EBP Edge: What's All the Buzz About? Five Updates for Clinical Voice Practice

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Introduction

Consider the following scenario. Regardless of setting, a clinical speech-language pathologist (SLP) finds a niche and invests intellectual curiosity, professional development, and dedicated service to practice at the top of the license for persons with communication and swallowing disorders due to a certain condition or disorder. For some, it might be working in a public school system with a high number of children with autism spectrum disorder eligibility. Another SLP might be working in an outpatient clinic and have a consistent referral cycle of persons with chronic aphasia. And then, after becoming comfortable, knowledgeable, and competent in practice, it happens: A patient suspected of a disorder with which the SLP has not had the time or resources to stay familiar with current evidence-based practices after graduate school is referred. Immediately, a myriad of questions begin to overwhelm the clinician's brain and clinical process. Some of these quandaries include where to get started, what is best practice, and what does that mean. Sound a little too familiar?

Nevertheless, SLPs are charged to stay informed in the most up-to-date clinical practices suggested in recent research in an evidence-based framework. Due to caseload and related work constraints, many clinical SLPs feel overwhelmed in learning new research-based practices, particularly for those disorders or populations that are not as common on a daily work basis. Working with voice disorders is a prime example. Voice disorders are fascinating and complex. Empirical research and expert clinical recommendations regarding voice disorders tend to reflect such attributes. When researching voice disorders and clinical practices, it can be like learning a new language. Buzz words and even new ideas that contradict what we were originally taught abound in the voice research. To further complicate our professional responsibility, just when new practices become standard, current research suggests it is time to make some updates.

Anticipating every future evidence-based change for clinical practice in voice disorders is unreasonable; however, clinicians need timely updates to provide best services for these patients. As such, emerging techniques and approaches should be reviewed and considered to make patient-centered evidence-based decisions. This report surveys the literature from the past 20 years with few exceptions to provide an accessible, relevant, and evidence-based update. As clinical experiences often lead to more questions than answers, topics are posed as five authentic questions. Each question is then answered with a short summary from select empirical studies and related evidence.

1. How Common Are Voice Disorders?

An important consideration for implementing an evidence-based practice framework is staying informed regarding incidence and prevalence for a certain disorder or population. For voice disorders, the exact incidence and prevalence are complicated. An array of variables impact analysis approach and results. For example, the data regarding if a person has a voice disorder at the time of a particular study looks drastically different from a study investigating previous history of a voice disorder. Factors such as gender, occupation, and age also influence how to analyze data for a study. Anywhere between three to 10 percent of the general population may have a voice disorder (e.g., Rubin et al., 2003). The lower end of the range suggests voice disorders do not occur frequently in typical clinical practice.

The reality is that voice disorders are much more prominent and closer to the higher end of the range based upon recent research. The National Institute on Deafness and Other Communication

Disorders (NIDCD, 2016) reports that 7.5 million people in the United States report having trouble using their voices for various reasons. Additional studies in the past decade (e.g., Bhattacharyya, 2014b; Morris et al., 2016) suggest that up to 17.9 million adults (approximately 7.6% of the population) report having a problem with their voice in the past 12 months. Over nine million people reported a voice problem lasting longer than a week. To many clinicians, it might be surprising how less frequently other communication disorders occur compared to voice disorders. For example, an estimated 2 million people are living with aphasia in the United States (National Aphasia Association, n.d.). One in 25 adults is likely to experience a swallowing disorder (Bhattacharyya, 2014a), but one in 13 adults is likely to experience a voice disorder (Bhattacharyya, 2014b). In children, speech sound and language disorders occur far more than voice disorders; however, evidence indicates that at least 1.4 million children in the United States have experienced a voice disorder (Black et al., 2012).

Furthermore, these data may be an underrepresentation as some individuals suspected of a voice disorder do not always pursue services (Cohen et al., 2012). Percentages regarding incidence and prevalence are often higher in occupational voice users, especially teachers and singers. Nevertheless, based upon these studies along with additional recent information from the NIDCD, voice disorders are arguably one of the most common communication disorders across the lifespan after hearing loss. Such figures challenge the notion that people experiencing voice disorders are rare or a “low-incidence” population.

2. Is There an App for That? Using Mobile Technology for Voice Evaluation

Watts and Awan (2019) advocate that all SLPs adhere to the “golden rule of voice therapy.” This clinical practice principle asserts that an otolaryngologist (ENT) should medically examine a patient suspected of any voice disorder before the SLP develops and implements a voice treatment program. It is imperative that an ENT completes laryngeal imaging, preferably videostroboscopy, before a patient begins voice therapy to determine if structural laryngeal pathology exists (e.g., Stachler et al.). Without visualizing the true vocal folds’ appearance and behavior, an accurate diagnosis cannot be provided. As such, voice therapy actually can cause more damage than benefit depending upon if a pathology is present and its nature. Collaboration and communication between the SLP and ENT is essential to best serve patients.

For the SLP, a comprehensive voice evaluation is multidimensional and includes several data points that can include stroboscopic observations, phonatory efficiency tasks, auditory-perceptual impressions, and acoustic analysis. Nevertheless, SLPs in the field may face significant barriers to providing a comprehensive, evidence-based voice evaluation. For example, many SLPs do not have access to an acoustics lab. SLPs also have had to adjust current practice recommendations for telehealth to continue services during the COVID-19 pandemic. Thanks to our smartphones, we can still obtain valuable data.

In the past decade, research has investigated the benefit and limitations to using mobile technology, usually apps, to gather voice data. The primary focus of many studies has been on acoustic data including perturbation measures and severity of dysphonia. Grillo et al. (2016) assessed the within-subject variability of voice measures using different devices including smartphones and popular, expensive software programs typically found in state-of-the-art acoustic voice labs. Results indicated that there were no significant differences across devices and software. Jannetts et al. (2019) explored the reliability of smartphone-based acoustic analysis for voice health monitoring. Results suggested that mean fundamental frequency and certain other acoustic measures had acceptable random error size; however, jitter and shimmer were problematic. One study indicated a mobile app motivated patients in resonant voice monitoring. Van Leer et al. (2017) developed an iOS app that calculated and displayed acoustic values for patients. Participants in the study remarked that the app was fun and easy to use. Other data from the study suggested the app increased self-efficacy and led to increased acoustic measures.

Clinicians have several options when selecting an app for collecting voice data. DecibelX, NIOSH Sound Level Meter, and VoiceEvalU8 are just a few examples. Vocal intensity, other acoustic and aerodynamic measures, and patient-reported outcomes can be collected via mobile apps as well as electronically. Another benefit is that several of the apps are either free or low-cost if the patient uses them for self-monitoring or if the clinician's budget is limited.

Clinical decisions should not rest upon a single factor in voice disorders. All data should be interpreted with caution regardless of collection methods. Savvy clinicians consider and balance different types of data as if putting pieces of a clinical puzzle together. Thorough and critical data collection is a necessity in good voice therapy practices to monitor progress, promote patient success, and justify services. Mobile technology can be a viable tool for voice assessment when balanced with essential procedures such as videostroboscopy, especially when less-than-ideal circumstances dictate adjusted or modified practices.

3. What Are Semi-Occluded Vocal Tract Exercises?

Physiological, particularly exercise-based, voice therapy has grown in popularity. Several trademarked voice therapy programs are based on physiological principles as they aim to modify vocal behaviors and promote maximal vocal efficiency with minimal effort through laryngeal muscle activity and speech subsystem focus. According to Sapienza and Ruddy (2018), voice therapy exercise protocols are structured and, therefore, often easy for patients to understand. Such qualities in addition to ample evidence compared to symptomatic or facilitative techniques (e.g., yawn-sigh) are likely for the rise of physiological voice therapy's popularity.

One particular set of exercises have become all the rage in voice rehabilitation—semi-occluded vocal tract (SOVT) exercises. There are various SOVT exercises; however, all of them aim to narrow and extend the anterior vocal tract for physiological changes in vocal fold vibratory and laryngeal muscle behavior (Watts & Awan, 2019). Essentially, through extending the vocal mechanism with a partially closed mouth, back pressure helps create optimal and easier vocal fold vibrations. Several physiological voice therapy approaches (e.g., vocal function exercises, resonant voice therapy) utilize SOVT to some extent.

Lip trills, straw phonation, and humming are some of the most popular SOVT exercises. A variant of straw phonation is cup-bubble, where the straw is submerged in various depths of water. The deeper the straw is submerged in water, the greater the back pressure (Andrade et al, 2014). Increased supraglottal and intraglottal pressures resulting from the back pressure help reduce vocal fold impact stress when adducting as well as facilitate abduction. Several expert clinicians as well as voice scientists have developed protocols, particularly for straw phonation. Titze (2006) suggested that SOVT exercises begin with greatest backwards pressure with less natural voicing contexts and progress to contexts that offer less backwards pressure but are more natural voicing contexts as demonstrated in the following protocol:

1. Phonating through small diameter straw (e.g., coffee stirring straw);
2. Phonating through larger diameter straw (e.g., drinking straw);
3. Phonating with bilabial or labiodental fricative;
4. Voiced lip or tongue trills;
5. Produce focused nasal consonants;
6. Produced focused /u/ and /i/ vowels.

Beginning with stimuli such as non-speech pitch glides, the exercises are then shaped into speech production as the patient adjusts to phonating with less vocal effort and strong vocal resonance.

Research indicates that using SOVT exercises are advantageous in treating voice disorders as well as preventing them. Kapsner-Smith et al. (2015) completed a randomized-controlled trial comparing straw phonation (referred to as "flow resistant tube" in the original study) and vocal function exercises for persons with dysphonia or vocal fatigue when compared to a delayed treatment group.

Patient outcomes improved for both treatment groups; however, vocal function exercises were not superior to straw phonation. The straw phonation treatment group also reported significant reductions in clinical auditory-perceptual evaluation compared to the vocal function group. Wu and Chan (2019) explored the effects of straw phonation in water on the aging voice compared to vocal hygiene education. Results indicated a six-week straw phonation program was a superior treatment for the aging voice in acoustic, auditory-perceptual, and patient-reported outcomes compared to vocal hygiene alone. Calvache et al. (2020) suggested that SOVT exercises, regardless of type, promoted improved vocal economy for persons with dysphonia as well as normal voices. Kang et al. (2019) indicated that straw phonation results in lingering positive effects on aerodynamics in vocally healthy individuals.

SOVT exercises are promising in their versatility as part of a comprehensive voice therapy program. Clinicians and patients may implement them as a means of prevention or restoration depending upon each individual case. A clinician might use cup-bubble to prevent vocal injury in a professional voice user (e.g., Muckala & Ruel, 2019) or use various SOVT methods to combat vocal hyperfunction secondary to unilateral vocal fold paralysis (e.g., Barkmeier-Kraemer, 2019a). SOVT exercises may become a future touchstone in voice therapy for all patients with various voice problems based upon their simplicity and supported outcomes.

4. So Why Can't They Talk? An Overview of Conversation Training Therapy

There are anecdotal instances in which a patient's voice quality improves in the isolated exercises but returns to dysphonic when words or conversation are attempted. Although some structure is beneficial when training patients, rigid protocols and hierarchies found in several voice therapy programs often isolate and teach skills out of context. Clinicians frequently report that generalization and carryover of new techniques are difficult for their patients, especially for meaningful conversations. Such is the well-established case in the compliance and adherence research for voice disorders.

Fortunately, a new approach to voice therapy is growing in popularity with emerging evidence. Conversation training therapy (CTT) (Gartner-Schmidt et al., 2016) is among the first voice therapy approaches that eliminates a traditional therapeutic hierarchy and instead uses patient-driven conversation with embedded techniques. As opposed to many voice and speech therapy programs, CTT is based upon the principles of motor learning rather than discrete behavior. As summarized in the original concept article, CTT implements whole-practice as well as contextual relevance to help in skill acquisition. Essentially, if the goal is for patients with voice disorders to have conversations with reduced dysphonia, voice therapy should utilize conversation immediately rather than scaffold to it through isolated tasks.

To achieve improved voice production, there are six facets of CTT (Gartner-Schmidt & Gillespie, 2020):

1. Clear speech;
2. Negative practice;
3. Auditory and kinesthetic awareness;
4. Embedded basic training gestures;
5. Rapport building; and
6. Prosody and pauses

With the exception of "clear speech," the facets of CTT are interchangeable and may be utilized at any or all components of the therapy session and process. Clear speech is best described as the natural style of speaking used to enhance intelligibility when speaking in challenging situations with persons who are hard-of-hearing (Picheny et al., 1986). Patients should notice the "sound" and "feel" of the voice during clear speech. In negative practice, patients as well as the clinician alternate between the target voice including clear speech as well as the dysphonic voice. Ear training and

auditory feedback are the targets for the auditory and kinesthetic awareness facet. Patients must be able to not only identify but also feel the differences between voices. Patients are asked to sustain consonants randomly in conversation to help the patient focus on kinesthetic sensations as well as other techniques in embedded basic training gestures. Patients begin to focus on how consonant energies including supporting airflow are altered when stressing certain sounds or words through prosody and pauses in conversational speech. Finally, rapport building is a natural byproduct of CTT as the relationship between the SLP and the patient is established more quickly through genuine stimuli rather than meaningless monologues or decontextualized tasks.

CTT is so novel that only preliminary research has been published. The existing evidence supports using CTT for vocal hyperfunction. Gillespie et al. (2019) investigated the effects of CTT for patients with benign vocal fold lesions and muscle tension dysphonia compared to historical matched control patients. Results indicated significant improvements for patient-reported outcomes, acoustic, and auditory-perceptual parameters for the CTT group compared to the controls. In addition, equivalent gains were observed following two sessions of CTT as opposed to four to eight sessions of traditional therapy. Case studies support the use of CTT for lesions (Gartner-Schmidt & Gillespie, 2019b) as well as for vocal fatigue (Timmons & Hapner, 2019).

CTT is advantageous because it begins with the end in mind. Conversation is addressed from the onset of treatment and used as the sole stimulus without a hierarchy. As more research is published, it will be exciting to see how CTT shifts our approach to voice therapy and impacts patient adherence and compliance.

5. What Can We Do for Vocal Tremor?

Invasive and routine Botox® injections intimidate many individuals with vocal tremor. As such, many individuals with vocal tremor may prefer to investigate alternative options. Fortunately, research suggests that patients with vocal tremor can benefit from voice therapy. The speech science literature provides some guidance regarding how to modify vocal behaviors to change listeners' detection of vocal tremor. Vocal tremor is detected easier in connected speech associated with a slower, sometimes elongated speaking rate (Lundy et al., 2004). The slower speaking rate is the result of a sensorimotor response to perturbed articulator oscillation affecting phonation (Ito et al., 2005). Listeners' perception and detection of tremor seems to decrease with shortened voiced duration and increased voiceless consonants in sentences (Lederle et al., 2012). Based upon these findings, Barkmeier-Kraemer et al. (2011) suggested a voice treatment program to manage vocal tremor.

In this voice treatment program, the ultimate goal is to reduce the prominence of vocal tremor during speaking (Barkmeier-Kraemer, 2020). Shortened voicing duration in conversation is achieved through progressive steps using easy voiced onset with shortened but not staccato vowel productions. Beginning with speech stimuli containing /h/ and vowels, the patient begins to implement shorter vowel duration as well as easy onset of consonants to mask or hide the tremor. These strategies are then implemented into words, sentences, and eventually conversational speech.

Much like CTT, this approach to treating vocal tremor has only emerging evidence to support its implementation. Case studies (e.g., Barkmeier-Kraemer, 2019b) indicate improved acoustic, auditory-perceptual, aerodynamic, and patient-reported outcomes. However, clinicians must emphasize that, due to vocal tremor's neurogenic etiology, voice therapy will not alleviate or cure vocal tremor. Sensitive listeners including patients themselves may still detect and perceive the tremor albeit less apparently.

Conclusion

This report addressed five questions pertaining to voice disorders and their management through a concise review of contemporary research for immediate implementation. Although it is impossible to stay informed regarding every update published in the communication and swallowing disorders

literature, occasional updates and overviews as presented in this report are essential to promote clinicians' competency and self-efficacy. Improved practices result in enhanced patient outcomes. As many of the approaches discussed are novel or emerging, it will be exciting to see which of them will become standard care in voice disorders management and which will be viewed as passing fads as more studies are published over time.

Research can improve our knowledge; however, It cannot always enhance our finesse. SLPs must balance science with art, structure with spontaneity, and often intention with serendipity, especially with voice disorders. In the author's opinion, the greatest question is how to achieve such skill in clinical practice. Are there any answers?

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