Scientific Research Publishing

Open Journal of Therapy and Rehabilitation, 2025, 13(3), 144-158
https://www.scirp.org/journal/ojtr
ISSN Online: 2332-1830
ISSN Print: 2332-1822

Post-COVID Rehabilitation Service: COVID-19 Yorkshire Rehabilitation Scale (C-19 YRS) and Health-Related Quality of Life EuroQol Five-Dimensional Five-Level Questionnaire (EQ-5D-5L) Outcomes

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How to cite this paper: Griffiths, C., James, N., Jiang, H. and Keiper, S. (2025) Post-COVID Rehabilitation Service: COVID-19 Yorkshire Rehabilitation Scale (C-19 YRS) and Health-Related Quality of Life EuroQol Five-Dimensional Five-Level Questionnaire (EQ-5D-5L) Outcomes. *Open Journal of Therapy and Rehabilitation*, **13**, 144-158.
https://doi.org/10.4236/ojtr.2025.133013

Received: July 26, 2025
Accepted: August 18, 2025
Published: August 21, 2025

Abstract

Background: In the United Kingdom (UK) long COVID symptoms are defined as symptoms that are unexplained by an alternative diagnosis and persist for more than 12 weeks after acute COVID-19. Long COVID services have been commissioned in the UK to respond to patient needs. **Purpose/Aim:** To investigate whether a post-COVID rehabilitation service and its interventions have a positive impact on patients' outcomes as measured by the COVID-19 Yorkshire Rehabilitation Scale (C-19 YRS) and the EuroQol five-dimensional, five-level questionnaire (EQ-5D-5L) health-related quality of life scale. **Methods:** A retrospective investigation was conducted using routinely collected data (baseline and a 12-week follow-up) from service users of a post-COVID rehabilitation service. Twenty-one EQ-5D-5L and thirty C-19 YRS datasets were collected. **Results:** There was a significant improvement in symptom severity on the C-19 YRS score from baseline (M = 19.57, SD = 6.41) to 12-week follow-up (M = 17.13, SD = 7.60), with a medium effect size. There was a significant improvement in functional disability on the C-19 YRS score from baseline (M = 8.14, SD = 4.20) to 12-week follow-up (M = 7.17, SD = 4.38), with a small-medium effect size. There was an improvement in C-19 YRS "overall health", but this was not statistically significant. The EQ-5D-5L dimension of "usual activities" improved, with a significant decrease in issues reported from baseline (M = 3.19, SD = 1.03) to follow-up (M = 2.86, SD = 1.24), with a small-moderate effect size. The EQ-5D-5L dimension "mobility

issues" improved; participants reported mild to moderate issues (level 2) at baseline and no issues (level 1) at follow-up. **Conclusion:** The results show that a post-COVID rehabilitation service can have a significant positive impact on symptoms of long COVID and real-world functioning. It is essential that treating long COVID symptoms remains a healthcare priority. As there is a move away from specific long COVID services there is a need for effective services for tackling long-term conditions and symptoms that have occurred due to COVID-19.

Keywords

C-19 YRS, EQ-5D-5L, Quality of Life, Long COVID, Brain Fog, Breathlessness, Fatigue, Relaxation, Pain, Depression, Anxiety

1. Introduction

The persisting sequelae and longer-term complications of COVID-19 were named "long COVID" by people experiencing them on May 20, 2020 [1]. This term was used by people living with these sequelae to demand recognition and access to treatment [2]. The UK's National Institute for Health and Clinical Excellence (NICE) uses the titles: "ongoing symptomatic COVID-19" and "post-COVID-19 syndrome", and the definition: "symptoms that are unexplained by an alternative diagnosis and persist for more than 12 weeks after acute COVID-19" [3].

Estimates of the incidence of long COVID after acute infection range from 50–85% for unvaccinated people who were hospitalised, 10% - 35% for unvaccinated people who were not hospitalised, and 8% - 12% for vaccinated individuals who were not hospitalised [4]. UK data for the prevalence of long COVID symptoms 12 weeks or more after acute COVID-19 infection in England and Scotland (collected in February and March 2024) were 1.8% [5]. People aged 35 - 65 years were the most affected; of the individuals who provided a date, 71% had had symptoms for at least 1 year, 51% for at least 2 years, and 31% for at least 3 years [5]. Long COVID prevalence is strongly associated with area-level social deprivation, female sex, age, smoking, obesity, and co-morbidities [6].

People experience long COVID as a heterogeneous condition, with a wide variety of physical and psychological symptoms and consequences [7]. A systematic review and meta-analysis found that the most frequently reported long COVID symptoms were linked to mental health, gastrointestinal, cardiopulmonary, neurological, and pain issues [8]. The most common symptom in long COVID is fatigue, which often becomes worse following physical or mental exertion (known as "post-exertional symptom exacerbation"), and has been associated with sleep disturbance, pain, and loss of cognitive function [9]. Other common symptoms include persistent respiratory symptoms (especially breathlessness), allergic symptoms (rashes, streaming eyes, or blocked nose), throat and upper gastrointestinal symptoms, dizziness, anxiety, depression, and loss of muscle mass and

strength [9]. These symptoms result in functional impairment: individuals cannot do what they previously did [9], with negative consequences for individuals' sense of identity, employment status, and relationships with family and friends [7]. A systematic review and meta-synthesis of qualitative evidence indicates a high burden of biopsychosocial challenges among people with long COVID [10].

Various mechanistic changes may underlie symptoms. These may include disruption of cellular energy production due to mitochondrial dysfunction, decreased oxygen supply due to coagulopathy and endothelial damage, and immune dysregulation [11]. Therefore, multidisciplinary healthcare and treatment approaches employing epidemiology, immunology, and multisystem physiology are required to restore health [11].

Long COVID course and recovery vary considerably, and some people experience periods of recovery followed by relapse [9]. The recovery rate is highest in people who had less severe acute COVID-19 illness, are in the first 6 months after illness, and were vaccinated; people whose illness has lasted between 6 months and 2 years are less likely to fully recover [9]. Of 460 patients referred to long COVID services, 112 (mean time since infection 38 months; mean time post-discharge of 10 months) completed outcome measures. Of these service users, 90% continued to experience long COVID symptoms and associated disability, with most having not returned to their pre-COVID-19 health status [12]. People with persistent long COVID symptoms face substantial economic challenges if they are unable to work, either at their premorbid level or at all [9].

The complexity, uniqueness, and variability of symptoms impacting everyday life present challenges for healthcare services seeking to address symptoms and their impact [13]. There is evidence of a substantial unmet clinical need, with difficulties for many in accessing appropriate healthcare services and treatment, and suboptimal recognition of and response to their illness [14]. Supported self-management interventions that rely on signposting and generic advice and information rather than personalized treatment approaches have evidence of limited effectiveness [13].

In the UK, there is a tiered approach to long COVID services set out in the NHS England [3] "Commissioning guidance for Post COVID services". Tier 1 is for the most mildly affected, who are provided with online resources and other information to self-manage. Tier 2 is primary care General Practitioner (GP) based support, which involves excluding other conditions; educating; arranging required input, e.g., physiotherapy; managing comorbidities; organizing further investigations and referrals to services; and working with the patient to set goals and monitor recovery [4] [15]. Tier 3 is referral to specialist services for long COVID and is for patients with more severe and/or persistent symptoms [4] [16]. Tier 3 services were developed in response to NHS England's [3] call for broad-based multi-disciplinary teams to provide holistic, symptom-led rehabilitation for those whose symptoms were having a significant impact on their daily activities. Ser-

vices comprise a multidisciplinary team of occupational therapists, physiotherapists, dietitians, psychologists, employment consultants, and consultants in medical specialties of rehabilitation medicine, psychiatry, respiratory medicine, and cardiology [17].

A longitudinal qualitative study with 80 participants living with long COVID and 12 healthcare practitioners involved in their healthcare was conducted in the UK to explore the healthcare experiences of those with long COVID; it highlighted ongoing challenges in seeking and accessing support, including barriers, delays, and disruptions in obtaining treatment and achieving recognition and understanding of the complexity of their symptoms [18]. The study identified the need for healthcare providers to regularly review and adapt healthcare plans to accommodate the dynamic shifts in patient needs [18]. Both long COVID healthcare service staff and patients have emphasised the importance and value of staff listening to and believing the experiences of patients.

Outcome data from long COVID services outside of the UK are sparse. Australian data from a 12-week long COVID multidisciplinary service (with access to physiotherapy, occupational therapy, exercise physiology, social work, clinical psychology, neuropsychology, dietetics, rehabilitation physician, and music therapy) found that participants had improved understanding and control of symptoms on the Brief Illness Perception Questionnaire (BIPQ) [19], and there was a small average improvement in self-reported health related quality of life (EQ-5D-5L VAS) [20]. The thematic analysis of patient feedback revealed that the service was helpful but did not fully meet the needs of all service users [20].

Designing these new long COVID services that did not exist previously enabled healthcare teams to co-produce services with patient groups and various professional groups, with significant benefits including skills transference between professions [21]. Healthcare providers gaining expertise in diagnosing and treating long COVID has helped refine care approaches for this condition [22]. Collective learning has occurred through case-based reasoning in which practitioners build lessons from individual cases to use in further practice [4].

Given the complex and heterogeneous nature of long COVID, it is essential to evaluate not only the persistence and severity of symptoms, but also their broader impact on individuals' daily functioning and overall quality of life. Evaluating these domains can help determine whether interventions are leading to meaningful improvements from the patient's perspective and inform the ongoing development of responsive, person-centered healthcare services. Therefore, this study sought to find out whether a post-COVID rehabilitation service and its interventions have a positive impact on patients' outcomes, as measured by the COVID-19 Yorkshire Rehabilitation Scale (C-19 YRS) and EuroQol five-dimensional five-level questionnaire (EQ-5D-5L) health-related quality of life measure. Correlational analysis between C-19 YRS and EQ-5D-5L is also undertaken to understand links between these measures and their component factors.

2. Methods

2.1. Design

The study was a retrospective investigation using routinely collected data from patients utilizing a post-COVID rehabilitation service. The study used opportunity/convenience sampling, where participants are selected based on their availability and willingness to participate. There was no predetermined sample size.

2.2. Approval

The project was undertaken from 11.06.2024 to 10.06.2025. Approval for the study was obtained from the NHS healthcare trust in which the services were based (reference for approval: LongCOVID2024). The study was undertaken in accordance with the Declaration of Helsinki.

2.3. Setting

The sample was recruited from people referred to the post-COVID rehabilitation service. This service provides rehabilitation support to help people living with long COVID manage their ongoing symptoms. The post-COVID rehabilitation service has a multi-disciplinary team (MDT) model of care comprising occupational therapy (OT), physiotherapy, a registered nurse, care coordinators, a GP supporting in an advisory capacity, and a psychologist. Patients with long COVID symptoms are referred to the service by their GP.

A detailed medical and physical history is collected, including: a chronological symptom account; pre-morbid health status; number of infections; severity and duration of the acute COVID-19 episode or episodes; vaccination status; and how symptoms have affected their work, leisure activities, home life, and social relationships. The patient-reported outcome measure (PROM) C19-YRS is used, as people might not report all symptoms unless specifically asked. A key aim of the service is to help people self-manage their symptoms to enable them to do the activities that are important to and meaningful for them.

2.4. Post-COVID Rehabilitation Service Interventions

The information gathered from the C-19 YRS and EQ-5D-5L informs the basis of the discussion about the patients' ongoing symptoms. The patient is encouraged to set goals they would like to achieve while under the care of the service. An action plan of interventions to help the patient make progress towards their goals and understand how to manage their symptoms is agreed upon. The team has a weekly MDT meeting for discussing the caseload. At 12 weeks, patients are asked to repeat the outcome measures and a follow-up review with a clinician is arranged. If patients are effectively managing their symptoms using the tools suggested and the interventions provided, they are offered the option of patient-initiated follow-up (PIFU) in three months. At the end of the three months on PIFU, if no further needs for interventions have been identified, the referral is ended, and the patient's GP and the patient are sent a copy of the discharge letter.

Fatigue management is delivered via one-to-one sessions (home visit or Microsoft Teams) or a two-session in-person fatigue management group. Group sessions provide an opportunity for discussion with others also experiencing fatigue about their experiences of this symptom and what has helped them. "Managing brain fog" sessions are offered on a one-to-one basis with an OT, usually via Microsoft Teams. The sessions are individualised and consider factors that might be exacerbating the severity of brain fog and identify strategies and aids to support cognitive function in everyday activities and lessen the impact of brain fog on day-to-day life.

Employment support is offered; this can include letters that patients can share with their employers to help facilitate a discussion about their long COVID symptoms in the workplace. Further advice for employers about supporting people with long COVID at work can be found on the service's website. Where relevant, discussions with patients are undertaken about accessing occupational health assessments, reasonable adjustments, union support, and phased return to work from sick leave.

Physiotherapy assessment is offered via in-person clinic appointments to assess for breathing pattern disorders, deconditioning of global muscular function, and posture issues. An exercise programme is prescribed based on the patient's presentation. Appropriate psychology support and treatment are offered; this can include cognitive behavioural therapy (CBT), eye movement desensitization and reprocessing (EMDR), compassion focused therapy (CFT), and acceptance and commitment therapy (ACT). Referral may also be made to NHS psychotherapy services (Talking Therapies) where appropriate.

In-person clinic appointments are offered by a registered nurse and care coordinators; this may include completion of a ten-minute active stand test to screen for postural orthostatic tachycardia syndrome (POTS). When appropriate, POTS lifestyle advice is provided, and an onward referral is made if required. Relaxation techniques (e.g., meditation or breathing exercises) are delivered on a one-to-one basis, either at a home visit or via Microsoft Teams.

Connection with a GP is available at any point along the pathway when needed, e.g., for further medical investigations. Onward referrals to other services are made when appropriate, for example: dietitian, speech and language therapy, social prescribing service, and/or musculoskeletal (MSK) physiotherapy. The type and number of sessions patients are offered between the initial assessment and the 12-week follow-up vary depending on need.

2.5. Inclusion/Exclusion Criteria

Participants were included if they were determined by staff to have symptoms of long Covid based on NICE guidelines, consented to, and were able to complete the C-19 YRS and EQ-5D-5L patient-reported outcome measures (via the software application). Exclusion criteria comprised: patients who declined to complete the C-19 YRS and EQ-5D-5L patient-reported outcome measures and pa-

tients who did not have symptoms of long COVID. Numbers excluded and reasons were not recorded.

2.6. Procedure

On acceptance of referral, patients are sent an email explaining that the service uses the C-19 YRS software app and that they are required to register with the app. If the patient consents, a care coordinator will register the patient with the app and send them the login details. The patient then completes the C-19 YRS and EQ-5D-5L, and once completed, an administrator contacts the patient to arrange an initial assessment appointment with a clinician. If the patient declines to register with the app or is unable to access the app, the questionnaires are sent to the patient via email or post to complete and return.

Baseline data were collected at the point of entry to the service. Follow-up self-report measures were collected after 12 weeks of using the service. Demographic information (sex, age, ethnicity) and outcomes data were extracted from clinical records containing routinely collected data.

2.7. Measures

Both the C-19 YRS and EQ-5D-5L have been recommended for use in the national commissioning guidance for post-COVID services [3]: "The 5-level EQ-5D version (EQ-5D-5L), Health-Related Quality of Life (HRQOL) measure should be completed for all patients on assessment, during follow-up or rehabilitation support at three or six months."

EuroQol five-dimensional five-level questionnaire (EQ-5D-5L) [23] [24] is a five-dimension and visual analogue scale (VAS); it is a self-rated measure of health-related quality of life and overall health status developed by the EuroQol Group to provide a simple, standardised measure for clinical appraisal [23]. Its five dimensions comprise mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, each of which is measured within five levels (no problems, slight problems, moderate problems, severe problems, and extreme problems). The digits from the five dimensions are combined to create a five-digit number measuring holistic health state. Each health state can be assigned an index score based on societal preference weights for the health state. Health state index score 1 = the value of full health, with higher scores indicating higher health utility. The EQ VAS is a subjective measure of a participant's current health, ranging from 0 (worst health imaginable) to 100 (best health imaginable). The EQ-5D-5L has good construct validity and is sensitive to change [25]. The EQ-5D-5L is a validated measure of health status widely used in national health surveys worldwide and in clinical trials of health interventions [26] [27]. Additionally, the EQ-5D-5L is recommended by the UK's National Institute for Health and Care Excellence (NICE) to estimate health state utility weights for quality-adjusted life years (QALYs) [28].

The COVID-19 Yorkshire Rehabilitation Scale (C19-YRS) is the first condition-

specific, validated scale for patient assessment and monitoring in post-COVID-19 syndrome (PCS); the 22-item scale's subscales are symptom severity, functional disability, additional symptoms, and overall health [29]. The C19-YRS is used to record patients' symptoms, functioning, and disability, and is clinically useful and satisfies standard psychometric criteria, with evidence of its suitability as a measure of post-COVID symptoms (PCS) [30]. The items in the scale provide qualitative information to clinicians to assist in targeting their clinical interventions to individuals' needs [29]. The scale allows patients and health care staff to monitor these aspects over the course of the condition, potentially capture long COVID fluctuations, and assess the impact of rehabilitation interventions for the condition [29].

2.8. Analysis

Data were analyzed using the statistical software package SPSS Statistics 26.

3. Results

3.1. EQ-5D-5L

Descriptive Statistics

In total, there were ten females (47.6%) and eleven males (52.4%) who completed the EQ-5D-5L at both baseline and follow-up. Their age range was 24 - 74 years, $M = 48.5$ years, $SD = 13.29$. Table 1 shows self-reported ethnicity.

Table 1. Ethnicity.

Ethnicity	Number of participants (%)
White (includes any white background)	10 (47.52%) (90.9% of those who stated their ethnicity)
Asian (includes any Asian background, for example, Bangladeshi, Chinese, Indian, or Pakistani)	1 (4.76%) (9.1% of those who stated their ethnicity)
Not stated	10 (47.62%)

The only EQ-5D-5L dimension which saw a significant improvement was for "usual activities", with a significant ($p = 0.049$) decrease in issues reported from baseline ($M = 3.19$, $SD = 1.03$) to follow-up ($M = 2.86$, $SD = 1.24$), with a small-moderate effect size (Cohen's $d = 0.456$). There were decreases (all non-significant) in issues reported for all of the other four domains, namely in "mobility" (baseline [$M = 2.29$, $SD = 1.01$] to follow-up [$M = 2.10$, $SD = 1.18$]), "self-care" (baseline [$M = 1.67$, $SD = 0.97$] to follow-up [$M = 1.52$, $SD = 0.93$]), "pain/discomfort" (baseline [$M = 2.86$, $SD = 1.11$] to follow-up [$M = 2.90$, $SD = 1.22$]), and "anxiety/depression" (baseline [$M = 2.67$, $SD = 1.39$] to follow-up [$M = 2.57$, $SD = 1.17$]), with all showing low effect sizes (Cohen's $d = -0.052$ to 0.218). Additionally, there was a non-significant ($p = 0.874$) increase in health today score from baseline ($M = 45.14$, $SD = 20.52$) to follow-up ($M = 45.71$, $SD = 20.23$), with a small effect size (Cohen's $d = -0.035$). Table 2 presents the EQ-5D-5L dimension change and Table 3 EQ-5D-5L dimension levels.

Table 2. EQ-5D-5L dimension change.

EQ-5D-5L dimension	Baseline *M* (*SD*)	Follow-up *M* (*SD*)	*t*	*p*	*d*
Mobility	2.29 (1.01)	2.10 (1.18)	0.847	0.407	0.185
Self-care	1.67 (0.97)	1.52 (0.93)	0.441	0.329	0.218
Usual activities	3.19 (1.03)	2.86 (1.24)	2.092	0.049*	0.456
Pain/discomfort	2.86 (1.11)	2.90 (1.22)	0.371	0.815	−0.052
Anxiety/depression	2.67 (1.39)	2.57 (1.16)	0.525	0.649	0.101
Health today	45.14 (20.52)	45.71 (20.23)	6.838	0.874	−0.035

*significant at $p < 0.05$ level.

The only EQ-5D-5L dimension that changed level from baseline to follow-up was mobility issues, with most participants reporting mild to moderate issues (level 2) at baseline and no issues (level 1) at follow-up. The other four dimensions (self-care, usual activities, pain/discomfort, and anxiety/depression) remained at the same level from baseline to follow-up (which was level 2—mild to moderate issues for all dimensions apart from self-care, which was level 1—no issues).

Table 3. EQ-5D-5L dimension levels.

EQ-5D-5L Dimension	Level	Baseline	Follow-up
Mobility	1	5 (23.81%)	9 (42.86%)
	2	13 (61.90%)	8 (38.10%)
	3	3 (14.29%)	4 (19.05%)
Self-care	1	13 (61.90%)	15 (71.43%)
	2	7 (33.33%)	5 (23.81%)
	3	1 (4.76%)	1 (4.76%)
Usual activities	1	0 (0.00%)	2 (9.52%)
	2	14 (66.67%)	13 (61.90%)
	3	7 (33.33%)	6 (28.57%)
Pain/discomfort	1	2 (9.52%)	1 (4.76%)
	2	14 (66.67%)	13 (61.90%)
	3	5 (23.81%)	7 (33.33%)
Anxiety/depression	1	5 (23.81%)	4 (19.05%)
	2	10 (47.62%)	12 (57.14%)
	3	6 (28.57%)	5 (23.81%)

1 = no issues (1), 2 = mild to moderate issues (2 - 3), 3 = severe to extreme issues (4 - 5) reported.

3.2. C-19 YRS

Seventeen females (56.67%) and thirteen males (43.33%) completed the C-19 YRS at both baseline and follow-up. Their age range was 24 - 74 years, $M = 50.6$ years, $SD = 13.31$. Table 4 presents self-reported ethnicity.

Table 4. Ethnicity.

Ethnicity	Number of participants (%)
White (includes any White background)	13 (43.33%) (86.7% of those reported)
Asian (includes any Asian background, for example, Bangladeshi, Chinese, Indian, or Pakistani)	2 (6.67%) (13.3% of those reported)
Not stated	15 (50%)

There was a non-significant increase in overall health C-19 YRS score from baseline ($M = 4.33$, $SD = 2.07$) to 12-week follow-up ($M = 4.63$, $SD = 1.88$), with a small effect size (Cohen's $d = 0.190$). There was a significant decrease in symptom severity C-19 YRS score from baseline ($M = 19.57$, $SD = 6.41$) to 12-week follow-up ($M = 17.13$, $SD = 7.60$), with a medium effect size (Cohen's $d = 0.544$). There was a significant decrease in functional disability C-19 YRS score from baseline ($M = 8.14$, $SD = 4.20$) to 12-week follow-up ($M = 7.17$, $SD = 4.38$), with a small-medium effect size (Cohen's $d = 0.494$). Table 5 presents C-19 YRS dimension change.

Table 5. C-19 YRS dimension changes.

	Baseline M (SD)	Follow-up M (SD)	t	p	d
Overall Health	4.33 (2.07)	4.63 (1.88)	−1.041	0.307	0.190
Symptom Severity	19.57 (6.41)	17.13 (7.60)	2.982	0.006*	0.544
Functional Disability	8.14 (4.20)	7.17 (4.38)	2.660	0.013*	0.494

*significant at $p < 0.05$ level.

3.3. Correlational Analysis

There was a non-significant weak negative correlation ($r = -0.215$) between the C-19 YRS overall health baseline score and the EQ-5D-5L health today score. There was a non-significant weak negative correlation ($r = -0.246$) between these scores at follow-up. There was a significant ($p < 0.001$) moderate-strong positive correlation ($r = 0.686$) between the C-19 YRS overall health baseline and follow-up scores, indicating that a higher overall health baseline score was correlated with a higher overall follow-up score. There was a non-significant ($p = 0.61$) moderate positive correlation ($r = 0.415$) between the EQ-5D-5L health today baseline and follow-up score. There was a non-significant ($p = 0.349$) weak negative correlation ($r = -0.215$) between the baseline C-19 YRS overall health and baseline EQ-5D-5L health today score. There was a non-significant ($p = 0.283$) weak negative correlation ($r = -0.246$) between the follow-up C-19 YRS overall health and follow-up EQ-5D-5L health today score.

4. Discussion

This study sought to find out if a post-COVID rehabilitation service and the interventions it provides had a positive impact on patients' outcomes as measured

by the COVID-19 Yorkshire Rehabilitation Scale (C-19 YRS) and the EuroQol five-dimensional five-level questionnaire (EQ-5D-5L) health-related quality of life measure. There were significant improvements in the EQ-5D-5L dimension of "usual activities" and a reduction in average mobility issues from "mild to moderate issues" at baseline to "no issues" at follow-up. There was a significant improvement in "symptom severity" and "functional disability" on the C-19 YRS. The C-19 YRS results generally align with those reported in the NHS national evaluation [3]. The findings also align with the NHS national survey in that the average patient at three months still had long COVID symptom burden and disability, *i.e.*, on average, the condition had improved, but many patients were not fully recovered.

The significant decrease in symptom severity on the C-19 YRS shows that patients using the service experienced improvements in their reported symptoms, which could include: breathlessness; cough/throat sensitivity/voice change; fatigue (tiredness); smell/taste; pain/discomfort; cognition; palpitations/dizziness; post-exertional malaise (worsening of symptoms); anxiety/mood and/or sleep. Improvements in the "usual activities" dimension of the EQ-5D-5L suggest a positive shift in ability to engage in everyday roles and responsibilities. This reflects meaningful progress, given the significant functional impairments associated with long COVID, particularly in relation to fatigue, cognitive dysfunction, and post-exertional symptom exacerbation, and enhanced capacity to perform routine activities such as work, study, housework, or caregiving [4] [7]. These improvements indicate that the interventions provided may have contributed to improved symptom management and adaptation strategies [12]. Improvements can contribute to broader psychosocial benefits, including increased confidence, social participation, and sense of identity, which are frequently disrupted by long COVID [10]. The improvements in mobility (walking about) indicate that the post-COVID rehabilitation service had enabled improvements in patients' ability to get about, allowing them to better undertake activities of daily living (ADL), do things that they choose to do, and achieve their goals. These findings provide evidence that targeted interventions can lead to measurable gains in symptom management and functioning, reinforcing the value of specialist long COVID services in addressing complex needs.

The non-significant, and often weak correlations between the C-19 YRS and EQ-5D-5L mean scores indicate that there is a lack of association between scores from the two measures. This may be because both are measuring different outcomes: the C-19 YRS asks participants about specific COVID-related symptoms e.g. breathlessness and coughing, whereas the EQ-5D-5L is a more general outcome measure, which asks participants to rate on five overarching domains. Even if a participant reports symptoms on the C-19 YRS, they might still report good health related quality of life on the EQ-5D-5L. This suggests that some people living with long COVID and have maybe adjusted their lives to "live with" its symptoms. Further qualitative exploration around how patients have adapted

their lives to long COVID symptoms is needed.

By working across service boundaries, long COVID services have enabled closer collaboration between primary and specialist services, and they have helped a broader multidisciplinary team become involved in complex care and treatment decision-making to effectively meet therapeutic needs [21]. The use of vocational rehabilitation and employment support referrals has shown promising outcomes [21]. There is potential for service improvement. Patient experience research indicates that support mechanisms must incorporate lived experiences and foster strong therapeutic relationships between patients and professionals to improve patient outcomes [31]. Healthcare professionals would benefit from collaborating with their patients in co-producing services and providing evidence-based online resources [32].

5. Further Research

5.1. Limitations

There were several limitations of the study. There was no control group, the sample size was small, and the treatment was open-label and adjunct to any existing treatments or therapies. Pre-existing diagnoses prior to COVID-19 were not captured. This study collected outcome measures after twelve weeks of service use, with no later follow-up data collection; it is recommended that future studies employ additional follow-up data collection points, e.g., 6 and 12 months. The participants were from a single UK county, reducing generalisability. There were more females than males, and so the results are less generalizable to males; however, this study's sample has a more equal balance of males to females than the NHS national evaluation, which had a female: male ratio of 2.1:1 [3]. The average age in this study was similar to that of the NHS national evaluation [3].

5.2. Conclusions

This study adds to the findings of other published service data that show outpatient-delivered treatments by a multidisciplinary post-COVID rehabilitation service are effective in assessing and reducing symptoms and improving functioning. These findings highlight the value of individually tailored interventions to address the complex and persistent impact of long COVID and underscore the importance of using robust patient-reported outcome measures. More evidence would be valuable regarding the long-term effectiveness of long COVID services and the potential need for ongoing treatment to sustain any benefits gained.

It is essential that treating long COVID remains a health-care priority; gaining more understanding of the mechanisms that drive the long-term effects of COVID-19 on all body organs should help in the development of new tests, new treatments, and improved outcomes [33]. The varied, fluctuating, and persistent symptoms and psychological and functional consequences experienced by people with long COVID indicate a need for continued co-produced, multidisciplinary, holistic, patient-centred assessment, management, treatment, and specialist referral.

The ideal model for long COVID treatment in the future should be influenced by the needs of patients; for example, services to address fatigue. As there is a move away from services specifically for long COVID, there is a need for effective services and interventions tackling long-term conditions and symptoms that have occurred due to COVID-19 [21].

Acknowledgements

We wish to thank the patients and the staff at the NHS Trust for their support.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Callard, F. and Perego, E. (2021) How and Why Patients Made Long Covid. *Social Science & Medicine*, **268**, Article 113426. https://doi.org/10.1016/j.socscimed.2020.113426

[2] Prior, R. (2024) The Long Haul: How Long Covid Survivors Are Revolutionizing Health Care. MIT Press.

[3] NHS England (2022) Commissioning Guidance for Post COVID Services for Adults, Children, and Young People. https://www.england.nhs.uk/publication/national-commissioning-guidance-for-post-covid-services/

[4] Greenhalgh, T., Darbyshire, J.L., Lee, C., Ladds, E. and Ceolta-Smith, J. (2024) What Is Quality in Long COVID Care? Lessons from a National Quality Improvement Collaborative and Multi-Site Ethnography. *BMC Medicine*, **22**, Article No. 159. https://doi.org/10.1186/s12916-024-03371-6

[5] https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/selfreportedcoronaviruscovid19infectionsandassociatedsymptomsenglandandscotland/november2023tomarch2024

[6] Shabnam, S., Razieh, C., Dambha-Miller, H., Yates, T., Gillies, C., Chudasama, Y.V., *et al*. (2023) Socioeconomic Inequalities of Long COVID: A Retrospective Population-Based Cohort Study in the United Kingdom. *Journal of the Royal Society of Medicine*, **116**, 263-273. https://doi.org/10.1177/01410768231168377

[7] Macpherson, K., Cooper, K., Harbour, J., Mahal, D., Miller, C. and Nairn, M. (2022) Experiences of Living with Long COVID and of Accessing Healthcare Services: A Qualitative Systematic Review. *BMJ Open*, **12**, e050979. https://doi.org/10.1136/bmjopen-2021-050979

[8] Natarajan, A., Shetty, A., Delanerolle, G., Zeng, Y., Zhang, Y., Raymont, V., *et al*. (2023) A Systematic Review and Meta-Analysis of Long COVID Symptoms. *Systematic Reviews*, **12**, Article No. 88. https://doi.org/10.1186/s13643-023-02250-0

[9] Greenhalgh, T., Sivan, M., Perlowski, A. and Nikolich, J.Ž. (2024) Long COVID: A Clinical Update. *The Lancet*, **404**, 707-724. https://doi.org/10.1016/s0140-6736(24)01136-x

[10] O'Mahoney, L.L., Routen, A., Gillies, C., Ekezie, W., Welford, A., Zhang, A., *et al*. (2023) The Prevalence and Long-Term Health Effects of Long Covid among Hospitalised and Non-Hospitalised Populations: A Systematic Review and Meta-Analysis. *E Clinical Medicine*, **55**, Article 101762. https://doi.org/10.1016/j.eclinm.2022.101762

[11] Astin, R., Banerjee, A., Baker, M.R., Dani, M., Ford, E., Hull, J.H., *et al*. (2023) Long COVID: Mechanisms, Risk Factors and Recovery. *Experimental Physiology*, **108**, 12-27. https://doi.org/10.1113/ep090802

[12] Bodey, R., Grimaldi, J., Tait, H., Godfrey, B., Witton, S., Shardha, J., *et al*. (2024) How Long Is Long COVID? Evaluation of Long-Term Health Status in Individuals Discharged from a Specialist Community Long COVID Service. *Journal of Clinical Medicine*, **13**, Article 5817. https://doi.org/10.3390/jcm13195817

[13] Busse, M., Pallmann, P., Riaz, M., Potter, C., Leggat, F.J., Harris, S., *et al*. (2025) Effectiveness of a Personalised Self-Management Intervention for People Living with Long Covid (Listen Trial): Pragmatic, Multicentre, Parallel Group, Randomised Controlled Trial. *BMJ Medicine*, **4**, e001068. https://doi.org/10.1136/bmjmed-2024-001068

[14] Knuppel, A., Boyd, A., Macleod, J., Chaturvedi, N. and Williams, D.M. (2024) The Long COVID Evidence Gap in England. *The Lancet*, **403**, 1981-1982. https://doi.org/10.1016/s0140-6736(24)00744-x

[15] NICE (2022) Royal College of General Practitioners. COVID-19 Rapid Guideline: Managing the Long-Term Effects of COVID-19. National Institute for Health and Care Excellence, London.

[16] Wolf, S., Zechmeister-Koss, I. and Erdös, J. (2022) Possible Long COVID Healthcare Pathways: A Scoping Review. *BMC Health Services Research*, **22**, Article No. 1076. https://doi.org/10.1186/s12913-022-08384-6

[17] Parkin, A., Davison, J., Tarrant, R., Ross, D., Halpin, S., Simms, A., *et al*. (2021) A Multidisciplinary NHS COVID-19 Service to Manage Post-Covid-19 Syndrome in the Community. *Journal of Primary Care & Community Health*, **12**, 1-9. https://doi.org/10.1177/21501327211010994

[18] Fang, C., Baz, S.A., Sheard, L. and Carpentieri, J.D. (2024) "They Seemed to Be Like Cogs Working in Different Directions": A Longitudinal Qualitative Study on Long COVID Healthcare Services in the United Kingdom from a Person-Centred Lens. *BMC Health Services Research*, **24**, Article No. 406. https://doi.org/10.1186/s12913-024-10891-7

[19] Broadbent, E., Petrie, K.J., Main, J. and Weinman, J. (2006) The Brief Illness Perception Questionnaire. *Journal of Psychosomatic Research*, **60**, 631-637. https://doi.org/10.1016/j.jpsychores.2005.10.020

[20] D'Souza, A.N., Merrett, M., Griffin, H., Tran-Duy, A., Struck, C., Fazio, T.N., *et al*. (2024) Recovering from COVID-19 (ReCOV): Feasibility of an Allied-Health-Led Multidisciplinary Outpatient Rehabilitation Service for People with Long Covid. *International Journal of Environmental Research and Public Health*, **21**, Article 958. https://doi.org/10.3390/ijerph21070958

[21] van der Feltz-Cornelis, C., Heightman, M. and Allsopp, G. (2023) Learning from Long COVID: Integrated Care for Multiple Long-Term Conditions. *British Journal of General Practice*, **73**, 196-197. https://doi.org/10.3399/bjgp23x732561

[22] Sunkersing, D., Ramasawmy, M., Alwan, N.A., Clutterbuck, D., Mu, Y., Horstmanshof, K., *et al*. (2024) What Is Current Care for People with Long COVID in England? A Qualitative Interview Study. *BMJ Open*, **14**, e080967. https://doi.org/10.1136/bmjopen-2023-080967

[23] EuroQol Group (1990) EuroQol—A New Facility for the Measurement of Health-Related Quality of Life. *Health Policy*, **16**, 199-208.

[24] van Hout, B., Janssen, M.F., Feng, Y., Kohlmann, T., Busschbach, J., Golicki, D., *et al*. (2012) Interim Scoring for the EQ-5D-5L: Mapping the EQ-5D-5L to EQ-5D-3L

Value Sets. *Value in Health*, **15**, 708-715. https://doi.org/10.1016/j.jval.2012.02.008

[25] Peasgood, T., Brazier, J. and Papaioannou, D. (2012) A systematic Review of the Validity and Responsiveness of EQ-5D and SF-6D for Depression and Anxiety. HEDS Discussion Paper.

[26] Brooks, R. and EuroQol Group (1996) EuroQol: The Current State of Play. *Health Policy*, **37**, 53-72. https://doi.org/10.1016/0168-8510(96)00822-6

[27] Herdman, M., Gudex, C., Lloyd, A., Janssen, M., Kind, P., Parkin, D., *et al*. (2011) Development and Preliminary Testing of the New Five-Level Version of EQ-5D (EQ-5D-5L). *Quality of Life Research*, **20**, 1727-1736. https://doi.org/10.1007/s11136-011-9903-x

[28] NICE (2019) Position Statement on Use of the EQ-5D-5L Value Set for England (Updated October 2019). https://rees-france.com/wp-content/uploads/2018/10/Position-statement-on-use-of-the-EQ-5D-5L.pdf

[29] Sivan, M., Preston, N., Parkin, A., Makower, S., Gee, J., Ross, D., *et al*. (2022) The Modified COVID-19 Yorkshire Rehabilitation Scale (C19-YRSm) Patient-Reported Outcome Measure for Long Covid or Post-COVID-19 Syndrome. *Journal of Medical Virology*, **94**, 4253-4264. https://doi.org/10.1002/jmv.27878

[30] O'Connor, R.J., Preston, N., Parkin, A., Makower, S., Ross, D., Gee, J., *et al*. (2022) The COVID-19 Yorkshire Rehabilitation Scale (C19-YRS): Application and Psychometric Analysis in a Post-COVID-19 Syndrome Cohort. *Journal of Medical Virology*, **94**, 1027-1034. https://doi.org/10.1002/jmv.27415

[31] Thomas, C., Faghy, M.A., Owen, R., Yates, J., Ferraro, F., Bewick, T., *et al*. (2023) Lived Experience of Patients with Long COVID: A Qualitative Study in the UK. *BMJ Open*, **13**, e068481. https://doi.org/10.1136/bmjopen-2022-068481

[32] Turk, F., Sweetman, J., Chew-Graham, C.A., Gabbay, M., Shepherd, J. and van der Feltz-Cornelis, C. (2024) Accessing Care for Long Covid from the Perspectives of Patients and Healthcare Practitioners: A Qualitative Study. *Health Expectations*, **27**, e14008. https://doi.org/10.1111/hex.14008

[33] Brightling, C.E., Evans, R.A., Singapuri, A., Smith, N., Wain, L.V., Brightling, C.E., *et al*. (2023) Long COVID Research: An Update from the PHOSP-COVID Scientific Summit. *The Lancet Respiratory Medicine*, **11**, e93-e94. https://doi.org/10.1016/s2213-2600(23)00341-7