

Effect of Behavioral Cough Suppression Therapy Delivered via Telehealth

*Nathaniel Sundholm, *†Sandeep Shelly, †Miranda L. Wright, ‡Jane Reynolds, ‡Laurie Slovarp, and *†Amanda I. Gillespie, *†Atlanta, Georgia, ‡Salt Lake City, Utah, and ‡Missoula, Montana

Summary: Objectives/Hypothesis. Behavioral cough suppression therapy (BCST) has demonstrated up to 88% effectiveness at treating refractory chronic cough (RCC). With onset of the COVID-19 pandemic, along with many other medical services, BCST shifted to telehealth delivery. Our group hypothesized that BCST delivered via telemedicine by a specialized Speech-Language Pathologist would be comparable to previously reported response to treatment for in-person settings.

Study Design. Retrospective review.

Methods. An Emory IRB approved, retrospective review of electronic medical records was completed for RCC patients who received BCST via telehealth from March 2020 through January 2022 at Emory Voice Center. Patients were included in the study if they had a diagnosis of RCC, were referred for BCST, were seen for at least one therapy session in the telehealth setting, and provided Cough Severity Index (CSI) data pre and post-treatment. Patients were excluded if they had incomplete datasets, a known pulmonary condition, structural laryngeal disorders, smoking history, dysphagia, and ACE-inhibitor use. Change in CSI score pre- and post-treatment was calculated to determine treatment effect. Paired-samples t-tests were conducted to compare pre-and post-treatment CSI score change.

Results. Fifty-one RCC patients were included in this study; 88% were female with an average age of 60 years (SD = 12.68). Post-treatment CSI scores were significantly lower than pretreatment CSI scores ($P < 0.0001$). These findings are comparable to historical documented CSI change achieved with in-person BCST.

Conclusions. This study provides preliminary evidence of the efficacy of BCST via telehealth for treating RCC. The findings of this study support the continued flexibility in speech-language pathology service delivery to include in-person and telehealth platforms for RCC beyond the COVID-19 pandemic.

Key Words: Chronic cough—Behavioral Cough Suppression Therapy—Speech Language Pathology—Laryngology—Treatment outcomes—Telehealth.

INTRODUCTION

Behavioral cough suppression therapy (BCST) is a low-cost, low-risk, non-pharmacological treatment for patients living with refractory chronic cough (RCC). It is delivered by voice and upper-airway specialized speech-language pathologists (SLPs). BCST improves cough-related quality of life and reduces cough severity and frequency in up to 88% of patients with RCC after just 1 to 4 weekly sessions.^{1–7}

During the COVID-19 pandemic, many clinical settings rapidly incorporated telehealth (ie, virtual delivery of healthcare services via videoconferencing platforms) in lieu of in-person visits.^{8–11} Given the risk of airborne transmission of the virus,¹² it was imperative that SLPs pivoted from traditional models of care to a safer virtual option.^{13–15} The American Speech-Language-Hearing Association (ASHA) specifies that telehealth must not compromise quality when

compared to in-person services.¹⁶ Since emergency exceptions were in place during the height of the COVID-19 pandemic to allow for rapid expansion of telehealth,¹¹ a unique opportunity was presented to examine the efficacy of telehealth interventions for SLP services, including RCC.

Telehealth was viewed positively by Americans prior to the COVID-19 pandemic for reasons such as convenience and cost savings,¹⁷ and there are many potential benefits of maintaining more flexible service delivery models in the SLP field. Telehealth delivery of voice therapy for a variety of conditions has been shown to be feasible, appropriate, and as efficacious as in-person therapy.^{13,18–24} A recent study explored the merits of a virtual interprofessional cough clinic and researchers found this model was highly satisfactory for RCC patients and efficient for clinical providers.²⁴ The telehealth model also addresses a shortage of specialized SLPs in rural areas across the country²⁵ by connecting SLPs to patients who perhaps would not otherwise have the resources to access specialty care.²⁶

To the best of our knowledge, only one other study based in the U.K. investigated the efficacy of Skype delivery of BCST to patients with RCC. Lillie et al. (2014) reported a 6-month case series of 11 patients with RCC and a related condition, vocal cord dysfunction/inducible laryngeal obstruction (VCD/ILO), who received SLP services via Skype. Endoscopic assessment was completed in person prior to initiating telehealth services where patients participated in a minimum of

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From the *Emory Voice Center, Emory Healthcare, Atlanta, Georgia; †Emory University School of Medicine, Atlanta, Georgia; ‡Department of Communication Science and Disorders, University of Utah, Salt Lake City, Utah; and the §University of Montana School of Speech-Language-Hearing & Occupational Sciences, Missoula, Montana.

Address correspondence and reprint requests to Nathaniel Sundholm, MS CCC-SLP, Emory University Hospital Midtown, Medical Office Tower, 9th Floor, Voice Center, 550 Peachtree St. NE, Atlanta, GA, 30308. E-mail: Nathaniel.sundholm@emoryhealthcare.org

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four sessions. Specific treatment activities were not described. Cough-specific quality of life improved by a clinically significant degree (minimal clinically important difference [MCID] = 1.3^{27,28}) with an LCQ median score change of 5.8 and with all patients reporting being at least “very satisfied” with services received.²⁹

The purpose of the present study was to evaluate the effectiveness of telehealth delivery of BCST at a university clinic during the COVID-19 pandemic. We hypothesized that BCST delivered via telehealth would significantly improve cough-related quality of life. A secondary hypothesis was that cough improvements would be equivalent to those reported in the literature for patients who received in-person BCST. If these hypotheses were supported, the current investigation would contribute additional evidence to support a call for continued flexibility in SLP service delivery models to include in-person and telehealth platforms beyond the COVID-19 pandemic.

METHODS

A retrospective review of electronic medical records (EMR) of patients who received BCST via telehealth for RCC at an urban voice, swallowing and upper airway center (Emory Voice Center (EVC)) was completed. This review was approved by the Emory’s Institutional Review Board (IRB00054821). Telehealth visits were synchronous, two-way audiovisual encounters conducted via a healthcare Zoom account with a voice and upper airway-specialized SLP. All patients received treatment by one of five specialized SLP’s at the EVC. BCST of this included cohort received treatment to laryngeal efficiency in voice and breathing as well as emphasis on awareness of urge-to-cough (UTC) and cough suppression techniques in response to UTC.³⁷ UTC awareness training included identification of cough triggers, patient’s perception of the amount time between UTC and cough onset, and successes and failure of avoidance strategies. Patients were also instructed in a variety of cough suppression techniques, including semi-occluded vocal tract postures during respiration and phonation, pursed lips breathing, effortful swallow, and chin-tuck swallow. The patients were instructed to use whatever techniques were most effective for them when UTC was identified. They were also instructed to practice these strategies a-symptomatically. Treatment also included individualized instruction in resonant voice in patients who also presented with muscle tension dysphonia, as is common in this population.^{1–2,4–5}

Cough Severity Index (CSI) were gathered from patients who participated in telehealth BCST pre and post-treatment from March 2020 to January 2022. The CSI is a valid and reliable cough-specific quality-of-life questionnaire with 10 items rated on a 5-point Likert scale. The total score ranges from zero to 40 with a lower score indicating improved quality-of-life. There is no established minimal clinically important difference (MCID) for the CSI, but a total score greater than 3.23 is considered “symptomatic for cough” (p.1933).³⁰

All chart entries in the EMR that were coded both for chronic cough (R05) and CPT codes for SLP evaluation and treatment in the telehealth setting (ie, 92524 and 92507-95) were pulled for inclusion evaluation. A total of 940 chart entries were reviewed and aggregated, representative of 344 individual patients.

Inclusion criteria were: diagnosis of RCC, referred for BCST, received at least one therapy session via telehealth, and completed CSI data pre-post treatment.

Exclusion criteria were: patients with incomplete clinical data, known pulmonary conditions, structural laryngeal disorders, smoking history, dysphagia, and ACE-inhibitor use. Two hundred ninety-three patients of the 344-patient data set were excluded from the study, with the greatest contribution being incomplete or unreported baseline or post-BCST CSI scores. A total of 51 patients met inclusion criteria. This data set could not be compared to in-person BCST because baseline and post-treatment CSI scores were not routinely collected or recorded until 2020, at which time in-person BCST was no longer provided secondary to concerns for aerosolized disease-containing respiratory particles associated with the COVID-19 pandemic.

Statistical analysis was conducted using SAS 9.4 software (SAS, Cary, NC). The primary outcome of interest was change in CSI scores, tested with a student’s paired T-test.

RESULTS

Clinical (pre- and post-CSI) scores and demographic data were extracted from 51 patient charts. The majority of patients were female (N = 45; 88.24%) and had an average age of 60 years (SD = 12.68) (Table 1). Paired T-test revealed significantly decreased (improved) pre to post-treatment CSI scores (mean = -4.5490; 90% CI = -6.25, -2.8468; $P < 0.0001$). Table 2 presents the mean pre- and post- CSI scores stratified by sex.

TABLE 1.
Patient Demographics and CSI Score Characteristics

Demographics (N = 51)	
Age (Mean, SD, in years) Range	60 (12.68) 28-85
Sex	
Male	6 (11.76%)
Female	45 (88.24%)
Ethnicity	
African American	14 (27.45%)
Asian	1 (1.96%)
Caucasian	30 (58.82%)
Unreported	6 (11.76%)
CSI score (Mean, SD)	
Pre	20.98 (8.73)
Post	16.43 (10.36)

TABLE 2.
Pre- and Post-treatment CSI Scores by Sex

	N	Pretreatment CSI scores Mean (SD)	Post-treatment CSI scores Mean (SD)
Female	45	22.28 (8.08)	17.08 (9.94)
Male	6	11.16 (7.57)	11.5 (13.02)

DISCUSSION

The findings of this study provide evidence that BCST delivered via telehealth is effective in treating RCC, based on significant CSI change pre to post-treatment. While efficacy of in-person delivery of BCST has been shown in several studies,^{1,5,7,38} telehealth delivery of BCST has not been extensively studied. Telehealth is convenient, time and cost efficient.^{10,17} Data show that treatment attrition is reduced and visit attendance improved when patients are given the option to receive telehealth services compared to in-person treatment.³¹

Results of the current study align with the existing literature on efficacy of RCC treatment, both pharmacologic and behavioral. Specifically, five studies evaluating the efficacy of medical and procedural therapies to treat RCC have used the CSI as a primary outcome measure.^{32–36} Yang et al. (2021) is the only behavioral therapy study that included the CSI. They investigated the effects of two-to-four sessions of in-person breathing training plus cough suppression therapy delivered over six months. Patients in that pre-post study had an average decrease in the CSI of -6.7 from a baseline mean of 16.74.³⁷ Although the CSI decrease of -4.6 in the current study is slightly lower, the baseline mean CSI score in the present study was higher at 20.98, suggesting patients in the current study were more severe. Factors such as differences in the intervention and duration of treatment may also account for the slightly greater improvement in the Yang study. Of note, none of the studies that used the CSI as a cough outcome measure achieved a final CSI score of equal to or less than 3.23 (considered the normal cutoff for being cough symptomatic), indicating that despite showing improvement, on average, participants were still registering a symptomatic cough.

While the study was not balanced to analyze the effects of sex on cough outcomes, it is worth noting that the six male participants did not demonstrate as robust a CSI decrease as the females. Closer investigation of these male participants revealed one, who had a negative response to treatment (Pre CSI: 19, Post CSI: 32), was referred to gastroenterology (GI) after reporting signs and symptoms consistent with reflux over the course of BCST. A confirmatory BRAVO was completed with results demonstrating a high correlation between cough and reflux events. Per recent interaction with GI, the patient's enhanced compliance with reflux therapy has since eliminated the cough. It should be noted that GI referral was generated by the treating SLP during BCST. This may indicate that BCST remains an appropriate intervention for cough that provides not only treatment but also ongoing

evaluation. Three other male participants described a qualitative difference in their symptoms either during a follow-up physician visit or final BCST session with the SLP; these changes, however, were not represented by the CSI score. Further study with a larger sample of males is necessary to determine if there are sex-specific responses to BCST delivered via telehealth specifically.

No such outliers were observed in the female group.

Limitations. The current study has several limitations. One, the MCID for the CSI is unknown. Results of the current study indicate statistically significant improvements, but how clinically meaningful those improvements were is unknown. Future clinical practice and cough research would benefit from the use of an outcome measure in which the MCID is known (eg, the LCQ). Second, the sex differences observed in this investigation might be biased due to unbalanced sample size between the two groups. The study had significantly more females than males, so it is unknown if the small change in CSI in the males is representative of the greater population of males with RCC. The male group also had at least one participant whose cough resolved with GI evaluation and treatment, and several participants whose subjective response to treatment (verbal report of improved cough) did not align with their post-treatment CSI scores. Third, many patients who received evaluation and some treatment for RCC were not included in this retrospective review because they did not have complete patient-reported outcome information, either because it was not recorded, or they were lost to follow-up. At the time of data collection, patient-reported outcome measures were collected via an online portal system. Prior to each visit, patients received a text message from the healthcare system requesting they complete the forms. Incomplete data can result from patients opting out of text alerts or ignoring them. The absence of complete clinical data may contribute to poor understanding of outcomes for the wider patient population who either self-discharge or complete BCST without completing a post-treatment patient-reported quality-of-life measure (eg, CSI). Fourth, it is not possible to compare the findings of the current study to in-person data from the same location, because the treating location did not historically collect CSI data with regularity before introduction of an automated patient-reported outcome measures (PROMS) survey system, which was put into effect in the beginning of 2020 and no-longer provides in-person BCST secondary to concerns related to aerosolized respiratory particles. Fifth, while BCST was delivered by five highly skilled, specialized SLPs there was no standardized, prescriptive therapeutic approach to care, as seen in the Yang (2021) article. Finally, these data are from one clinic in an urban setting in the US Southeast. Future research should include more geographically diverse populations.

CONCLUSION

This study provides evidence that BCST delivered via telehealth improves cough-related quality-of-life in patients

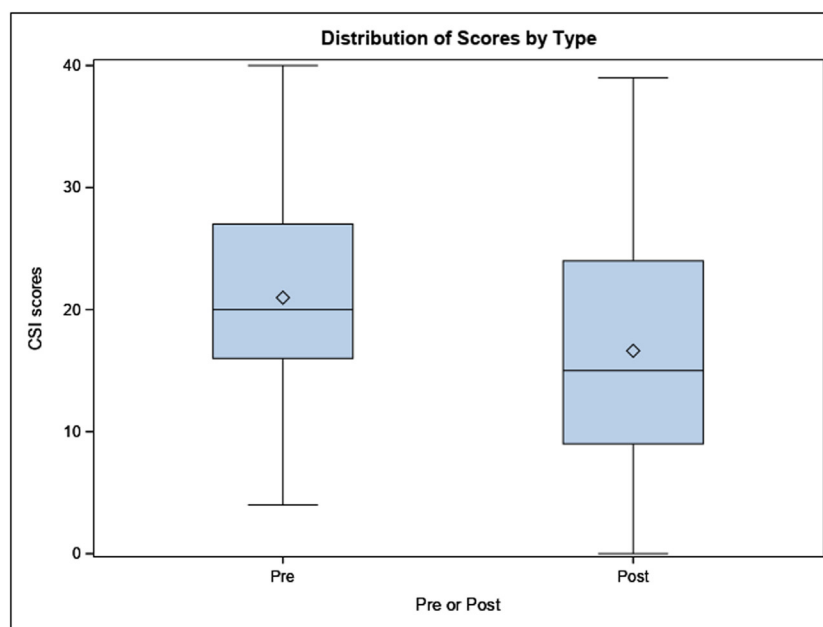


FIGURE. CSI Pre and Post BCST Treatment.

with RCC. Providers and patients should not avoid virtual delivery of BCST as it is low-cost, low-risk, convenient, and, as this study demonstrates, effective in treating RCC. [Figure 1](#)

FINANCIAL DISCLOSURE

The authors have no financial interests to report.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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