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THE VOICE AND VOICE THERAPY

N I N T H E D I T I O N



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Ninth Edition



The Voice and Voice Therapy

DANIEL R. BOONE

University of Arizona

STEPHEN C. McFARLANE

University of Nevada Medical School

SHELLEY L. VON BERG

California State University, Chico

RICHARD I. ZRAICK

*University of Arkansas for Medical Sciences/
University of Arkansas at Little Rock*

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From Dan to his sister, Barbara Boone Brueggemann, who typed the raw manuscripts of the first two editions of this textbook.

From Stephen to his wife, Patty, and his family.

From Shelley to her mother, Sarah Von Berg, an extraordinary speech pathologist and mentor.

From Richard to his wife, Amanda, and his twin daughters, Kaitlyn and Brooklyn, whose voices fill his heart with joy.

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About the Authors

Daniel R. Boone celebrates his 60th year as a speech-language pathologist with the publishing of this ninth edition of *The Voice and Voice Therapy*. Dr. Boone has held professorships over the years at Case Western Reserve University, University of Kansas Medical Center, University of Denver, and the University of Arizona (where he is now a professor emeritus). Dr. Boone is a former president of the American Speech-Language-Hearing Association and holds both a Fellowship and the Honors of that organization. He is the author of over 100 publications and is well known nationally and internationally for his many workshop presentations. Dr. Boone is perhaps best known for his love of his students and turning them on to the excitement of clinical voice practice.

Stephen C. McFarlane is a professor emeritus at the School of Medicine at the University of Nevada, Reno. He was awarded ASHA Fellowship in 1982 and ASHA Honors in 1999. He received both his B.S. and M.S. degrees from Portland State University and his Ph.D. degree from the University of Washington. Dr. McFarlane has a long history of research interests in the area of voice disorders. Study of the outcomes from voice therapy and the development of new treatment techniques is of particular interest. His scholarly work has been published in dozens of books and journals, among them *Seminars in Speech and Language*; *American Journal of Speech Language Pathology*; *Phonoscope*; and *Current Opinion in Otolaryngology & Head and Neck Surgery*.

Shelley L. Von Berg teaches, practices, and researches in the areas of voice, dysphagia, and motor speech disorders in adults and children in the Department of Communication Sciences and Disorders at California State University, Chico, where she holds the rank of Associate Professor. She earned her M.S. and Ph.D. degrees from the School of Medicine at the University of Nevada, Reno. She has presented on the assessment and intervention of neurogenic speech-language disorders nationally and abroad. She also teaches abroad on occasion. Dr. Von Berg has been published in the ASHA *Leader Series*; *Unmasking Voice Disorders*; *Language, Speech, and Hearing Services in Schools*; *Current Opinion in Otolaryngology & Head and Neck Surgery*; *Cleft Palate–Craniofacial Journal*; and *AAC Journal*. Areas of interest are intelligibility and comprehensibility of synthetic speech and speech produced by individuals with motor speech disorders.

Richard I. Zraick holds the rank of Professor in the Department of Audiology and Speech Pathology, a consortium program offered by the University of Arkansas for Medical Sciences (UAMS) and the University of Arkansas at Little Rock (UALR). He earned his doctorate at Arizona State University. Dr. Zraick is a clinician and teacher-scholar with over 25 years of experience in clinical practice and academia. His research grants, journal articles, and book chapters are in the areas of voice

disorders, neurogenic speech-language disorders, speech and voice perception, clinical skills training, and health literacy. He regularly speaks about these topics at state, regional, and national scientific and professional conventions. He is a recipient of multiple Faculty Excellence in Research and Faculty Excellence in Teaching awards from both UALR and UAMS.



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Preface

NEW TO THIS EDITION

The original edition of *The Voice and Voice Therapy* was published in 1971. The preface to the first edition concluded with a statement that has as much relevance today as it did some forty years ago:

The Voice and Voice Therapy is an attempt to take some of the magic out of voice therapy. I hope there is something here not only for the student of voice therapy, but also for the clinical speech pathologist and the practicing laryngologist. I think there is.

In subsequent revisions, we have attempted to maintain the book's relevance to students and voice clinicians alike. Each edition has incorporated the most current scientific knowledge from a variety of disciplines, as well as information about the latest advances in technology. This current edition has some major updates to both the fundamental content of the book and to the pedagogical elements supporting its use in the classroom and clinic. Some chapter-by-chapter highlights include:

- Chapter 1, “An Introduction to Voice Disorders and Their Management,” features current data on the incidence and prevalence of voice disorders in the general population and in specific populations. There are also expanded discussions of the classification of voice disorders and of the various approaches to managing the person with dysphonia.
- Chapter 2, “Normal Voice: Anatomy and Physiology Through the Lifespan,” has been expanded considerably. It features a more comprehensive description of the anatomy and physiology of normal voice production. In addition, the chapter has all new anatomy illustrations. This chapter can stand alone, thus eliminating the need for students, instructors, or clinicians to refer to outside source material.
- Chapter 3, “Functional Voice Disorders,” presents practical approaches to identifying and managing behaviorally based voice disorders. The chapter includes expanded discussions of excessive laryngeal muscle tension and the benign laryngeal pathology that may develop as a result, as well as voice disorders with a psycho-emotional basis or overlay. We also review evidence-based practice (EBP) studies supporting the value of our Voice Facilitating Approaches in treating persons with functional or psychogenic dysphonia.
- Chapter 4, “Organic Voice Disorders,” presents practical approaches to identifying and managing organic voice disorders. We present current literature on the medical management of these disorders and on the role of the voice clinician in evaluation and therapy.

- Chapter 5, “Neurogenic Voice Disorders,” presents the latest research in the behavioral, pharmacological, and surgical management of neurogenic voice disorders. We also review numerous evidence-based practice (EBP) studies supporting the value of our Voice Facilitating Approaches in treating the respiration, phonation, and resonance subsystems in persons with dysarthria.
- Chapter 6, “Evaluation of the Voice,” has been expanded considerably. It features the latest approaches to the auditory-perceptual evaluation of the voice and to assessment of voice-related quality of life. Multiple case studies illustrate both instrumental and noninstrumental assessment of the voice across medical and educational settings. These case studies also provide a framework for report writing and special considerations for voice populations across the lifespan. New figures illustrate instrumental approaches to identifying and quantifying voice and resonance disorders. Over a dozen new tables present the student and clinician with normative data across the lifespan for a variety of acoustic, aerodynamic, and related voice measures. This chapter can stand alone, thus eliminating the need for students, instructors, or clinicians to refer to outside source material.
- Chapter 7, “Voice Facilitating Approaches,” remains the bedrock of this textbook. We have retained our core set of 25 Voice Facilitating Approaches, and present the latest evidence-based practice (EBP) studies supporting their value in treating persons with dysphonia. Many of the cases illustrating the approaches have been updated to reflect the types of patients seen in current clinical practice, including applications for audiovisual feedback in therapy. We also discuss current literature on patient compliance and barriers to treatment.
- Chapter 8, “Therapy for Special Patient Populations,” features expanded discussions of the identification and management of children, adolescents, and older adults with dysphonia. In particular, we discuss in greater detail the professional voice user and the management of dysphonia in this increasing population of patients. We also discuss in more detail the management of dysphonia in children and adults with hearing impairment, in those who are transgendered, and in those with a variety of respiratory-based conditions.
- Chapter 9, “Management and Therapy Following Laryngeal Cancer,” is new and features expanded discussion of the medical management of patients with laryngeal cancer and the role of the voice clinician in evaluation and therapy. We have added new illustrations and photographs throughout the chapter.
- Chapter 10, “Resonance Disorders,” features both the instrumental and noninstrumental assessment of persons with disorders of nasal or oral resonance. We have expanded the chapter’s discussion of the team management of persons with cleft palate speech. Application of our Voice Facilitating Approaches to treatment of resonance disorders is illustrated.

Close to 1,000 references to other studies are included throughout the text. Cardinal literature from the past 40 years of voice science and care is included, as well as the most current literature from a variety of disciplines. Greater than half the references are new in this edition, with the majority representing advances in our field from the year 2000 to the present.

All new pedagogical elements supporting the use of the book for teaching include the following:

- The Learning Objectives at the beginning of each chapter have been expanded.
- Check Your Knowledge boxes within each chapter stimulate critical thinking.

- Clinical Sidebars reinforce clinical application of material.
- Clinical Concepts at the end of select chapters reflect many of the learning objectives.
- Guided Reading exercises at the end of select chapters reference key clinical articles.
- Multiple-choice questions (Preparing for the PRAXIS™) at the end of select chapters help readers master the type of content covered in the Praxis II™ examination in speech-language pathology.
- A companion website contains a wealth of supplemental materials.



Did you know this book is also available as an enhanced Pearson eText? The affordable, interactive version of this text includes 3–5 videos per chapter that exemplify, model, or expand upon chapter concepts. Look for the play button in the margins to see where video is available in the affordable enhanced eText version of this text. To learn more about the enhanced Pearson eText, go to www.pearsonhighered.com/etextbooks.

We are fascinated by the human voice and intrigued by the art and science of voice therapy. As the great American poet Henry Wadsworth Longfellow wrote,

“Oh, there is something in that voice that reaches the innermost recesses of my spirit!”

We invite you to join us as lifelong students of the human voice, and we hope that while you read this edition, you will share the passion we had for writing it.

DANIEL R. BOONE
STEPHEN C. MCFARLANE
SHELLEY L. VON BERG
RICHARD I. ZRAICK

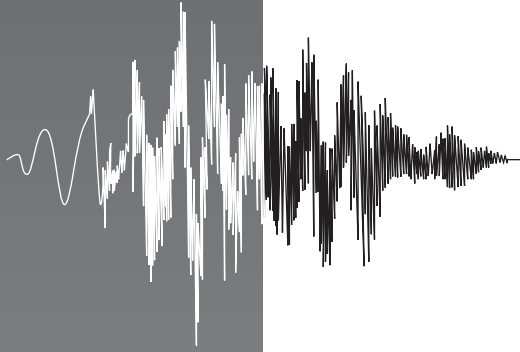
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DANIEL R. BOONE
STEPHEN C. MCFARLANE
SHELLEY L. VON BERG
RICHARD I. ZRAICK

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An Introduction to Voice Disorders and Their Management

LEARNING OBJECTIVES

After reading this chapter, one should be able to:

- List and describe the biological, emotional, and linguistic functions of the larynx.
- List and describe the kinds of voice disorders.
- Describe the incidence and prevalence of voice disorders in the general population.
- Describe the incidence and prevalence of voice disorders in specific populations.
- Describe the types of intervention for voice disorders.

When we hear the long-awaited cry of the newborn infant, we are hearing the infant's first coordination of the outgoing use of the breath stream passing between the vocal folds. More important, we are hearing the confirming evidence that a new life has been born. From that moment on, the mother and those nearby listen closely to the baby's vocalizations. The mood states of anger, loving, and hunger can be heard in the baby's vocal shadings. Similarly, for a lifetime, the sound of the voice often carries more meaning than the words that we say.


Speaking is a distinctive way of using the larynx. The act of singing is even more so. Both speaking and singing demand a combination and interaction of respiration, phonation, resonance, and speech articulation. The best speakers and singers are often those persons who, by natural gift or training, or by a studied blend of both, have mastered the art of optimally using these vocal mechanisms. For most of the population, however, we count on our voices being there when we speak, sing, cry, or laugh with very little conscious effort required.

The larynx sits at the top of the airway, and it appears that its primary function in mammals (including humans) is protecting the airway from any kind of obstruction. Production of the human voice is a secondary function. While the focus of this text is on voice habilitation and rehabilitation, whatever we do in therapy must be consistent with the primary demands of the respiratory system. We will also see that, beyond breathing problems, voicing difficulties can be the

result of anatomic deviation and disease, or of emotions overriding normal vocal function, or of a change of vocal function resulting from misuse and overuse of vocal mechanisms.

The voice evaluation by both the physician and the speech-language pathologist (SLP) attempts to identify the causal factors of a particular voice disorder. This dual evaluation of voice documents and quantifies the elements for possible vocal change. If remediation of the voice problem is indicated, it will be by medical treatment and/or voice therapy alone. The focus of this text is on voice therapy by the SLP, regardless of the setting (school, clinic, hospital) in which he or she works with the patient with a voice disorder.

THE BIOLOGICAL FUNCTION OF THE LARYNX

 As you watch this **video**, note how the clinician takes time to frame strategic questions to attempt to approach the voice disorder holistically. He is interested in the entire person, not just the pathology. Grand Rounds: What additional questions might you ask this patient? Explain why you would ask these questions.

A description of the biological aspects of laryngeal function provides us an early hint of how the biological demands of the airway and the larynx will always take precedence over artistic or communicative vocal production. When the brain signals the body's need for renewal of oxygen in the breath cycle, we automatically take in a breath. Oxygen-laden air flows through the passages of the upper airway into the lungs, followed by the outgoing carbon dioxide-loaded air flowing out of the body through the airway. This transportation of air into and out of the lungs is the primary function of the airway. Protecting the airway for an unobstructed passage of the air supply is the larynx. The primary biological function of the larynx is to keep fluids and foods from going into the airway (aspiration).

The larynx sits in a vital site at the front, bottom of the throat (pharynx), and at the top of the windpipe (trachea). As fluids and chewed food (bolus) come down the posterior throat, they are diverted from the lower throat (hypopharynx) into the open esophagus, where they continue their journey through the esophagus down into the stomach. As part of the swallowing act, the larynx raises high in the neck (elevating the esophagus and trachea with it). As swallowing progresses, the tongue comes back, and the epiglottis, which acts as a partial cover, closes over the open glottis (see Sidebar 1.1).

Whenever the larynx plays this sphincteric role of closing off the airway to permit the posterior passage of liquids or food, the entire laryngeal body rises. Also, in fear situations, the larynx may reflexively elevate as part of its primary role in protecting the airway. Some voice patients, sometimes those with excessive fears, will attempt voice with the larynx in its elevated "protector" posture. Such excessive laryngeal elevation is not a good posture for producing a normal voice. This may be associated with the Polyvagal theory (see Porges, 2003).

Besides the elevating capability of the larynx, which helps prevent aspiration, airway closure is aided by three laryngeal muscle valves, described in Chapter 2 as the aryepiglottic folds, the ventricular folds (false folds), and the thyroarytenoid muscles (the true vocal folds). The most vertical of these valve pairs in the larynx are the aryepiglottic folds, which are considered part of the supralarynx. Under vigorous valving conditions, such as severe coughing, they begin to approximate (adduct). Below them are the ventricular folds; only during vigorous adductory activities, like the cough, do they approach each other. The lowest and more medial of the three laryngeal valves are the thyroarytenoid muscles, the true vocal folds. During swallowing, they always adduct to prevent possible aspiration. Also, the individual has

SIDEBAR 1.1

To appreciate this movement, put your right index finger on your Adam's apple and swallow repeatedly. You should feel the larynx rising and gliding forward, and then gliding back and lowering to its resting position.

fine control of the true vocal folds, with some capability of altering their shape, length, and tension, to produce various voicing changes.

When one breathes naturally, all three valve sites are open. The vocal folds separate further on inspiration, allowing a greater volume of air to pass through quickly; on expiration, they move slightly toward (adduct) one another. As further described in Chapter 2, voice is produced when the vocal folds adduct slightly together, allowing expired air to pass between them, setting the folds into vibration. This vibration produces voice (phonation). This phonation is then resonated through various sites of the vocal tract. The resonance of the voice begins with this vibratory sound in the larynx, traveling up through the pharynx and the oral and nasal cavities above. The voice we hear, then, is produced by a combination of respiratory activation, phonation, and amplifying resonance. Although the primary role of the larynx is to protect the airway, the larynx and voice in the human plays an important role in emotional and linguistic expression.

THE EMOTIONAL FUNCTION OF THE LARYNX

The infant seems to express emotions by making laryngeal sounds. Certainly, the caregiver can soon detect differences in the emotional state of the baby by changes in the sound of the baby's vocalizations: A cry from hunger may sound different from a cry of discomfort or the vocalization of anger. Contentment (after a full stomach or being held) can be heard in the relaxed cooing responses of the baby. From early infancy throughout the lifespan, the sound of one's vocalization often mirrors one's internal emotional state.

Our voice can sound happy or sad, contented or angry, secure or unsafe, placid or passionate (see Sidebar 1.2). How one feels affectively may be heard in the sound of the voice as well as in changes of the prosodic rhythm patterns of vocalization. Our emotional status plays a primary role in the control of respiration; for example, nervousness may be heard in one's shortness of breath. Our emotional state seems to dictate the vertical positioning of the larynx, the relative relaxation of the vocal folds, and the posturing and relaxation of the muscles of the pharynx and tongue.

One's emotionality can be heard in the voice, a fact that can be threatening to the professional singer, or harmful to sales for the nervous salesperson, or embarrassing to someone who sounds like he or she is crying when actually happy. Our mood state can be harmful to voice. Many voice disorders are the result of various affective excesses; for example, a young professional woman attempts to use normal conversational voice when her larynx is postured in a high, sphincter-like position, resulting in a tight, tense voice. Her problem may be more related to unchecked and unrealistic fear than it is to faulty use of the vocal mechanisms per se.

Because emotionality and vocal function are so closely intertwined, effective voice therapy often requires the treatment of the total person and not just remediation of voice symptoms. Therefore, as we will see in later chapters, getting to know the patient is an important prerequisite to taking a case history or making an instrumental-perceptual voice evaluation. Voice clinicians have long recognized that the patient in the office may not resemble the same person in play or stress settings; the patient's voice will change according to his or her mood state. To assess voice realistically, we often have to observe and listen to the patient in various life settings.

SIDEBAR 1.2

To appreciate this, try to express various emotional states using just your voice. See if the person who is listening to you can detect which emotional state you are trying to convey.

THE LINGUISTIC FUNCTION OF THE VOICE

Voice seems to hold spoken language together. From the primitive emotional vocalization that may color what we say to the skilled use of voice stress to emphasize a particular utterance, the voicing component of spoken language plays a primary role. It is not always what we say that carries the message, but how we say it.

New interest in infant vocalization is producing a fascinating literature. By the time typical one-year-old babies utter their first word, they have already used their voice in highly elaborate jargon communication. While human babies all seem to babble about the same way from four to six months of age, babbling becomes more language-differentiated beyond that age. That is, babies no longer sound alike after six months; rather, they begin to sound like the primary language they have been hearing. The melody of the parent language, or its prosody, begins to color the vocalizations of the baby. The vocalizations of Chinese babies begins to sound like the sweeping tonal patterns of the Chinese Mandarin language; the pharyngeal sounds of an Arab language begin to be heard in the vocalizations of Arab babies.

These prosodic vocal patterns exist far beyond the individual word or segment. Such voicing is known as suprasegmental phonation. In young babies, suprasegmental vocalization far exceeds the voicing of actual word segments. As infants speak new words, they often place them in the proper place of their ongoing voicing rhythm. If they want to say “milk,” they are far more likely to say the word at the end of a jargon phrase, such as “gawa na ta milk,” rather than say the word in isolation. The jargon leading up to the word is suprasegmental voicing. The jargon voice carries a noncoded message with no specific meaning but seems to convey some general meaning by the overall sound of it. The mood and need state of the baby influence the sound of the vocalization.

Although jargon speech appears to diminish after the first 18 months of life, we continue to use suprasegmental vocalization in all aspects of spoken communication. We may add vocal stress patterns to augment the meaning of what we say. The actual words we say are only part of the communication. The “how we say it” is conveyed by various vocal stress strategies, such as changing loudness, grouping words together on one breath, changing pitch level, changing vocal quality and resonance to match our mood. These stress changes of the suprasegmentals can be produced with or without intent. That is, if it serves our purpose, we can sound angry by talking louder, or we may sound angry despite our best efforts to hide our anger from our listener. Once again, the voice carries much of the message. The same words spoken or written may convey different messages (as any lawyer taking depositions will tell you) depending on the stress patterns given the words by the speaker, with or without intent.

Considering the role of the voice in both emotional and linguistic expression, it is no wonder that people with voice disorders may find themselves handicapped in their communication. A young girl with vocal nodules, for example, may have developed them in part from excessive emotional vocalization (such as constantly yelling). Once the nodules were developed, however, she may be unable to use the vocal suprasegmentals and stress patterns she had previously used with ease in communication. As anyone knows who has ever suffered a complete loss of voice from severe laryngitis, the lack of voice prevents you from being you. Whisper and gesture somehow do not carry the communication effectiveness that normal voice allows you to add to the words you say (see Sidebar 1.3).

SIDEBAR 1.3



To experience this restriction, whisper the phrase *Today is Tuesday* two different ways—once as a statement and once as a question. Repeat these phrase contrasts using a normal voice. Which is more effective: whisper or voice?

While a primary role of the human larynx appears to be biological (guarding the airway), laryngeal voicing plays a vital role in the expression of both emotional and linguistic communication. When we add the voicing dimensions of acting and singing as laryngeal functions, we can truly appreciate the amazing artistic capabilities of the vocal tract (that a few people are fortunate to have and sometimes use). The role of the human larynx is obviously more complex and more subtle than the way the larynx functions as an airway protector in most other mammals.

CHECK YOUR KNOWLEDGE

1. What is the primary biological function of the larynx?
2. List and describe three emotional or linguistic functions of the larynx.

PREVALENCE OF VOICE DISORDERS IN THE GENERAL POPULATION

It is difficult, for several reasons, to establish normative incidence and prevalence data on voice disorders (see Sidebars 1.4 and 1.5). For example, voice can become temporarily disordered from a common cold that changes laryngeal tissue vibration and may fill resonating sinuses with infected mucus; almost everyone has experienced some voice change (phonation or resonance) as a result of a cold. Or some people experience voice changes from allergies. Therefore, if we were to take a large segment of the population and determine the present and past incidence of a voice disorder, our incidence reporting would be near 100%. Such incidence data would be meaningless. Rather, if we took a segment of a population, such as airline pilots, and looked back at the occurrences of hoarseness in a certain time period, we would determine some prevalence data for that particular group. Even these data would have far more meaning if there were a comparison between the pilots' voices and the voices of matched controls (matched, for example, by gender and age).

There have been only a handful of epidemiologic studies of the prevalence and risk factors of voice disorders in the general population (see Cohen and colleagues, 2012a; Verdolini and Ramig, 2001; and Best and Fakhry, 2011, for reviews). There has been substantial variability in reported prevalence estimates across the studies (Roy and colleagues, 2005). Conflicting definitions of voice disorder and methodological differences in procedures, and patient populations and sizes, are some of the causes of variations in the overall reported prevalence (Van Houtte and colleagues, 2010). The absence of acceptable epidemiologic data makes it difficult to precisely identify specific populations at risk, delineate the causes and effects of voice disorders, develop early screening procedures to identify those at risk, estimate societal costs related to voice disorders, and plan healthcare services designed to prevent or treat such problems (Roy and colleagues, 2005, p. 1988).

Roy and colleagues (2005) conducted a cross-sectional telephone interview survey of over 1,300 adults chosen at random. They discovered that nearly 7% of respondents had a voice disorder at the time of the interview and that nearly 30% had experienced a voice disorder at least once in their lifetime. About 7% of adults had missed work for more than one day because of their voice disorder. These findings are remarkably similar to those reported by Cohen (2010), who surveyed over 850 adults seeking medical care by their primary care physician for a variety of

SIDEBAR 1.4

Incidence is a frequently used epidemiological measure of rate of occurrence of new cases of a disease or condition. Incidence is calculated as the number of *new cases* of a disease or condition in a specified time period (usually a year) divided by the size of the population under consideration who are initially disease-free (Le and Boen, 1995).

SIDEBAR 1.5

Prevalence is a frequently used epidemiological measure of how commonly a disease or condition occurs in a population. Prevalence measures *how much of some disease or condition occurs in a population at a particular point in time*. The prevalence is calculated by dividing the number of persons with the disease or condition at a particular point in time by the number of individuals examined (Le and Boen, 1995).

reasons. Cohen discovered that the lifetime prevalence of dysphonia in this population was 29%, and that the point prevalence (number of persons with dysphonia at the time) was just over 7%. Four percent of patients had experienced dysphonia for more than 4 weeks, and 73% had experienced dysphonia more than once. With over 300 million people in the United States, a 7% point prevalence rate means that approximately 20 million people have a voice disorder at any given time.

Cohen and colleagues (2012a) recently examined the prevalence and common causes of dysphonia as diagnosed by primary care physicians (PCPs) and otolaryngologists (ENTs) and evaluated differences in etiologies offered by these care providers. A retrospective analysis of data from a nationally representative administrative U.S. claims database of 55 million individuals revealed that about 1% of patients received a diagnosis of dysphonia. It was further discovered that females were almost twice as likely as males to be diagnosed with dysphonia, and that adults over the age of 70 years were two-and-a-half times more likely than those under age 70 years to be diagnosed with a voice disorder. The most frequent diagnoses overall were acute laryngitis, nonspecific dysphonia, benign vocal fold lesions, and chronic laryngitis. Some trends noted by Cohen were that prevalence decreased slightly after age nine years, and increased after the age of 30 years, peaking among those greater than 70 years old (p. 344). Also, within age categories, males had a higher prevalence rate in zero- to nine-year-olds, and females had a higher prevalence beginning with puberty and persisting until age 70 years or older (p. 345).

In a similar study using the same database, Cohen and colleagues (2012b) reported that nearly three-fourths of patients who received a diagnosis of dysphonia received medical treatment for 12 months or more. More women than men required follow-up treatment. These clinical researchers estimated that the total annual direct costs of caring for such persons ran into the hundreds of millions of dollars, which is comparable to other chronic disease states. The mean cost per patient over 12 months was between approximately \$500 and \$1,000. In an effort to identify how ENTs manage such patients, Cohen, Pittman, and colleagues (2012) surveyed 1,000 ENTs about their practice patterns. Approximately 300 physicians responded, and they reported that prescribing medication to control laryngopharyngeal reflux disease was their most common approach, followed closely by referral to speech-language pathology for voice therapy. The most common laryngeal conditions leading to voice therapy referral were vocal fold nodules and muscle tension dysphonia.

CHECK YOUR KNOWLEDGE

1. Define the terms *incidence* and *prevalence*.
2. What is the prevalence of voice disorders in the general population?

PREVALENCE OF VOICE DISORDERS IN SPECIAL POPULATIONS

While the information already summarized in this chapter is helpful, a look at the prevalence of voice disorders in particular segments of the population may be more meaningful than looking at the population as a whole. Doing so may help clinicians focus their prevention, screening, and intervention efforts. In the following sections, we summarize the prevalence data on voice disorders in children and older adults, and across occupations (see also Chapter 8).

Prevalence of Voice Disorders in Children

The actual prevalence of voice disorders in children is difficult to determine. As summarized in McKinnon and colleagues (2007), a variety of different methods have been used to establish the presence of a communication disorder. The methods depend on both the age of the individual and the setting. Both direct (face-to-face assessment including screening and diagnostic techniques) and indirect (parent or teacher report) methods have been used extensively. Parent report measures are commonly used with preschool-age children while teacher report measures are commonly used with school-age children. Lower prevalence rates are typically derived from indirect methods in comparison to direct methods. Methodological challenges notwithstanding, it is very important that children be identified because it has been shown that a communication disorder such as dysphonia can negatively affect academic achievement and affect vocational choices later in adulthood (Pack, 2008; Ruben, 2000).

A number of researchers have concluded conservatively that between 6 and 9% of school-age children may have a voice disorder (Andrews, 2002; Carding and colleagues, 2006; Cornut and Troillet-Cornut, 1995). Some studies, such as the one conducted by Duff and colleagues (2004), have reported a slightly lower prevalence rate of 4%. Other studies have reported that the prevalence rate may actually be as high as 20 to 30% (Angilillo and colleagues, 2008; Boyle, 2000; Faust, 2003; Silverman and Zimmer, 1975). According to the U.S. Census Bureau (2010), there are approximately 74 million persons between the ages of 0 and 18 years; this is approximately 25% of the total U.S. population. Using a conservative prevalence rate of 6 to 9% suggests that there are between 4.5 and 6.6 million children who may have a voice disorder (for information about voice-disorder prevalence rates for other countries, see Akif Kilic and colleagues, 2004; Milutinovic, 1994). Perhaps even more alarming than this actual number is the fact that most of these children are not receiving voice therapy (Andrews and Summers, 2002). This is consistent with school SLPs who report a much higher incidence. Very little data are available on the incidence or prevalence of voice disorders among students in middle school (where among the students most normal voice changes occur) or in high school.

Prevalence of Voice Disorders in the Elderly

According to the U.S. Census Bureau (2010), there are approximately 40 million persons age 65 years or older, comprising about 13% of the total U.S. population. In spite of this large number (which is expected to grow), there are very few studies of the prevalence, risk factors, and psychosocial impact of dysphonia in the elderly. Studies of the incidence and prevalence of dysphonia in this population have been restricted solely to investigations of those seeking treatment; thus, the true prevalence of voice disorders in the general elderly population remains largely unknown. Three separate studies examining the prevalence of voice disorders in a non-treatment-seeking population over age 65 years (Cohen and Turley, 2009; Golub and colleagues, 2006; Roy and colleagues, 2007) discovered that between 20 and 30% of persons completing a survey about their voices reported having a current voice disorder, and that more than half these persons experienced significant quality-of-life impairment resulting from their dysphonia. The prevalence data reported by Roy and colleagues and Golub and colleagues are supported by the finding reported by Cohen and colleagues (2012a) that adults over the age of 70 years were two-and-a-half times more likely than those under the age of 70 years to be diagnosed with a voice disorder; in fact, adult males

over the age of 70 years were the most likely persons to experience a voice disorder. The risk of an elderly person having a voice disorder is greater if the person also has a hearing loss, and having either disorder is more likely to lead to depression (Cohen and Turley, 2009).

Prevalence of Voice Disorders in Teachers and Student Teachers

It has been estimated that 5 to 10% of the U.S. workforce are “heavy occupational voice users” (Titze and colleagues, 1997). Within this group are over 3 million primary and secondary school teachers—the largest group of professionals who use their voice as a primary tool of their trade (U.S. Department of Labor, Bureau of Labor Statistics, 2006; U.S. Census Bureau, 2010). As described in VanHoudt and colleagues (2008, p. 371), these teachers are at risk for having a voice disorder due to vocal load (hours of voice use, number of communication partners), physical factors (physical condition, mucosal problems), psycho-emotional factors (stress, emotions, work pressure), and environmental factors (acoustics, humidity, environmental pollutants) (see also Da Costa and colleagues, 2012; Ferrand, 2012).


The prevalence of voice disorders in U.S. teachers has been studied quite extensively, yielding prevalence rates ranging from 4 to 50% or higher (Munier and Kinsella, 2008; Roy and colleagues, 2004a, 2004b), with most studies indicating a prevalence rate higher than that for comparable persons from the general population. For example, Roy and colleagues (2004a) surveyed about 1,200 teachers and 1,300 nonteachers and reported a prevalence rate for teachers of 11% compared to 6% for nonteachers; furthermore, 57% of these teachers had experienced a voice disorder at some point in their lives, compared to 26% for the nonteachers. Of those teachers who had experienced a voice disorder at some point in their lives, only 14% sought help from physicians and/or SLPs. Roy and colleagues also examined risk factors, and discovered that being a teacher, being a woman, being between 40 and 59 years of age, having 16 or more years of education, and having a family history of voice disorders were each positively associated with having experienced a voice disorder. In a related survey study of the same two groups, Roy and colleagues (2004b) discovered that teachers, compared with nonteachers, had missed more workdays over the preceding year because of voice problems and were more likely to consider changing occupations because of their voice (p. 542). To address this issue, vocal training programs targeting vocal health in teachers have been developed (see Roy and colleagues, 2001, for an example). The problem of voice disorders in teachers is not limited to those working in the United States; similar problems have been reported by teachers working in other developed countries (see Medeiros and colleagues, 2011, for a review).

Student teachers are also at risk for developing a voice disorder. Thomas and colleagues (2007) compared the incidence of voice complaints in student teachers versus students from nonteaching disciplines, and reported an incidence rate of 17% for student teachers compared to slightly less than 10% for their peers. Timmermans and colleagues (2005) reported that student teachers experience significantly more symptoms of dysphonia than their peers, including throat clearing, coughing, hoarseness, pain in the throat, fatigue, and difficulty being heard. One study reported that 90% of future teachers who experienced voice problems during their education experienced voice problems later in their teaching career (deJong and colleagues, 2006). To address this issue, individual and group training programs have been developed to address vocal health in student teachers (see Simberg

and colleagues, 2006, and Timmermans and colleagues, 2011, for examples). In Chapter 8, we discuss the issue of voice disorders in teachers and student teachers in greater detail.

Prevalence of Voice Disorders in SLPs and Future SLPs

SLPs are professionals who also rely on healthy voices. SLPs and those in training to be SLPs have high vocal loads and often use their voices in emotional or stressful contexts, such as therapy, counseling, conferencing, and public speaking. They must also demonstrate and model appropriate voice use. Gottliebson and colleagues (2007) investigated the prevalence of voice disorder in 104 U.S. student SLPs (94% female) and reported that 12% had perceptual features of dysphonia in their habitual voice—a higher prevalence rate than that of the general population of students, and one that is similar to that of student teachers (see Thomas and colleagues, 2007). Because of the risk to this population, intervention programs have been developed to address vocal health and performance (see Van Lierde and colleagues, 2011, 2012, for examples).

 The identification of causes of vocal fatigue is a journey made by the patient with guidance from the clinician. In this **video**, the clinician actively listens to the SLP patient and then reiterates the patient's observations to ensure that both are "on the same page." Grand Rounds: Describe how the Voice Facilitating Approaches of focus, open mouth and yawn-sigh reduce vocal hyperfunction and increase use of the resonating chambers.

CHECK YOUR KNOWLEDGE

1. Describe the direct and indirect methods for determining prevalence of a disorder.
2. Which specific populations are at higher risk for having a voice disorder?

KINDS OF VOICE DISORDERS

When we talk about “kinds of voice disorders,” we are usually talking about classifying the cause of voice disorders. This kind of classification over time has led to the historic causal simplification: the organic and functional dichotomy. In most classification systems, there is a mixture of etiologic causations and descriptive names of conditions, such as *cancer* as a causative form of an organic disorder, and *dysphonia* as the name of a condition that may have organic or functional origins.

Let us look at a few literature presentations of voice disorder classifications. The Classification Manual for Voice Disorders–I (Verdolini and colleagues, 2006) describes seven distinct causal classifications: laryngeal problems related to structural (1) pathologies, (2) inflammatory conditions, and (3) trauma or injury; (4) systemic conditions; (5) nonlaryngeal aero digestive disorders; (6) psychiatric-psychological disorders; and (7) neurological disorders. The manual also offers two other categories (“other disorders” and “undiagnosed”). Under each of the causative categories is specific information about etiology, behavioral description of the voice disorder, severity criteria, and so on, all of which can be most helpful to the SLP. Such diversity of nomenclature generates many categories of voice patient groups, however, complicating the task for generating evidence-based data.

Addressing the need to develop useful outcome data, an Australian diagnostic system (Baker and colleagues, 2007) presents a modified classification system as part of an inter-rater reliability study. Baker and colleagues basically modify the historic two broad categories of voice disorders, organic and functional. The organic classification of voice disorder causation combines structural changes of the vocal folds or cartilages or by “interruption of neurological innervations of the laryngeal