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Validating the Impact of Teaching Pursed-Lips Breathing With Skype

A Pilot Study

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Providing palliative care to persons with diseases other than cancer is challenged by the need to determine the trajectory for death. Persons with chronic disease, including cancer, require the same care directed at symptom management, optimization of quality of life, advanced care planning, and caregiver support. Chronic obstructive pulmonary disease is projected to be the third leading cause of death by 2030, with dyspnea being the most frequently reported symptom. Pursed-lips breathing (PLB) is a self-management technique that relieves shortness of breath by decreasing hyperinflation, thereby potentially improving activity tolerance. This feasibility study measured the effect of PLB training delivered over Skype on dyspnea, physical activity, health-related quality of life, and self-efficacy. The intervention was found to be feasible and demonstrated marginal improvements in quality-of-life measures. However, when controlling for degree of breathlessness with activity, dyspnea, activity levels, and quality-of-life measures were significantly different, suggesting that as dyspnea worsens, training PLB may be more effective. Given the challenges with health care access, using communication software for the education and management of patients with chronic diseases and their caregivers may be both effective and efficient and especially useful for those who are geographically dispersed or homebound.

KEY WORDS

chronic disease, chronic obstructive pulmonary disease, dyspnea, pursed-lips breathing, symptom management, telehealth

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It is well documented that palliative care is effective at improving the quality of life and death of persons with cancer.[1] Although less studied, the challenge is determining when to begin providing palliative care for noncancer diagnoses because of uncertainties in the trajectory for death.[2-4] Regardless of the diagnosis, providing early palliative services directed at symptom management, optimization of quality of life, advanced care planning, and caregiver support is growing in importance with the ever increasing numbers of persons with chronic disease.[2,5-14]

Chronic obstructive pulmonary disease (COPD) refers to a group of chronic lung diseases that result in persistent airflow limitation and is composed of two main conditions: Emphysema and chronic bronchitis. The World Health Organization predicts that COPD will become the third leading cause of death worldwide by 2030.[15] Even more striking is the fact that whereas age-adjusted mortality rates for coronary heart disease declined by approximately 74% between 1963 and 2007, rates for COPD increased by 147%.[16]

COPD disease is often preventable and there is no cure, but treatment can control symptoms and slow progression.[17] Dyspnea is one of the most distressing and frequently reported symptoms for those with COPD,[18,19] and its complex nature requires management similar to persons with cancer that includes successful use of pharmacological and nonpharmacological therapies.[4,5,20-22] However, provider-driven strategies for relieving dyspnea symptoms may not be feasible for this population; self-management techniques may be more appropriate but are not as well studied.

Pursed-lips breathing (PLB) is a self-management technique that relieves dyspnea by optimizing the mechanical function of the lungs and decreasing hyperinflation, thereby potentially improving activity tolerance.[23-25] While patients with COPD report the effectiveness of PLB, health care providers often fail to incorporate this technique as a standard of care,[24] and given the challenges to access, few studies have been conducted demonstrating the effectiveness of home-based interactive education for dyspnea management.

In geographically dispersed populations, access to care for persons with chronic diseases is challenging; this is especially true in the island state of Hawaii. Telehealth is a promising strategy for isolated and underserved populations. With the more recent addition of the Internet, telehealth has an even larger role in the management of chronic diseases. Specific to patients with COPD, telephonic management has been effective in combination with other modalities, such as physiologic monitoring and home visits.[26,27] The use of video teleconferencing for pulmonary rehabilitation was found to be effective at improving quality of life and exercise capacity.[28,29]

A recent feasibility study using Skype to deliver PLB instruction resulted in improvements in perceptions of social support and dyspnea intensity in a sample of 22 male, predominantly White (64%), Veterans Administration participants with COPD living in southern California.[28] Although the results of this initial study are promising, the sample size and/or duration of the intervention may have precluded significant impact on other variables and the sustainability of its impact. Therefore, the purpose of this study was to validate the feasibility of PLB training using interactive telecommunication in a different population.

The specific objectives of this study were to (1) validate the feasibility of an interactive telecommunication system (Skype) to reinforce a breathing-pattern retraining self-management intervention in adults with COPD in Hawaii and (2) compare a structured PLB self-management intervention (four 1-hour weekly sessions) for dyspnea reduction, increased physical activity, improved health-related quality of life (HRQOL), and improved self-efficacy to a wait-listed control group.

METHODS

This feasibility study used a randomized-controlled trial design with a wait-listed control group. The wait-listed control group received the intervention once all data were collected. The University of Hawaii Committee on Human Studies approved this study.

Participants

Recruitment took place from January 2009 to November 2010 across the island of Oahu, which is home to the capital city of Honolulu and has a population of approximately 1 million residents or 90% of the state's population. Recruitment efforts encompassed a multifaceted approach of newspaper advertisements, brochures, flyers, letters to physicians, word-of-mouth communication, presentations to COPD support groups, and a recruitment booth at the Hawaii COPD Coalition's COPD Education Day. Recruitment ended when 24 participants were enrolled. Participants received an incentive of a $20 gift card for completion of each of the three data collection points and upon computer installation.

Participants were recruited if they were 45 years or older, had a clinical diagnosis of COPD, and had self-reported shortness of breath with activity as assessed by a score of 2 or greater on the Medical Research Council (MRC) Breathlessness Scale.[30,31] Sixty-two potential participants were screened by the graduate assistant. Exclusion criteria included recent exacerbation of symptoms (dyspnea, increased sputum volume, and/or increased sputum purulence), hospital admission within the past 4 weeks, change in bronchodilator therapy within the past 2 weeks, inability to walk, unstable angina, unstable cardiac dysrhythmia, unstable heart failure, and/or unstable neurosis or psychiatric disturbance. We did not query potential participants about reasons for nonparticipation. A total of 38 persons were excluded from the study.

Intervention

The intervention consisted of four weekly interactive educational sessions with a registered respiratory therapist via Skype. Prior to the sessions, a 1-hour, face-to-face baseline session was provided at the University of Hawaii campus, during which participants received an overview of the anatomy and physiology of the lungs, a PLB introduction, and a short (15 minutes) session where a return demonstration of PLB was practiced.

Technology

A videoconferencing technology system was installed for each participant regardless of access to their own computer and included a laptop, webcam, router, and headset. Accommodations were made for participants who had wireless, DSL, or no Internet access, and grant monies covered each participant's Internet service during the 4-week intervention. The real-time, Internet-based, videoconferencing technology system consisted of a Dell Vostro 1000 notebook, which had a 2.0-GHz dual-core mobile processor with 2-GB RAM at 533 MHz. Accessories included a webcam image of VGA (640 × 480) video at up to 30 frames per second with auto focus, a headset with microphone to maintain conversation privacy and reduced external noise, Internet connection, and a router for the incoming Internet connection. The system for all participants was preconfigured to simplify operation with limited keyboard functions, automatic popup and reminder removal to reduce distractions, remote monitoring to allow for computer usage data collection, and the ability to remotely repair software glitches.

Structured PLB Training

PLB training was provided by a single registered respiratory therapist with more than 30 years of clinical experience, including 14 years as a pulmonary rehabilitation specialist and 5 years experience using distance education technology. Before the first interactive session, the therapist called each participant to arrange appointment dates and times, confirm computer setup, exchange contact information, and review computer startup directions. The therapist also encouraged learners to keep a notepad adjacent to their computers and to write down any questions or "sticky thoughts" for their health care providers. Each of the interactive educational sessions used a spiraling technique, where content built upon previous sessions. Objectives and an outline of topics were developed and individualized for every participant at each session; ample time was given to address sticky thoughts.

Instruments

Age, gender, ethnicity, and education were assessed using a demographic survey. Frequency of computer use, access to and comfort using a computer, and usefulness of computer technology for learning were assessed using a 6-item Likert scale survey. The MRC Breathlessness Scale is a 5-item scale indicating degree of breathlessness with activity and was used at the time of screening.[30,31]

Shortness of Breath Questionnaire (SOBQ): The SOBQ is a 24-item instrument measuring shortness-of-breath severity during the past week while performing 21 daily living activities using a 6-point scale. Lower scores indicate less shortness of breath. The reported internal consistency measure was 0.96.[32]

Visual Analog Scale (VAS): The VAS items were as follows: (1) "During the last 24 hours, how easy or how hard was it to get your breath?" with verbal anchors of "easy" and "hard" and (2) "During the last 24 hours, how distressing or upsetting was your shortness of breath?" with verbal anchors of "not at all" and "as bad as can be." Each question was scored on a scale from 0 to 100. Test-retest reliability ranges from 0.56 to 0.91.[33]

Human Activity Profile (HAP): The HAP is used to evaluate physical activity on 94 self-care activities, personal/household work activities, entertainment/social activities, and independent exercise activities.[34] The highest oxygen-demanding activity the person is still doing is the patient's primary score, reported as the maximal activity score. The adjusted activity scores reflect functional performance.

Short-Form 36 (SF-36): The SF-36 measures HRQOL and measures 8 domains with 36 items.[35] The physical dimension includes (1) physical function, (2) role physical, (3) bodily pain, and (4) general health. The mental health dimension includes (1) vitality, (2) social functioning, (3) role emotional, and (4) mental health. The Physical Component Summary score combines the four physical dimensions and the Mental Component Summary score combines the four mental health dimensions. Cronbach α's for the Physical Component Summary and Mental Component Summary range from .92 to .94 and .87 to .89, respectively.

Stanford Chronic Disease Self-efficacy Scale: This 6-item scale measuring self-management of chronic disease was used to assess participants' confidence in reducing conditions that may interfere with the things they like or need to do. The verbal anchors were "not at all confident" to "totally confident" on a scale from 1 to 10.[36] The scale has an internal consistency reliability of .91.

Sample Size

The feasibility of this study was defined as the participants' ability to complete the entire intervention of learning the PLB technique using Skype. Therefore, a power analysis was not conducted, and a sample size of 24 participants was deemed adequate to test for feasibility.

Randomization

The first four participants received the PLB intervention to pilot the intervention. No subsequent changes were made to the methodology, and, in consultation with the funding agency, these participants were included in the final data analysis.[37] All participants recruited after the first four participants were randomized using a computer-generated, random-number assignment table for immediate (experimental) or wait-listed (control) participation in the PLB intervention; the wait-listed participants waited up to 16 weeks before receiving the intervention. Participants were notified of their assigned group only after baseline data were collected.

Procedure

During recruitment, interested participants were screened using the inclusion/exclusion criteria and then scheduled for the introductory face-to-face session with the respiratory therapist in groups of up to four participants. The principal investigator introduced the study and asked the participants to complete the consent form, the demographic questionnaire, and baseline surveys. At the end of 4 and 12 weeks, questionnaires were mailed to all participants.

Data Analysis

The major outcome of this feasibility study was whether participants were able to complete the intervention; a total of 23 participants completed the intervention and questionnaires. Subsequent exploration was intended to determine if there were any group differences. In small sample sizes, as in this study, a major concern is the power of the analysis. Compared with other analysis methods that could be used for analyzing repeated measurements such as paired *t* tests, analysis of variance, or nonparametric Friedman tests, linear-mixed modeling has been shown to have greater

TABLE 1 Baseline Measurements in Adults With Chronic Obstructive Pulmonary Disease (COPD) Comparing Control With Internet Intervention Groups

Variable	Control Group, Mean (SD) (n = 12)	Intervention Group, Mean (SD) (n = 12)	*P*	Intervention Group, Mean (SD) (n = 8)[a]	*P*
MRC Breathlessness Scale	3.17 (1.40)	3.58 (.90)	.40	3.63 (0.92)	1.0
Age, y	68.25 (10.12)	78.33 (5.96)	.007[b]	78.00 (6.57)	.06
Years of school	16.20 (2.57)	15.67 (3.34)	.68	15.25 (4.03)	1.0
Male sex	42%	33%	.67	50%	.71
Currently married	50%	58%	.68	50%	1.0
Ethnicity: White	67%	50%	.50	38%	.28
Primary language spoken in home: English	100%	100%	Not applicable	100%	Not applicable
I have used a computer	92%	100%	.31	100%	.40
I use a computer frequently	83%	100%	.14	100%	.22
I have a computer at home	91%	100%	.29	100%	.38
I am very comfortable using a computer as a means of learning	67%	75%	.59	100%	.63
Computer learning for shortness of breath is very useful	67%	50%	.38	50%	.48
It is somewhat easy to use a computer	58%	42%	.44	25%	.83
Shortness of Breath Questionnaire	58.20 (13.82)	42.70 (19.02)	.05[b]	41.00 (23.76)	.20
VAS[1]: How easy or hard was it to get breath?	49.64 (19.46)	31.55 (17.32)	.03[b]	25.89 (7.31)	.03[b]
VAS[2]: How distressing or upsetting was shortness of breath?	49.41 (23.44)	21.73 (19.27)	.005[b]	13.75 (7.94)	.003[b]
HAP: maximal activity score	66.25 (10.64)	68.25 (8.32)	.61	68.63 (7.80)	1.0
HAP: adjusted activity score	53.00 (15.54)	53.14 (13.16)	.98	54.17 (14.10)	[c]
SF-36: physical function	50.45 (22.19)	43.75 (22.78)	.48	39.38 (23.67)	.91
SF-36: role physical	14.58 (22.51)	43.75 (40.06)	.04[b]	43.75 (43.81)	.21
SF-36: bodily pain	58.75 (34.86)	76.25 (23.27)	.16	74.06 (19.59)	.84
SF-36: general health	40.00 (21.11)	57.73 (24.02)	.07	51.88 (24.34)	.75
SF-36: vitality	40.91 (12.81)	51.25 (19.20)	.15	48.75 (20.49)	.97
SF-36: social functioning	52.27 (36.15)	83.75 (19.59)	.03[b]	80.36 (22.66)	.21
SF-36: role emotional	38.89 (48.89)	69.44 (41.34)	.11	79.17 (30.54)	.19

(continues)

TABLE 1 Baseline Measurements in Adults With Chronic Obstructive Pulmonary Disease (COPD) Comparing Control With Internet Intervention Groups, Continued

Variable	Control Group, Mean (SD) (n = 12)	Intervention Group, Mean (SD) (n = 12)	*P*	Intervention Group, Mean (SD) (n = 8)[a]	*P*
SF-36: mental health	61.67 (27.15)	80.36 (11.93)	.05[b]	78.29 (14.21)	.37
SF-36: Physical Component Summary	33.81 (8.48)	38.37 (8.79)	.25	35.84 (9.09)	1.0
SF-36: Mental Component Summary	41.71 (16.17)	54.66 (7.19)	.03[b]	54.75 (7.87)	.17
Self-efficacy	6.09 (2.04)	7.48 (2.22)	.12	6.98 (2.49)	1.0

Abbreviations: HAP, Human Activity Profile; SF-36, Short-Form 36; VAS, Visual Analog Scale.
[a]*Without the initial, nonrandomized 4 pilot participants.*
[b]*Significant differences between experimental and control group baseline measurements.*
[c]*One group has fewer than 2 cases.*

power.[38] Linear-mixed modeling has the following properties that make it more favorable than other methods for analyzing repeated measurements in small data sets: (1) Linear-mixed modeling has the ability to use all of the data, which contributes to larger power; missing data have no effect on other scores from that same subject. All other methods will delete all the information from the subject if a score is missing; (2) Other analyses require consistent test intervals; linear-mixed modeling does not. For example, the fact that one subject may have had a follow-up test at 4 months whereas another had his/her follow-up test at 6 months does not influence the results; and (3) There is no assumption of sphericity or compound symmetry in the model. It allows a natural variance-covariance structure based on the data, thus providing more accurate inference than all other methods.

Repeated measures in this sample required the use of multilevel modeling in order to adjust for correlated errors of repeated measures within the same subject and maximize power.[39,40] Linear-mixed modeling was used to assess changes in the dependent variables of dyspnea, physical activity, HRQOL, and self-efficacy. The type I error rates were controlled at 5%, and multiplicity adjustments were not made because of the small sample size and exploratory nature of the study. Baseline differences were detected with and without the four pilot participants, so tests were done with and without them, resulting in minor differences. To correct for these differences, the final analyses were conducted to control for severity of illness using the MRC score as a proxy measure and baseline group differences.

RESULTS

Sample Characteristics

A total of 23 participants received the PLB intervention (1 subject was lost to attrition after the initial session); 11 participants were assigned to the experimental group, and 12 participants to the wait-listed control group.

When combined, participants were on average 73 years old with 16 years of education. The majority of participants were female (62%) and White (58%). All participants spoke English as the primary language in their home. At baseline, participants reported an average score of 3.38 on the MRC scale indicating breathlessness between walking on a level surface after 30 minutes to stopping for breath after walking a few minutes; this measure was used as a proxy for disease severity. More than 90% of the participants used a computer frequently and had a computer in their home, and 71% reported being very comfortable using a computer as a means of learning. Only half of the participants thought computers were very useful for learning about shortness of breath and were somewhat easy to use.

At baseline, the experimental group was older with a mean age of 78 years, compared with 68 years old for the control group (P = .007 with and .06 without the four pilot subjects, respectively). The experimental group (with and without the four pilot subjects) differed from the control group on other measurements as well (Table 1). Given the randomization, it is unclear how the groups were so disparate; however, the final data analyses controlled for any significant group differences in baseline measures.

Outcomes

Although not solicited, some participants provided comments to the research team about the effectiveness of the program. One subject said, "During a recent move, I went into a panic and was short of breath and wheezing, but I started my breathing exercises, and it helped me a lot!" Another stated that "PLB made a big difference for me. I am now able to remain off the expensive inhalation medication and enjoy my daily exercises much more." Six months later, "I'm still off my medication and use the breathing technique on a daily basis, especially during my morning exercises. I have been able to increase my exercises and feel much better during the day."

Eleven of 12 participants in the experimental group completed the required 4 training sessions using the telecommunication software, achieving the primary outcome of the study. Secondarily, the exploration as to group differences demonstrated that the effect of the intervention on dyspnea, as measured by VAS^1 and VAS^2 change scores from baseline to the 4- and 12-week surveys, was not significant. When baseline MRC scores were analytically controlled, dyspnea, physical activity, and HRQOL measurements improved (Table 2).

Of the three instruments used to measure dyspnea, participants with higher MRC scores had significantly higher SOBQ scores ($P = .013$) from baseline to the 12-week data collection point in the intervention group. Physical activity scores did not change with the intervention. When the MRC score was included in the model, adjusted activity scores, as measured by the HAP, were significantly lower for those participants reporting higher scores on the MRC scale ($P = .013$) from baseline to 12 weeks. The intervention resulted in marginally significant differences as measured by the role-physical and vitality subscales of the SF-36 Health Survey. Trends were detected from baseline to 4 weeks on the role-physical subscale ($P = .073$) and from 4 to 12 weeks on the vitality subscale ($P = .078$). When the screening variable of the MRC score was added to the model, differences from baseline to 12 weeks were detected on the General Health subscale scores and improved for those participants reporting higher scores on the MRC scale ($P = .011$) (Table 2). Also, the Mental Component Summary scores varied after the intervention by gender and ethnicity: Men had significantly higher scores than did women ($P = .027$) and Whites had significantly higher scores than Asian ($P = .04$) and other ethnic groups ($P = .045$). The intervention had no significant effect on self-efficacy.

DISCUSSION

The results of this study generally validate Nield and Soo Hoo's[28] feasibility study and corroborate recent literature.[24,25] Although the study was not powered for an intervention, the use of an interactive telecommunication system to reinforce breathing training was feasible in this sample of persons with COPD. The free, user-friendly software and widespread use and access to the Internet were a viable solution for the delivery of the training. However, only HRQOL measures, specifically the role-physical and vitality subscales of the SF-36, marginally changed following the intervention. We also found that some improvements were not sustained beyond the end of the intervention, indicating that longitudinal studies of interventions that sustain the effect are warranted.

When the degree of breathlessness with activity was added to the models, as measured by the MRC scale, dyspnea, activity levels, and quality-of-life measures (general health and mental health) were significantly different from baseline to the 12-week data collection point in the intervention group. Although the MRC score is not a true measure of severity of illness, these results suggest that, as dyspnea worsens, PLB may be more effective; this finding is comparable to a recently published guideline.[41]

Also, the Mental Component Summary scores of the SF-36 varied by gender and ethnicity when the MRC score was added to the model. White men had significantly better scores following the intervention. This may be a result of receptivity to the concept and practice of self-management of chronic disease and/or the use of technology for training. Interestingly, self-efficacy did not change as a result of the intervention and should be explored further.

Randomization in this small sample failed to correct for key variable differences across the intervention and control groups. Given the various presentations of COPD and chronic diseases in general, assigning participants to groups by severity of illness and/or other characteristics should be considered.

Although not an exact replication, this study reveals similarities with Nield and Soo Hoo's[28] results. Reproducing the intervention demonstrated that interactive telecommunication software is feasible and perhaps efficacious for providing training for dyspnea management with this population. Both samples recruited participants with high levels of education and computer usage and suggest that the intervention may be required beyond the four weekly sessions in order to sustain its benefits; it is unclear as to the required subsequent "dose." In addition, whether the results can be generalized to other populations will require follow-up studies.

An interesting difference between the two studies was related to the measurement of dyspnea. In Nield and Soo Hoo's[28] study, the VAS was sensitive to the intervention, but the Borg scale and SOBQ were not. In this study, the VAS failed to detect any differences, but the SOBQ did after controlling for MRC scores. Also, this validation study measured social functioning using the two items on the SF-36 and found no effect of the intervention. This is in contrast to the findings when the more comprehensive Social Support survey was used by Nield and Soo Hoo.[28] Sample size in both studies may be responsible for these differences, indicating the need for larger studies. However, both studies demonstrate feasibility and indicate readiness for a larger randomized-controlled trial.

Limitations

Recruitment was a major challenge for this pilot study and spanned 2 years, resulting in possible differences in the COPD population characteristics and availability of new modes of therapy and technology. Despite a large and growing COPD population, the challenge of recruitment requires further exploration, especially because larger

TABLE 2 Comparison of Experimental and Control Groups at Pretest, 4-Week, and

Study Variable	Pretest to Week 4 Difference Between Experimental and Control Groups				
				95% Confidence Interval	
	t	*P*	Effect Size	Lower Bound	Upper Bound
SOBQ	0.45	.66	0.08	−7.97	12.51
VAS: How easy or hard was it to get breath? (VAS[1])	−1.12	.27	−0.20	−34.30	10.04
VAS: How distressing or upsetting was SOB? (VAS[2])	−0.15	.88	−0.03	−24.26	20.88
HAP: maximal activity score	−0.89	.38	−0.14	−7.50	2.91
HAP: adjusted activity score	0.14	.89	0.02	−3.66	4.21
SF-36: physical function	0.42	.68	0.07	−13.83	21.01
SF-36: role physical	−1.84	.073[b]	−0.29	−45.27	2.10
SF-36: bodily pain	−1.36	.18	−0.22	−32.32	6.39
SF-36: general health	−0.17	.87	−0.03	−9.83	8.31
SF-36: vitality	0.21	.84	0.03	−12.82	15.72
SF-36: social functioning	−0.63	.53	−0.10	−26.23	13.73
SF-36: role emotional	0.73	.47	0.14	−25.25	53.32
SF-36: mental health	−1.23	.23	−0.22	−27.32	6.77
SF-36: Physical Component Summary	−1.25	.22	−0.23	−10.51	2.54
SF-36: Mental Component Summary	−0.34	.74	−0.07	−13.28	9.51
Self-efficacy	0.62	.54	0.10	−1.44	2.70

Abbreviations: HAP, Human Activity Profile; SF-36, Short-Form 36; SOB, shortness of breath; SOBQ, Shortness of Breath Questionnaire; VAS, Visual Analogue Scale
[a]*Controlling for Medical Research Council Breathlessness score.*
[b]*$P \leq .10$.*

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samples will be needed to confirm these results. Exclusion criteria should also be carefully examined.

Although the results generally indicate a successful intervention, similar to Nield and Soo Hoo,[28] these participants were mostly White, highly educated, and comfortable using computers at baseline. It is unclear how the Internet-delivery mode of this intervention would benefit those who do not own a computer or are ill at ease using the Internet. Replication of this study in a sample with varied demographics and disease severity is needed to ensure the intervention's real value.

The communication of medical information is a critical consideration when using this technology. Voice over the Internet, even after encryption, does have recognized security issues; and Skype is in that class of Internet services.[42] Although the possibility of the release of protected information during training is minimal, it can be further reduced by purposely excluding personal information during training, for example, using first and last names.

CONCLUSION

A recent review of the literature demonstrated the benefit of pulmonary rehabilitation on functional outcomes, dyspnea perception, and quality of life[17] and is supported by a National Guideline Clearinghouse practice guideline that also recommends pulmonary rehabilitation as an effective method for managing dyspnea but concluded that the benefits wane when the rehabilitation program ends.[43] Interestingly, pulmonary rehabilitation and palliative care have much in common and are both underutilized for persons with COPD.[44,45]

12-Week Data Collection Points

Weeks 4-12 Difference Between Experimental and Control Groups					Pretest to Week 12 Difference Between Experimental and Control Groups				
			95% Confidence Interval					95% Confidence Interval	
t	*P*	Effect Size	Lower Bound	Upper Bound	*t*	*P*	Effect Size	Lower Bound	Upper Bound
−0.25	.80	−0.05	−10.79	8.43	0.22	.013[a]	0.05	−9.35	11.54
0.69	.50	0.12	−14.88	29.93	−0.46	.65	−0.09	−25.28	16.07
−0.14	.89	−0.02	−24.64	21.57	−0.28	.78	−0.05	−26.69	20.24
0.02	.99	0.00	−5.49	5.58	−0.65	.52	−0.09	−9.25	4.75
−0.13	.90	−0.02	−3.51	3.08	0.03	.013[a]	0.00	−4.96	5.09
0.17	.86	0.03	−16.29	19.31	0.70	.49	0.15	−10.16	20.35
0.20	.84	0.03	−21.44	26.10	−1.37	.18	−0.28	−48.26	9.75
1.07	.29	0.18	−9.21	29.71	−0.26	.80	−0.05	−24.51	19.08
1.07	.29	0.18	−4.30	13.84	0.92	.011[a]	0.19	−5.08	13.11
1.81	.078[b]	0.28	−1.49	27.26	1.64	.11	0.22	−3.13	31.80
−0.04	.97	−0.01	−20.33	19.63	−0.51	.61	−0.07	−32.41	19.22
−1.27	.22	−0.24	−64.04	15.06	−0.68	.50	−0.14	−42.23	21.32
1.32	.20	0.24	−5.97	27.94	0.10	.92	0.02	−14.22	15.65
0.69	.50	0.13	−4.51	9.10	−0.49	.63	−0.11	−8.99	5.62
0.03	.98	0.00	−11.62	11.90	−0.36	.72	−0.09	−11.92	8.43
−0.88	.39	−0.14	−2.98	1.18	−0.22	.82	−0.03	−2.69	2.15

Chronic diseases, such as COPD, may require repeated, intermittent dosing of education, management, and support to effectively maintain quality of life and prevent exacerbations and hospital admissions.[46] As conditions worsen, additional support for their caregivers will also be required.[47-49] Technology may be one useful strategy, and PLB training using Skype may be especially useful for geographically dispersed, homebound, and rural populations. Given the challenges with health care access, using communication software for the self-management of other chronic diseases may be both effective and efficient. Assuming no worsening of the condition, the technology and/or intervention did no harm.

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