

REVIEW

A literature review on breathing retraining as a self-management strategy operationalized through Rosswurm and Larrabee's evidence-based practice model

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Abstract

Purpose: The purpose of this article is to critically appraise and synthesize the literature on breathing retraining as a self-management strategy for individuals with chronic obstructive pulmonary disease (COPD) guided by Rosswurm and Larrabee's evidence-based practice model.

Data sources: Scientific literature review, grey literature review, and hand searching.

Conclusions: An exhaustive review of the literature revealed evidence that regularly practiced pursed lip breathing is an effective self-management strategy for individuals with COPD to improve their dyspnea.

Implications for practice: It is expected that implementation of this non-pharmacological self-management intervention will improve perception of dyspnea, functional performance, and self-efficacy in individuals with COPD.

The personal and societal burden associated with chronic obstructive pulmonary disease (COPD) challenges both clients and their providers to find new ways to manage the hardship of dyspnea. Self-management is one emerging model that encourages and/or engages the individual in care management. The purpose of this article is to critically appraise and synthesize the literature on breathing retraining self-management strategies for individuals with COPD using Rosswurm and Larrabee's (1999) evidence-based practice model as a guide.

Several conceptual models are used for transferring evidence into clinical practice. Rosswurm and Larrabee's (1999) model utilizes a change theory and can facilitate practice change within an organization. The trans-theoretical model is a behavioral change model involving six stages of change: precontemplation, contemplation, preparation, action, maintenance, and termination, which can help predict an individual's success or failure with an anticipated behavior change (Prochaska, 2008). Self-efficacy is an individual's belief or confidence in their ability to carry out a behavior to obtain a desired outcome and is considered part of the social cognitive the-

ory (Bandura, 1982). Teaching self-management skills is not enough to bring about behavior change; an individual must learn to integrate these skills in their daily life, which is a component of the behavioral learning theory (Hand, 2006). The chronic care model (Wagner, 1998) was developed as an integrated reorganization of health-care delivery to improve patient outcomes and consists of six elements: community resources, health system, self-management, support delivery system design, decision support, and clinical information.

Breathing retraining is a strategy of self-management that incorporates Wagner's chronic care model, self-efficacy, and behavioral learning theory and can be operationalized through Rosswurm and Larrabee's model. Rosswurm and Larrabee's (1999) evidence-based practice model was selected because it guides healthcare providers through a systematic process for evidence-based practice change utilizing change theory and a combination of quantitative and qualitative data along with clinical expertise. The six stages of the Rosswurm and Larrabee's model are: assess need for change, link problem interventions and outcomes, synthesize best evidence, design

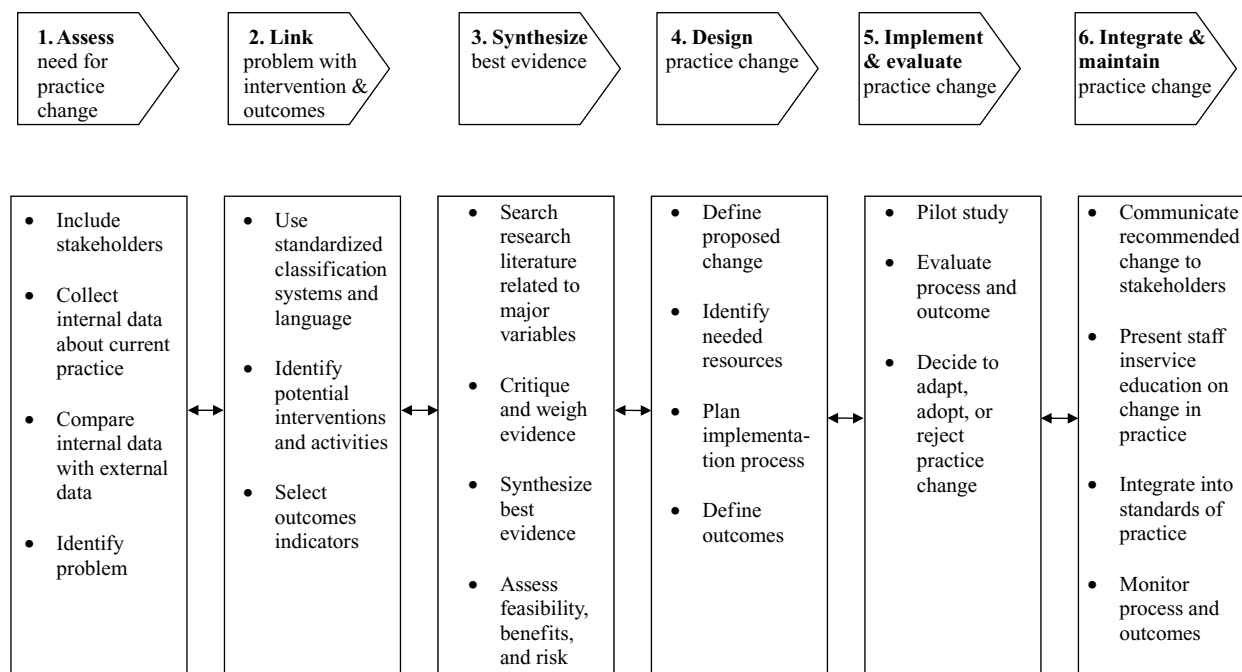


Figure 1 A model for evidence-based practice. Rosswurm, M. A., & Larrabee, J. H. (1999). A model for change to evidence-based practice. *Journal of Nursing Scholarship*, 31(4), 317–322. Reprinted with permission from Wiley-Blackwell, Inc.

practice change, implement and evaluate change in practice, and integrate and maintain change in practice (see Figure 1, Rosswurm & Larrabee's Modified Model).

Step 1: Assess need for change

COPD affects approximately 8% of individuals worldwide, with 10% of the individuals older than 40 years, and affects men and women equally (Halbert et al., 2006). With approximately 726,000 COPD patients hospitalized in the United States annually, the annual cost for COPD treatment exceeded \$42.6 billion in 2006 (National Heart, Lung & Blood Institute, 2007). The true prevalence is likely higher as COPD is both under-recognized and under-diagnosed. COPD was the sixth leading cause of death worldwide in 1990 and is expected to become the third leading cause of death by 2020 (Lopez et al., 2006). Assessing the need for practice change is the first step in Rosswurm and Larrabee's evidence-based practice model. Both the financial and human toll COPD takes on the individual and society compels further investigation of better ways to manage COPD.

COPD is a slowly progressing lung disease that leads to dyspnea, productive cough, wheezing, chest tightness, and a decline in ability to perform daily living activities. Management of COPD involves both pharmacother-

apy and nonpharmacologic options. Patient education is an important part of managing individuals with COPD and is a routine component of pulmonary rehabilitation. Self-management refers to educational programs that focus on teaching skills necessary to carry out medical regimens specific to the disease, guide health behavior change, and provide emotional support for patients to control their disease and improve functional health (Effing et al., 2007). Self-management programs and pulmonary rehabilitation programs have similar educational components, allowing individuals to better manage their chronic health condition. Patient education encourages self-management by the client, as well as partnership between the client and healthcare provider, which leads to improved health, better adherence to treatment plans, reduced hospitalizations and emergency room visits, reduced office visits, and improved quality of life (Bourbeau & Barlett, 2008; Bourbeau & Nault, 2007; Chang et al., 2007; Make, 1994). As clinicians, it is important to identify the client's stage of change when making mutual decisions regarding self-management strategies, so both client and provider can have realistic expectations (Johnson, Cummins, Evers, Prochaska, & Prochaska, 2009). When clients are in the "action" stage of change, they may be more successful in incorporating breathing retraining self-management strategies into their lives.

Step 2: Link problem with interventions and outcomes

The benefits of pulmonary rehabilitation have only been shown to persist for 12–18 months (Chang et al., 2007; Norwig, Whiteson, Malgady, Mola, & Rey, 2005; Nguyen et al., 2008). Not all pulmonary clients are able to attend pulmonary rehabilitation programs because of travel distance, lack of insurance reimbursement, or time commitment. Given the lack of long-term benefits or the inability of individuals with COPD to participate in pulmonary rehabilitation programs, the need exists for teaching self-management strategies to individuals with COPD to improve management of this chronic healthcare condition. Because self-management can have a positive impact on an individual's life, promoting self-control of frequently occurring symptoms of COPD, the first step in clinical practice change is to address the most common symptom experienced—dyspnea.

Dyspnea is an individual's subjective perception of breathing discomfort with varying degrees of intensity that can elicit both behavioral and psychological responses (American Thoracic Society, 1999). Identifying self-management strategies that improve dyspnea and functional performance are necessary in order to empower clients and reduce healthcare costs associated with COPD (Dechmand & Wilson, 2004). Linking breathing retraining self-management strategies to perception of dyspnea, functional performance, and self-efficacy provides clinicians with measurable outcomes over time and is the second step in Rosswurm and Larrabee's model. Incorporating self-management strategies to existing standards of care will augment or complement the existing services already available to individuals with COPD. To successfully manage COPD, both the healthcare provider and the client need to acknowledge the importance of shared responsibility for disease management.

Step 3: Synthesize best evidence

The magnitude of COPD associated symptoms and complications of the disease has led to an exploration of alternative management strategies that can augment or complement existing clinical management available to individuals with COPD. This leads to the refined guiding clinical question written in PICOT format: in clients with COPD (P), how does breathing retraining (I) as a self-management strategy compared to standard of care (C) affect dyspnea (O) over one's lifetime (T)?

The third step in Rosswurm and Larrabee's model includes searching the literature then critically appraising and synthesizing the best evidence. Therefore, an exhaustive literature search utilizing several databases was

conducted (see Figure S2, Database Flow Diagram). The Cochrane databases were selected as they include systematic reviews that are a valuable source of synthesized evidence. Ovid Medline was selected as it offers a comprehensive life science and biomedicine source. Excerpta Medica Database Guide, referred to as EMBASE, was selected as it contains European publications, and Cumulative Index to Nursing and Allied Health (CINAHL), because it includes nursing publications. Controlled vocabulary utilized in all databases as singular words or combined with other words included "self care," "COPD," "self-management," "behavioral contracts," "breathing retraining," and "pursed lip breathing (PLB)." Boolean connectors commonly used were "and," "or," "and not," or "not." Minimal limits were used on all the searches. Some of the limits used were English language, human subject, abstract, full text, and years 1950 to 2009.

CINAHL for the time period 1985–April 2009 produced 10,898 articles on "self care," "self care" and "obstructive lung disease" produced 131 articles, and "breathing exercises" and "COPD" and "self care" narrowed the search to five articles. In Cochrane database for the time period 1985–2009, "COPD" revealed 4258 articles, when combined with the Boolean "and," "COPD" and "self-management" produced 127 articles, "breathing retraining" and "COPD" and "PLB" narrowed the search to four articles. EMBASE from 1988 to 2009 search results yielded 2698 articles on "COPD," "PLB" yielded 187 articles, and 8295 on self-management. Combining "COPD" and "quality of life" and "self-management" results were narrowed to 24 articles. Combining "PLB" and "COPD" yielded 14 articles. Ovid Medline was searched from 1950 to 2009 with the search results yielding 35,501 studies for "self-management," "COPD" and "self-management" and "quality of life" narrowed the search to 34, "PLB" and "COPD" narrowed the search to 32 studies.

As the literature was reviewed, specific authors were identified and a hand search of their publications was performed. These authors included Katie Lorig, PhD, at Stanford University and Jean Bourbeau, MD, of Canada, who have done extensive research and are leaders in chronic disease self-management, and Paula Meek, PhD, and Susan Lareau, MS, who have done extensive COPD research.

The severity of COPD usually guides the intervention, so studies that included mild to severe COPD subjects were included in the study selection. The search was narrowed to 11 studies addressing the issue of self-management and breathing retraining. These studies demonstrated validity and reliability and were applicable to individuals with COPD in a clinical practice at a southwestern state tertiary clinic. Clinical decisions are based on the strongest level of evidence available that

refers to Level I systematic reviews or meta-analysis of randomized controlled trials (RCTs), or Level II, which includes evidence obtained from an RCT. Therefore, the studies selected included two RCTs, five systematic reviews, and four cohort studies (see Table S1, Evaluation Tables).

Sampling size was important as the larger the sampling size, the more ability the study has to detect differences. Most studies included a sampling population ranging from 22 to 107, with only one study including 7442 subjects. All study subjects were recruited voluntarily, with no harm risk identified to the subjects. Age of the sampling population was important as the majority of individuals with COPD are older than 40 years. The conceptual framework of self-efficacy; behavioral and cognitive theories; independent variables, which included self-management, chronic disease management, breathing retraining, and education; and dependent variables such as health status, health behaviors, health outcomes, and breathing techniques were identified. Assessment instruments used in some of the breathing retraining studies included the Borg and Visual Analog Scale, which is considered a reliable and valid tool. A weakness of all 11 studies was a lack of diverse ethnic representation.

A review of the eight breathing retraining citations examined several breathing techniques, such as diaphragmatic chest wall, progressive muscle relaxation, pursed lip, pacing, and self-talk. Bianchi et al. (2004), Dechman and Wilson (2004), Faager, Stahle, and Larsen (2008); and Nidel, Soo Hoo, Roper, and Santiago (2007) all reported PLB to be an effective strategy to reduce dyspnea in individuals with COPD. Nidel, Soo Hoo, Roper, and Santiago (2007) compared breathing retraining techniques such as PLB and expiratory muscle training on dyspnea and functional performance in moderate to severe COPD participants. All participants were taught how to perform PLB and instructed to practice PLB daily, recording their practice time on a log. They returned for 4 weekly visits, where PLB education was reinforced. Dyspnea was evaluated at baseline, week 4, and week 12 with a shortness of breath questionnaire and the modified Borg scale. A significant reduction in participants' perception of dyspnea using PLB at 12 weeks but not at 4 weeks was reported (see Table S1, Evaluation Tables, Article No. 4). Cahalin, Brage, Matuso, and Hernandez (2002) examined diaphragmatic breathing through a literature review and found that moderate to severe COPD and marked hyperinflation subjects may be poor candidates for diaphragmatic breathing.

Faager, Stahle, and Larsen (2008) assessed the effect of PLB on walking endurance in moderate to severe COPD subjects. Subjects performed one walk test without and one with PLB on the same day. The results showed that

the use of PLB increased walk times by an average of 37 s (Faager, Stahle, & Larsen, 2008). Bianchi et al. (2004) assessed the change in chest wall volume in 22 mild to severe COPD subjects, measuring dyspnea with the modified Borg scale. A comparison between spontaneous breathing and PLB was done, resulting in a statistically significant reduction of the chest wall's end expiratory volume when PLB was used. This suggests that PLB may reduce dyspnea by decreasing the end expiratory volume. Dechman and Wilson (2004) reviewed 22 articles that looked at the effects of breathing retraining on individuals with stable COPD. They concluded that PLB does reduce dyspnea in certain subjects, although it was difficult to predict who would benefit. In the subjects that reported improved dyspnea with PLB, the authors found that the mechanical functioning of the lung was optimized by preventing increases in the end expiratory lung volume and, therefore, the effects of hyperinflation (Dechman & Wilson, 2004).

Meek (2000) examined the effect of attention on the perception of dyspnea given alterations in attentional focus based on the participant's experience with the perception. The Visual Analog Scale was used to measure perception of dyspnea with findings suggesting that memories that alter attentional focus contribute to variations in ones' perception of breathlessness. These findings were statistically significant in the COPD group. Meek, Lareau, and Hu (2003) measured breathing distress and effort daily over a 2- and 4-week period in individuals with COPD and found the Visual Analog Scale to be a reliable and valid tool to measure breathing effort and distress.

In a systematic review, Foster, Taylor, Eldridge, Ramsey, and Griffiths (2008) examined 17 studies of disease self-management programs. The review found that participants increased disease knowledge, self-management skills, responsibility for disease management, and demonstrated improvement in self-rated general health, aerobic exercise, and self-efficacy (see Table S1, Evaluation Tables, Article No. 1). Bodenheimer, Lorig, Holman, and Grumbach (2002) did a systematic review of 107 studies finding patient-education programs that taught self-management skills to be more effective than information only programs in improving clinical outcomes and decreasing cost associated with some chronic health-care conditions. Bourbeau and Nault's (2007) systematic review addressed self-management in COPD, reporting reduced COPD hospital admissions by 40%, admissions for other health issues by 57%, emergency department visits decreased by 41%, and unscheduled physician visits by 59%, when an intervention of home exercise, action plans, and case management are utilized. The large sampling size, study design, and statistically

significant findings of all three of these studies provide credibility to the evidence regarding the utilization of self-management strategies to address chronic disease management.

In summary, a synthesis of the articles reviewed found self-management to be an effective long-term approach for addressing chronic disease management, resulting in reduced healthcare costs and improvement in general health. The long-term benefits of structured pulmonary rehabilitation programs wane within 12–18 months; therefore, as clinicians, we need to offer our COPD clients education on breathing retraining techniques. Augmenting the current standard of care with PLB as a self-management strategy may enable individuals with COPD to have longer control of their dyspnea and chronic disease.

Step 4: Design practice change

Designing practice change is the fourth step in Ross-wurm and Larrabee's evidence-based practice model. It includes beginning to plan the implementation process and define outcomes. A review of literature revealed evidence to support breathing retraining, specifically PLB, as a self-management strategy for individuals with COPD. PLB is easily taught to COPD clients at office visits. Therefore, it should be integrated into their self-management strategies at the time of their COPD diagnosis, even if their severity of COPD is mild. Encouraging individuals with COPD to practice PLB on a daily basis can lead to improvement in their perception of dyspnea, functional performance, and self efficacy that are outcomes that can easily be measured utilizing reliable and valid instruments.

Step 5: Implement and evaluate practice change

Once a practice change has been identified, implementing and evaluating the practice change is the fifth step in this model. The practice change recommended would be that all individuals with COPD be taught how to perform PLB at routine office visits by their healthcare provider as opposed to just being referred to pulmonary rehabilitation programs. This practice change is meant to augment the standard of care treatment, not replace it. Each clinician may teach PLB differently as there is no standard of care for teaching PLB (Tiep, 2007). When teaching PLB, instruct the client to breathe in normally through the nose, if possible, and exhale through pursed lips, as if trying to whistle or make a candle flame waver. Implementation of a self-management breathing retraining program over a specified period of time will allow for data

collection and proposed outcome analysis. Once the data are analyzed, it will be important to evaluate the practice change to determine whether the practice change should be adopted, rejected, or adapted.

Step 6: Integrate and maintain practice change

The final step is integrating and maintaining practice change. *Crossing the Chasm Report* (Institute of Medicine, 2001) identifies six aims for quality improvement: safe, effective, efficient, timely, patient centered, and equitable. Several of these aims are incorporated into this evidence-based practice change recommendation. Breathing retraining is considered a safe intervention as there is no harm risk identified to the patient. It is about empowering patients with a chronic disease to learn self-management strategies to improve their symptoms and self-efficacy. Providing breathing retraining education in a timely fashion and facilitating daily practicing of PLB before clients become so short of breath they are unable to successfully use the technique to slow their breathing down can augment COPD management strategies. The literature shows that PLB when practiced on a regular basis will improve dyspnea in individuals with COPD.

As healthcare providers, using evidence-based self-management strategies, delivered through solid practice models, will result in empowered clients who have the opportunity to lead productive, satisfying lives. To accomplish this, one must understand how to obtain, interpret, and integrate the best scientific evidence into our clinical practices. The utilization of Ross-wurm and Larrabee's evidence-based practice model is one method that offers healthcare providers a conceptual framework for practice change that can easily be integrated into clinical practice.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1 Literature evaluation tables

Figure S2 Databases and search strategy flow diagram

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