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## Do Patients Treated For Voice Therapy With Telepractice Show Similar Changes In Voice Outcome Measures As Patients Treated Face To Face?

By: Balaji Rangarathnam, PhD, Haley Gilroy, BA, and **Gary H. McCullough, PhD**

### Abstract

Clinical Question: Do patients treated for voice therapy with telepractice show similar changes in voice outcome measures as patients treated face-to-face? Method: Systematic Review. Study Sources: MEDLINE, PubMed, Google Scholar, ASHA journals. Search Terms: Voice therapy OR telepractice OR telehealth OR telerehabilitation. Number of Included Studies: 6. Primary Results: Delivery of voice therapy by telepractice provided positive outcomes comparable to face-to-face delivery. Number of studies employing quantitative data is relatively limited, restricting generalization of results. Conclusions: The goal of the speech-language pathologist is to maximize functional outcomes for individuals with communication disorders. Evidence found in this literature review for the effectiveness of telepractice delivery for the treatment of voice disorders indicates that treatment outcomes are comparable to face-to-face therapy and shows promising scope for this mode of service delivery.

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# Do Patients Treated for Voice Therapy With Telepractice Show Similar Changes in Voice Outcome Measures as Patients Treated Face-to-Face?

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## Clinical Scenario

LB is a 47-year-old singer who performs in a nightclub three nights a week for about eight hours each night. He developed concerns with his voice characterized by complaints of vocal fatigue when talking (for more than 40 minutes), intermittent glottal fry, and moderate raspiness at the end of the day. He also felt that he is producing his voice with increased effort compared to prior months. LB lives in a rural area and his primary-care physician referred him to the closest otolaryngology facility located three hours away from his home. After an interdisciplinary consult with the otolaryngologist, Dr. Collins, and the speech-language pathologist (SLP), Ms. Gina Martinez, LB was diagnosed with primary muscle tension dysphonia and recommended for voice therapy for five weeks. Unfortunately for LB, he may not be able to travel for three hours every week because of his busy work schedule. He may have to lose a part of his income if he decides to commute for his care; the situation has impacted LB's quality-of-life substantially. Gina was interested in offering her services through telehealth, but had questions regarding the research evidence for voice therapy outcomes using telehealth.

## Background Information

The American Speech-Language-Hearing Association (ASHA) defines telepractice as the application of telecommunications technology to the delivery of speech-language pathology and audiology professional services at a distance by linking clinician to client/patient or clinician to clinician for assessment, intervention, and/or consultation. Some of the early applications of telecommunications technology in speech-language pathology focused on diagnosis and treatment of neurogenic communication disorders. One of the first documented uses of telepractice was at the Birmingham Veteran's Affairs Hospital (Vaughn, 1976). Vaughn (1976) predominantly used the telephone to offer services related to assessment and treatment

of communication impairments. Beginning in 1987, investigators at the Mayo Clinic provided speech-language pathology telepractice consultations for patients with communication disorders including dysarthria, apraxia, and cognitive-communicative impairments, and reported positive outcomes of telepractice (Duffy, Werven, & Aronson, 1997).

Since the 1990s, ASHA has explored and emphasized research evidence related to telepractice and the potential of using this mode of service delivery for patients with speech-language and hearing disorders. Due to improvements in technology and the ease of using telecommunications, telepractice has gained momentum and become a successful mode of assessment and treatment for various speech-language, hearing, and swallowing disorders (Waite et al., 2006; Hill, Theodoros, Russell, & Ward, 2009; Malandraki, McCullough, He, McWeeny, & Perlman, 2011). In spite of the potential significance of telepractice as a viable service-delivery model, investigations on the efficacy of treatment are scant. Among the few investigations related to treatment, research related to voice therapy is minimal. Gina decided to complete a review of the available evidence for telepractice and voice therapy to understand the research evidence in this area to make informed decisions about her treatment plan.

## Clinical Question

Before starting her review, Gina decided to adopt the Population Intervention Comparison Outcome (PICO) model (Richardson, Wilson, Nishikawa, & Hayward, 1995) to frame her research question. Gina defined her parameters as follows:

P (population): Individuals referred for voice therapy, but require or want services delivered via telepractice.

I (intervention): Voice therapy delivered through telepractice.

C (comparison): Outcomes of voice therapy delivered face-to-face.

O (outcome): Changes in vocal measures (auditory/visual-perceptual, acoustic, aerodynamic, or quality-of-life).

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Gina identified her research question based on the PICO model: Do patients treated for voice therapy with telepractice show similar changes in voice outcome measures as patients treated face-to-face?

## Search for the Evidence

The purpose of Gina's search was to gather evidence to answer her research question: Is there evidence to support equivalent outcomes of telepractice and face-to-face service-delivery methods for individuals with voice disorders? She employed MEDLINE, PubMed, and Google Scholar to identify studies that addressed telepractice for voice therapy with the key words voice therapy, telepractice, telehealth, and telerehabilitation from 2000 to present. The search generated a total of 139 studies. Of these results, Gina filtered studies in the English language that reported voice treatment outcomes in individuals treated with telepractice. In order to obtain high-quality evidence, Gina decided to include articles reported in peer-reviewed journals only and articles that reported changes in at least one voice outcome measure (auditory/visual perceptual, aerodynamic, acoustic, quality-of-life). Gina included studies that used experimental, quasi-experimental, single-subject designs, or case study designs. She found that research related to voice therapy for specific voice disorders was very limited, so she chose to evaluate the evidence for all studies that addressed voice therapy through telepractice. At the outset, Gina read and reviewed the titles and the abstracts of all the articles. After reading the abstracts, Gina finally included six studies for the review that met the aforementioned criteria.

## Search Strategy

Gina first sought to describe her studies in chronological order before evaluating the strength of evidence obtained from each of them. In one of the first studies discussing voice therapy and telepractice, Mashima et al. (2003) compared voice treatment delivered face-to-face and through telepractice for two groups of individuals with different laryngeal conditions including nodules, vocal fold paralysis, hyperfunction, and edema. Telepractice and face-to-face groups consisted of 23 and 28 individuals, respectively. Subjects were assigned to the groups randomly but matched for diagnostic category. Depending on the vocal pathology, the authors administered several treatment methods including facilitating voice treatment approaches (Boone,

McFarlane, Von Berg, & Zraick, 2013), "confidential voice" (Colton & Casper, 1990), or vocal function exercises (Stemple, Glaze, & Gerdeman, 1995), in addition to vocal hygiene education. Outcome measures included auditory-perceptual and acoustic voice assessments, patient satisfaction, and laryngoscopic assessment. Posttreatment gains were shown in both groups and were comparable.

In another study, Tindall, Huebner, Stemple, and Kleinert (2009) examined voice treatment outcomes delivered through videophone calling for a group of 24 individuals with Parkinson's disease treated through the Lee Silverman Voice Treatment (LSVT) method. They compared their results to a previously reported study (Ramig, Sapir, Fox, & Countryman, 2001) on individuals who were treated face-to-face with the same treatment method. The authors reported statistically significant improvement in vocal intensity and the results were similar to that obtained by Ramig et al. (2001) for face-to-face delivery of therapy.

Constantinescu et al. (2010, 2011) reported results from two studies investigating the utility of telepractice in voice treatment for individuals with Parkinson's disease. In the first case report, Constantinescu et al. (2010) reported data from a patient with idiopathic Parkinson's disease who was treated remotely for voice and speech impairments using LSVT and showed improvements in sound pressure levels, duration of sustained vowel production, vocal quality, intelligibility, and high satisfaction with the treatment. In another study, the same authors reported successful delivery of LSVT in 34 subjects with Parkinson's disease and hypokinetic dysarthria (Constantinescu et al., 2011).

More recently, Rangarathnam et al. (2015) and Fu, Theodoros, and Ward (2015) reported positive outcomes in individuals with primary muscle tension dysphonia (MTD) and bilateral vocal fold nodules respectively treated through telepractice. Rangarathnam et al. (2015) studied seven individuals with primary MTD treated face-to-face and seven others through telepractice. The subjects underwent six weeks of treatment, which consisted of flow phonation exercises and vocal hygiene education. Significant improvements were reported in auditory-perceptual and quality-of-life measures and positive changes, although not statistically significant, on acoustic and aerodynamic measures. Fu et al. (2015) studied 10 female participants with bilateral vocal nodules who were treated with vocal hygiene education for the first session delivered face-to-face followed by nine sessions of voice therapy through telepractice. The therapy included components of relaxation

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exercises (Verdolini Abbott, 2008), Lessac-Madsen Resonant Voice Therapy (Verdolini Abbott, 2008), and Vocal Function exercises (Stemple, Lee, D'Amico, & Pickup, 1994). Pre- and posttreatment outcomes consisted of auditory-perceptual, acoustic, vocal fold function evaluated through videostroboscopy, and physiological measures obtained through aerodynamic analyses. In addition, the participants also completed the voice handicap index and a satisfaction questionnaire. Several of these measures, including overall severity on auditory perception, mucosal wave, glottal closure, mean airflow rate, and noise to harmonic ratio had significantly improved posttreatment and participants were generally satisfied with the telepractice delivery.

## Evaluating the Evidence

Gina adopted the guidelines provided by the Oxford Centre for Evidence-Based Medicine (OCEBM Levels of Evidence Working Group, 2009) to evaluate the strength of evidence obtained from the six articles. These guidelines are shown in Table 1. Gina provided an alphanumeric score to each of the studies based on these guidelines and also identified how these studies conform to the PICO model for her research question and presented these in tabular form (see Table 2).

None of the six studies was a meta-analysis of more than one randomized control trial (RCT), which provides superior evidence. However, two of these six studies (Mashima et al., 2003; Rangarathnam et al., 2015) were well controlled RCTs. Whereas the participants in the Mashima et al. study (2003) did not represent a homogenous sample or were provided one uniform treatment, those in the Rangarathnam et al. (2015) study were all patients with primary muscle tension dysphonia treated uniformly with the flow phonation exercises and vocal hygiene education. These were the only two studies that included a comparison group and provided strong support of the use of telepractice for patients with voice disorders—primary muscle tension dysphonia in particular. This is further supported by data from well-controlled cohort studies of Tindall et al. (2009) and Constantinescu et al. (2011) for individuals with Parkinson's disease and Fu et al. (2015) for women with vocal fold nodules. Even though these studies did not include a control group, two of these studies (Tindall et al., 2009; Fu et al., 2015) attempted to compare outcomes of other investigations that included face-to-face delivery. All of the studies reported changes in at least one outcome measure as an effect of therapy delivered through telepractice.

## The Evidence-Based Decision

Gina carefully reviewed all her articles and the resulting evidence provided by each of them for her clinical research question: Can telepractice be successfully used to treat individuals with voice disorders with comparable changes in voice-related measures as an effect of voice therapy delivered face-to-face? Gina had a difficult decision to make primarily because of the overall lack of quantitative research in telepractice and voice therapy. Even though Gina had a wealth of information from the studies she reviewed, only two studies included a face-to-face group to compare the results of therapy delivered through telepractice. This was an important requirement in answering the clinical question based on the PICO model. Additionally, the study by Mashima et al. (2003) did not represent a group that received uniform treatment—this might be an important variable because one treatment method could be easier or difficult to administer from a distance compared to others. In other words, telepractice is only a different mode of delivering the same treatment method (and not a different treatment method altogether). This could impact appropriate interpretation of the data for Gina's specific clinical research question. The study by Rangarathnam et al. (2015) did report uniform treatment to all the subjects who represented one clinical diagnostic entity of primary muscle tension dysphonia but the sample size in their study was relatively small (seven subjects in each group).

Despite these disconcerting pieces of information, Gina was convinced in making an informed decision that there was evidence that telepractice may be a viable option for LB. Gina's decision was based on several important considerations. First, the studies by Mashima et al. (2003) and Rangarathnam et al. (2015) were randomized control designs and demonstrated clinically significant changes. Second, the collective evidence from these studies was positive and the data were complementary: the Mashima et al. (2003) study included a larger sample size and the Rangarathnam et al. (2015) study provided data from a highly homogenous sample that provided uniform treatment. Third, both studies included a control group and demonstrated changes in several voice outcome measures—namely auditory-perceptual, acoustic, aerodynamic, and subjects' own perception of the problem; the results in the experimental and control group were largely similar. Lastly, even though the levels of evidence were relatively weaker for the remaining studies, they did demonstrate changes in

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outcome measures in a single cohort of subjects who were provided voice therapy through telepractice.

The goal of the speech-language pathologist is to maximize functional outcomes for individuals with communication disorders. Some individuals, like LB, who live in areas far from a healthcare facility that offers speech-language pathology services, demonstrate hardships in general livelihood because of the impact on regular income and reduction in their quality-of-life. Others may have mobility or transportation issues, may be immunocompromised, may have a conflict of interest with a therapist, or may simply desire to be seen by an expert voice therapist rather than a general speech-language pathologist. All of these concerns may warrant seeking services through telepractice. Gina's review of the few articles available offers some promise regarding the potential use of telepractice for delivering voice therapy. The impact could be as substantial as improving health care and cutting costs to consumers. Gina was cautious in interpreting these data as there are a wide variety of voice disorders and treatments and different treatments may be more suited for telepractice than others. It may not be necessary to provide data supporting every available type of voice therapy method for use with telepractice, but interpretations based on the few available studies need to be considered conscientiously.

## Authors' Notes

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**Table 1. Oxford Centre of Evidence-Based Medicine (OCEBM) Levels of Evidence\***

1a	Systematic reviews (with homogeneity) of randomized controlled trials
1b	Individual randomized controlled trials (with narrow confidence interval)
1c	All or none randomized controlled trials
2a	Systematic reviews (with homogeneity) of cohort studies
2b	Individual cohort study or low-quality randomized controlled trials (e.g., < 80% follow-up)
2c	“Outcomes” Research; ecological studies
3a	Systematic review (with homogeneity) of case-control studies
3b	Individual case-control study
4	Case series (and poor quality cohort and case-control studies)
5	Expert opinion without explicit critical appraisal, or based on physiology, bench research, or “first principles”

\* OCEBM Working Group (2009)

**Table 2. Description of the Studies Based on the PICO Model and Levels of Evidence**

Article	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	Level of Evidence
Mashima et al. (2003)	X	X	X	X	1b
Tindall, Huebner, Stemple, & Kleinert (2009)	X	X		X	2b
Constantinescu et al. (2010)	X	X		X	3b
Constantinescu et al. (2011)	X	X		X	2b
Rangarathnam et al. (2015)	X	X	X	X	1b
Fu, Theodoros, & Ward (2015)	X	X		X	2b