

Review protocol

The effect of home-based telehealthcare on physical activity level, physical capacity and dyspnea in patients with chronic obstructive pulmonary disease: a systematic review

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Background

Chronic Obstructive Pulmonary Disease (COPD) is a major public health problem, associated with significant economic and social burden and increasing mortality (1). Dyspnea, muscle wasting and decreased physical capacity are common symptoms in patients with COPD, which leads to lower quality of life (2). Patients with COPD show a reduction in physical activity level compared to healthy controls (3). Since it has emerged that reduced physical activity level in patients with COPD increases the risk for death (4), it is important to find ways to increase their physical activity level.

Pulmonary rehabilitation (PR) including exercise training is proven to have positive effects on physical capacity, quality of life and health status (5, 6), although only a small amount of patients with COPD have access to a PR program (7-9). Furthermore, despite the good effect of PR, the effect on physical activity level after the rehabilitation period is very low (10).

To make PR more available home-based solutions can be used. Patients with COPD have reported counselling via telephone as very valuable and a help to develop strategies for behaviour change and to increase motivation to maintain those changes (11). In addition, self-management programs via telephone (12) and internet (13) have been shown to have the same positive effects on dyspnea as face-to-face programs. A combination of a pedometer and a web-based walking program significantly increased numbers of steps in male patients with COPD (14). Home-based telehealthcare for patients with chronic diseases tends to reduce costs, although studies with a higher quality are needed (15).

There is moderate evidence that the use of telehealthcare for patients with COPD increase quality of life (QoL) and decrease hospital admissions and emergency department visits compared to usual care. The effect on mortality and patient satisfaction is not consistent (16, 17). None of these systematic reviews have evaluated the effect of telehealthcare on physical activity level, physical capacity or dyspnea in patients with COPD.

Review question and inclusion criteria

Objective

To investigate the effects of home-based telehealthcare on physical activity level, physical capacity and dyspnea in patients with COPD.

To describe how these telehealthcare interventions have been designed.

Participants

Studies of participants (40 years or older) with COPD according to GOLD (Global Initiative for Chronic Obstructive Lung Disease) (1), ERS (The European Respiratory Society) (18)/ATS (the American Thoracic Society) (19, 20) or BTS (the British Thoracic Society) (21). No restriction in severity stage of COPD. Studies investigating several diagnoses will also be included as long as the results for the patients with COPD can be evaluated separately.

Interventions

The review will include studies where the major part of the intervention could be classified as home-based telehealthcare, according to the definition of Field (22): *“the use of electronic information and communications technologies to provide and support health care when distance separates the participants”*. Telehealthcare consists of following components (23):

- The information (delivery of health services) is transmitted electronically over a distance
- The information can be e.g. voice, sounds, video, pictures or text
- The transmission can be asynchronous (store-and-forward applications) or synchronous (e.g. two-way video consultations)

Outcomes

Outcomes measured before and after intervention and (when applicable) at follow-up.

Physical activity level, measured objectively, e.g. steps per day, energy expenditure (EE) or physical activity level (PAL) measured with activity monitor, accelerometer, pedometer, or subjectively with e.g. questionnaires.

Physical capacity, measured objectively as whole body endurance (e.g. with cycle ergometer), muscle performance (e.g. with maximal or endurance muscle tests) or functional performance (e.g. with 6-minute walk test (6MWT)).

Dyspnea, measured subjectively with questionnaires or scales.

Study design

All studies with an intervention group, that measures physical activity level, physical capacity or dyspnea before and after intervention will be included. Reviews and qualitative studies will be excluded.

Defining inclusion criteria

Inclusion

- Participants at least 40 years old
- Patients with COPD according to GOLD, ERS/ATS or BTS
- The major part of the intervention is classified as home-based telehealthcare
- Some kind of feed-back, motivational element or counselling via telehealthcare towards the patient
- Any of the outcomes physical activity level, physical capacity or dyspnea measured before and after intervention
- RCT, CT or Observational studies with available full text

- English language

Exclusion

- Participants 39 years or younger
- Studies investigating several diagnoses where the result for COPD can't be evaluated separately
- Home-based telehealthcare is not the major part of the intervention
- Less than three contacts via telehealthcare during the first three months of the intervention
- Contacts that only consists of follow-up of compliance of intervention
- Reviews and qualitative studies
- No full text available or unpublished
- Not in English language

Methodological quality

Due to the risk of few studies matching the inclusion criteria, all studies evaluating an intervention, despite control group or not, will be included. The Cochrane Collaboration's tool for assessing risk of bias (24) will be used and two independent researchers (SL and BR) will assess risk of bias. No studies will be excluded due to high risk of bias.

Language

All available articles will be identified, although only articles published in English will be included in the review.

Publication type/status

Only peer-reviewed published intervention studies (Randomized controlled trials (RCT), Controlled trials (CT) and Observational studies) with available full text will be included. Unpublished studies, reviews, qualitative studies and studies with only abstract available will be excluded.

Identifying research evidence

The searches will be performed in the following databases: the Cochrane Central Register of Controlled Trials (CENTRAL) (via Cochrane Library issue 11, 2012), PubMed, CINAHL, the Allied and Complementary Medicine Database (AMED), PsycINFO, Web of Science, Scopus and the Physiotherapy Evidence Database (PEDro). In addition the "related articles" function in PubMed will be used for the included studies, the reference list of the included studies will be searched and the authors of the included studies will be contacted by email and asked for additional articles. References will be managed in Endnote X6. When relevant articles have been included from the above searches a complementary and final search will be performed.

A broad search strategy has been developed to increase sensitivity (SL). Different synonyms for COPD, telehealthcare and the different outcomes were combined (see Appendix 1-2 for full search strategy). MeSH terms have been searched, although they will be used as free text terms to broaden the search (marked with [MeSH] in Appendix 1-2) and combined with other free text terms and synonyms. The search strategy was developed according to PubMed database and was then repeated in other databases. The part of the search strategy concerning the COPD diagnose have been developed with assistance from the search coordinators of the Cochrane airways group, and

during the search in CENTRAL this part was designed slightly different and MeSH terms will partly be used for this part (Appendix 2). In PEDro the search will be performed with the following terms: Chronic Obstructive Pulmonary Disease AND tele. There will be no restriction in publication year.

The search process and results will be documented and presented in the finished review. The information included in the presentation will be the names of the databases searched, the dates for the searches and the full search strategy used (search terms, combinations of search terms and hits per search term).

To ensure that no other similar review exists or are on-going, searches have been performed in the Database of Abstract of Reviews on Effects (DARE), the International prospective register of systematic reviews (PROSPERO) and the Cochrane Database of Systematic Reviews (CDSR) at October 30, 2012.

Study selection

The procedure for selection of studies to include in the review will be performed unblinded in three steps, with a standardized form based on eligibility criteria:

Step	Task	Performed by
1	Screen titles, exclude obviously irrelevant articles	SL
2	Review abstracts, exclude obviously irrelevant articles	SL + KW + ÅHR
3	Review full texts, exclude articles not meeting inclusion criteria	SL + KW + ÅHR

At first, one researcher will screen all titles and exclude articles that are obviously irrelevant for this systematic review. Then three researchers will, independently, review abstracts and obviously irrelevant articles will be excluded. Finally, three researchers will, independently, review full texts and after a collective decision exclude articles not meeting inclusion criteria. If there is disagreement at step three there will be a discussion and then the disagreement will be solved by a majority decision.

When the related articles in PubMed and reference lists of selected articles have been searched and authors contacted for additional articles the three steps will be repeated.

Agreement between assessors will be presented in per cent.

The procedure for the study selection will be presented in a flow chart, in accordance to PRISMA (25).

Data extraction

Two researchers (SL and BR) will extract data from the full texts of included articles using a standardized data extraction form. Disagreement will be solved by consensus, and if disagreement can't be solved a third researcher (KW) will be contacted and a majority decision will be taken. The data extraction form has been developed based on the Cochrane checklist of items to consider in data extraction (24). It has also been pilot tested. Authors of the included articles will be contacted by email in case of any missing or unclear data.

The data that will be extracted and presented in the review:

Source: Title, author name, publication year, country and language.

Method: Inclusion and exclusion criteria and study design.

Participants: Total number, age, gender and pulmonary function.

Intervention/comparator: Description of the structure, setting, frequency and duration.

Outcomes: Detailed description of measurements for each relevant outcome

Results: Sample size, drop outs and summary data for each relevant outcome

Other: Funding source.

Special attention will be paid to the items suggested by Higgins et al (24) to identify possible multiple reports from the same study.

Risk of bias assessment

Risk of bias will be assessed individually by two researchers (SL and BR) in an unblinded manner. Disagreement will be solved by consensus, and if disagreement can't be solved a third researcher (KW) will be contacted and a majority decision will be made. The Cochrane risk of bias tool (24) will be used and each domain will be rated as "low risk", "high risk" or "unclear risk". The domains are sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting and other sources of bias. The risk of bias for each study will be summarized as low, high or unclear.

Agreement between assessors will be presented in per cent.

Data synthesis

Due to the probable heterogeneity in interventions, study design and outcome measures in the included studies a meta-analysis is not planned for this review. The result will be presented descriptively.

Dissemination

The aim with the finished systematic review is to publish it in a relevant journal and as part of a doctoral thesis.

Appendix

Appendix 1 – Search strategy for PubMed, AMED, CINAHL, PsycINFO, Web of Knowledge and Scopus

#1 obstructive lung disease
#2 copd
#3 coad
#4 cobd
#5 aecd
#6 chronic obstructive lung disease
#7 chronic obstructive airways disease
#8 chronic airways limitation
#9 chronic airways obstruction
#10 Pulmonary Disease, Chronic Obstructive [Mesh]
#11 Lung Diseases, Obstructive [Mesh]
#12 Pulmonary Emphysema [Mesh]
#13 Bronchitis, Chronic [Mesh]
#14 (#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13)
#15 Telecommunications [Mesh]
#16 tele communication
#17 telecommunication
#18 telehealth
#19 tele health
#20 Telemedicine [Mesh]
#21 tele medicine
#22 telecare
#23 tele care
#24 telehomecare
#25 tele homecare
#26 Telehealthcare
#27 Tele healthcare
#28 telemonitor*
#29 tele monitor*
#30 Telephone [Mesh]
#31 telemanagement
#32 tele management
#33 teleconsultation
#34 tele consultation
#35 telematic*
#36 telesupport
#37 tele support
#38 phone
#39 Internet [Mesh]
#40 web based
#41 Wireless Technology [Mesh]
#42 wireless
#43 bluetooth
#44 Electronic Mail [Mesh]
#45 email
#46 e mail
#47 computer mediated therapy
#48 Cellular Phone [Mesh]
#49 Text Messaging [Mesh]
#50 sms
#51 ehealth
#52 e health
#53 mhealth
#54 m health
#55 Mobile Health Units [Mesh]
#56 mobile health
#57 mobile healthcare

#58 m healthcare
 #59 home care
 #60 home healthcare
 #61 interactive
 #62 video
 #63 Remote Consultation [Mesh]
 #64 remote care
 #65 (#15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64)
 #66 (#14 AND #65)
 #67 step count
 #68 steps per day
 #69 Motor Activity [Mesh]
 #70 physical activity
 #71 PAL
 #72 physical capacity
 #73 physical performance
 #74 work capacity
 #75 Work Capacity Evaluation [Mesh]
 #76 aerobic capacity
 #77 exercise capacity
 #78 exercise performance
 #79 exercise behavior
 #80 exercise tolerance
 #81 Physical Endurance [Mesh]
 #82 Endurance
 #83 Muscle Strength [Mesh]
 #84 Strength
 #85 walk test
 #86 walking distance
 #87 walk distance
 #88 6MWT
 #89 walking
 #90 Step test
 #91 EE
 #92 Energy expenditure
 #93 Energy Metabolism [Mesh]
 #94 Dyspnea [Mesh]
 #95 Breath shortness
 #96 Shortness of breath
 #97 Breathlessness
 #98 breathing discomfort
 #99 (#67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79 or #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93 or #94 or #95 or #96 or #97 or #98)
 #100 (#66 AND #99)

Appendix 2 – Search strategy for CENTRAL

#1 MeSH descriptor: [Lung Diseases, Obstructive] this term only
 #2 MeSH descriptor: [Pulmonary Disease, Chronic Obstructive] explode all trees
 #3 emphysema*
 #4 chronic* near/3 bronchiti*
 #5 obstruct* near/3 (pulmonary or lung* or airway* or airflow* or bronch* or respirat*)
 #6 COPD
 #7 COAD
 #8 COBD
 #9 AECB
 #10 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9
 #11 Telecommunications [Mesh]
 #12 tele communication
 #13 telecommunication
 #14 telehealth
 #15 tele health

#16 Telemedicine [Mesh]
 #17 tele medicine
 #18 telecare
 #19 tele care
 #20 telehomecare
 #21 tele homecare
 #22 Telehealthcare
 #23 Tele healthcare
 #24 telemonitor*
 #25 tele monitor*
 #26 Telephone [Mesh]
 #27 telemanagement
 #28 tele management
 #29 teleconsultation
 #30 tele consultation
 #31 telematic*
 #32 telesupport
 #33 tele support
 #34 phone
 #35 Internet [Mesh]
 #36 web based
 #37 Wireless Technology [Mesh]
 #38 wireless
 #39 bluetooth
 #40 Electronic Mail [Mesh]
 #41 email
 #42 e mail
 #43 computer mediated therapy
 #44 Cellular Phone [Mesh]
 #45 Text Messaging [Mesh]
 #46 sms
 #47 ehealth
 #48 e health
 #49 mhealth
 #50 m health
 #51 Mobile Health Units [Mesh]
 #52 mobile health
 #53 mobile healthcare
 #54 m healthcare
 #55 home care
 #56 home healthcare
 #57 interactive
 #58 video
 #59 Remote Consultation [Mesh]
 #60 remote care
 #61 (#11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60)
 #62 (#10 AND #61)
 #63 step count
 #64 steps per day
 #65 Motor Activity [Mesh]
 #66 physical activity
 #67 PAL
 #68 physical capacity
 #69 physical performance
 #70 work capacity
 #71 Work Capacity Evaluation [Mesh]
 #72 aerobic capacity
 #73 exercise capacity
 #74 exercise performance
 #75 exercise behavior
 #76 exercise tolerance

#77 Physical Endurance [Mesh]
 #78 Endurance
 #79 Muscle Strength [Mesh]
 #80 Strength
 #81 walk test
 #82 walking distance
 #83 walk distance
 #84 6MWT
 #85 walking
 #86 Step test
 #87 EE
 #88 Energy expenditure
 #89 Energy Metabolism [Mesh]
 #90 Dyspnea [Mesh]
 #91 Breath shortness
 #92 Shortness of breath
 #93 Breathlessness
 #94 breathing discomfort
 #95 (#63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79 or #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93 or #94)
 #96 (#62 AND #95)

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