



Telerehabilitation for patients with respiratory diseases

Expanding the outreach

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Defintion of Pulmonary rehabilitation in DK (year 2023)

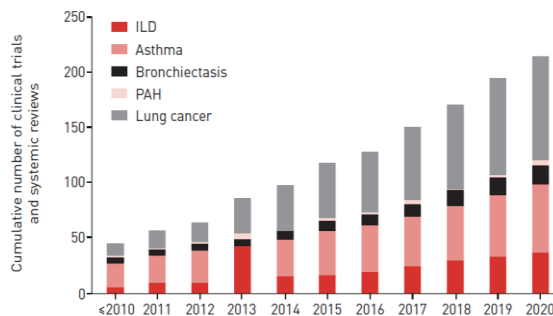
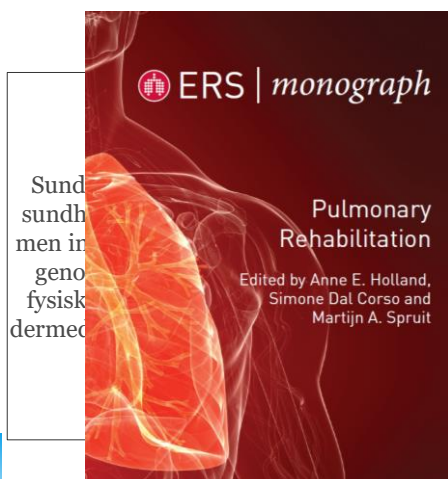


Figure 1. Cumulative number of clinical trials and systematic reviews on PR for people with people with ILD, asthma, bronchiectasis, pulmonary arterial hypertension (PAH) and lung cancer published up to December 2020.

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Evidence



Pulmonary rehabilitation for chronic obstructive pulmonary disease (Review)

McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y

Conclusion:

No more RCT on effect from PR warranted.

Research perspectives:

New delivery models, identifying new components.

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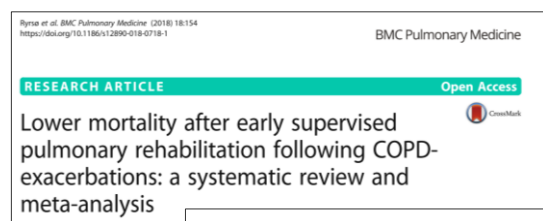
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Evidence

- 32 to 72% reduced mortality risk
- 56% reduced risk of readmission
- Faster recovery
- ↑ 62m change in 6MWD
- ↓ 7.80 point in SGRQ
- **Strong national recommendation for early PR in DK by NBH**



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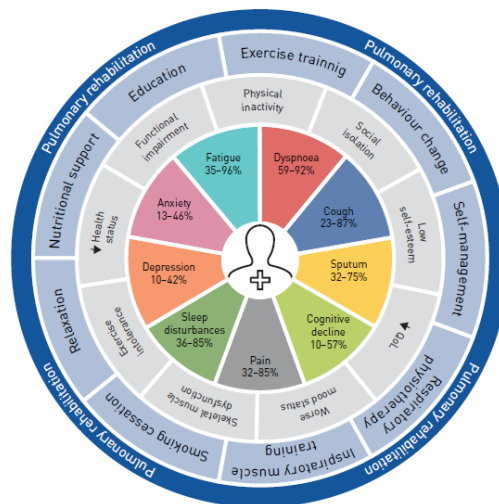
Evidence



Pulmonary rehabilitation for chronic disease (Review)

McCarthy B, Casey D, Devane D, Murphy K, Murphy

2 in 3 RCT studies reach the MID when compared on respectively maximal exercise capacity, 6l and St George's Respiratory (SGRQ)



Reviews

Long-acting muscarinic antagonists and long-acting beta2-agonists in a combined inhaler versus placebo for chronic obstructive pulmonary disease (Review)

Munavvar M, Wang R, Crossingham I, Evans DJW

Once daily long-acting beta2-agonists and long-acting muscarinic antagonists in a combined inhaler would result in only 138 more people per 1000 (13.8%) SGRQ compared to placebo.

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McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane Database of Systematic Review 2015, Issue 2. Art. No.: CD003793

Maqsood U, Ho TN, Palmer K, Eccles FJR, Munavvar M, Wang R, Crossingham I, Evans DJW. Once daily long-acting beta2-agonists and long-acting muscarinic antagonists in a combined inhaler versus placebo for chronic obstructive pulmonary disease. Cochrane Database of Systematic Review 2019

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Referral

Uptake

Completion

Effect

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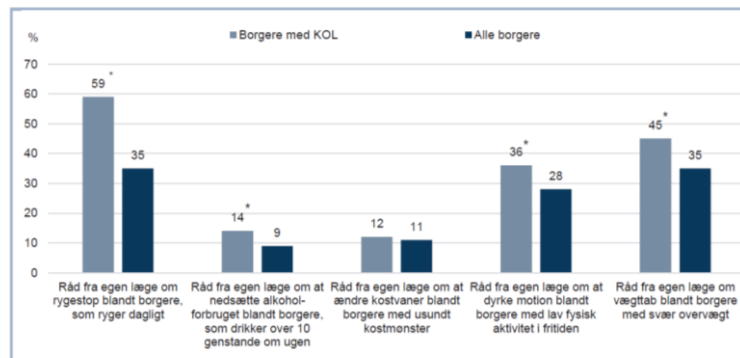
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Danish National Health Profile 2021 - COPD

Figur 7.2 Råd fra egen læge om adfældsændring eller vægttab blandt borgere med KOL, som har uhensigtsmæssig sundhedsfærd eller svær overvægt



* Statistisk signifikant forskellig fra andel i Region H (alle borgere).

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Grossly Underutilized PR in Denmark

Municipalities



Recruitment, acceptance and compliance

- 26.352 scheduled GP control visits
- 8% offered PR in GP consultation
- ? % accepts PR in community centers
- ? % complete PR ($\geq 50\%$) in community centers
- ? % gain clinically relevant improvement(s)

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Grossly Underutilized PR in Denmark

Regions



Recruitment, acceptance and compliance

- 12.354 scheduled control visits
- 91% offered PR in hospital consultation
- 2% accepts PR in hospital
- 44% complete PR ($\geq 50\%$)
- >42% gain clinically relevant improvement

Municipalities



Recruitment, acceptance and compliance

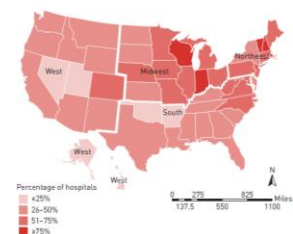
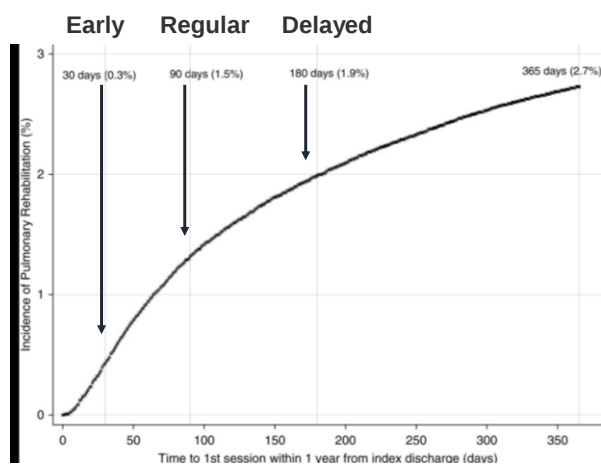
- 26.352 scheduled GP control visits
- 8% offered PR in GP consultation
- ? % accepts PR in community centers
- ? % complete PR ($\geq 50\%$) in community centers
- ? % gain clinically relevant improvement

RKKP –DR-KOL 2023 rapport

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Underutilized PR in US



US sample of 223.832 individuals hospitalized for AECOPD (medicare beneficiaries)

Spitzer KA et al. 2019, Ann Am Thorac Soc

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Barriers and facilitators

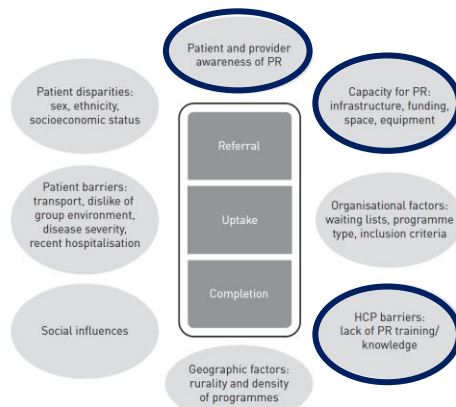


Figure 4. Factors affecting participation in PR.

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Houchen-Wolff et al. ERS Monograph – Pulmonary Rehabilitation 2021

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Barriers and facilitators

- Older Patients ↓
- Female Patients ↓
- Non-white ethnic minorities ↓
- Higher deprivation ↓
- Support network ↑
- Mixed finding with comorbidities
 - Severity ↓
 - Anxiety/Depression ↓
 - Diabetes etc. ↓

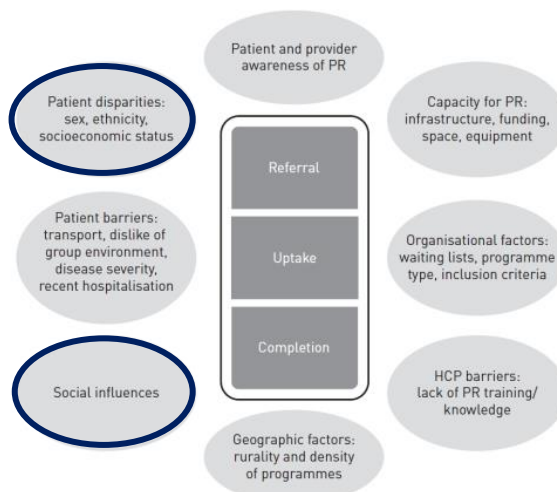


Figure 4. Factors affecting participation in PR.

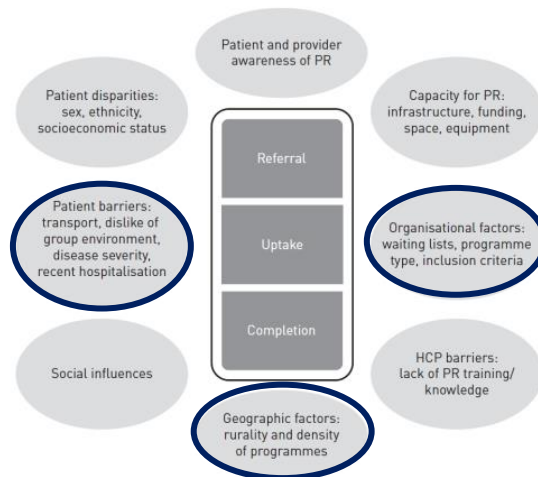
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Houchen-Wolff et al. ERS Monograph – Pulmonary Rehabilitation 2021

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Barriers and facilitators



- BMI 30+ ↓
- Reduced physical capacity ↓
- Smoking Status (Less likely) ↓

Service Factors

- Transport/distance (anecdotal) ↓
- Shorter Waiting Times (Increase Participation) ↑
- Staff member / provider attitude and awareness ↔
- Location/day/time where offer is made ↔
- Reimbursement (maintenance) ↔

Figure 4. Factors affecting participation in PR.

Barriers and facilitators

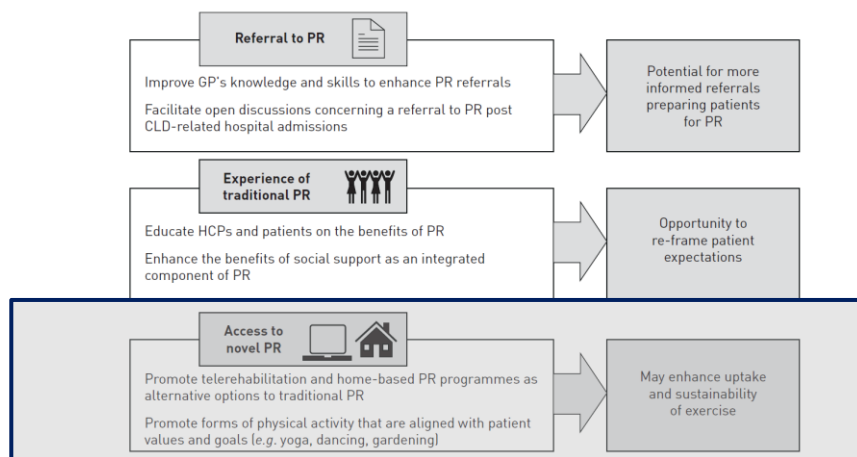
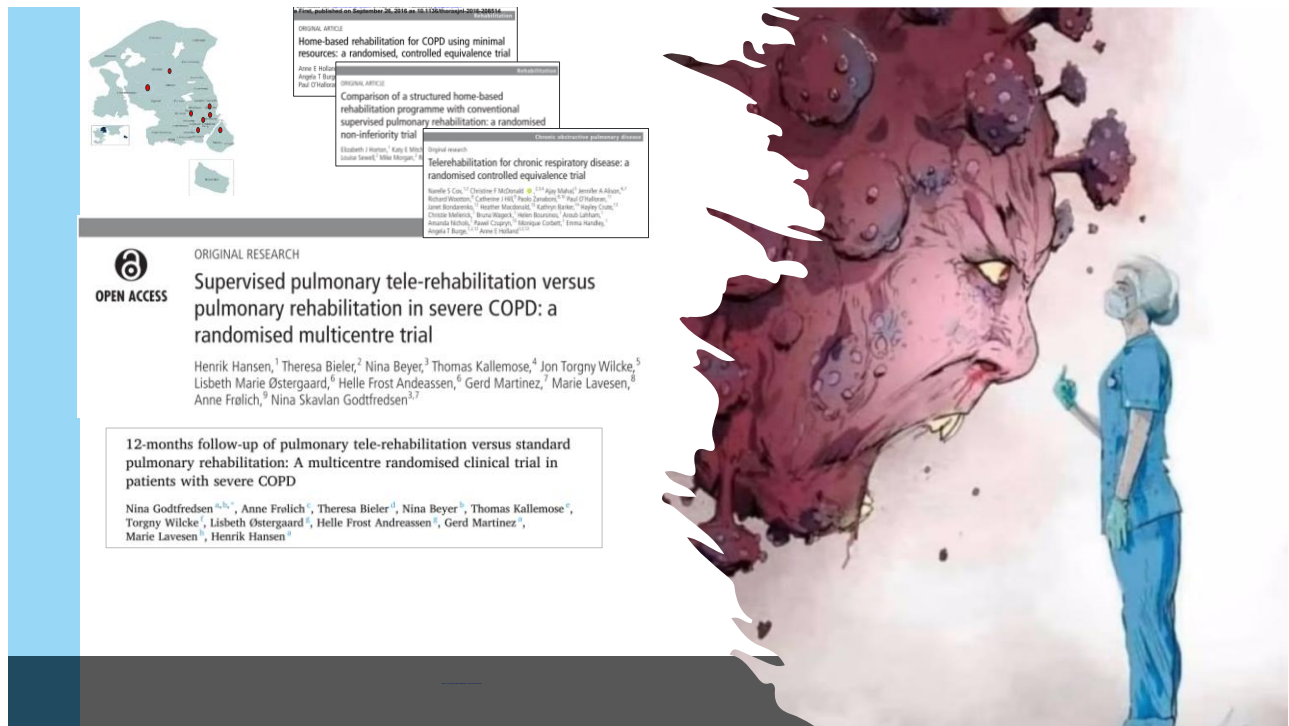


Figure 1. How HCPs can enhance the experience of PR for individuals with chronic lung disease (CLD). GP: general practitioner.



ORIGINAL RESEARCH

Supervised pulmonary tele-rehabilitation versus pulmonary rehabilitation in severe COPD: a randomised multicentre trial

Henrik Hansen,¹ Theresa Bieler,² Nina Beyer,³ Thomas Kallumose,⁴ Jon Torgny Wilcke,⁵ Lisbeth Marie Østergaard,⁶ Helle Frost Andreassen,⁶ Gerd Martinez,⁷ Marie Lavesen,⁸ Anne Frølich,⁹ Nina Skavlan Godtfredsen^{3,7}

12-months follow-up of pulmonary tele-rehabilitation versus standard pulmonary rehabilitation: A multicentre randomised clinical trial in patients with severe COPD

Nina Godtfredsen^{3,7}, Anne Frølich⁹, Theresa Bieler², Nina Beyer³, Thomas Kallumose⁴, Torgny Wilcke⁵, Lisbeth Østergaard⁶, Helle Frost Andreassen⁶, Gerd Martinez⁷, Marie Lavesen⁸, Henrik Hansen¹

ORIGINAL ARTICLE
Home-based rehabilitation for COPD using minimal resources: a randomised, controlled equivalence trial
Anne E. Hillen, Angela T. Hillen, Paul O'Halloran

ORIGINAL ARTICLE
Comparison of a structured home-based rehabilitation programme with conventional supervised pulmonary rehabilitation: a randomised non-inferiority trial
Elizabeth J. Norton, Kay E. Moxham, Louise Smeeth, Mike Morgan

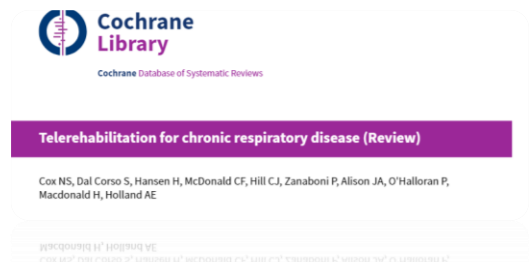
ORIGINAL ARTICLE
Telerehabilitation for chronic respiratory disease: a randomised controlled equivalence trial
Nanette S. Cox,^{1,2} Christine F. McDonald,^{3,4} Amy Myles,⁵ Jennifer A. Hillen,^{6,7} Richard Wootton,⁸ Catherine J. Hill, Peter J. Zoranson,⁹ Paul O'Halloran,¹⁰ Jane Broadbent,¹¹ Heather Macdonald,¹² Kathryn Spence,¹³ Heather Cunniff,¹⁴ Christine McNeill,¹⁵ Bruce Rogers,¹⁶ Helen Bourne,¹⁷ Annah Lathams,¹⁸ Amanda Kelly,¹⁹ Ryan Cooper,²⁰ Michelle Collett,²¹ Teresa Hendley,²² Angela T. Budge,²³ Anne E. Hillen²⁴

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Pending evidence

Main results

- Equally Safe
- No between group difference in
 - 6MWD (MD: 0.06(m), 95%CI -10.82 m to 10.94 m; 556 participants; four studies; moderate-certainty evidence)
 - SGRQ (MD -1.26, 95%CI -3.97 to 1.45; 274 participants; two studies; low- certainty evidence)
 - CAT score (MD -1.4, 95%CI -1.41 to -0.3; 224 participants; two studies; moderate-certainty evidence)
- Higher completion rates from telerehabilitation
93% completion rate (95% CI 90% to 96%), versus a 70% completion rate for conventional out-patient PR.
- A small number of studies and need for more maintenance studies
- Missing effects from other lung diseases (ILD, IPF and more) and patient opting from conventional programs



Cochrane Library
Cochrane Database of Systematic Reviews

Telerehabilitation for chronic respiratory disease (Review)

Cox NS, Dal Corso S, Hansen H, McDonald CF, Hill CJ, Zanaboni P, Alison JA, O'Halloran P, Macdonald H, Holland AE

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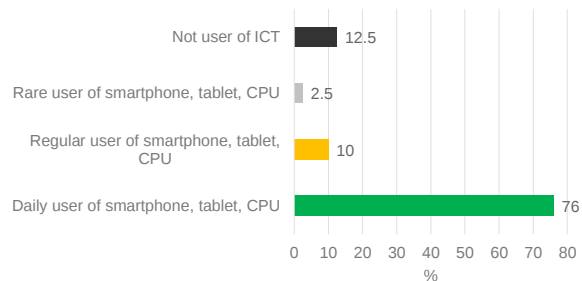


Are people declining center-based PR ICT connected ?

people declining pulmonary rehabilitation

- 63% female, average 71 years, FEV₁ 33% predicted
- 76% daily ICT user
- >70% rate themselves as capable to participate in a home-based tele-rehabilitation program
- >75% expect home-based tele-rehab will ease inconvenience and participation

Declining centre-based PR



Patient Preference and Adherence

Dovepress

ORIGINAL RESEARCH

Listen to Me! – A Mixed-Methods Study of Thoughts and Attitudes Towards Participation in Pulmonary Telerehabilitation Among People with Severe and Very Severe COPD Who Declined Participation in Pulmonary Rehabilitation

 Kira Marie Skibsted¹, Christine Esmann², Henrik Hansen³
¹Department of Physical and Occupational Therapy, University Hospital Amager Hvidovre Hospital, Hvidovre, Denmark; ²Department of Quality and Innovation, University Hospital Hvidovre Hospital, Copenhagen, Denmark; ³Respiratory Research Unit and Department of Respiratory Medicine, University Hospital Amager Hvidovre Hospital, Hvidovre, Denmark

Correspondence: Henrik Hansen, hank.hansen@regionh.dk

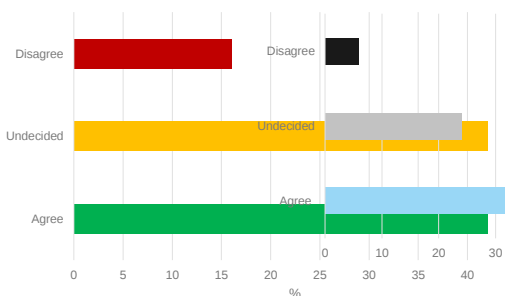
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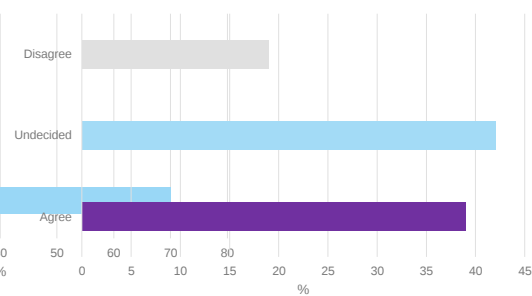
Thoughts on effect and safety?

Centre based PR vs. home-based tele-rehab equally effective



Perceived safety

I will benefit from participation



Patient Preference and Adherence

Dovepress

ORIGINAL RESEARCH

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Correspondence: Henrik Hansen, hank.hansen@regionh.dk

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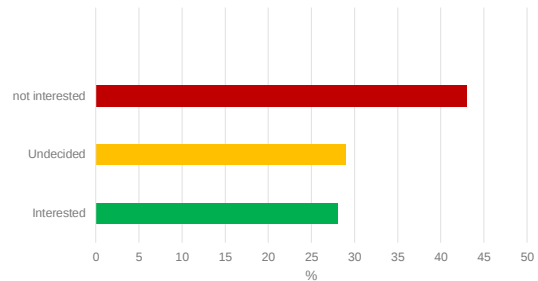
Are people declining centre-based PR ICT interested in home-based tele-rehabilitation?

Possible enabler or barrier

- Information about effect, safety, support
- Attitude and knowledge among HCP

Importantly home-based modes are not a one size fits all solution

Interest in Telerehabilitation



Patient Preference and Adherence

Devganga

Listen to Me! – A Mixed-Methods Study of Thoughts and Attitudes Towards Participation in Pulmonary Telerehabilitation Among People with Severe and Very Severe COPD Who Declined Participation in Pulmonary Rehabilitation

Kira Marie Skibdal¹, Christina Emme², Henrik Hansen³

¹Department of Physical and Occupational Therapy, University Hospital Amager Hvidovre Hospital, Hvidovre, Denmark; ²Department of Quality and Education, University Hospital Bispebjerg University, Copenhagen, Denmark; ³Department of Respiratory Medicine, University Hospital Amager Hvidovre Hospital, Hvidovre, Denmark

Correspondence: Henrik Hansen, Email: henrik.hansen@regionh.dk

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Design

Randomized clinical multicenter trial (RCT)

Centers:

- Amager & Hvidovre hospitaler
- Glostrup hospital
- Bispebjerg & Frederiksberg hospitaler
- Gentofte & Herlev hospitaler
- Nordsjællands hospitaler (Frederikssund & Hillerød)
- *Municipalities*

Amager og Hvidovre Hospital

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Rethink Pulmonary Rehabilitation – the REPORT Study

- a multicenter randomized clinical trial

Research responsibility/Primary Co-supervisor Henrik Hansen, DSc, PT Copenhagen University Hospital Hvidovre/Amager Respiratory Research Unit / Respiratory Department	Project lead Christina Nielsen, DSc, student, MSc, PT Copenhagen University Hospital Hvidovre/Amager Respiratory Research Unit / Respiratory Department
Main supervisor Niels Christensen, MSc, PhD, Associate professor Copenhagen University Hospital Hvidovre/Amager Respiratory Research Unit / Respiratory Department	Co-supervisor Ole Mathiasen, MSc, PhD, Associate professor, Deputy Head of research unit Copenhagen University Hospital Hillerød/Frederikssund Research Department (Internal)
Co-supervisor Charlotte Ørskov, MSc, Nurse, Professor, Head of research unit Copenhagen University Hospital Hvidovre/Amager Respiratory Research Unit / Respiratory Department	

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Objective and Hypotheses - 1

Primary objective (RCT- study I) of the REPORT study is to evaluate the effects of structured home-based pulmonary rehabilitation (HPR) and supervised pulmonary tele-rehabilitation (PTR) on respiratory symptoms, quality of life, functioning and physical activity in **patients with moderate to severe COPD who are unable or unwilling to access the conventional hospital- and community-based PR programs.**

Our hypotheses are that **HPR and PTR** will lead to **respiratory symptom relief (CAT score)** in the patients and that HPR and PTR will be **equivalent** to each other and **superior to usual care, that is the control group** (CON - no intervention) among patients unable to access conventional rehabilitation programs.

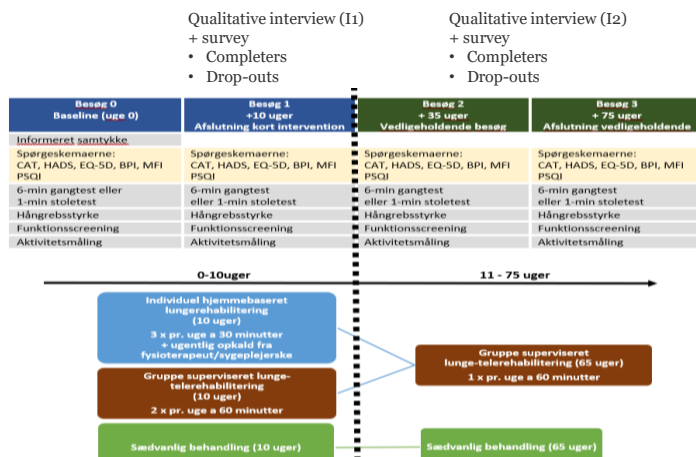
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Design



Design

Randomized clinical multicenter trial (RCT)

Centers:

- Amager & Hvidovre hospital
- Glostrup hospital
- Rigshospitalet & Frederiksberg hospital
- Gentofte & Hellerup hospital
- Norddjurs hospital (Frederiksborg & Hillerød)
- Marienhospital



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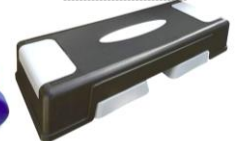
Intervention PTR

Table 6 Exercise protocol intervention group COPD online rehabilitation (Chronological order)

Exercise#	Exercise name	Extremities	Uni/bilateral execution	Bodyposition	Time/volume	Exercise load
1	Sit-to-stand	Lower extremities	Bilateral	Sitting and standing	Active: 80-160 s Rest: 160-80s Total: 240 s	Bodyweight and dumbbells
2	Biceps curl-shoulder press	Upper extremities	Bilateral	Standing	Active: 80-160 s Rest: 160-80s Total: 240 s	Dumbbells
3	Step-up	Lower extremities	Bilateral	Standing	Active: 80-160 s Rest: 160-80s Total: 240 s	Bodyweight, dumbbells and stepbox
4	Bent Over Rowing	Upper extremities	Unilateral	Standing Upper body slightly forward bended	Active: 80-160 s Rest: 160-80s Total: 240 s	Dumbbells
5	Static-dynamic Squat	Lower extremities	Bilateral	Standing	Active: 80-160 s Rest: 160-80s Total: 240 s	Bodyweight and dumbbells
6	Front Raise Dumbbells	Upper extremities	Bilateral	Standing	Active: 80-160 s Rest: 160-80s Total: 240 s	Dumbbells

Table 7 Progression model - intervention group COPD online rehabilitation (Chronological order)

Phase	Week number	Working volume in seconds	Rest volume in seconds	Number of sets for each exercise
Familiarization	1-2	20	40	4
Progression 1	3-6	30	30	4
Progression 2	7-10	40	20	4



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Hansen H et al. Thorax 2020, Godtfredsen N et al. Resp med 2020

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Intervention PTR


Table S14. Patient education protocol—intervention group pulmonary tele-rehabilitation

Topic/themes	Communication/ learning form	Week	Duration	Number of sessions
Welcome and individual presentation	Information, dialog	1	20min	3
COPD and the treatment	Information, dialog	2	20min	3
Early signs of exacerbation and action plan	Information, dialog, reflection	3	20min	3
Medication and use of devices and inhalation techniques. Use of nebulizer apparatus and oxygen apparatus.	Information, dialog, reflection, practical exercises	4	20min	3
Physical activity and exercise	Information, dialog, reflection	5	20min	3
Food, importance of food in COPD	Information, dialog, reflection, practical exercises	6	20min	3
Smoking, cessation, substitution	Information, dialog, reflection	7	20min	3
Anxiety management, relaxation	Information, dialog, reflection, practical exercises	8	20min	3
Repetition		9	20min	3
Group needs		10	20min	3

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Hansen H et al. Thorax 2020, Godtfredsen N et al. Resp med 2020

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Amager og Hvidovre Hospital

Intervention HPR

Home-based rehabilitation for COPD using minimal resources: a randomised, controlled equivalence trial

Anne E Holland,^{1,2,3} Ajay Mahal,⁴ Catherine J Hill,^{3,5} Annemarie L Lee,^{1,2,3}
Angela T Burge,^{1,2,3} Narelle S Cox,^{1,3} Rosemary Moore,³ Caroline Nicolson,^{1,2}
Paul O'Halloran,⁶ Aroub Lahham,^{1,3} Rebecca Gillies,^{1,5} Christine F McDonald^{3,7,8}



Uge 1 - Min træningsdagbog

Dag	Mandag	Tirsdag	Onsdag	Torsdag	Freitag	Lørdag	Søndag
Dato							
Mine SKAL øvelser							
SKAL øvelserne udføres på følgende måde: 20 sek. arbejde - 40 sek. pause. Dette gøres i 4 sæt.							
1. Rejse sætte sig fra stol (___ kg.)	/ / /	/ / /	/ / /	/ / /	/ / /	/ / /	/ / /
BORG dyspno score (0-10)							
BORG anstrengelse (6-20)							
2. Biceps curl - skulder pres (___ kg.)	/ / /	/ / /	/ / /	/ / /	/ / /	/ / /	/ / /
BORG dyspno score (0-10)							
BORG anstrengelse (6-20)							
3. Step op på stepbænk (___ kg.)	/ / /	/ / /	/ / /	/ / /	/ / /	/ / /	/ / /
BORG dyspno score (0-10)							
BORG anstrengelse (6-20)							
Mine VALGTE øvelser							
De VALGTE øvelser udføres på følgende måde: 20 sek. arbejde - 40 sek. pause. Dette gøres i 4 sæt.							
1.							
2.							
3.							
Anden fysisk aktivitet							
Mindfulness (1x / 10x) - session							
Bemærkninger							



Spørgsmål til ugens mål

Antal træninger denne uge? (svk. medtag den her, hvis der sker noget med dagbogen)

Træningsmål for ugen?

Hvorfor er det vigtigt for dig?

Hvordan vil du udføre din træning?

Hvor vil du udføre din træning?

Hvor ofte vil du udføre din træning?

Hvad kan komme i vejen for din træning?

Hvad kan du gøre hvis dette sker?

Hvor sikker er du på at du kan gennemføre dit mål?

Bemærkninger

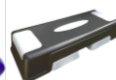
DARN method (commitment and change talk)

Hvorfor ønsker du at træne mere? (Desire)

Hvordan vil du gøre det, hvis du beslutter dig for det? (Ability)

Hvad vil være de vigtigste fordele for dig ved at øge træningen? (Reason)

Hvor vigtigt er det for dig at træne mere? (Need)



Holland et al. Thorax 2017, Cox et al. Thorax 2022

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Amager og Hvidovre Hospital

Revaki
Rehabilitation Sciences & Physiotherapy
Universiteit Antwerpen

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Control



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Knowledge gaps for tele- and home-based-rehabilitation in chronic respiratory diseases

- Which patients with chronic respiratory disease will benefit the most?
- How can we promote the new solutions as HCP and society?
- Which model is most effective? (app/web, online supervised groups, home-based individual)
- Which model is most cost-effective?
- Which components of pulmonary rehabilitation should/can we offer in this new delivery method?
- What is the role of monitoring?
- What are the longer term outcomes/gains of tele- and home-based rehabilitation models?

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Key messages

1. Need for political/HCP awareness and responsibility
#Increase provision of PR for all Chronic Respiratory Diseases.
2. We need more individual clinical rehabilitation strategies to meet individual barriers for participation.
3. Novel delivery models should be one option but are not the only solution.

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Thank you for your attention



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