumental evaluation is indicated for patients with suspected or high risk for pharyngeal dysphagia. Oral stage dysphagia treatment may continue prior to the instrumental assessment. The final analysis and interpretation of an instrumental assessment should include a definitive diagnosis, identification of the swallowing phase(s) affected, and a recommended treatment plan, including compensatory swallowing techniques and/or postures and food and/or fluid texture modification. An instrumental assessment is not indicated if findings from the clinical evaluation fail to support a suspicion of dysphagia or if they suggest dysphagia but (1) the patient is unable to cooperate or participate in an instrumental evaluation or (2) the instrumental examination would not change the clinical management of the patient.

Absence of instrumental evaluation does not preclude the patient from receiving dysphagia treatment.

Speech-language pathologists use instrumentation in assessment and treatment procedures for swallowing disorders (ASHA, 2004d), including but not limited to the following:

- videofluoroscopic swallowing study (VFSS), or motion fluoroscopic evaluation of swallowing by cine or video recording, also known as the modified barium swallow (MBS)
- endoscopic evaluation of swallowing by cine or video recording (also called flexible fiberoptic endoscopic evaluation of swallowing (FEES)
- flexible fiberoptic endoscopic evaluation of swallowing with sensory testing (FEESST).

Videofluoroscopic Swallowing Study (VFSS), or Motion fluoroscopic evaluation of swallowing by cine or video recording, also known as the modified barium swallow (MBS) is a videofluoroscopic, radiographic test that differs from the traditional barium swallow procedure. The MBS incorporates a set of modifications in consistency, bolus size, texture, patient positioning, and radiographic focus to facilitate optimum visualization of the oral-pharyngeal-laryngeal structures and their function during swallowing. The effects of compensatory maneuvers and diet modification on aspiration prevention and/or bolus transport during

swallowing can be studied radiographically to determine a safe diet and to maximize efficiency of the swallow.

Endoscopic evaluation of swallowing by cine or video recording (also called Flexible Fiberoptic Endoscopic Evaluation of Swallowing (FEES) utilizes the fiberoptic nasopharyngolaryngoscope to evaluate the pharyngeal swallow. Detailed information regarding swallowing function and related functions of structures within the upper aerodigestive tract are obtained. Therapeutic maneuvers are attempted during this examination to determine a safe diet and to maximize the efficiency of the swallow.

Flexible Fiberoptic Endoscopic Evaluation, of Swallowing with Sensory Testing (FEESST) is the performance of a FEES with the incorporation of laryngeal sensory testing. The sensory evaluation is completed by delivering pulses of air at sequential pressures to elicit the laryngeal adductor reflex. A sensory threshold is thus established.

This information has been adapted from ASHA's *Model Medical Review Guidelines for Dysphagia Services* (ASHA, 2004a) and refined from Medicare's original guidelines. To view the model guidelines, go to
www.asha.org/uploadedFiles/practice/reimbursement/medicare/DynCorpDysphHCEC.pdf

Individuals of all ages are treated on the basis of swallowing function assessment. At the conclusion of the assessment, the presence, severity, and pattern of dysphagia should be determined, and recommendations made with collaboration among the therapist, physician, and patient/family.

Electrolarynx

An **electrolarynx** is a handheld device held against the throat region (or mouth with an oral adapter immediately post-op) to provide vibrations that allow speech sound. Electrolarynx training is generally required. An electrolarynx is a type of speech-substitute device for patients who have lost laryngeal function, for example, after a laryngectomy.

Laryngeal Function Studies

Laryngeal function studies (e.g., aerodynamic testing and acoustic testing) are important instrumental measures that may be used to assess voice production and/or laryngeal function. Aerodynamic testing assesses average airflow, peak airflow, vocal efficiency, and subglottal pressure. Acoustic tests include pitch, loudness, jitter, shimmer, signal-to-noise ratio, and spectral analysis. Instrumental techniques ensure the validity of signal processing, analysis routines, and elimination of task or signal artifacts. Computer analysis is used.

Velopharyngeal Dysfunction Instrumental Assessment

If **velopharyngeal dysfunction (VPD)** is suspected, instrumentation may be used to further assess the disorder. The type of instrumentation will vary with the age of the patient and the perceptual findings. If a cleft palate/craniofacial team is involved, for example, team members will have access to:

- a nasometer that analyzes acoustic energy emitted through the oral cavity and nasal cavity during the production of speech
- aerodynamic assessment, measuring oral pressure and oral airflow during speech, and estimating the size of the velopharyngeal gap/orifice
- nasopharyngoscopy (a procedure using a flexible fiberoptic nasopharyngealscope) to visualize the velopharyngeal mechanism and its function by viewing the nasal surface of the velum and the velopharyngeal port during connected speech
- videofluoroscopy and lateral cephalographs to assess velopharyngeal closure during speech and phonation, respectively.

Videostroboscopy

The *ASHA Scope of Practice* (ASHA, 2007a) states that the practice of speech-language pathology includes providing services using videoendoscopy/stroboscopy.

Videostroboscopic laryngoscopy incorporates a stroboscope, laryngeal fiberscope, and videoscope to produce a permanent image of the motion of the vocal folds. The slow motion effects of the stroboscope enable clinical observation of vocal fold vibrations. Videostroboscopy is a diagnostic procedure for examination of the vocal cords when pathology is suspected (based on persistent symptoms or other findings with suspected pathology such as carcinoma, vocal cord paralysis, or polyps) despite a negative or unsatisfactory/inadequate mirror-image and endoscopic examinations. It is performed by an otolaryngologist or licensed speech-language pathologist.

See also *Knowledge and Skills for Speech-Language Pathologists with Respect to Vocal Tract Visualization and Imaging* (ASHA, 2004d) at www.asha.org/docs/html/KS2004-00071.html.

Speech-Language Pathology Prosthetics

Intervention services are conducted to help individuals to understand, use, adjust, and restore their customized prosthetic/adaptive devices (e.g., palatal lifts, obturators, artificial larynges, tracheoesophageal fistulization prostheses, and tracheostomy speaking valves). Prosthetic/adaptive device interventions include fitting, orientation, modification, and repair (ASHA, 2004c)

See also: *Preferred Practice Patterns for the Profession of Speech-Language Pathology* at www.asha.org/docs/html/PP2004-00191.html#sec1.3.28.

Speech-language pathologists may use the following prosthetics, including but not limited to:

- tracheoesophageal prosthesis (TEP)
- tracheostomy speaking valves
- cochlear implants
- laryngeal implants.

Tracheoesophageal Prosthesis (TEP)

A **tracheoesophageal prosthesis (TEP)** is a device that is placed into a puncture or opening between the trachea and the esophagus to generate tracheoesophageal speech, prevent aspiration, and maintain the integrity of the opening. The TEP shunts pulmonary air to the esophagus and the residual tissue at the juncture of the pharynx and esophagus becomes a vibratory sound source for alaryngeal speech. TEPs are surgically placed to permit laryngectomized and other nonvocal (e.g., amyotrophic lateral sclerosis) patients' production of tracheoesophageal speech (Hoffman, Bolton, & Ferry, 2008).

Tracheostomy Speaking Valves

Tracheostomy speaking valves such as the Passy-Muir valve are considered voice prosthetics that enable the wearer to produce speech. A clinician at a children's hospital in Philadelphia reports, "We treat many children requiring tracheostomy tube placement. With potential for a tracheostomy tube to be in place for an extended period of time, these children may be at risk for long-term disruption to normal speech development. As such, speaking valves that restore more normal phonation are often key tools in the effort to restore speech and promote more typical language development in this population"(Hoffman, Bolton, & Ferry, 2008). Tracheotomized patients, both adults and children, use tracheostomy speaking valves.

Cochlear Implants

Cochlear Implants are small, complex electronic devices that help to provide a sense of sound to a person who is profoundly deaf or severely hard-of-hearing. Cochlear implants, coupled with intensive post-implantation therapy, can help young children to acquire speech, language, and social skills and, in adult implant patients, facilitate sound awareness, increased speech, and environmental sound detection. Cochlear implants enable sound to transmit to the auditory nerve so that profoundly hearing impaired or entirely deaf patients can process sounds. Speech-language pathologists help patients adjust to cochlear implants.

The implant consists of an external portion that sits behind the ear and a second portion that is surgically placed under the skin. An implant has the following parts:

- a microphone, which picks up sound from the environment
- a speech processor, which selects and arranges sounds picked up by the microphone
- a transmitter and receiver/stimulator, which receive signals from the speech processor and convert them into electric impulses
- an electrode array, which is a group of electrodes that collects the impulses from the stimulator and sends them to different regions of the auditory nerve.

An implant does not restore normal hearing. Instead, it can give a deaf person a useful representation of sounds in the environment and help him or her to understand speech (National Institute on Deafness and Other Communication Disorders, 2009).

See also: National Institutes of Health, National Institute on Deafness and Other Communication Disorders Web site on Cochlear Implants at www.nidcd.nih.gov/health/hearing/coch.asp.

Laryngeal Implants

Laryngeal implants are devices used to restore voice when the larynx is damaged or paralyzed, precluding speech production. Implants are of various types and materials such as Gore-Tex, titanium, silastic material, collagen, or tubular expanded polytetrafluoroethylene (e-PTFE). They are implanted into a vocal fold or laryngeal vestibule to allow for precise, easily adjustable control of vocal cord medicalization to approximate a natural voice.

Section V

Applicable Billing Codes

Applicable Billing Codes: CPT, ICD-9-CM, HCPCS Codes

The following list of treatment and diagnosis codes are commonly utilized codes for services provided by speech-language pathologists, and include but are not limited to:

Current Procedural Terminology (CPT)

92506	Evaluation of speech, language, voice, communication, and/or auditory processing disorder
92507	Treatment of speech, language, voice, communication, and/or auditory processing disorder; individual
92508	Treatment of speech, language, voice, communication, and/or auditory processing disorder; group, 2 or more individuals
92511	Nasopharyngoscopy with endoscope (separate procedure)
92520	Laryngeal function studies (ie, aerodynamic testing and acoustic testing)
92526	Treatment of swallowing dysfunction and/or oral function for feeding
92610	Evaluation of oral and pharyngeal swallowing function
92611	Motion fluoroscopic evaluation of swallowing function by cine or video recording
92612	Flexible fiberoptic endoscopic evaluation of swallowing by cine or video recording
92614	Flexible fiberoptic endoscopic evaluation, laryngeal sensory testing by cine or video recording
92616	Flexible fiberoptic endoscopic evaluation of swallowing and laryngeal sensory testing by cine or video recording
92626	Evaluation of auditory rehabilitation status, first hour
92627	Evaluation of auditory rehabilitation status, each additional 15 minutes
92630	Auditory rehabilitation; prelingual hearing loss
92633	Auditory rehabilitation; postlingual hearing loss
92597	Evaluation for use and/or fitting of voice prosthetic device to supplement oral speech
92605	Evaluation for prescription of non-speech-generating augmentative and alternative communication device
92606	Therapeutic service(s) for the use of non-speech-generating device, including programming and modification

92607	Evaluation for prescription for speech-generating augmentative and alternative communication device, face-to-face with the patient; first hour
92608	Evaluation for prescription for speech-generating augmentative and alternative communication device, face-to-face with the patient; each additional 30 minutes
92609	Therapeutic services for use of speech-generating device, including programming and modification
96105	Assessment of aphasia (includes assessment of expressive and receptive speech and language function, language comprehension, speech production ability, reading, spelling, writing, eg, by Boston Diagnostic Aphasia Examination) with interpretation and report, per hour96110 Developmental testing; limited, with interpretation and report
96111	Developmental testing; extended (includes assessment of motor, language, social, adaptive and/or cognitive functioning by standardized developmental instruments) with interpretation and report
96125	Standardized cognitive performance testing (eg, Ross Information Processing Assessment) per hour of a qualified health care professional's time, both face-to-face time administering tests to the patient and time interpreting these test results and preparing the report
97532	Development of cognitive skills to improve attention, memory, problem solving (includes compensatory training), direct (one-on-one) patient contact by the provider, each 15 minutes
97533	Sensory integrative techniques to enhance sensory processing and promote adaptive responses to environmental demands, direct (one-on-one) patient contact by the provider, each 15 minutes
31575	Laryngoscopy; flexible fiberoptic; diagnostic
31579	Laryngoscopy; flexible or rigid fiberoptic, with stroboscopy
92551	Screening test, pure tone, air only

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)

Multiple and varied.

Health Care Procedure Coding System National (HCPCS) Level II Codes

E1902	Communication board, nonelectronic augmentative or alternative communication device
E2500	Speech generating device, digitized speech, using prerecorded messages, less than or equal to 8 minutes recording time
E2502	Speech generating device, digitized speech, using prerecorded messages, greater than 8 minutes but less than or equal to 20 minutes of recording time
E2504	Speech generating device, digitized speech, using prerecorded messages, greater than 20 minutes but less than or equal to 40 minutes of recording time
E2506	Speech generating device, digitized speech, using prerecorded messages, greater than 40 minutes of recording time
E2508	Speech generating device, synthesized speech, requiring message formulation by spelling and access by physical contact with the device
E2510	Speech generating device, synthesized speech, permitting multiple methods of message formulation and multiple methods of device access
E2511	Speech generating software program, for personal computer or personal digital assistant
E2512	Accessory for speech generating device, mounting system
E2599	Accessory for speech generating device, not otherwise specified
G0153	Services performed by a qualified speech-language pathologist in the home health or hospice setting, each 15 minutes
G0161	Services performed by a qualified speech-language pathologist, in the home health setting, in the establishment or delivery of a safe and effective therapy maintenance program, each 15 minutes
L8499	Unlisted procedure for miscellaneous prosthetic services
L8500	Artificial larynx, any type
L8501	Tracheostomy speaking valve
L8505	Artificial larynx replacement battery/accessory, any type
L8507	Tracheo-esophageal voice prosthesis, patient inserted, any type, each

L8509	Tracheo-esophageal voice prosthesis, inserted by a licensed health care provider, any type
L8510	Voice amplifier
L8511	Insert for indwelling tracheoesophageal prosthesis, with our without valve, replacement only, each
L8512	Gelatin capsules or equivalent, for use with tracheoesophageal voice prosthesis, replacement only, per 10
L8513	Cleaning device used jwith tracheoesophageal voice prosthesis, pipet, brush, or equal, replacement only, each
L8514	Tracheoesophageal puncture dilator, replacement only, each
L8515	Gelatin capsule, application device for use with tracheoesophageal voice prosthesis, each
S9128	Speech therapy, in the home, per diem
S9152	Speech therapy, re-evaluation
V5336	Repair/modification of augmentative communicative system or device (excludes adaptive hearing aid)
V5362	Speech screening
V5363	Language screening
V5364	Dysphagia screening

Section VI

References

The following sources of information were used in this document and may be referenced for more detail:

American Speech-Language-Hearing Association. (2004a). *Admission/discharge criteria in speech-language pathology [Guidelines].* Retrieved from http://www.asha.org/docs/html/GL2004-00046.html

American Speech-Language-Hearing Association. (2004b). *Model medical review guidelines for dysphagia services.* Retrieved from http://www.asha.org/uploadedFiles/practice/reimbursement/medicare/DynCorpDysphHCEC.pdf

American Speech-Language-Hearing Association. (2004c). *Preferred practice patterns for the profession of speech-language pathology [Preferred Practice Patterns].* Retrieved from http://www.asha.org/docs/html/PP2004-00191.html

American Speech-Language-Hearing Association. (2004d). *Knowledge and skills for speech-language pathologists with respect to evaluation and treatment for tracheoesophageal puncture and prosthesis [Knowledge and Skills].* Retrieved from http://www.asha.org/docs/html/KS2004-00070.html

American Speech-Language-Hearing Association. (2007a). *Scope of practice in speech-language pathology [Scope of Practice].* Retrieved from http://www.asha.org/docs/html/SP2007-00283.html

American Speech-Language-Hearing Association. (2007b). *Childhood apraxia of speech [Position Statement].* Retrieved from http://www.asha.org/docs/html/PS2007-00277.html

American Speech-Language-Hearing Association. (2008a). *Incidence and prevalence of communication disorders and hearing loss in children*. Retrieved from http://www.asha.org/research/reports/children.htm

American Speech-Language-Hearing Association. (2008b). *Incidence and prevalence of hearing loss and hearing aid use in the United States*. Retrieved from http://www.asha.org/research/reports/hearing.htm

American Speech-Language-Hearing Association. (2008c). *Incidence and prevalence of communication disorders and hearing loss in adults in the United States*. Retrieved from http://www.asha.org/research/reports/speech_voice_language.htm

American Speech-Language-Hearing Association. (2010). *Certification*. Retrieved from http://www.asha.org/certification/

American Speech-Language-Hearing Association. (n.d.-a). Treatment efficacy summaries. Retrieved from http://www.asha.org/public/EfficacySummaries.htm.

American Speech-Language-Hearing Association. (n.d.-b). Compendium of EBP Guidelines and Systematic Reviews. Retrieved from http://www.asha.org/members/ebp/compendium/

American Speech-Language-Hearing Association, Ad Hoc Committee on Autism Spectrum Disorders. (2006). *Principles for speech-language pathologists in diagnosis, assessment, and treatment of autism spectrum disorders across the life span [Technical Report]*. Retrieved from http://www.asha.org/docs/html/TR2006-00143.html

American Speech-Language-Hearing Association, Ad Hoc Committee on Service Delivery in the Schools. (1993). *Definitions of communication disorders and variations [Relevant Paper]*. Retrieved from http://www.asha.org/docs/html/RP1993-00208.html

American Speech-Language-Hearing Association and American Academy of Otolaryngology-Head and Neck Surgery. (2005). *The Use of Voice Therapy in the Treatment of Dysphonia [Technical Report].* Retrieved from http://www.asha.org/docs/html/TR2005-00158.html

Benninger, M. S., Crumley, R. L., Ford, C. N., Gould, W. J., Hanson, D. G., Ossoff, R. H., et al. (1994). Evaluation and treatment of the unilateral paralyzed vocal fold. *Otolaryngology-Head and Neck Surgery, 111*, 497-508.

Blood, G. W. (1994). Efficacy of a Computer-Assisted Voice Treatment Protocol. *American Journal of Speech-Language Pathology, 3*, 57-66.

Campbell KP (Ed.) . (2007). *Investing in maternal and child health: An employer's toolkit.* Washington, DC: Center for Prevention and Health Services, National Business Group on Health; 2007. Retrieved from http://www.businessgrouphealth.org/healthtopics/maternalchild /investing/ docs/mch_toolkit.pdf

Gordon, M. T., Pearson, L., Paton, F., & Montgomery, R. (1997). Predictive assessment of vocal efficacy (PAVE): A method for voice therapy outcome measurement. *Journal of Laryngology and Otology, 3*, 120-133.

Heuer, R. J., Sataloff, R. T., Emerich, K., Rulnick, R., Baroody, M., Spiegel, J. R., et al. (1997). Unilateral recurrent laryngeal nerve paralysis: The importance of "preoperative" voice therapy. *Journal of Voice, 11*, 88-94.

Hoffman, L., Bolton, J., & Ferry, S. (2008, June). Passy-Muir Speaking Valve Use in a Children's Hospital: An Interdisciplinary Approach. *Perspectives on Voice and Voice Disorders,* 18, 76-86.

Holmberg, E. B., Hillman, R. E., Hammarberg, B., Sodersten, M., & Doyle, P. (2001). Efficacy of a behaviorally based voice therapy protocol for vocal nodules. *Journal of Voice, 15*, 395-412. Lai, C., Fisher, S., Hurst, J., Vargha-Khadem, F., & Monaco, A. (2001, October 4). A forkhead-domain gene is mutated in a severe speech and language disorder. *Nature, 413*, 519-523.

Lancer, M., Syder, D., Jones, A. S., & Le Boutillier, A. (1988). The outcome of different management patterns for vocal cord nodules. *Journal of Laryngology and Otology, 102*, 423-432.

LeDuc, J. A. (2008, December). Cleft Palate and/or Velopharyngeal Dysfunction: Assessment and Treatment. *Perspectives on School-Based Issues, 9*, 155-161.

McCrory, E. (2001). Voice therapy outcomes in vocal fold nodules: A retrospective audit. *International Journal of Language & Communication Disorders*, 36(Suppl.), 19-24.

Merson, R., & Rolnick, M. (1998, August). *Physical Medicine and Rehabilitation Clinics of North America, 9*, 631-641.

Murry, T., & Woodson, G. E. (1992). A comparison of three methods for the management of vocal fold nodules. *Journal of Voice, 6*, 271-276.

National Business Group on Health. (2007). *Investing in Maternal and Child Health: An Employer's Toolkit.* (K. Campbell, Ed.) Retrieved from http://www.businessgrouphealth.org/healthtopics/maternalchild/investing/docs/mch_toolkit.pdf

National Institute on Deafness and Other Communication Disorders. (2004). *Auditory Processing Disorders in Children*. Retrieved from http://www.nidcd.nih.gov/health/voice/auditory.asp

National Institute on Deafness and Other Communication Disorders. (2009). *Cochlear Implants*. Retrieved from http://www.nidcd.nih.gov/health/hearing/coch.asp

National Institute on Deafness and Other Communication Disorders. (2010). *Stuttering*. Retrieved from: http://www.nidcd.nih.gov/health/voice/stutter.htm

National Multiple Sclerosis Society. (n.d.). *The Role of Rehabilitation in Managing MS*. Retrieved from http://www.nationalmssociety.org/about-multiple-sclerosis/what-we-know-about-ms/treatments/rehabilitation/index.aspx

NIH Consensus Development Panel on Rehabilitation of Persons with Traumatic Brain Injury. (1999). Rehabilitation of Persons with Traumatic Brain Injury. *The Journal of the American Medical Association, 282*, 974-983.

Patient Protection and Affordable Care Act (2010). Pub. L. 111-148, 124 Stat. 1990 (to be codified in scattered sections of 42 U.S.C.).

Paul-Brown, D. (2003). *Let's Talk: What are Auditory Processing Problems?* Retrieved from American Speech-Language-Hearing Association Web site: http://www.asha.org/uploadedFiles/aud/LetsTalkAuditoryProcessing.pdf

Shannon, P., & Bockenek, W. (2009). *Amyotrophic Lateral Sclerosis.* Retrieved from http://emedicine.medscape.com/article/306543-overview

Smith, S., & Thyme, K. (1976). Statistic research on changes in speech due to pedagogic treatment (the accent method). *Folia Phoniatricia, 28*, 98-103.

Speyer, R., Weineke, G., Hosseini, E. G., Kempen, P. A., Kersing, W., & Dejonckere, P. H. (2002). Effects of voice therapy as objectively evaluated by digitized laryngeal stroboscopic imaging. *Annals of Otology, Rhinology & Laryngology, 111*, 902-908.

Stedman's Medical Dictionary. (2000). 27th ed. Baltimore, MD: Lippincott Williams & Wilkins, 2000, 1784.

Thibeault, S., Zelazny, S. C., & Cohen, C. (2009, May 26). Voice boot camp: Intensive treatment success. *The ASHA Leader*. Retrieved from http://www.asha.org/Publications/leader/2009/090526/090526b.htm

Verdolini-Marston, K., Burke, M. K., Lessac, A., Glaze, L., & Caldwell, E. (1995). Preliminary study of two methods of treatment for laryngeal nodules. *Journal of Voice,9*, 74-85.

Working Group on Cognitive-Communication Disorders, ASHA Special Interest Division I, Language Learning and Education, and Division 2, Neurophysiology and Neurogenic Speech and Language Disorders. (2005). *Roles of Speech-Language Pathologists in the Identification, Diagnosis, and Treatment of Individuals With Cognitive-Communication Disorders [Position Statement].* Retrieved from http://www.asha.org/docs/html/PS2005-00110.html

Ylitalo, R., & Hammarberg, B. (2000). Voice characteristics, effects of voice therapy, and long-term follow-up of contact granuloma patients. *Journal of Voice, 14*, 557-566.