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Exploring the delivery of remote physiotherapy during the COVID-19 pandemic: UK wide service evaluation

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ABSTRACT

Introduction: During the Coronavirus (Covid-19) pandemic, physiotherapists changed rapidly to working remotely. Research demonstrates the benefits of remote physiotherapy, but little is known about its implementation in practice.

Purpose: Explore the take-up and delivery of remote physiotherapy during the pandemic in the United Kingdom.

Methods: Sequential mixed methods evaluation with physiotherapists leading remote physiotherapy delivery. Two-stage approach included online survey (2020) and semi-structured interviews with documentary/data analysis (2021).

Results: There were 1620 physiotherapists who completed the survey. The most used devices were telephone ($n = 942, 71.0\%$) and the AttendAnywhere platform ($n = 511$, 38.5%). Remote consultations were frequently used for initial assessment ($n = 1105$, 83%), screening/triage ($n = 882$, 67%), or to review, monitor, and progress treatment ($n = 982–1004$, 74%–76%). Qualitative survey responses reflected respondents' response to COVID-19 and delivery of remote physiotherapy. Twelve remote physiotherapy leads were then purposively sampled across clinical areas. Three main themes emerged from interviews: response to Covid-19, delivery of remote physiotherapy, and future of remote physiotherapy.

Conclusion: Remote physiotherapy was safe, feasible, and acceptable for those who accessed it. There were patients for which it was deemed unsuitable across clinical areas. In practice, it should be combined with in-person consultation based on patients' needs/preferences. Further research should explore post-pandemic maintenance of remote delivery.

Introduction

There is growing evidence globally, supporting video consultations in health care compared with standard programs (Donaghy et al., 2019; Field, Gray, and Smith, 2012, Greenhalgh et al., 2018; Kairy, Lehoux, Vincent, and Visintin, 2009; Laver et al., 2020). For the delivery of remote physiotherapy, there is stronger evidence across musculoskeletal, neurological, pulmonary, and cardio rehabilitation and less established knowledge around how and what elements may be utilized within other clinical areas (Hawley-Hague et al., 2022). There are potential benefits for remote physiotherapy delivery, both for patients and services. Those reported in the literature include improved access for those who were unable to attend a physiotherapy department and reduction in travel costs (Cottrell et al., 2018; Tyagi et al., 2018).

However, it is also reported that remote physiotherapy exacerbated "digital exclusion" for those without the digital literacy or technology to use such services, widening health inequalities (Hawley-Hague et al., 2021).

There was already a high unmet need for physiotherapy globally and this gap widened during the Coronavirus (Covid-19) outbreak (Andrenelli et al., 2020; Chartered Society of Physiotherapy, 2019; NHS England, 2020). Physiotherapy providers rapidly moved to remote consultations to allow delivery to continue, with 70% of physiotherapy services reported as disrupted globally (World Physiotherapy, 2021). Globally, during lockdown restrictions, only "essential" physiotherapy treatments were allowed in many countries. However, the definition of essential was not

consistent across these different countries (World Physiotherapy, 2021).

At the start of the COVID-19 pandemic, physiotherapy delivered in person was curtailed in the United Kingdom (UK) (Chartered Society of Physiotherapy, 2020). UK physiotherapists were advised during the first lockdown that in-person consultations should only be offered to patients in hospital; patients who would require care from General Practice, hospital, or social care agencies if rehabilitation was not provided, or where patients required rapid discharge from hospital (Chartered Society of Physiotherapy, 2021). During further lockdowns remote physiotherapy was still seen as the first option, but in-person consultation could be offered if deemed necessary. However, many rehabilitation teams continued to be redeployed to acute services until 2021 (Chartered Society of Physiotherapy, 2023) and therefore were not offering rehabilitation in the community.

As the first wave of the pandemic and associated restrictions eased, it was important to understand how physiotherapy has adapted and how this knowledge could influence future provision. This is important as remote physiotherapy aligns with the National Health Service (NHS) Long-Term Plan, which recommends "digital enablement," where health professionals should be provided with appropriate tools to support patients (NHS England, 2019). Prior to the COVID-19 pandemic there was limited knowledge around remote physiotherapy's diffusion and delivery outside of a research-based setting (Hawley-Hague et al., 2022). Therefore, our aim was to explore the take-up, implementation, opportunities, and challenges of delivering remote physiotherapy during the COVID-19 pandemic. This study has the potential to enable understanding of which aspects of remote physiotherapy are feasible to implement within practice (i.e. triage, assessment, intervention, and self-management) and how this might be delivered across a mixed care model (i.e. National Health Service led, commissioned private sector, and independent private sector delivery).

Methods

Sequential mixed methods were adopted as part of a large UK-wide service evaluation. Within this sequential mixed-methods study, quantitative data was collected from physiotherapists in the first stage to establish a broad overview of the extent remote physiotherapy was being used, the different context in which it was being used, the way it was being evaluated, and the data collected to evaluate it. This then informed a second qualitative stage where

implementation was explored in further detail (Klassen et al., 2012). Additional quantitative data was collected in the second stage based on first-stage responses to provide an indication of populations reached with remote physiotherapy, and potential outcomes achieved.

The study was underpinned by the RE-AIM Evaluation Framework, a well-established implementation science framework which has been used for real-world evaluations of telehealth and health programs (Agboola et al., 2014). RE-AIM focuses on individual (i.e. Reach and Effectiveness) and organization level (i.e. Adoption, Implementation, and Maintenance) measures to assess impact by addressing different levels of engagement using a variety of data collection methods to maximize our understanding. The evaluation involved: 1) a national online survey of physiotherapists' experiences of implementing and delivering remote physiotherapy in response to the pandemic covering reach, adoption, and implementation and 2) detailed semi-structured interviews, alongside documentation and data from clinical practice exploring effectiveness, adoption, implementation, and maintenance with a purposive sample of respondents who led the implementation. Documentation and data provided by the physiotherapists informed the interview schedule and further triangulated the findings.

Stage 1. The survey

Sampling and recruitment

Discussions with our sponsor, local NHS Ethics Committee and Health Research Authority and local governance teams at NHS services led to a decision that the study did not require ethical approval as it was evaluating the delivery of standard care. The research team worked with NHS research and data governance teams to ensure relevant data protection, confidentiality, and ethical processes were followed. We included physiotherapists who led a UK physiotherapy or rehabilitation clinic/team and were registered with the Chartered Society of Physiotherapists (CSP). A link to the survey was sent out to all 59,000 CSP members via e-mail on two occasions, included on the CSP's website and relevant online fora in August–September 2020. Only those leading a clinic/team delivering remote physiotherapy delivery were asked to respond. There were no restrictions on the type of clinic/team, setting, or client group as we wanted to establish a broad picture of delivery.

Data collection

The web-based survey (Surveynet, University of Manchester's encrypted survey tool) was devised with questions derived from our earlier scoping review (Hawley-Hague et al., 2022) and piloted with the project's patient and professional advisory groups. It included closed questions regarding: type of clinics/teams using remote physiotherapy (e.g. private or NHS and clinical groups); setting (e.g. location, rural, and urban); type of technology used; purpose of the remote consultations; and patient characteristics (i.e. service or patient criteria for remote consultations). We also asked about data the respondents collected about their remote delivery, including how they developed and evaluated it. There was an open-ended comments box at the end of the survey that allowed respondents to reflect further on any of their answers in detail (Supplementary File 1).

Analysis

Quantitative data were analyzed with descriptive statistics (i.e. frequencies and percentages) using Statistical Package for the Social Sciences (SPSS). Inductive thematic content analysis (Braun and Clarke, 2006) was undertaken on data within the open-ended comments box, independent of wider survey responses. The data were coded independently by two researchers (HHH and EM) and then discussed with the wider research team to agree on emerging themes.

Stage 2. Interviews

Sampling and recruitment

Survey respondents were asked if they were willing to be approached about further involvement in the evaluation. We purposively sampled a range of physiotherapists leading clinics/teams ($n = 40$) to ensure diverse clinical specialties, health-care settings, geographical areas, and based on service data they reported collecting. Twelve physiotherapists were then recruited. Respondents were approached between December 2020-March 2021 by e-mail with details of the evaluation protocol and a participant information sheet.

Data collection

Participants were requested to provide relevant documentation and data (e.g. clinic/team activity data, patient outcomes, satisfaction surveys, standard operating procedures, and service-level agreements) to be considered alongside the interviews. Semi-structured interviews of 30–60 min were undertaken by a single researcher (HHH) remotely using Microsoft Teams/Zoom, recorded and transcribed verbatim. A topic guide was developed based on our previous scoping review (Hawley-Hague et al., 2022), the responses to the survey, and discussions with the project advisory group (Supplementary File 2) and then changes made to develop remote delivery including organizational context, such as: type of consultation and purpose; delivery/preparation time; experiences of setting-up and delivering a remote service; "top tips" for delivery; changes staff had undergone to deliver remote physiotherapy (i.e. skills, behavior, and attitude); facilitators and barriers to adoption; what made remote physiotherapy successful or unsuccessful; perceived costs and benefits of remote physiotherapy; and future plans.

Analysis

Quantitative data from the data/documentation supplied were analyzed with descriptive statistics, including frequencies and percentages, using SPSS. Transcripts from the interviews were analyzed across sites, using framework thematic analysis. Themes which emerged from survey data and clinic/team data/documentation were used as an initial framework (Gale et al., 2013) for the interview data and built upon. Coding was completed independently by four of the authors (RS, AG, SA, and EM) who were not directly involved in the data collection using NVivo 11. Discussions to further develop the codes and progress the analysis were held between the team (ST, HHH, RS, AG, SA, and EM). To ensure internal validity, emergent findings from the interviews were reviewed for accuracy and completeness by the interviewees and survey participants who attended a virtual workshop to discuss the initial results. Two further "external member checking" workshops were held with academics working in the field and patients from interview sites to discuss themes and findings and ensure they reflected a broad range of experience. If important themes were identified as missing during this process, the data would be re-interrogated and discussed within the team with the potential for further interviews. Data saturation was felt to be met when no new themes emerged during analysis or within workshops. Interviews were triangulated with the clinic/team data and documentation provided, where it was available. We define triangulation in this study as looking to see where data and documentation supported or differed from the themes that emerged from interviews (O'Cathain, Murphy, and Nicholl, 2010).

Reflexivity

The authors involved in the data collection and analysis were an academic physiotherapist; a healthcare researcher working in technology development, evaluation and rehabilitation; a clinical academic Occupational Therapist from community rehabilitation; a clinical academic podiatrist; a social work researcher and an exercise physiologist researching digital technology. Reflexivity includes reflection on how the researcher is part of the research both in how their background influences their engagement with participants and how participants respond to them, also how their background can influence the interpretation of data (Finlay, 1998). Team discussions encouraged reflection on how background and knowledge influenced the coding and how the researcher (HHH) may have influenced the interviews as she was known to several of the physiotherapists interviewed. This discussion allowed us to come to a consensus around emerging themes considering our viewpoints.

Table 1. Characteristics of respondents' remote physiotherapy service.

	Number of services (%) N = 1620
Service sector[a]	NHS[b] Primary Care 357 (22.0%)
	NHS Secondary Care 339 (20.9%)
	NHS Community Care 313 (19.3%)
	Private Practice 339 (20.9%)
	Independent/Private Healthcare 84 (5.2%)
	NHS Tertiary Care 76 (4.7%)
	Other 39 (2.4%)
	Social Enterprise 17 (1.0%)
	Charity 21 (1.3%)
	Hospice 13 (0.8%)
	Mental Health Care 11 (0.7%)
	Missing 4 (0.2%)
Clinical area[a]	Musculoskeletal care 943 (58.3%)
	Trauma and Orthopaedics 259 (16.0%)
	Sports and exercises 228 (14.1%)
	Pain management 216 (13.3%)
	Rheumatology 95 (5.9%)
	Hand therapy 81 (5.0%)
	Care of older people 181 (11.2%)
	Community Rehabilitation 179 (11.0%)
	Falls 151 (9.3%)
	Neurological 250 (15.4%)
	Stroke rehabilitation 127 (7.8%)
	Pulmonary rehabilitation/respiratory 184 (11.4%)
	Cardiac Rehabilitation 39 (2.4%)
	Intensive/Critical care 24 (1.5%)
	Children and Adolescents 185 (11.4%)
	Womens/Mens's health 110 (6.8%)
	Oncology and palliative care 102 (6.3%)
	Learning disabilities/mental health 84 (5.2%)
	Occupational Health 77 (4.8%)
	Amputees 54 (3.3%)
	Other 95 (5.9%)

[a]More than one sector or clinical area could be selected; [b]National Health Service.

Results

Stage 1

One thousand six hundred and twenty responses ($n = 1620$) to the survey were received, 60% of whom worked in the NHS with approximately equal representation from primary, secondary, community care, and private practice (Table 1). It is not possible to establish a response rate as our recruitment strategies were unable to specifically identify members who led clinics/teams. The survey was sent out to all CSP members, including some who did not meet inclusion criteria. The most common area of practice was musculoskeletal (MSK) care including several sub-specialties (Table 1), care of older people, and neurological and stroke rehabilitation. Most respondents served rural and urban areas, while a quarter served inner city and sub-urban areas. Most responses were from England, with responses from other UK countries proportionate to their population (Supplementary File 3).

Respondents reported primarily using the telephone (71.0%) to deliver remote services, but AttendAnywhere, Zoom, and Accurx were also commonly used (Table 2). Remote consultations were frequently used as part of an initial assessment, screening/triage, or to review, monitor, and/or progress treatment (Table 3). Treatment included exercise prescription or delivery, providing advice, education, or self-management support to individuals (Table 3).

Answers regarding the development and delivery of remote physiotherapy reflected the rapid way they had been devised and implemented (Table 3). Less than half had a service specification or standard operating procedure for the delivery of remote physiotherapy, fewer had defined criteria for patients or referral processes, and just over a quarter had involved patients in the development of the delivery. Evaluation of patients' experience was a higher priority, but only 20% evaluated staff experience/satisfaction, the time taken to deliver remote physiotherapy, and digital exclusion (i.e. the proportion of those who were unable to use remote physiotherapy). Adverse incidents and costs of remote physiotherapy were rarely evaluated. Although 50% of respondents reported challenges to delivering remote physiotherapy, half said they had overcome them.

The responses to the survey's open comment questions ($n = 449$) gave detail to physiotherapists' experience of delivering remote physiotherapy. Two main themes emerged from this data: "The response to Covid-19" and "delivering remote physiotherapy", with four subthemes. Because these themes overlap with interview data, we present them together under stage 2, but illustrate in Figure 1 how the data emerged.

Table 2. Platforms used (*N* = 1327).

Platform used	Number of responses (%)
Telephone (landline or mobile	942 (71.0)
Attend Anywhere	511 (38.5)
Zoom	418 (31.5)
Microsoft teams	314 (23.7)
Accurx	187 (14.1)
Facetime	172 (13.0)
Skype	134 (10.1)
Whatsapp	63 (4.7)
Cliniko	19 (1.4)
Sisco/cisco Webex	19 (1.4)
Google meet	13 (1.0)
Physitrack	11 (0.8)
TM3	8 (0.6)
My [a]COPD	8 (0.6)
Pexip	7 (0.5)
Visconn	7 (0.5)
Visonable	7 (0.5)
PhysioTech	7 (0.5)
Bluejeans	6 (0.5)
Email	5 (0 4)
One consultation	5 (0 4)
Video me/vidyo/videyo	5 (0 4)
Xuper	5 (0 4)
Escape Pain	5 (0 4)
Other	51 (3.8)

[a]COPD - chronic obstructive pulmonary disease.

Details of key characteristics of respondents' clinics/teams are provided after the quotes to illustrate how findings spanned this broad range clinics/teams and clinical areas.

Stage 2

Physiotherapists who led 12 clinics/teams in England took part in the interviews and provided clinic/team documentation/data (Table 4). Ten were NHS-based and two private practices. Of the NHS sites, three were based in outpatient departments of hospitals. Community-based teams mainly worked in patients' homes but also ran rehabilitation programs in gyms, health centers, and council venues. One musculoskeletal (MSK) service was based mainly in general practitioners (GPs) surgeries. Four clinics/teams mainly dealt with MSK problems, three covered stroke and/or neurological problems, and one was a community rehabilitation team for people with limited mobility. There was one falls prevention team, one cardiac rehabilitation clinic, one pulmonary rehabilitation team, and one specialist pediatric clinic. None had provided care remotely before the pandemic.

Five participants who completed the survey but not the interviews, five patients of participating interview sites, and seven academics attended external validation workshops. The consensus was that our findings reflected their experiences, without deviation, and no missing themes were identified.

Three main themes emerged from the interviews that were influenced by the different stages of the response to the pandemic and setting-up of services: 1) response to Covid-19; 2) delivery of remote physiotherapy; and 3) future of remote physiotherapy (maintenance), with sub-themes providing more detail (Figure 1). Participants' "top tips" for delivering remote physiotherapy are also summarized in Table 5.

Theme 1: response to Covid-19

During the pandemic, physiotherapy and rehabilitation teams needed to balance patient need/demand with minimizing the risk of transmission of COVID-19 by following national guidance. The pandemic left participants

Table 3. Survey responses: development and delivery of the remote service (*n* = 1620).

|	Number of services (%)
Service Development	
Service specification or standardized operating procedures for the service available.	Yes = 643 (39.7%); No = 581 (35.9%); Missing = 396 (24.4%)
Patient population and referral criteria for the remote service were defined	Yes = 514 (31.7%); No = 693 (42.8%); Missing = 413 (25.5%)
Users were involved in developing the service	Yes = 451 (27.8%); No = 791 (59.6%) Missing = 378 (28.5%)
Service Evaluation	
Users were involved in developing evaluation measures.	Yes = 162 (10.0%); No = 795 (49.1%); Missing = 663 (40.9%)
Patient's experience/satisfaction is evaluated	Yes = 799 (49.3%); No = 432 (27.0%); Missing = 389 (24.0%)
Patients' outcomes are evaluated	Yes = 860 (53.0%); No = 262 (16.2%); Missing = 498 (30.7%)
Staff experience/satisfaction of remote delivery evaluated.	Yes = 327 (20.1%); No = 714 (44.1%); Missing = 579 (35.7%)
Time taken to deliver the remote service evaluated.	Yes = 345 (21.3%); No = 649 (40.0%); Missing = 626 (38.6%)
Cost of delivering the remote service evaluated.	Yes = 203 (12.5%); No = 747 (46.1%), Missing = 670 (41.4%)
Information gathered on those who are unable/unwilling to use the remote service (Digital exclusion)	Yes = 310 (19.0%); No = 696 (43.0%); Missing = 614 (37.9%)
Not currently evaluating their remote service, but plan to so within the next six months.	Yes = 435 (26.9%); No = 84 (5.2%) Unsure = 367 (22.7%); Missing = 734 (45.3%)
Incident reporting	
Patient-related "incidents" reported (e.g. falls, technology or software failure).	Yes = 172 (10.6%); No = 758 (46.8%); Missing = 690 (42.6%)
Challenges	
Challenges experienced in setting up remote services.	Yes = 837 (51.7%); No = 114 (7.0%); Missing = 669 (41.3%)
Challenges have been overcome	Yes = 193 (11.9%); No = 46 (2.8%); Partially = 607 (37.5%); N/A = 62 (3.8%); Missing = 712 (44.0%)
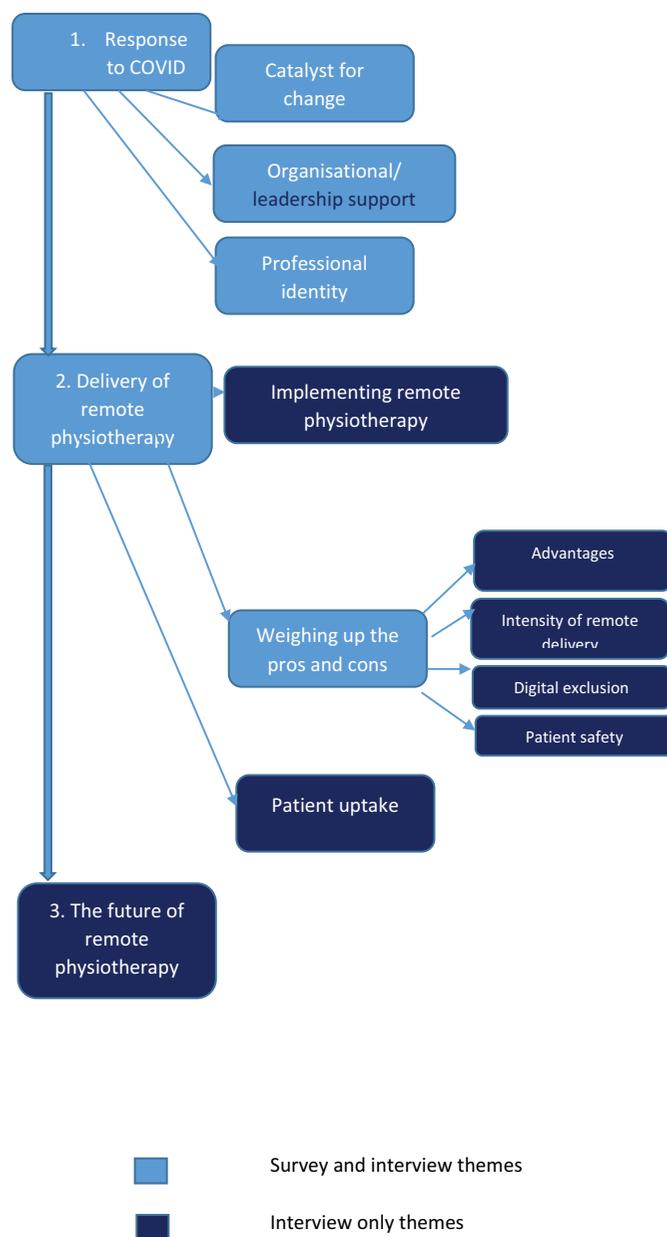
Figure 1. Qualitative themes from survey and interview data.

working with a high degree of uncertainty in a rapidly changing situation. Many were concerned about the risks of catching COVID-19 and transmitting it to patients or families. Thus, working remotely was seen as a positive development as it provided a *"safe space"* and allowed staff who were isolating because they or their significant others were clinically vulnerable, to continue working. However, it required rapid unplanned change which many considered required them to *"redesign services overnight"*.

Private practices reported different experiences to NHS services, as they had no alternative but to change to remote working to stay in business. Initial concerns focussed on whether patients, insurance companies, and case managers would be

prepared to pay for remote consultations, how they should be costed, and how future infrastructure to support remote delivery would be funded. The following subthemes illustrate an immediate response to COVID-19 from an individual, clinic/team, and wider organizational level.

A catalyst for change

Physiotherapists' response in the survey was that remote delivery was *"forced on"* them as a *"stop gap"* during the first lockdown. While most considered it a rapid, disruptive, and challenging necessity, others found it an

Table 4. The participating interview sites.

Site	Clinical Speciality	Conditions treated and referral routes	Usual care offered
1	Large hospital based out-patient musculoskeletal service including 1st contact and advanced practitioners	Acute and long-term orthopedic, rheumatology, pain, trauma, woman's health problems self-referred (1st contact practitioner) or from GPs and[a] consultants	Assessment including diagnostic investigations. Management plan agreed – often structured exercise program (individual +/or group); self-management programs for long-term conditions; corticosteroid injections
2	Musculoskeletal service in several local GP practices and hospital physiotherapy outpatients department	Acute and chronic [b]MSK conditions including pain management and post-operative rehabilitation. Self-referral, or GPs and consultants	Gym and/or home-based exercise program and/or hands-on treatments
3	Community rehabilitation	Housebound adults with a neurological, respiratory, or MSK problem including frequent fallers, reduced mobility or those who cannot access clinics	Integrated Physiotherapist, [c]OT and assistant practitioners, providing goal-led rehabilitation but not maintenance support
4	Multidisciplinary community stroke and neurological rehabilitation service. Clinics (3/week) but mostly home visits	Patients with a neurological condition in the geographical area	Assessment and treatment for patients while "progressing toward their goals"
5	Community-based cardiac Rehabilitation Service provided in "council venues". More complex patients seen 1-to-1 at home, gyms, and within the class itself	Patients who would benefit from cardiac rehabilitation including those with cardiac failure and with "complex issues"	Objective assessment before and after the exercise program, plus joint home visits with the OT for mobility assessments. Six weeks (2×/week) of individualized exercise circuits and group education
6	Large Community-based multi-disciplinary stroke rehabilitation team (n ~ 50) working in patients' homes	From stroke consultants and acute (hospital based) stroke service	Assessment within 48 hours of hospital discharge and "six month stroke reviews". Treatment = group exercise, gym sessions +/or home based treatment. Patients "stay" as long as they have therapy goals
7	Large community-based private neurological rehabilitation practice working in patients' homes	Adults and children with acquired brain & spinal cord injuries and other neurological conditions. Referrals from case managers and solicitors through litigation claims and self-referral.	Bespoke rehabilitation packages
8	Falls Service working in clinics and patients' homes.	Adults at risks of falls referred from health and social care colleagues and self-referrals	Assessment of falls risk; Eight-week progressive strength and balance exercise group (n= up to10) class with three staff.
9	Outpatient MSK service and also intermediate care unit.	Orthopaedic and Trauma. Self-referred (1st contact practitioner) and GPs	
10	Large (2.6 dwte PTs and 583 referrals 2019–20) multi-disciplinary community pulmonary rehabilitation service – operating in three different locations.	Patients with [e]COPD, Interstitial Lung Disease or/and Bronchiectasis whose function is affected by their disease	Initial telephone triage; full assessment; falls screen, goal setting. Pulmonary rehabilitation program (2×/week for 7 weeks) group based exercise (1 hour), education (1 hour) and personalized management plan. Then onward referral to leisure services.
11	"Traditional" private city-center MSK and sports injuries practice working in gyms and private clinics, plus occupational health and ergonomic assessment in clients' workplaces	Mainly working age clients attending on their way to or from work or in their lunch breaks. Referral via the practice website, consultants or other third party referrals	
12	Specialist multi-disciplinary team tertiary [f]NHS multi-disciplinary children and adolescents service	Children with neuromuscular conditions referred from consultants and other members of the team	Review assessments in clinic every 6, 12 or 18 months

[a]GP= general practitioner; [b]MSK = musculo-skeletal; [c]OT = occupational therapist; [d]wte= work time equivalent; [e]COPD = chronic obstructive pulmonary disease; [f]NHS = National Health Service.

opportunity to "think outside the box", gain new skills, and that it created a catalyst for positive change.

> I have been requesting [videoconferencing] for many years, so this was music to my ears. (Survey participant, Community, Falls, Neuro and Stroke service)

Some participants considered how they could improve skills, particularly ones related to communication.

We haven't got our hands, but we're motivators, facilitators, problem-solvers, movement analysers, teachers … I've become a much better teacher. (Interview Site 7)

Participants interviewed found it an opportunity to introduce developments they had considered for a long time, using the reduction in referrals during lockdown as an opportunity to review services. For example, reducing waiting lists or implementing more

Table 5. Interview participants' "top tips" for delivering remote physiotherapy.

Planning delivery	• Develop and pilot protocols and processes beforehand – especially to deal with 'concerns' (e.g. risk assessments; triage; assessment; and treatment protocols). Who does it work for?
	• Plan, plan plan
	○ with each other
	○ what is best way to deliver
	○ share examples of success
	○ how to approach certain interventions/ conditions/challenging issues.
	• Think about what you can do,
	○ think outside the box,
	○ do not try to deliver remotely as you deliver in-person - you have to adapt.
	• 'Buffering time' is required between appointments, as it is difficult to manage time during back-to-back virtual appointments.
	• User-friendly software aids success,
	○ Have different platforms or phone calls as backup.
	• Be prepared BEFORE appointments (know exactly what you can and will do)
	• Do not assume participants cannot engage based on age (older/young)
	• Be individual patient-led in what you do and how you do it.
Delivering remote physiotherapy	• Where possible involve administrators or rehabilitation assistants to:
	○ research different technologies to use.
	○ help set up the call before the physiotherapists gets involved
	○ make virtual [a]PT appointments to guide, trouble shoot and discuss expectations with patient.
	• Use resources to support set-up with an information page or leaflet sent by email or post
	• Explain how the initial assessment will work by phone or video, including that they
	○ need to be ready 15 minutes beforehand.
	○ should to be in a safe and appropriate place to conduct the session
	• End the call if not safe to carry-on.
	• Ask where they are (location address) at the start of the session so contact can be made if necessary.
	• Have a 'positive' attitude, especially with patients to encourage their uptake, your confidence makes them confident.

[a]Physiotherapist.

streamlined treatment pathways, creating new resources, and adapting old processes:

> We were able to do, in ten months, more than I've been able to do in ten years . . . I think it's been an absolutely unique opportunity to stop and pause and think "Right, what now? (Interview Site 5)

Effective leadership and organizational support

The effectiveness with which services transferred to remote working was felt to be largely dependent on organizational support. Many physiotherapists expressed in the survey that initially the support received from their employing organization was insufficient. Timely development of policy and procedures to ensure smooth implementation was key, as were sufficient resources, and infrastructure. Physiotherapists often reported that they were working in ways for which they felt untrained and lacked confidence, which was stressful. Further detail was given in interview where there were reports of slow responses, unhelpful policies, and lack of guidance such that many felt they were left to work things out for themselves:

> You were kind of left to your own devices, which did mean you were able to innovate, but also it's made everything really difficult and time-consuming and

long-winded . . . For example, every leaflet, every bit of patient information has to go through governance. (Interview Site 6)

Difficulty obtaining basic equipment and infrastructure such as laptops, headsets, webcams, landlines, desks and chairs, technical support, and training were common. One interview site became so frustrated that they reported a *"critical incident"*. Here videoconferencing was the hospital's preferred mode of remote consultation. However, the connection at the hospital was too weak to use mobile phones and calls often failed. Staff then had to transfer to a landline telephone, but only one landline was available for 20 staff, despite multiple requests for more lines over a prolonged period. Further barriers concerned the platform offered by organizations and its acceptability to patients. Patients and health professionals reported preferring devices and platforms with which they were familiar, but this sometimes conflicted with organizational security policies and was not always allowed.

> so when we started talking about the video conferencing app (which had an unusual name), patients sometimes hung up thinking it was a crank call. (Interview site 8)

> [Lack of] agreement on an appropriate platform has been the biggest barrier to delivering remote services . . . this has impeded service delivery where opportunity to work differently is identified but unable to. (Survey

participant, Community Care, Children and Adolescents, Rural and Urban)

However not all experiences were negative, some sites felt well supported and were provided with training:

> To be fair, the trust has been very good. We've had a lot of courses to go on to do IT and stuff . . .. (Interview Site 5)

In the interviews, participants reflected on how proactive and capable leadership made all the difference to therapists' experience of the impact of the pandemic, and of remote delivery. Capable leadership required a willingness to adapt, skilled management of change and team dynamics, and knowledge and confidence with technology. When teams pulled together, camaraderie was enhanced. The participants detailed how they needed to *"lead enthusiastically from the front"* to highlight the opportunities remote working offered with a *"can-do"* approach to dealing with challenges and making change happen. This required flexibility to accommodate staff with differing degrees of experience, skills, appetite for change, and personal circumstances. They talked about how they needed to be able to manage the team dynamics, involve the whole team, collaborate with others, and acquire resources (i.e. support, training, and equipment).

> It wasn't necessarily top-down. We've all gone "Okay, let's do this". There was a discussion between me and the team to look into how we can implement this. (Interview Site 4)

Professional identity

Changing the way of delivering physiotherapy made some participants reconsider their professional identity. In-person care and physical contact are considered essential parts of physiotherapy, and many said that they had feared that virtual consultations would lead to loss of specialist skills and poorer patient care. Survey and interview participants questioned whether they were *"even doing physiotherapy"* if they were not seeing patients in person, which negatively impacted on job satisfaction:

> I would be extremely concerned if this became the default. Physiotherapy is a caring profession and care is always better in the same room. (Survey participant, Private Practice, mixed caseload, Rural and urban)

> *You didn't really sign up to physio to be in a desk job really. (Interview Site 9)*

> *Physiotherapy is all about touch, and that's been an alien concept – being virtual (Interview Site 1).*

Others feared, it would affect training for the next generation of physiotherapists. Further concerns were raised that remote physiotherapy could become the norm to reduce cost. This could devalue the physiotherapy profession, fundamentally changing its core values and practice.

Theme 2: delivery of remote physiotherapy

It was made very clear by respondents that they felt that remote physiotherapy was not suitable for everyone, and patients' preferences and individual needs should be at the fore when considering whether to deliver care remotely. Participants noted that it took time, energy, work, and resources to develop, pilot, and refine effective processes and materials to ensure remote care was safe, meaningful, and realistic for as many patients as possible. These included triage and screening tools; risk assessments and procedures to deal with or prevent emergencies and adverse events; adapted assessment processes and outcome measures; refined treatment programs and new support materials; acquiring funding and equipment; establishing training materials and programs. Policies such as data security and patient confidentiality, safeguarding, health and safety also needed to be accommodated. Although some sites were able to use "off the shelf" apps most processes were developed in-house by trial and error. In some sites this was extensive such as: developing booklets to explain the service, program, and technology; cards/written material; and YouTube Channel to supplement the exercises. Like the survey data, sites reported that patients tended to prefer telephone to video calls. In addition to the above, some interviewees used specific apps such as MyHeart and MyCOPD.

By the time the interviews were undertaken, restrictions for COVID-19 had been lifted, and all but one site had moved to a blended form of delivery, combining remote and in-person care based on patient need. For some clinics/teams, this involved an in-person assessment followed by treatment delivered through teleconferencing or an app, while for other sites the initial assessment would be completed remotely and then treatment was offered either in-person or remotely dependent on patient need and preference. Some reported that this made assessment and triage more focused and accurate which had a positive impact on waiting lists.

Patient uptake

Four interview sites provided objective data about the uptake of remote physiotherapy ranging from 14% (Site 1) to 53% of patients (Site 6). Several

sites noted that many patients declined any physiotherapy immediately after lockdown. However, uptake improved over time as everyone became more familiar and confident with using technology. The number of patients seen remotely is described as *"about 30%"* (Site 1) or *"nearly half"* (Site 2) dependent on clinical area, type of treatment, purpose of consultation, and patient population. Several interview sites (1,4,5,9,10, and 11) noted increased attendance during lockdown compared to before, which was attributed to patients having fewer demands on their time. This was further supported by Site 1's observation that attendance fell when the first lockdown eased in the Summer of 2020 as patients returned to work.

Weighing up the pros and cons of remote physiotherapy

Advantages

Remote consultations were reported in the survey and interviews as useful to triage patients to appropriate type of care and complete subjective assessments, which made subsequent in-person appointment(s) more focused and efficient. Some found that being able to see the patient in their own home via video enhanced the assessment process, providing more holistic assessment of the patient's function in their own home.

> I love being able to see patients doing their exercises in their home environment. I have picked up on issues I would not have done when they get shown the exercises in the clinic. (Survey participant, Private, MSK, Rural and Urban).

Many participants felt that although patients who required "straight forward" assessment where diagnosis was clear and treatment well established could be managed remotely, those needing more complex assessment and treatment needed to be seen in-person. Views about delivering treatment remotely varied, delivering one-to-one exercise was generally thought possible, but experiences of delivering remote group-based physiotherapy were mixed with some assuming it infeasible. Some physiotherapists did successfully develop remote group sessions with patients reporting benefits.

> The people who attended my [Parkinson's Disease] group have found the virtual sessions very beneficial. Some prefer to continue with these rather than return to the gym. (Survey participant, Private Community rehabilitation, Rural)

Remote consultations for "follow-up appointments" to monitor progress and provide advice, education, and support self-management were discussed as feasible and effective. Many found that remote delivery promoted patients' self-reliance and problem-solving.

> Self-management. Now that is one of the big advantage I noticed in this last year with doing video appointments ... perfect. (Interview Site 2)

An unexpected benefit of remote delivery was that it supported a more patient-centered approach as it enabled more options which could be tailored to individuals' needs and preferences:

> It's about establishing early on, what a patient wants ... I think that's one massive thing that Covid's taught me, is it's got to mean something to the patient. (Interview Site 5)

From a staff perspective, the most common advantages of remote physiotherapy reported were reduced travel time for staff and patients (particularly for therapists in the community), and convenience for patients. It provided a *"safe space from covid"* for staff, patients, and their families when there was concern about the risks of infection. Some participants felt it led to better interaction with families and patients. It also allowed for more effective multidisciplinary team (MDT) meetings.

> It has also been helpful to arrange MDT meetings over Teams. Previously trying to get all professionals involved with a patient in one place in community was a significant barrier! (Interview Site 4)

Six interview sites presented data from formal assessments of patients' satisfaction (Sites 1,4,6,8,10, and 11) all of which delivered in-person and remote care. Feedback was over-whelmingly positive. The main advantages reported by patients were that it overcame safety concerns about having contact with another person or traveling to a hospital during lockdown and enabled patients to receive physiotherapy when the clinic would otherwise be closed. This patient data echoed survey and interview data reporting that they appreciated the convenience of remote consultations as they were quicker, easier, and cheaper and avoided the frustrations of finding parking space, time away from work, or other commitments.

Disadvantages

Digital exclusion

Some participants were concerned about barriers limiting the accessibility of remote physiotherapy for individuals with sensory, physical, or cognitive impairments or for non-English speakers. They reported that the

technology available did not always accommodate patients' impairments or English language skills. Especially at the start of the pandemic when there was no option for a blended approach:

> Many clients with cognitive impairments, hearing deficits, or balance issues need to be seen in-person for safe and effective assessment/treatment. (Survey participant, Community, Care of Older People, Rural and Urban setting)

Communication with patients who did not speak English was frequently raised as a challenge in the interviews because of difficulty organizing and facilitating interpreting services or family and friends to translate. This was an issue for in-person services but exacerbated further by remote delivery:

> . . . when English wasn't their first language, that ruled people out because at that time, interpreter services weren't really available. (Interview Site 4)

Many noted that patients with more complex needs had to be seen in-person, this included patients with "red flag assessments"; those needing hands on neurological assessment and treatments; and those with acute injuries.

For others, the concern was whether delivering physiotherapy remotely could exacerbate health inequalities through digital exclusion.

> The uptake of remote services has been very poor due to the lack of the required tech at home, both devices and data/wifi – We are in a very deprived area. (Survey participant, Social Enterprise, Pulmonary Rehabilitation, Urban)

We were unable to obtain sufficient patient data to analyze the characteristics of individuals who did or did not take-up remote physiotherapy and thus those digitally excluded. However, physiotherapists stated that remote physiotherapy was unsuitable for patients with no access to suitable technology, connectivity (WiFi), or digital literacy (i.e. knowledge about how to use the technology).

Patient safety

Although remote consultations were valued for screening, triage and subjective assessment, objective assessments were more challenging when the patient could not be clearly seen or touched. The concern that therapists may "miss something" was prevalent, particularly in survey data, and not just restricted to assessment.

> When we have seen patients face-to-face we have picked up issues that have been missed by GP, consultant, hospital doctors, specialist nurses during phone consultation . . . . all of which needed urgent medical attention. (Survey participant, Tertiary Care, Lymphodema/cancer care)

Difficulty was noted for postural and seating assessments and progressing patients' treatment.

> Assessments virtually are just nowhere near as accurate as face-to-face and we may miss things due to this. Orthopaedic tests can often be carried out by a partner with my guidance, but I missed being able to check reflexes, do cranial nerve tests . . .. (Survey participant, Private practice, mixed caseload)

Some aspects of remote treatment were found unsuitable or ineffective because of adaptions due to safety concerns. Participants noted difficulty delivering strength and resistance training without equipment and progressing patients' treatment when they could not see them clearly. Patient safety was identified as of increased concern when working with people with mobility and balance problems, at high risk of falls. The fear of "missing something" that was prevalent in the survey responses had started to recede for clinic/team leads interviewed, as by this time, most participants were able to see their patients in-person if needed and were therefore less anxious. Incidents such as technical difficulties and confidentiality issues were discussed, but no physical "patient incidents" or adverse events (falls or injuries) were reported in the survey, the documentation/data provided, or in interviews.

Intensity of remote delivery

Six interview sites (50%) provided data from surveys or meeting notes on staff satisfaction. All noted that delivering remote physiotherapy was intense, requiring great concentration and regular breaks, with some likening it to "working in a call center".

> There had to be some kind of policy around giving breaks in between patients. You can't just roll from one to the next to the next (Interview Site 6)

Participants also missed everyday conversations and the opportunity to share knowledge and experiences with colleagues, as they could not "just go next door" for a second opinion or support. Furthermore, trying to combine in-person and remote consultations was considered impractical as it was like "having two jobs". Community-based therapists also noted a loss of travel time between patients' homes, which was often used to reflect and problem-solve, so this time needed to be found elsewhere. Furthermore, delivering care remotely was reported as more time consuming because of additional preparation and patient support needed. One site noted that new assessments which usually took 30–45 min took about an hour when delivered remotely. Site 9

recorded the time spent in remote musculoskeletal consultations in detail: On average, first appointments took 117 min (22.6 min on preparation; 34.8 min in the consultation; 43.8 min writing clinical notes and 15.5 min arranging additional resources), while "follow up" appointments were, on average 51.3 min. In-person appointment times were not recorded, so direct comparison is not possible.

Theme 3: the future of remote physiotherapy

Despite widespread concerns, all physiotherapists interviewed felt the introduction of remote delivery was successful for some of their patients but not suitable for all patients. They reported planning to continue with a blended approach combining virtual and/or in-person care, depending on patients' needs, goals, and preferences. The balance of remote and in-person care varied and this seemed to depend on the number of patients able to access remote delivery. Site 3 is intended to only use remote delivery for MDT meetings in the long term as they found remote delivery with patients impractical for their client group and the platform unreliable. In contrast, Site 11 (city center, private musculoskeletal, and sports practice) felt *"Covid actually opened so many doors for us"* and intended to continue to operate primarily remotely.

Discussion

We present data from the first UK wide evaluation of the implementation of remote physiotherapy at scale. Using the RE-AIM framework (Agboola et al., 2014) qualitative and quantitative data which demonstrates remote physiotherapy's reach across populations, and some evidence of reported effectiveness is outlined. Evidence is provided of remote physiotherapy's adoption and implementation on an organizational level within the NHS, private, and third sector providers. What is not yet fully evidenced is how remote physiotherapy will be retained and maintained as the impact of the pandemic recedes. All interviewees indicated that they intended to continue using remote delivery, combined with in-person consultations in a blended approach. The move to blended delivery reflects a shift in tone between the survey and follow-up interviews. Changes in COVID-19 restrictions meant interviewees felt less anxious about missing something because they knew if required, they could see patients in person.

This study establishes that physiotherapists believe that remote physiotherapy is safe, acceptable, and feasible for the patients who could access it. It was particularly valued for initial triage, subjective assessments, "follow-up" appointments to monitor progress,

education, advice, and self-management, and these are the areas we suggest clinicians focus on within their blended delivery. Delivering physiotherapy was often reported as more time consuming than in-patient care because of the additional preparation and patient support required. Therefore, it is important that it is utilized when it has benefits to patient and clinic/team.

However, across the clinical areas explored, physiotherapists stated that it was not suitable for all patients. Those with impairments for whom remote consultation created barriers to participation (e.g. auditory, cognitive, and visual impairments) and patients who did not speak English were more likely to be excluded. This is reflected in the suggested percentage of remote delivery reported by teams/clinicsfor example, less patients attending neurological rehabilitation received remote physiotherapy compared to MSK.

Several publications have investigated remote health care response to the pandemic in other countries and echo our findings (Ackerman, Gleason, and Shipman, 2020; Assenza et al., 2020; Cliffe and Stevenson, 2021; Gilbert et al., 2020; Gilbert, Jones, Stokes, and May, 2022; Greenhalgh et al., 2018; Malliaras et al., 2021; Miller, Pak, Keller, and Barnes, 2021; Negrini et al., 2020; Turolla et al., 2020; Wherton, Shaw, Papoutsi Seuren, and Greenhalgh, 2020). However, there are few publications specifically exploring physiotherapists' experience of remote delivery in response to the COVID-19 pandemic. A specific study exploring video consultations in Australia reported high satisfaction levels with results that could be perceived as more positive (Bennell et al., 2021). This could be because 21% of respondents had previous experience of delivering remote physiotherapy and had undertaken specific training. This study and another study on remote physiotherapy in Switzerland (Rausch et al., 2021) found technical problems and the need to be able to see or touch patients cited as frequent barriers. For the Swiss study, there was reluctance to continue with remote methods and respondents did not see it as part of their future delivery. The findings from our study are also supported by the international pre-pandemic literature which identified some similar findings (Hawley-Hague et al., 2022).

This study illustrates how moving to deliver physiotherapy remotely in response to the pandemic required rapid and disruptive change. The loss of therapeutic touch led some participants to question their professional identity when delivering remote care (Bientzle, Minje, Cress, and Kimmerle, 2019). However, others considered it a positive opportunity to review and improve their service, largely driven by effective local leadership (Gilbert et al., 2021).

Leaders demonstrated features of a transformational leadership style by acting as role models with an inspiring "vision," and encouraged staff's personal development, creativity, and innovation (Eisenbach, Watson, and Pillai, 1999). This leadership style has been associated with effective change management and enhanced patient outcomes (Wang, Oh, Courtright, and Colbert, 2011; Wong and Cummings, 2007) and is an important consideration for organizations continuing to implement remote physiotherapy regardless of context.

Patients feedback collected from sites who took part in interviews, from workshops and from the literature triangulates the data we collected from physiotherapists. Data from across all sources report that patients found it saved on travel time, cost, was flexible, and aided communication (Hawley-Hague et al., 2022) for those who could access it. Patients are supportive of a blended approach and suggest that remote physiotherapy should be offered as part of the options of care.

Limitations

This was a large national survey, which had good representation across UK physiotherapy clinics/teams. However, recruitment was electronic via e-mail and social media, so some clinic/team leads may have been excluded due to lack of digital literacy. All CSP members were emailed and were asked to self-identify as a lead of remote physiotherapy delivery. The research team had no way to verify if survey respondents were leads of remote physiotherapy delivery and were therefore unable to exclude those who were ineligible. There is the potential for self-selection bias with only the most positive clinic/team leads responding, and we only surveyed or interviewed physio-therapists so have not captured all perspectives related to rehabilitation, even though some participants led multi-disciplinary teams. Missing data could also have affected representativeness. We attempted to recruit sites for interview from all four countries of the UK but only recruited from England, which may limit generalizability to Scotland, Wales, and Northern Ireland. However, participants from Wales and Scotland were represented in the external validation workshops. In addition, these findings may not be generalizable to other countries with different healthcare delivery models.

Finally, we only captured data at two specific timepoints, one early in the pandemic following the first lockdown (July–August 2020), and then during the "third lockdown" in Winter/Spring 2021. We therefore do not know to what extent the acceptability of remote delivery here was the result of the pandemic itself or how much was directly attributable to the mode of delivery.

Conclusion

UK physiotherapists report remote physiotherapy to be feasible, acceptable, and safe for those who were able to access it. Remote consultations were rarely reported as accessible for individuals with impairments and individuals who do not speak English. Based on these findings we suggest that it can be used for subjective assessments, triage, monitoring, education, advice, and self-management support to patients requiring straight forward assessment and interventions. A blended approach combining remote and/or in-person consultations is recommended, putting patients at the center of decision-making. Further implementation research is required to understand how remote physio-therapy can be maintained post-pandemic.

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