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Effectiveness and feasibility of telerehabilitation in patients with COVID-19: a protocol for a systematic review and meta-analysis

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ABSTRACT

Introduction Respiratory rehabilitation is the use of exercise, education, and behavioural interventions to alleviate symptoms and improve quality of life. Recent studies highlight that respiratory rehabilitation is effective and safe for patients with COVID-19. We aim to evaluate the effectiveness and feasibility of respiratory telerehabilitation on patients infected with COVID-19 by conducting a systematic review and meta-analysis.

Methods and analysis PubMed, Web of Science, Science Direct, Physiotherapy Evidence Database, Google Scholar and Cochrane Library databases will be searched from inception to the end of November 2021. Randomised controlled trials investigating the effectiveness of telerehabilitation in the management of COVID-19 will be included. The primary outcomes will be functional capacity, cardiopulmonary exercise tests and quality of life. Secondary outcomes will include anxiety/depression level, sleep quality, mortality rate, completion rate, reason for withdrawal, adverse events, service satisfaction, cost-effectiveness and other potential factors. Two reviewers will independently screen and extract data and perform quality assessment of included studies. The Cochrane risk of bias tool will be used to assess risk of bias. Review Manager V.5.4 (Cochrane Collaboration) software will be used for statistical analysis. Heterogeneity will be analysed using I^2 statistics. Mean difference or standardised mean difference with 95% CI and p value will be used to calculate treatment effect for outcome variables.

Ethics and dissemination Ethical approval is not required because this systematic review and meta-analysis is based on previously published data. Final result will be published in peer-reviewed journal and presented at relevant conferences and events.

PROSPERO registration number CRD42021287975.

Strengths and limitations of this study

- Data screening, extraction and methodological quality will be performed by two reviewers independently.
- This study will be reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.
- Standardised methodological appraisal tools will be used to assess risk of bias of the included studies in the review.
- Egger's and Begg's tests will be conducted for the assessment of the publication bias.
- The absence of sufficient high-quality randomised controlled trials, heterogeneity in the interventions, high dropout and small sample size might be the limitations for this review.

INTRODUCTION

COVID-19 is a highly infectious respiratory disease, which leads to respiratory, physical and psychological dysfunctions.[1 2] COVID-19 has clinical manifestations of cough, shortness of breath, chest pain and so on. Respiratory rehabilitation improves symptoms of dyspnoea, relieves anxiety, reduces complications, minimises disability, preserves function and improves quality of life both in the acute phase and after discharge.[2 3] Some of the respiratory physiotherapy interventions include airway clearance techniques, non-invasive ventilation and inspiratory positive pressure breathing, secretion clearance techniques, exercise and mobilisation, and many other techniques.[2–4]

Telerehabilitation is the provision of rehabilitation services through telecommunication networks or the internet offering remote treatments to the people in their homes or from a distance.[5 6] Since COVID-19 emerged and caused the collapse of health systems, many patients are not able to receive their face-to-face treatments. Chronic patients are unable to continue their follow-up as usual, professionals could not attend all of the consultations and the high contagious nature of the disease forced a new treatment approach, that is, telerehabilitation to be used widely.[6 7]

Telerehabilitation had found to improve exercise capacity, self-efficacy and mood in

patients with chronic obstructive pulmonary disease (COPD). Telerehabilitation also provided good patient adherence and less dropout throughout the intervention, which indicated that supervision of in-home exercise training using video conferencing is feasible and has benefits for patients with COPD.[8–10] Telemedicine has great potential for connecting patients and healthcare professionals, while respecting social safety restrictions. Digital health interventions can help provide self-monitoring tools, field updates, exercise protocols and psychological support.[4]

Telerehabilitation can be provided with applications via chat or video calling (eg, RespiraConNosotros, RehabApp), virtual reality, live talks, telephone, internet with or without supervision and at hospitals or health centres.[6 11–14] Scientific literature has explored the effectiveness of these treatments in different chronic pathologies such as diabetes mellitus, chronic lung disease, cardiovascular disease, and respiratory conditions, such as COPD or cystic fibrosis.[6]

It was mentioned in many research papers that respiratory telerehabilitation plays an important role in the recovery of patients from COVID-19. The first ever randomised controlled trial (RCT) aimed to evaluate exercise capacity, lower limb muscle strength (LMS), pulmonary function, health-related quality of life (HRQOL) and dyspnoea found that telerehabilitation improves functional exercise capacity, LMS and physical HRQOL but no improvements in pulmonary function tests and mental aspect of quality of life.[3] A recent systematic review on rehabilitation of patients in post-COVID-19 infection suggested that respiratory rehabilitation interventions improve pulmonary function, physical and psychological efficiency, and quality of life. But this study had limitations due to a lack of RCTs included in the review.[4]

It is unclear whether respiratory telerehabilitation could improve outcomes in patients with COVID-19 due to limited original research. To the best of our knowledge, this is the first review to investigate the effectiveness and feasibility of telerehabilitation in patients with COVID-19 in the literature. Thus, the aims of this systematic review and meta-analysis are twofold. First, we will evaluate the effectiveness of respiratory telerehabilitation in patients with COVID-19. Second, we will discuss the feasibility of respiratory telerehabilitation and potential contributing factors, and we will investigate and summarise completion rates, reasons for withdrawal, service satisfaction and cost-effectiveness of the interventions.

METHODS AND ANALYSIS

Search strategy

Literature search will be carried out in six databases: PubMed, Web of Science, Science Direct, Physiotherapy Evidence Database, Google Scholar, and Cochrane Library databases, and articles published from inception to the end of November 2021 will be included. The following search terms will be used: “COVID-19” OR “COVID-19” OR "novel coronavirus 2019” OR “novel coronavirus disease 2019” OR "2019-nCoV” OR “SARS-CoV” OR “SARS-CoV-2” OR "corona virus 2019” OR “new corona virus” OR “COVID-19 19 disease” AND “tele-rehabilitation” OR “telerehabilitation” OR “respiratory rehabilitation” OR “respiratory physiotherapy” OR “pulmonary rehabilitation” OR “pulmonary physiotherapy” AND “randomized controlled trial”. The literature selection process will be conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines[15] and presented in figure 1. RCTs concerning the effects of telerehabilitation programmes for patients with COVID-19 will be included in this systematic review and meta-analysis. Two reviewers will independently select studies, and any disagreement between the reviewers will be resolved by consensus or by another third reviewer. The detailed search strategy of PubMed is presented in table 1.

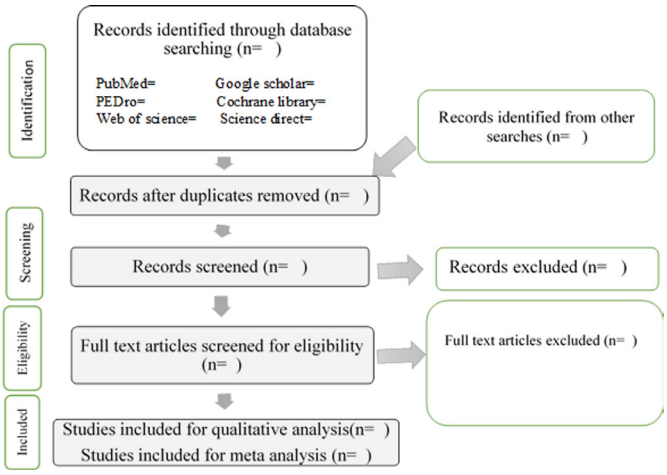

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-analyses flow chart describing the search strategy.

Inclusion criteria

RCTs comparing telerehabilitation with any rehabilitation programme in patients with COVID-19 in the acute or long-term follow-up will be included in this review. Telerehabilitation is defined as any rehabilitation programme delivered by physiotherapy professionals via telecom/internet network services to patients with COVID-19. Telerehabilitation for COVID-19 might include aerobic training (such as walking, fast walking, jogging, swimming, etc), progressive strength training, secretion drainage or ventilatory techniques, aerobic, flexibility and strengthening exercises for upper and lower extremity, breathing/respiratory exercise and other physical training programmes.[11 12 16] Two reviewers will independently assess the titles and abstracts, and full-text published RCTs in English language will be included.

Outcome measures

The primary outcomes of interest will be functional capacity (eg, 6 min walking distance), cardiopulmonary exercise tests and quality of life. Secondary outcomes

Table 1 PubMed search strategy

Search number	Search detail
#1	"COVID-19"[MeSH Terms]
#2	"COVID-19"[Title/Abstract]OR "COVID-19"[Title/Abstract]OR "novel coronavirus 2019"[Title/Abstract]OR "novel coronavirus disease 2019"[Title/Abstract]OR "2019-nCoV"[Title/Abstract]OR "SARS-CoV"[Title/Abstract]OR "SARS-CoV-2"[Title/Abstract]OR "corona virus 2019"[Title/Abstract]OR "new corona virus"[Title/Abstract]OR "COVID-19 19 disease"[Title/Abstract]OR "tele-rehabilitation"[Title/Abstract]OR "telerehabilitation"[Title/Abstract]
#3	"respiratory rehabilitation"[Title/Abstract]OR "respiratory physiotherapy"[Title/Abstract]OR "pulmonary rehabilitation"[Title/Abstract]OR "pulmonary physiotherapy"[Title/Abstract]OR "physiotherapy"[Title/Abstract]OR "rehabilitation"[Title/Abstract]OR "physical therapy"[Title/Abstract]OR "chest physiotherapy"[Title/Abstract]OR "respiratory exercise"[Title/Abstract]OR "pulmonary function"[Title/Abstract]OR "functional capacity"[Title/Abstract]OR "quality of life"[Title/Abstract]OR "home based rehabilitation"[Title/Abstract]OR "tele health"[Title/Abstract]OR "tele medicine"[Title/Abstract]OR "e rehabilitation"[Title/Abstract]OR "lung function test"[Title/Abstract]OR "breathing exercise"[Title/Abstract] OR "progressive strength training"[Title/Abstract]OR "secretion drainage"[Title/Abstract]OR "ventilatory techniques"[Title/Abstract]OR "aerobic exercise"[Title/Abstract]OR "upper extremity exercise"[Title/Abstract]
#4	#1 OR #2
#5	#3 AND #4

of interest will be anxiety and depression scales, sleep quality, mortality rate and smoking cessation. Feasibility outcomes of interest will include intervention completion rate, reason for withdrawal, adverse events, service satisfaction and cost-effectiveness. Other potential contributing factors for feasibility like information communication technology skill and experience, age and medical condition will be analysed where data are available.

Data extraction

Reviewers will independently extract the data on a standard worksheet and disagreements will be resolved by consensus or with the help of a third reviewer. The following information will be extracted from each included trial: author, year of publication, country of publication, inclusion/exclusion criteria, sample characteristics, number of participants, experimental and control interventions detail, duration of intervention, follow-up, outcomes and results. For missing data, we will contact the corresponding authors of the studies through email.

Methodological quality assessment

The risk of bias of the included trials will be assessed using the Cochrane risk of bias tool for RCTs.[17] The reviewers will reach concurrence on the final score of all the included trials and the result will be displayed in a table or graph. Grading of Recommendations, Assessment, Development and Evaluation will be used for assessment of the quality of evidence for outcomes and results will be categorised as 'high', 'moderate', 'low' or 'very low' accordingly.[18] Two authors (AAS and SAB) will rate independently and a third author (AAM) will address any discrepancy. Publication bias across studies will be examined using funnel plot method, Egger's test and Begg's test[19] using the Stata V.16.0 software.

Data synthesis

Review Manager V.5.4 (Cochrane Collaboration) software will be used to conduct the meta-analysis. The mean difference or standardised mean difference will be used to analyse continuous variables with 95% CI with corresponding p value. Heterogeneity among included trials will be assessed using the I^2 test. First, a fixed-effects model will be used for data analysis. If $I^2 > 0.5$ or $p < 0.1$, it is considered that there is a significant heterogeneity among the included trials,[2] and random-effects model will be used in this case. To determine the source of heterogeneity, sensitivity analysis will be conducted by excluding trials one by one.

Patient and public involvement

No patient involved.

Contributors All authors have made significant contributions to this study protocol. AAS developed the research question, wrote the first draft, designed the search strategy, and edited and approved the final version of the manuscript. SAB developed the research question, revised the search strategy of databases, developed the data extraction form, and edited and approved the final version of the manuscript. AAM revised the data extraction form and edited and approved the final version of the manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

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