


Delivery of Remote Pulmonary Rehabilitation: COVID-19 Service Evaluation in England

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Background: Recent evidence suggests that remote pulmonary rehabilitation (PR) meeting international criteria may be as effective as traditional in-person PR. During social distancing associated with COVID-19, in-person PR services were suspended in England. We assessed the use of remote PR services during COVID-19 social distancing.

Methods: An online questionnaire survey to assess the use of remote PR during the COVID-19 pandemic and the subsequent availability and delivery of remote PR in England was conducted. The characteristics of PR services in England that provided remote PR, and the barriers and facilitators of delivery of remote online PR by videoconferencing were assessed.

Results: Sixty-three services took part. Provision of remote PR rose from 17% to 95% for participating PR services during the pandemic. Remote PR was provided by telephone (65% of services), group videoconferencing (56%) and by individual patient videoconferencing (51%). Remote PR continued to be provided by 49 (76%) services following the relaxation of COVID-19-related restrictions on social contact. Barriers to the delivery of remote online PR using videoconferencing included patients' lack of internet access through inability to use smart phones or computers and perceived preference of patients for in-person provision. Perceived facilitators of remote online PR using videoconferencing were ease of staff delivery and the belief that it would be beneficial to patients.

Conclusion: Remote PR was widely used during the social distancing phase of the COVID-19 pandemic in England. Service users' lack of access to the internet was an important barrier to videoconferencing, the form of remote online PR for which evidence of effectiveness is most compelling. The provision of digital equipment and internet training should be considered to enable more equitable access to remote online PR. Despite no guideline recommendations for its utility at present, remote pulmonary rehabilitation via telephone or online videoconferencing appears to be a safe and feasible alternative when in-person pulmonary rehabilitation is unavailable.

Keywords: COPD, pulmonary rehabilitation, online, remote, digital access, telehealth, telemedicine

Introduction

Pulmonary rehabilitation (PR), an effective non-pharmacological patient-tailored treatment, is a core treatment for patients with chronic obstructive pulmonary disease (COPD) and other chronic lung diseases.¹ It is recommended for patients who are symptomatic at grade 3 or higher of the Medical Research Council's breathlessness questionnaire.^{2,3} Its three elements, exercise, education, and social interaction were designed for group delivery in person. Its relatively low cost and high clinical value places it in the optimal position in the Value Pyramid of cost-effectiveness of interventions for COPD.⁴⁻⁶ Remote forms of PR, known as telerehabilitation, were initially introduced to make PR more accessible to patients who had difficulty attending in-person classes. Telerehabilitation can be provided by telephone, videoconferencing online or by patient access to a website.⁷ Remote online PR with group videoconferencing may be comparable to in-person PR in outcomes achieved.⁸⁻¹⁰

The potential of remote PR to be effective is also seen in PR conducted in patients' homes augmented by regular telephone support, which can also result in comparable clinical outcomes, but the evidence is less robust.¹¹ Outcomes

reported from remote online PR remain limited and studies have been unable to confidently confirm equivalent primary patient outcomes to in-person PR.^{9,12}

During the social distancing phase of the COVID-19 pandemic between 2020 and 2022, PR services in England suspended in-person treatment. Services introduced online forms of remote PR, but many patients experienced difficulties in gaining access to online services.^{13,14} Polgar et al found about 50% of patients referred to PR were unable or unwilling to use online PR in 2020, a proportion that had decreased to 40% in 2021.¹³ Similar findings were reported by Lewis et al in 2021.¹⁴ There are currently no recommendations for the utility of online PR, with best practice yet to be decided due to lack of standardisation and a limited evidence base. Additional trials are required to determine its feasibility and effect in patients across a range of ages and severity. Evaluation of general physiotherapy services in England during COVID-19 had been conducted,¹⁵ but not in the context of PR services. The aim of this study was to assess the availability and practice of remote PR by services, the impact of the COVID-19 pandemic on the development of remote services, the characteristics of services that had used remote delivery, and its perceived barriers and facilitators.

Materials and Methods

Questionnaires were sent by e-mail between 30th March and 19th April 2022 to lead members of 182 PR services participating in the Royal College of Physicians National COPD and Asthma Audit Programme. The questionnaire was developed and tested with input from PR service physiotherapists. It comprised multiple choice questions on characteristics of remote PR services using a Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) and open-ended questions seeking responses in free text. The characteristics of remote forms of PR, and the perceived feasibility, acceptability, utility, and cost of delivering remote online PR in the form of videoconferencing were sought. The questionnaire was administered by e-mail using REDCap[®] within which data were collected and processed.¹⁶ The questionnaire is available in [Supplementary file A](#). Non-respondents were sent reminders at 7 and 14 days. Personal data on respondents were not requested or stored.

Results

Responses were received from 63 (35%) PR services in every region of England (see [Supplementary Table 1](#) and [Supplementary Figure 1](#)).

Delivery of Remote PR

At the time of the survey, COVID-19 social distancing restrictions had been lifted in England. Eleven services (17%) reported having provided some form of remote PR prior to the pandemic in March 2020 ([Supplementary Table 1](#)). These included self-management apps myCOPD¹⁷ and SPACE for COPD[®].¹⁸ Both apps were temporarily recommended by the National Institute for Health and Care Excellence (NICE) through an early value assessment, although evidence was limited.¹⁹ Following COVID-19 social distancing restrictions, a large increase in remote PR usage was reported ([Supplementary Table 1](#)). Ninety-five percent of participating PR services reported the usage of at least one remote PR method. Remote PR was most commonly provided by telephone (65%), followed by group videoconferencing (56%) and individual patient videoconferencing (51%).

Forty-eight PR services (76%) continued to provide some form of remote service delivery after the removal of COVID-19 restrictions. The use of self-management apps myCOPD¹⁷ and SPACE for COPD[®]¹⁸ were also reported by a minority of services during and after COVID-19 social distancing restrictions.

Perceived Feasibility, Acceptability, Utility, and Cost of Remote Forms of PR

Forty-five (71%) respondents said that remote PR was not too costly, and 40 (63%) said that remote PR was not too time-consuming to provide. Fifty-three (84%) respondents agreed that the training of staff to provide remote PR would not be difficult, and 54 (86%) agreed that remote PR was beneficial to patients. Forty-four (70%) respondents said they would know how to provide remote PR and where to get support to do so.

Thirty-two (51%) respondents said that PR staff would be less comfortable with remote than in-person PR. Twelve (19%) respondents were unsure if staff would be more, or less comfortable with remote PR. There was no consensus

regarding the ease of providing both remote and in-person PR simultaneously or the potential disruption to in-person PR this might cause.

Forty-seven (75%) respondents said that in-person PR would be preferred by patients and 40 (63%) said that patients did not have internet access. In the services that had attempted remote PR, 31 (53%) respondents said that at least 50% of referred patients had not been able to participate due to lack of internet access or unfamiliarity with using the internet with smart phones or computers.

No association (X^2 (d.o.f.= 3, $n = 63$) = 3.723, $p = 0.2930$) was found between the number of full-time equivalent PR staff and the continuation of remote PR after COVID-19 related social distancing restrictions were lifted (see [Supplementary Figure 2](#)).

Discussion

Our study found that remote PR was widely used during the social distancing phase of the COVID-19 pandemic in England. The most commonly reported method of remote PR was via telephone, followed by online videoconferencing in groups and individual videoconferencing. A significant proportion continued to provide some form of remote service delivery after the removal of COVID-19 restrictions. Most service staff members did not perceive remote online PR to be too costly or time-consuming and agreed it would be beneficial to patients. However, staff were less comfortable with remote online PR compared to in-person PR, noted patient preference for in-person PR, and were concerned regarding patient lack of access to the internet and familiarity with online remote PR methods.

This is the first investigation into the delivery of remote PR of which we are aware. It was conducted soon after the COVID-19 measures ended and is likely to be an accurate reflection of the experience of PR teams during this time. It may not be representative of all PR services in England, but it presents an important insight into the experience of teams that have incorporated remote delivery of PR into their services.

Telephone delivery of remote PR was the most widely reported method in our study, but evidence to support its efficacy is limited. Videoconferencing in groups may be comparable in outcomes achieved with in-person PR,^{8–10} though the challenges of online remote videoconferencing delivery must be understood to a greater degree. It is not known what proportion of patients in England were invited to online videoconferencing in groups nor how many were able to successfully engage. The British Thoracic Society have highlighted digital literacy as a concern when delivering PR online²⁰ and the provision of equipment and patient training may be needed to enable more equitable access.

A service evaluation of general physiotherapy services in England during COVID-19 also found telephone to have been the most widely used method of remote provision, with online video calling methods reported second.¹⁵ The increase in telemedicine utilisation during this time is consistent with the service adaptations and changes reported globally.^{13,15,21,22} The continuation of remote delivery via telephone and online videoconferencing post-pandemic has also been reported in the context of general physiotherapy services in the UK.¹⁵ It is unclear if remote delivery of PR via telephone and online videoconferencing will be adopted in routine practice. Perceptions of the ease of delivering a combined remote and in person PR service varied. This may be due to variable service-specific factors such as funding and staff preference, including concerns surrounding safety and low staff satisfaction.¹⁵ Preference for in-person PR and concerns regarding the financial cost of online PR to service users has been reported previously, including in the context of general physiotherapy services.^{13,15,23,24} A significant proportion of PR service users had never accessed the internet or were not confident doing so.^{13,14,24} One randomised controlled trial reported up to 41% of PR service users experiencing equipment issues when using internet-based remote methods.²⁵ In general physiotherapy, remote uptake varied from 14–53% across 12 physiotherapy sites in England.¹⁵ Some reports suggest high compliance with remote online PR via mobile apps.^{26,27} We believe studies reporting high compliance should be interpreted with caution given that inclusion criteria in some studies required participants to have personal internet access or have prior familiarity with using digital communication equipment.

The person best suited for remote online PR is a service user with previous experience and familiarity with the internet and associated digital technology. Until digital devices are more widely used among the ageing population, or until PR services can provide them for patients, access to remote online PR will be restricted to those who already have internet access.

While we report positive staff perceptions toward cost, there is no data on the cost-effectiveness of remote online PR. Thus, the true cost of remote online delivery is currently unknown, but equipment, software, apps and technical support would be required. Additional trials to determine patient outcomes across a broad range of age and severity, and an economic feasibility assessment, are needed. The development of a standardised, feasible, online platform, to ensure consistency within trials assessing patient outcomes and cost-effectiveness may be the next step.

Strengths and Limitations

A key strength of this study is the reporting of PR service activity during the COVID-19 pandemic, capturing a real-time perspective from staff actively involved in service delivery. The study benefited from reports across a broad geographical area in England. Lockdown and social distancing provided an unexpected dividend of allowing the subjective perspectives of PR staff of remote PR to be assessed. Staff were largely positive about its impact, but these perceptions will need to be tested in further randomised controlled real-world effectiveness and implementation trials. A limitation of this survey is its likely unrepresentativeness suggested by the response rate of 35%, although responses were received from all regions in England. The responses do encourage further investigation of the views of PR staff outside of the context of limited social distancing and social lockdown. Similarly, although PR staff were positive about the perceived economic cost of remote online PR, its cost-effectiveness is a key gap in our understanding.

Conclusion

Remote PR was widely used during the social distancing phase of the COVID-19 pandemic in England. Service users' lack of access to the internet was an important barrier to online videoconferencing, the form of remote PR for which evidence of effectiveness is most compelling. Despite no specific recommendations for its utility at present, remote pulmonary rehabilitation via telephone or online videoconferencing appears to be a safe and feasible alternative when in-person pulmonary rehabilitation is unavailable. The provision of digital equipment and internet training should be considered to enable more equitable access to remote PR. Therefore, future trials are needed. Further effectiveness and implementation trials across a broader range of age groups and disease severity are required to support the positive results already obtained.

Ethics Approval and Informed Consent

Ethical approval was granted by King's College London Research Ethics Committee, reference number MRSU-21/22-28309. Informed consent was given by completion of the survey questionnaire.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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