Ontario
Health Quality Ontario
Qualité des services de santé Ontario

Pulmonary Rehabilitation in the Home Versus Other Settings for Individuals With Chronic Obstructive Pulmonary Disease (COPD): A Rapid Review

M Wang

February 2015

Evidence Development and Standards Branch at Health Quality Ontario

Pulmonary Rehabilitation in the Home Versus Other Settings for Individuals With Chronic Obstructive Pulmonary Disease (COPD): A Rapid Review. February 2015; pp. 1–23

Suggested Citation

This report should be cited as follows:

Wang M. Pulmonary rehabilitation in the home versus other settings for individuals with chronic obstructive pulmonary disease (COPD): a rapid review. Toronto: Health Quality Ontario; 2015 February. 23 p. Available from: http://www.hqontario.ca/evidence/evidence-process/episodes-of-care#community-copd.

Permission Requests

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL:
http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

All authors in the Evidence Development and Standards branch at Health Quality Ontario are impartial. There are no competing interests or conflicts of interest to declare.

Rapid Review Methodology

Rapid reviews are completed in 2–4-week time frames. Clinical questions are developed by the Evidence Development and Standards branch at Health Quality Ontario, in consultation with experts, end users, and/or applicants in the topic area. A systematic literature search is then conducted to identify relevant systematic reviews, health technology assessments, and meta-analyses. The methods prioritize systematic reviews, which, if found, are rated by AMSTAR to determine the methodological quality of the review. If the systematic review has evaluated the included primary studies using the GRADE Working Group criteria (http://www.gradeworkinggroup.org/index.htm), the results are reported and the rapid review process is complete. If the systematic review has not evaluated the primary studies using GRADE, the primary studies in the systematic review are retrieved and the GRADE criteria are applied to 2 outcomes. If no systematic review is found, then RCTs or observational studies are included, and their risk of bias is assessed. All rapid reviews are developed and finalized in consultation with experts.

About Health Quality Ontario

Health Quality Ontario is an arms-length agency of the Ontario government. It is a partner and leader in transforming Ontario's health care system so that it can deliver a better experience of care, better outcomes for Ontarians, and better value for money.

Health Quality Ontario strives to promote health care that is supported by the best available scientific evidence. The Evidence Development and Standards branch works with expert advisory panels, clinical experts, scientific collaborators, and field evaluation partners to conduct evidence-based reviews that evaluate the effectiveness and cost-effectiveness of health interventions in Ontario.

Based on the evidence provided by Evidence Development and Standards and its partners, the Ontario Health Technology Advisory Committee—a standing advisory subcommittee of the Health Quality Ontario Board—makes recommendations about the uptake, diffusion, distribution, or removal of health interventions to Ontario's Ministry of Health and Long-Term Care, clinicians, health system leaders, and policy-makers.

Health Quality Ontario's research is published as part of the *Ontario Health Technology Assessment Series,* which is indexed in MEDLINE/PubMed, Excerpta Medica/Embase, and the Centre for Reviews and Dissemination database. Corresponding Ontario Health Technology Advisory Committee recommendations and other associated reports are also published on the Health Quality Ontario website. Visit http://www.hqontario.ca for more information.

About Health Quality Ontario Publications

To conduct its rapid reviews, Evidence Development and Standards and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Evidence Development and Standards collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Disclaimer

This rapid review is the work of the Evidence Development and Standards branch at Health Quality Ontario, and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. In addition, it is possible that other relevant scientific findings may have been reported since completion of the review. This report is current as of the date of the literature search specified in the Research Methods section. Health Quality Ontario makes no representation that the literature search captured every publication that was or could be applicable to the subject matter of the report. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Table of Contents

List of Abbreviations

AMSTAR	Assessment of Multiple Systematic Reviews
COPD	Chronic obstructive pulmonary disease
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
HRQOL	Health-related quality of life
PR	Pulmonary rehabilitation
RCT	Randomized controlled trial
SR	Systematic review

Background

As legislated in Ontario's *Excellent Care for All Act*, Health Quality Ontario's mandate includes the provision of objective, evidence-informed advice about health care funding mechanisms, incentives, and opportunities to improve quality and efficiency in the health care system. As part of its Quality-Based Procedures (QBP) initiative, Health Quality Ontario works with multidisciplinary expert panels (composed of leading clinicians, scientists, and administrators) to develop evidence-based practice recommendations and define episodes of care for selected disease areas or procedures. Health Quality Ontario's recommendations are intended to inform the Ministry of Health and Long-Term Care's Health System Funding Strategy.

For more information on Health Quality Ontario's Quality-Based Procedures initiative, visit www.hqontario.ca.

Objective of Analysis

The objective is to determine the effectiveness of home-based pulmonary rehabilitation compared to pulmonary rehabilitation in other settings for patients with chronic obstructive pulmonary disease (COPD).

Clinical Need and Target Population

Chronic obstructive pulmonary disease encompasses a group of conditions which are all characterized by irreversible airflow limitation from lung tissue damage. COPD affects more than 1.5 million Canadians (1) and is a major cause of both morbidity and mortality, with patients often experiencing shortness of breath (dyspnea), decreased exercise capacity and impaired quality of life. Sudden worsening of COPD is characterized by exacerbations, which often lead to hospitalizations and therefore increased health care costs. Due to the long-term effects of the condition, therapeutic interventions are aimed at preventing disease progression and exacerbations, relieving symptoms, increasing exercise tolerance, and reducing mortality.

Technology/Technique

Pulmonary rehabilitation (PR) is considered one of the most important interventions for COPD patients and has been shown to control and alleviate symptoms of COPD through improvements in dyspnea, exercise capacity, functional status, and health-related quality of life. (2) Programs vary in duration and may be broad in nature, usually combining exercise or endurance training with other components such as nutrition counselling, patient self-management and education, breathing and energy-conserving strategies, and/or psychosocial support. By focusing on multiple patient needs, PR functions to address the chronic and disabling aspect of COPD.

Despite the recognized benefits of PR, it is underutilized, with an estimated less than 2% of Ontarians having access. (3) To date, most PR programs are multidisciplinary and have been performed in a hospital or physical therapy facility; however, they are costly even in an outpatient setting and are limited in availability. Recently, home-based PR programs have emerged as an alternative due to their potential for fewer resources and increased patient accessibility based on their location. However, the effectiveness of these PR programs compared to other settings is unclear.

Rapid Review

Research Question

What is the effectiveness of home-based pulmonary rehabilitation compared to pulmonary rehabilitation in other settings?

Research Methods

Literature Search

Search Strategy

A literature search was performed on December 10, 2013, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), and EBM Reviews for studies published from January 1, 2008, to December 10, 2013. (Appendix 1 provides details of the search strategies.) Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

- English-language full-text publications
- published between January 1, 2008, and December 10, 2013
- systematic reviews (SRs) and meta-analyses comparing home-based pulmonary rehabilitation with pulmonary rehabilitation in settings other than the home for COPD and pneumonia patients

Exclusion Criteria

- randomized controlled trials (RCTs), editorials, case studies, observational studies, or commentaries
- home-based pulmonary rehabilitation indicated for maintaining the effects of inpatient/outpatient programs, where training was completed in locations other than at home, or programs requiring regular visits to a rehabilitation centre
- comparison of home-based pulmonary rehabilitation program to standard or usual care (i.e., no pulmonary rehabilitation)
- studies where outcomes of interest cannot be abstracted

Outcomes of Interest

- exercise capacity
- health-related quality of life (HRQOL)

Expert Panel

In November 2013, an Expert Advisory Panel on Post-Acute, Community-Based Care for COPD Patients was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, and representatives from community-based care organizations.

The role of the expert advisory panel was to provide advice on primary COPD patient groupings; to review the evidence, guidance, and publications related to defined COPD patient populations; to identify and prioritize interventions and areas of community-based care; and to advise on the development of a care pathway model. The role of panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert panel members.

Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of systematic reviews. (4)

The quality of the body of evidence for each outcome was examined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria. (5) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that randomized controlled trials (RCTs) are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that may raise the quality of evidence were considered: large magnitude of effect, dose response gradient, and accounting for all residual confounding factors. (5) For more detailed information, please refer to the latest series of GRADE articles. (5)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect.
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different.
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect.
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of effect.

Results of Rapid Review

The database search yielded 613 citations published between January 1, 2008, and December 10, 2013, (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.

One systematic review by Vieira et al (6) published in 2010 met the inclusion criteria, which examined the effectiveness of home-based PR and included 12 studies in total, 4 of which were relevant comparing home-based PR to PR in another setting (Table 1). No systematic reviews or meta-analyses pertaining to a pneumonia population were found for the research question. A hand search of the reference list did not identify any other relevant studies. The included systematic review by Vieira et al (6) was of mediocre quality, with an AMSTAR rating of 6 (see Appendix 2, Table A1 for AMSTAR evaluation).

Table 1: Summary of Included Systematic Review by Vieira et al (2010)

Inclusion Criteria	# of RCTs	Comparison
COPD (by any definition) patients, ≥40 years old.	8	Home PR vs. standard care (i.e., no PR)
Home-based PR ≥4 weeks in duration or 12 sessions with lower limb endurance exercise training.	3	Home PR vs. outpatient PR
	1	Home PR vs. standard care vs. outpatient PR

Abbreviations: COPD; chronic obstructive pulmonary disease; PR, pulmonary rehabilitation; RCT, randomized controlled trial.

As pulmonary rehabilitation has already been shown to be effective in improving outcomes such as health-related quality of life and exercise capacity, (2) the focus was on the 4 studies comparing the location of PR (see Appendix 3, Table A4 for characteristics of the 4 included studies). Of the included studies, by far the largest in size was by Maltais et al involving 252 total COPD patients, while the other 3 studies were of smaller sample size, ranging from 41 to 57, and underpowered for the study outcomes measured (6). Maltais et al was also the most rigorously designed study in considering noninferiority and intention-to-treat, which were not mentioned in the other studies (6). The comparison was of home PR to PR in another setting and blinding was not possible as the setting was apparent to both the patients and therapists; however, two of the studies blinded the assessor in measuring outcomes. (7;8) The patient population for all was stable patients with moderate to very severe COPD. Although all settings were considered for the research question, the only comparisons found were between the home and outpatient setting. In addition, due to the self-monitored nature of PR along with necessary adherence, there were high drop-out rates between both groups of patients, although studies reported no difference between the dropout patients among the groups. Adverse events were reported in only one study (7) (see Appendix 2, Table A3 for risk of bias).

The studies could not be combined for meta-analysis due to differences in study duration (8 to 12 weeks), follow-up (6 to 18 months), PR components offered, and measures and values of the study outcomes for exercise capacity and HRQOL (see Appendix 2, Table A2 for GRADE of the outcome measures). Additional PR components included patient self-management information and education, which when included were offered to both groups. Thus, the studies were summarized in tabular format for the individual study results based on the outcomes of interest: HRQOL and exercise capacity (Tables 2 and 3, respectively). Health-related quality of life was measured using the COPD-specific Chronic Respiratory Questionnaire (domains of dyspnea, mastery, fatigue, and emotion) in 3 studies (7-9), with one study using the Borg scale for dyspnea (10) and another also including the St. George's Respiratory Questionnaire (SGRQ) (7). Exercise capacity was measured either through the 4- or 6-minute walk test, the constant work rate test, peak maximum oxygen consumption, and/or maximum work load.

Table 2: Health-related Quality of Life for Home-based Versus Other Setting Pulmonary Rehabilitation

		Within group difference from baseline		Between group difference
HRQOL Test	**Study**	**Home PR**	**Other PR**	**Home PR – Other PR**
CRQ Dyspnea	Güell et al (8)	0.56[a]	0.87[a]	−0.21 (NS)
	Maltais et al (7)	0.82[a]	0.78[a]	0.05 (NS)
	Puente-Maestu et al (9)	0.8[a]	0.72[a]	(NS)
CRQ Mastery	Güell et al (8)	NS	0.6[a]	−0.42 (NS)
	Maltais et al (7)	0.49[a]	0.51[a]	−0.02 (NS)
	Puente-Maestu et al (9)	1.35[a]	0.75[a]	(NS)
CRQ Fatigue	Güell et al (8)	NS	0.56[a]	−0.19 (NS)
	Maltais et al (7)	0.36[a]	0.46[a]	−0.10 (NS)
	Puente-Maestu et al (9)	0.7[a]	0.82[a]	(NS)
CRQ Emotion	Güell et al (8)	NS	0.76[a]	−0.58[b]
	Maltais et al (7)	0.35[a]	0.38[a]	−0.03 (NS)
	Puente-Maestu et al (9)	0.67[a]	0.43[a]	(NS)
SGRQ Total Symptom Activity Impact	Maltais et al (7)	-7.7[b] -9.2[b] -5.9[b] -8.1[b]	-6.3[b] -3.1 (NS) -5.7[b] -7.9[b]	−1.4 (NS) −6.1[b] −0.2 (NS) −0.2 (NS)
Borg Dyspnea	Strijbos et al (10)	-0.4[c]	-0.3[c]	(NS)

Abbreviations: CRQ, Chronic Respiratory Questionnaire; HRQOL, health-related quality of life; NS, not significant; PR, pulmonary rehabilitation; SGRQ, St. George's Respiratory Questionnaire.

[a] $P < 0.05$.

[b] $P < 0.01$.

[c] $P < 0.005$.

Table 3: Exercise capacity for home-based versus other setting pulmonary rehabilitation

Exercise Capacity Test	Study	Within group difference from baseline		Between group difference
		Home PR	Other PR	Home PR – Other PR
4-minute walk test (metres)	Strijbos et al (10)	Difference NA[a]	Difference NA[a]	NS
6-minute walk test (minutes)	Guëll et al (8)	Difference NA[b]	Difference NA[b]	8.69 (NS)
	Maltais et al (7)	8 (NS)	11[b]	-3 (NS)
Constant work rate test (minutes)	Maltais et al (7)	4.1[c]	3.95[c]	0.15 (NS)
	Puente-Maestu et al (9)	3.9[c]	8[c]	NS
Peak VO_2 max (mL/min)	Puente-Maestu et al (9)	5 (NS)	110[c]	Difference NA[b]
Borg scale for leg effort	Strijbos et al (10)	-2.4[a]	-1.0[a]	NS
Maximum workload (Watts)	Strijbos et al (10)	Difference NA[b]	Difference NA[a]	NS

Abbreviations: NA, data not available; NS, not significant; PR, pulmonary rehabilitation; VO_2 max, maximum oxygen consumption.
[a]$P < 0.005$.
[b]$P < 0.05$.
[c]$P < 0.01$.

In general across the studies, there was no difference in improvement between home PR and outpatient PR for exercise capacity or health-related quality of life, suggesting benefit for both types of PR regardless of location. However, Puente-Maestu et al (9) found significant changes in physiological improvements which were not present in the home PR group, which may be due to the study specifically examining the effects of supervised versus self-monitored PR. As such, there was minimal involvement on the part of the home PR therapists compared to other home-based PR programs, which attempted to be more consistent with the corresponding components offered in outpatient PR. In addition, Guëll et al (8) found a significant difference between home and outpatient PR for the Chronic Respiratory Questionnaire (CRQ) domain of emotion only, which the authors hypothesized may be related to the presence of psychological support, which was unique to the outpatient PR program. Exercise capacity values were reported more variously, with some studies noting a significant difference within each of the home and outpatient PR groups without presenting the exact values. The overall outcome was not significant in exercise capacity regardless of the method of measure when comparing home and outpatient PR programs.

From the Vieira et al (6) systematic review, there are few studies comparing home-based PR, with very low quality evaluation of the outcomes of exercise capacity and health-related quality of life. In general, the conclusions of the studies were that home PR and hospital outpatient PR resulted in similar improvements in exercise capacity and HRQOL if properly adhered to. As home-based PR can also be tailored to patients and allow for greater accessibility, they may be an alternative to outpatient PR.

Conclusions

- One relevant systematic review by Vieira et al 2010 (6) was identified and within the review 4 relevant RCTs compared home-based pulmonary rehabilitation with outpatient-based pulmonary rehabilitation.
- Statistically or clinically significant differences were in general not found for the outcomes of exercise capacity or health-related quality of life between home-based versus outpatient-based pulmonary rehabilitation (GRADE quality: very low).

Acknowledgements

Editorial Staff
Timothy Maguire

Medical Information Services
Corinne Holubowich, BEd, MLIS

Health Quality Ontario's Expert Advisory Panel on Post-Acute Community-Based Care for COPD Patients

Panel Members	Affiliation(s)	Appointment(s)
Co-Chairs		
Dr Chaim Bell	Mount Sinai Hospital University of Toronto	Clinician Scientist Associate Professor
Lisa Droppo	Ontario Association of Community Care Access Centers (OACCAC)	Chief Care Innovations Officer
Primary Care		
Dr Kenneth Hook	Ontario College of Family Physicians STAR Family Health Team	Past-President Senior Physician
Dr Alan Kaplan	Family Physicians Airway Group of Canada	Chair, Family Physicians Airway Group of Canada
Dr Peter Selby	Department of Family and Community Medicine & Psychiatry and Dalla Lana School of Public Health University of Toronto Ontario Tobacco Research Unit	Associate Professor Principal Investigator
Respirology		
Dr Samir Gupta	St Michael's Hospital	Adjunct Scientist, Keenan Research Centre
Dr Roger Goldstein	West Park Health Centre Toronto Rehabilitation Institute	Respiratory Division Head Associate Medical Staff Professor of Medicine
Respiratory Therapy		
Ivan Nicoletti	Erie St. Clair CCAC	Care Coordinator
Sara Han	Ontario Lung Association Mount Sinai Hospital	PCAP Provincial Coordinator Certified Respiratory Educator
Miriam Turnbull	ProResp Inc	General Manager
Madonna Ferrone	Erie St. Clair LHIN	Project Manager ARGI, Lung Health Collaboratist
Nursing		

Panel Members	Affiliation(s)	Appointment(s)
Cheryl Lennox	South West Community CCAC, Intensive Home Care Team	Nurse Practitioner-Primary Health Care Certified Respiratory Educator
Andrea Roberts	Toronto Central CCAC	Rapid Response Transition Nurse
Mary-Jane Herlihey	ParaMed Home Health Care Ottawa	Clinical Consultant
Suzy Young	St. Mary's General Hospital	Nurse Practitioner Primary Health Care SWCCAC Intensive Health Care Team Certified Respirator Educator

Appendices

Appendix 1: Literature Search Strategies

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to October 2013>, EBM Reviews - ACP Journal Club <1991 to November 2013>, EBM Reviews - Database of Abstracts of Reviews of Effects <4th Quarter 2013>, EBM Reviews - Cochrane Central Register of Controlled Trials <November 2013>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <4th Quarter 2013>, EBM Reviews - NHS Economic Evaluation Database <4th Quarter 2013>, Ovid MEDLINE(R) <1946 to November Week 3 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <December 09, 2013>
Search Strategy:

---

1 exp Patient Discharge/ (19905)
2 exp Aftercare/ or exp Convalescence/ (10298)
3 "Continuity of Patient Care"/ or exp "Recovery of Function"/ (49411)
4 ((patient* adj2 discharge*) or after?care or post medical discharge* or post?discharge* or convalescen*).ti,ab. (37891)
5 exp Heart Failure/ (93131)
6 (((cardia? or heart) adj (decompensation or failure or incompetence or insufficiency)) or cardiac stand still or ((coronary or myocardial) adj (failure or insufficiency))).ti,ab. (135925)
7 exp Pulmonary Disease, Chronic Obstructive/ (26667)
8 exp Emphysema/ (11099)
9 (copd or coad or chronic airflow obstruction* or (chronic adj2 bronchitis) or emphysema).ti,ab. (60068)
10 (chronic obstructive adj2 (lung* or pulmonary or airway* or airflow* or respiratory or bronchopulmonary) adj (disease* or disorder*)).ti,ab. (37815)
11 exp Pneumonia/ (78260)
12 (pneumoni* or peripneumoni* or pleuropneumoni* or lobitis or ((pulmon* or lung*) adj inflammation*)).ti,ab. (147382)
13 or/1-12 (513261)
14 exp Exercise Tolerance/ (9966)
15 exp Exercise/ (127308)
16 exp Rehabilitation/ (162816)
17 exp Rehabilitation Nursing/ (1136)
18 exp "Physical and Rehabilitation Medicine"/ (19975)
19 exp Rehabilitation Centers/ (12881)
20 exp Physical Therapy Modalities/ (136983)
21 (rehabilitat* or (physical* adj (fit* or train* or therap* or activit*)) or ((exercise* or fitness) adj3 (treatment or intervent* or program*)) or (train* adj (strength* or aerobic or exercise*)) or wellness program* or ((pulmonary or lung* or respirat* or cardiac) adj2 (physiotherap* or therap* or rehabilitat*)) or angina plan* or heart manual*).ti,ab. (235554)
22 or/14-21 (536336)
23 Meta Analysis.pt. (52738)
24 Meta-Analysis/ use mesz or exp Technology Assessment, Biomedical/ use mesz (61456)
25 (meta analy* or metaanaly* or pooled analysis or (systematic* adj2 review*) or published studies or published literature or medline or embase or data synthesis or data extraction or cochrane).ti,ab. (211340)
26 ((health technolog* or biomedical technolog*) adj2 assess*).ti,ab. (2746)
27 or/23-26 (227857)

28 13 and 22 and 27 (1230)
29 limit 28 to (english language and yr="2008 -Current") [Limit not valid in CDSR,ACP Journal Club,DARE,CCTR,CLCMR; records were retained] (773)
30 remove duplicates from 29 (613)

Appendix 2: Evidence Quality Assessment

Table A1: AMSTAR Score of Included Systematic Review

Author, Year	AMSTAR Score	(1) Provided Study Design	(2) Duplicate Study Selection	(3) Broad Literature Search	(4) Considered Status of Publication	(5) Listed Excluded Studies	(6) Provided Characteristics of Studies	(7) Assessed Scientific Quality	(8) Considered Quality in Report	(9) Methods to Combine Appropriate	(10) Assessed Publication Bias	(11) Stated Conflict of Interest
Vieira et al, 2010 (6)	6	✓		✓			✓	✓	✓			✓

Abbreviations: AMSTAR, Assessment of Multiple Systematic Reviews.

[a]Maximum possible score is 11. Details of AMSTAR score are described in Shea et al (4)

Table A2: GRADE Evidence Profile for Exercise Capacity and Health-Related Quality of Life Outcomes

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Exercise capacity							
4 (RCTs)	Serious limitations (–1)[a]	No serious limitations	Serious limitations (–1)[b]	Serious limitations (–1)[c]	Undetected		⊕ Very Low
Health-related quality of life							
4 (RCTs)	Serious limitations (–1)[a]	No serious limitations	Serious limitations (–1)[b]	Serious limitations (–1)[c]	Undetected		⊕ Very Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; RCT, randomized controlled trial.

[a]Method of randomization was not specified in two studies although it was noted they were RCTs (9;10). Lack of blinding for all studies for patient and therapists due to home-based versus other setting pulmonary rehabilitation; however, in 2 studies, the assessors were blinded. (9;10) Only 1 study followed the intention-to-treat principle and was designed as a noninferiority trial. (7) There were high losses of follow-up and lack of adherence, but it was explicitly stated in studies that there was not an imbalance between rates in the home versus outpatient groups. One study reported only pre- and post- pulmonary rehabilitation measures and did not contain follow-up reporting. (9) Adverse events were only reported in one study. (7)

[b]The types of pulmonary rehabilitation programs varied in terms of study duration (8-12 weeks) and components (e.g., endurance training, informative sessions, physical therapy). One study's objective was to compare two types of rehabilitation programs, one which was self-monitored with minimal therapist involvement (analogous to a home-based PR program) versus a stricter supervised program involving hospital workers. (9) Reported outcome measures differed between the studies for health-related quality of life (St. George's Respiratory Questionnaire, Chronic Respiratory Questionnaire, Borg scale for dyspnea) as well as for exercise capacity (4-minute walk test, 6-minute walk test, maximum work level, maximum oxygen consumption). Follow-up reporting also varied from 6 to 18 months, except for one study where there was no period of follow-up. (9)

[c]All studies had low sample sizes (30-57 for the home-based versus outpatient-based arms of the study) and were underpowered, except for the study which had the largest number of participants (N=252) and was adequately powered for noninferiority. (7) However, this study's primary outcome was only dyspnea, with secondary outcomes of other domains of health-related quality of life and exercise capacity. (7)

Table A3: Risk of Bias Among Randomized Controlled Trials for Pulmonary Rehabilitation at Home Versus in Another Setting for COPD

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Güell et al, 2008 (8)	Limitations[a]	Limitations[b]	No limitations	No limitations	Limitations[c]
Maltais et al, 2008 (7)	No limitations	Limitations[b]	No limitations	No limitations	No limitations
Puente-Maestu et al, 2000 (9)	Limitations[d]	Limitations[e]	Limitations[f]	No limitations	Limitations[c]
Strijbos et al, 1996 (10)	Limtations[a]	Limitations[e]	No limitations	No limitations	Limitations[c]

[a]Specific method of randomization was not specified; however, the study was identified as a RCT.
[c]No mention of noninferiority study design or intention-to-treat principle.
[b]Patients and therapists could not be blinded due to study design; however, assessors were blinded.
[d]Allocation to pulmonary rehabilitation program was determined by the patients' referring pneumologist.
[e]Patients, therapists, and assessors could not be blinded due to the supervised nature of the comparator pulmonary rehabilitation program.
[f]Unlike the other two studies, Puente-Maestu et al (9) did not have a follow-up period and the only analyses performed were for pre- and post-training. Most of the patients in the self-monitoring (home-based) group walked more than the time requested by the study. More than half the patients missed at least one visit.

Appendix 3: Randomized Controlled Trials Included in Vieira et al 2010 Systematic Review

Table A4: Characteristics of Included Studies for Home Versus Other Setting Pulmonary Rehabilitation for COPD

Author, Year	Sample Size, n	Mean Age, Years (SD)	Study Population	Home-Based PR	PR in Other Setting	Study Outcomes	Length of Follow-Up
Güell et al, 2008 (8)	Total: 51 Home PR: 23 Other PR: 28	Home PR: 66 (6) Other PR: 63 (7)	Stable severe to very severe COPD, 50-75 years old Former smokers or current smokers intending to quit FEV_1 30%-50% predicted Exclusion: significant response to bronchodilator, severe hypoxemia, asthma, severe coronary artery disease, orthopedic disease limiting mobility	9 weeks, 3x/week Respiratory muscle training in two 15-min sessions using threshold device at 40% maximum inspiratory pressure 30 min arm training lifting weights Unsupervised walking daily at 4 km/h for: 15 min (week 1); 30 min (week 2-4); 45 min (weeks 5-9); and stepping up and down stairs for 5 min before and after each walk Attended 2 sessions about COPD education, self-management and respiratory and exercise therapies in week 1	Hospital outpatient PR: 9 weeks, 3x/week Respiratory muscle training in two 15-min sessions using threshold device at 40% maximum inspiratory pressure 30 min arm training lifting weights 30 min leg training cycling at 60% of peak work rate Attended 2 sessions about COPD education, self-management and respiratory and exercise therapies in week 1	HRQOL (CRQ) Exercise capacity (6 minute walk test, muscle strength of upper limb) Pulmonary function	6 months
Maltais et al, 2008 (7)	Total: 252 Home PR: 126 Other PR: 126	Home PR: 66 (9) Other PR: 66 (9)	Stable moderate-severe COPD, ≥40 years old Current or former smokers of ≥ 10 pack-years FEV_1 <70% predicted, FEV_1/FVC <0.70, MRC dyspnea score ≥2 Exclusion: previous diagnosis of asthma, congestive heart failure, terminal disease,	Aerobic and strength exercise 8 weeks, 3x/week Self, monitored with weekly telephone calls for reinforcement and problem detection Endurance cycling at 60% peak work rate for 40 min/day	Hospital outpatient PR: 8 weeks, 3x/week Endurance cycling at 80% of peak work rate for 25-30 min Strength training exercises for 30 min	Primary: HRQOL (dyspnea domain of CRQ) Secondary: HRQOL (other domains of CRQ, and SGRQ)	12 months

Author, Year	Sample Size, n	Mean Age, Years (SD)	Study Population	Home-Based PR	PR in Other Setting	Study Outcomes	Length of Follow-Up
			dementia, uncontrolled psychiatric illness	Strength training exercises for 30 min Diary of each completed training session		Exercise capacity (6-min walk test, CPET) Pulmonary function Adverse events	
Puente-Maestu et al, 2000 (9)	Total: 41 Home PR: 20 Other PR: 21	Home PR: 66 (5) Other PR: 63 (4)	Stable severe COPD, <75 years old Former smokers of ≥10 pack-years FEV_1 <50% predicted, FEV_1/FVC <0.70, arterial blood carboxyhemoglobin <3%, mMRC dyspnea score ≥2 Exclusion: asthma, bronchiectasis, obliterating bronchiolitis, scarring affecting >20% of one hemithorax, thoracic deformities, fibrothorax, cardiomyopathies, severe arrhythmia, type 1 diabetes, neuromuscular disorders, severe hepatic or renal diseases, physical or psychological impairment impeding exercise	8 weeks, 4x/week Self-monitored endurance walking 3-4 km in 1 hour Visit 1x/week in clinic to check record log and encouraged to continue with training	8 weeks, 4x/week Hospital outpatient PR: supervised endurance walking on treadmill for 1 hour at 3km/h and slope 25% of peak VO_2	HRQOL: CRQ Exercise capacity: CPET and constant work rate on treadmill Pulmonary function	None

Author, Year	Sample Size, n	Mean Age, Years (SD)	Study Population	Home-Based PR	PR in Other Setting	Study Outcomes	Length of Follow-Up
Strijbos et al, 1996 (10)	Total: 45 Home PR: 15 Other PR: 15 Control: 15	Home PR: 61 (6) Other PR: 60 (8) Control: 63 (5)	Stable COPD Dyspnea on exertion, limiting activities of daily living $PaCO_2$ <6.5 kPa at rest, PaO_2 >7.5 kPa at rest, FEV_1 postbronchodilation between 600 and 1800 mL, FEV_1 <65% predicted Exclusion: ischemic heart disease, musculoskeletal disorders, disabling diseases restricting rehabilitation therapy	12 weeks, 24 sessions x 30 min of individualized exercise by physiotherapist Instructed to exercise individually ≥30 min on exercise days, ≥15 min other days Local homecare nurse visit 3x for medication check, daily peak flow values, motivation to continue exercises at home All patients visited their general practitioner 3x Patient education for correct medication use, disease course, and when to seek help Taught breathing and relaxation exercises and bronchial hygiene	Hospital outpatient PR: 12 weeks, 2x/week 1 hour individualized rehabilitation exercises by PT Instructed to practice daily exercises individually for ≥15 min Patient education 3x by respiratory nurse, 1 hour per visit All patients visited supervising physician 3x Patient education for correct medication use, disease course, and when to seek help Taught breathing and relaxation exercises and bronchial hygiene	HRQOL: Borg scale for dyspnea Exercise capacity: Borg scale for leg effort, 4-min walk test, maximum workload	18 months

Abbreviations: COPD, chronic obstructive pulmonary disease; CPET, cardiopulmonary exercise testing; CRQ, Chronic Respiratory Questionnaire; FEV_1, forced expiratory volume in one second; FVC, forced vital capacity; HRQOL, health-related quality of life; MRC, Medical Research Council; mMRC, modified Medical Research Council; PR, pulmonary rehabilitation; SD, standard deviation; SGRQ, St. George's Respiratory Questionnaire; VO2, oxygen consumption.

References

(1) Canadian Lung Association. Chronic obstructive pulmonary disease (COPD) in Canada [Internet]. [updated 2012 Dec 9; cited 2013 Dec 27]. Available from: http://www.lung.ca/pdf/copd/COPD_in_Canada.pdf

(2) Lacasse Y, Goldstein R, Lasserson TJ, Martin S. Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2006;(4):CD003793.

(3) Bowen JM, Campbell K, Sutherland S, Brooks D, Bartlett A, Qureshi R, et al. Pulmonary rehabilitation in Ontario: a cross-sectional survey. Toronto: Health Quality Ontario. In press.

(4) Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7:10.

(5) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011 Apr;64(4):380-2.

(6) Vieira DS, Maltais F, Bourbeau J. Home-based pulmonary rehabilitation in chronic obstructive pulmonary disease patients. Curr Opin Pulm Med. 2010;16(2):134-43.

(7) Maltais F, Bourbeau J, Shapiro S, Lacasse Y, Perrault H, Baltzan M, et al. Effects of home-based pulmonary rehabilitation in patients with chronic obstructive pulmonary disease: a randomized trial. Ann Intern Med. 2008 Dec 16;149(12):869-78.

(8) Güell MR, de LP, Galdiz JB, Montemayor T, Rodriguez Gonzalez-Moro JM, Gorostiza A, et al. [Home vs hospital-based pulmonary rehabilitation for patients with chronic obstructive pulmonary disease: a Spanish multicenter trial]. Arch Bronconeumol. 2008 Oct;44(10):512-8.

(9) Puente-Maestu L, Sanz ML, Sanz P, Cubillo JM, Mayol J, Casaburi R. Comparison of effects of supervised versus self-monitored training programmes in patients with chronic obstructive pulmonary disease. Eur Respir J. 2000 Mar;15(3):517-25.

(10) Strijbos JH, Postma DS, van AR, Gimeno F, Koeter GH. A comparison between an outpatient hospital-based pulmonary rehabilitation program and a home-care pulmonary rehabilitation program in patients with COPD. A follow-up of 18 months. Chest. 1996 Feb;109(2):366-72.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca