



Association of Respiratory
Nurse Specialists



Delivering Post COVID Rehabilitation

Laura Graham

Respiratory Lead (Currently on Mat Leave)

**Adult Cardiorespiratory Enhanced and Responsive Service (ACERS)
Homerton Healthcare Foundation Trust**

Co-founder of the London AHPS Long COVID Network

Aims

- Brief overview of Post COVID definition and symptoms
- Discuss Evidence for the role of Pulmonary Rehabilitation (PR) in the management of Post COVID patients
- Discuss aspects of the delivery of Post COVID rehabilitation

NICE (2020) Clinical Case Definition: Post COVID Syndrome

NICE National Institute for
Health and Care Excellence



•**Acute COVID-19:** signs and symptoms of COVID-19 for up to 4 weeks.



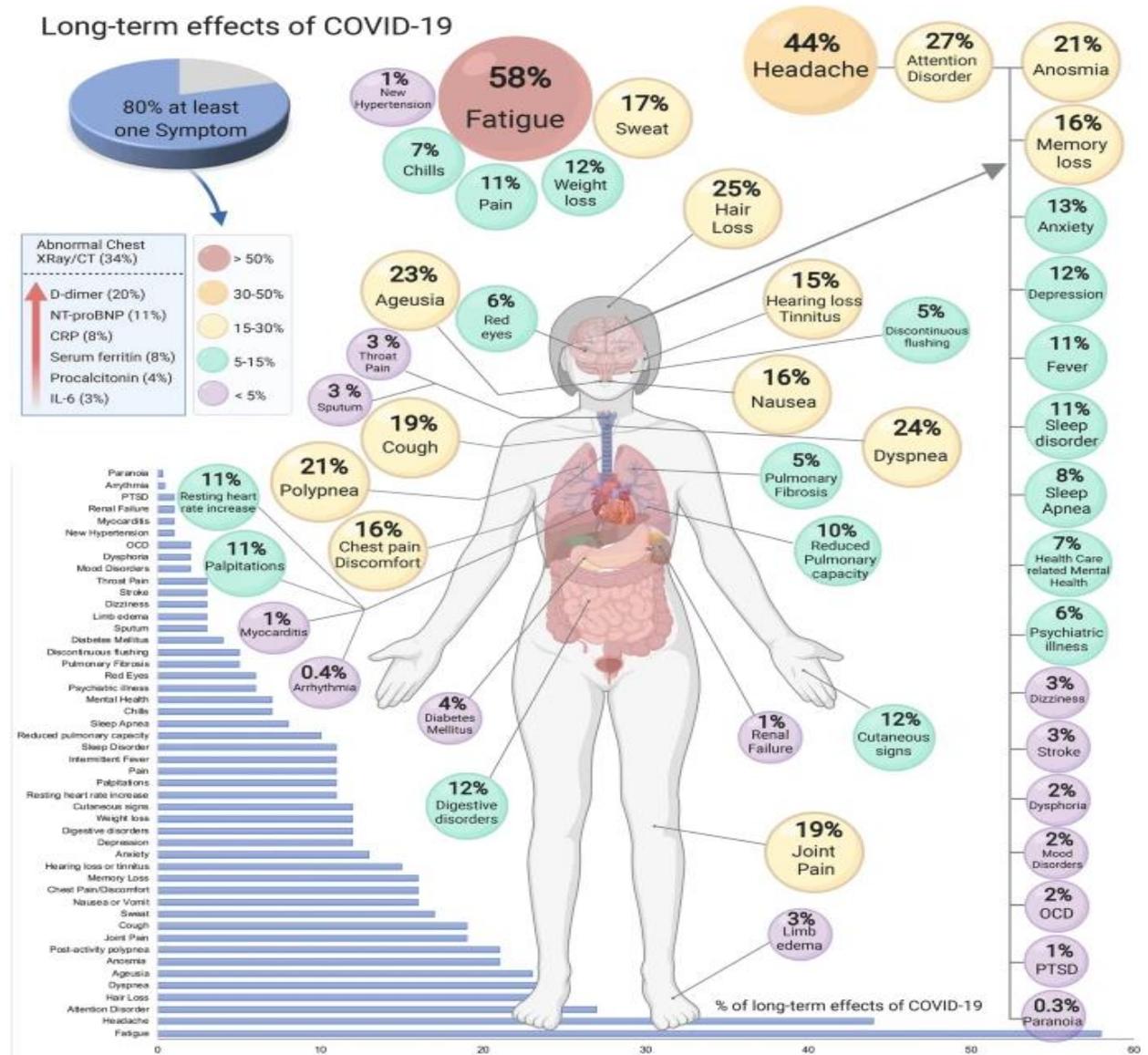
•**Ongoing symptomatic COVID-19:** signs and symptoms of COVID-19 from 4 to 12 weeks.



•**Post-COVID-19 syndrome:** signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are *not explained by an alternative diagnosis*.

Symptom Profile for Post COVID (Long COVID) Syndrome

- Symptom overlap with Chronic Respiratory Disease
- However, many symptoms that do not overlap with chronic respiratory diseases
- Most common Post COVID Symptoms:
 - Fatigue
 - Headache
 - Hair loss
 - Attention disorder
 - Dyspnoea
 - Anosmia
 - Rapid breathing



Lopez-Leon, S., Wegman-Ostrosky, T., Perelman, C. *et al.* More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. *Sci Rep* 11, 16144 (2021). <https://doi.org/10.1038/s41598-021-95565-8>

British Thoracic Society survey of rehabilitation to support recovery of the post-COVID-19 population

Sally J Singh^{1, 2},  Amy C Barradell^{1, 2}, Neil J Greening^{1, 2}, Charlotte Bolton³, Gisli Jenkins³, Louise Preston⁴,  John R Hurst⁵

Correspondence to Dr Sally J Singh; sally.singh@quh-tr.nhs.uk

- Holistic symptom focused programme was recommended
- 6-8 weeks post rehabilitation – based on early evidence from American Thoracic Society (ATS)
- Adapt current rehabilitation service
- Include comprehensive assessment, including screening for fatigue, PTSD, Breathlessness, cough - as well as normal components of a PR assessment

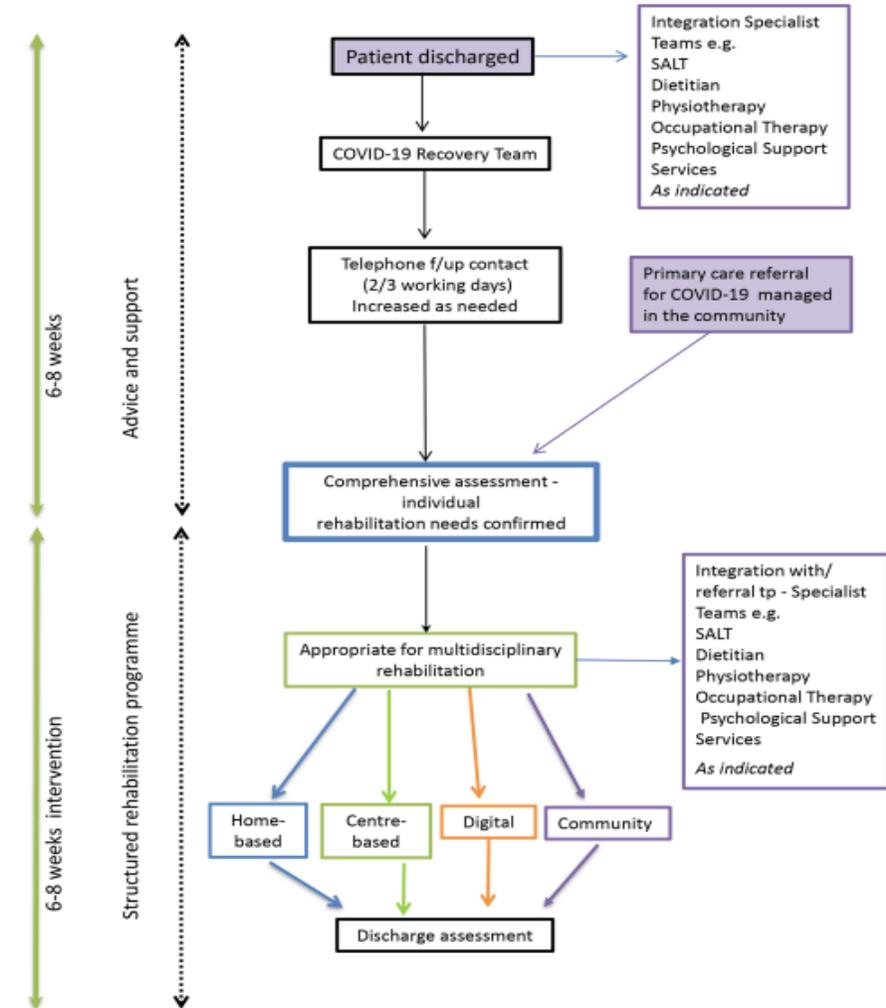


Figure 4 Recovery pathway for patients recovering from COVID-19. f/up, follow-up; SALT, speech and language therapy.

Singh SJ, Barradell AC, Greening NJ, et al British Thoracic Society survey of rehabilitation to support recovery of the post-COVID-19 population *BMJ Open* 2020;10:e040213. doi: 10.1136/bmjopen-2020-040213

The effectiveness of pulmonary rehabilitation for Post-COVID symptoms: A rapid review of the literature

[Lesley J.J. Soril](#),^{a,b} [Ronald W. Damant](#),^{a,c} [Grace Y. Lam](#),^c [Maeve P. Smith](#),^c [Jason Weatherald](#),^d [Jean Bourbeau](#),^e [Paul Hernandez](#),^f and [Michael K. Stickland](#)^{a,c,*}

- Rapid review of literature between July 2020 and June 2021 – 9 studies identified
- Patients hospitalized with COVID-19
- Mixed methodologies, overall small and of low quality
- Follow up – 10 days to 6 months, post discharge
- Intervention ranged from 3 weeks to 3 months
- Inpatient, outpatient and telerehabilitation interventions
- Number of sessions: range 4 x daily to twice weekly
- Varied exercise programme delivery and education provided
- Reported improvements in exercise capacity, pulmonary function and quality of life
- None reported worsening of outcomes or adverse events
- Does Natural recovery have a role?

Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study

Kai Liu^{a,1}, Weitong Zhang^{b,1}, Yadong Yang^{c,1}, Jinpeng Zhang^{c,1}, Yunqian Li^a, Ying Chen^{d,*}

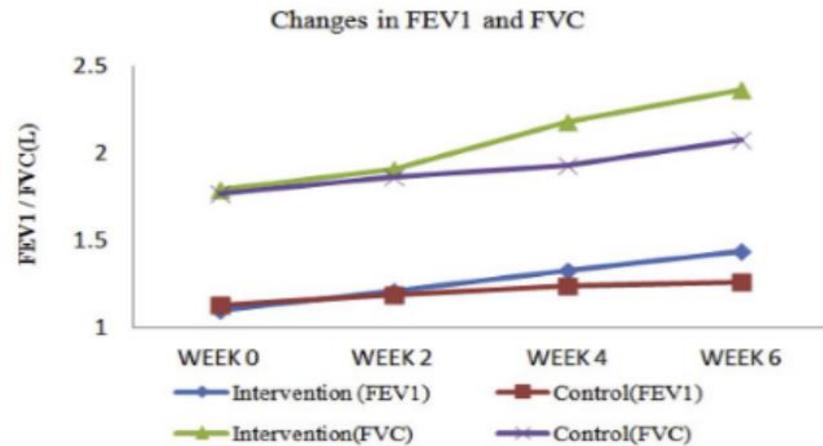


Fig. 1. Changes in FEV1 and FVC over a 6 week time frame for the full cohort of patients.

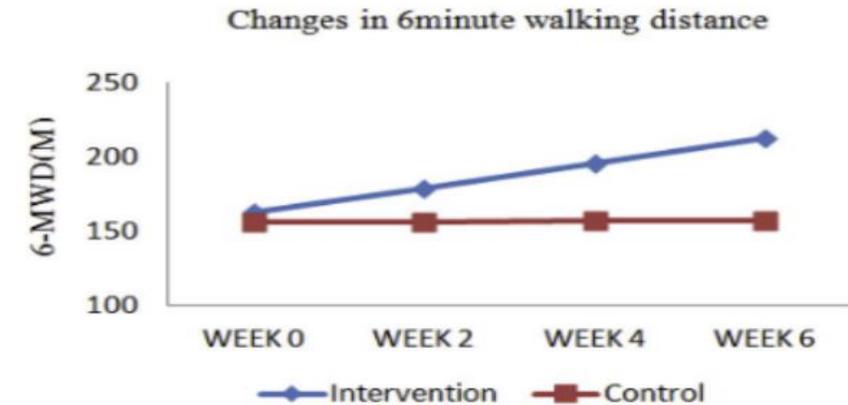


Fig. 3. Changes in 6 min walking distance over a 6 week time frame for the full cohort of patients.

- Only RCT
- 6 weeks respiratory rehabilitation training
- 36 participants in both intervention and control arm

Results:

- No difference in activities of daily living (ADLS)
- Statistically significant Improvement in QoL in intervention group
- Statistically significant improvement in anxiety in intervention group

Kai Liu, Weitong Zhang, Yadong Yang, Jinpeng Zhang, Yunqian Li, Ying Chen, Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study, *Complementary Therapies in Clinical Practice*, Volume 39, 2020, 101166, ISSN 1744-3881, <https://doi.org/10.1016/j.ctcp.2020.101166>

Feasibility of an Outpatient Training Program after COVID-19

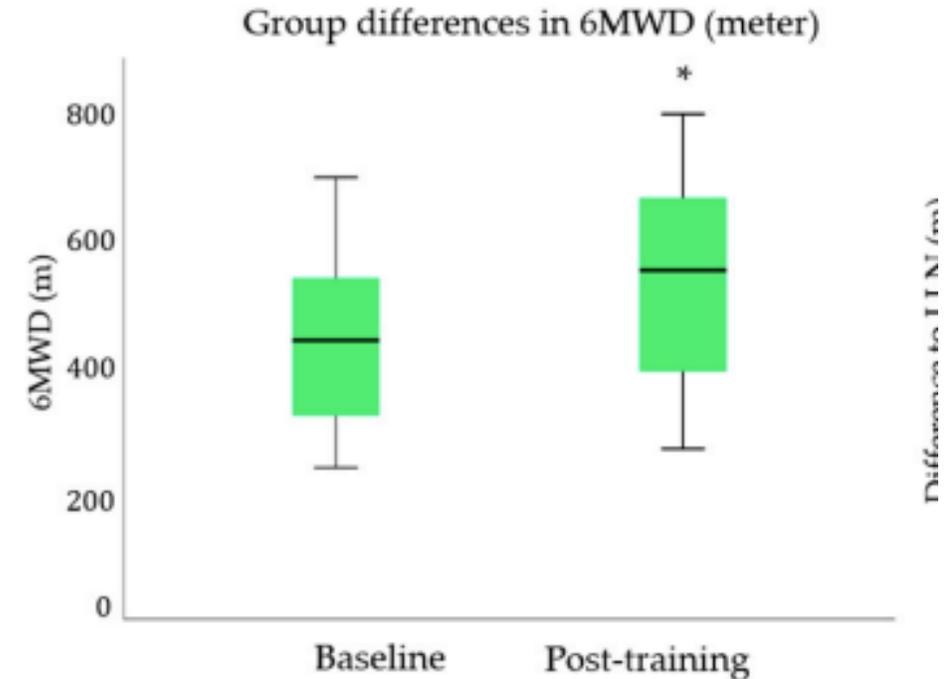
Martina Betschart ^{1,*}, Spencer Rezek ¹, Ines Unger ¹, Swantje Beyer ², David Gisi ¹, Harriet Shannon ³ and Cornel Sieber ²

- 12 patients, 9 completed
- Twice weekly training, 60-90 mins
- Education and Physical activity coaching provided
- Measured: recruitment, adherence, tolerability
- Clinically significant improvements in exercise capacity
- Statistically significant improvements in HRQoL

Table 1. Illustration of the training dose and intensity.

Aerobic Cycle Endurance Training (ACE)	Resistance Training (RT)
Duration 30 min	Duration 30–40 min
Interval mode (alternating HI and MI)	
Warm-up 4 min at 15% peakWR	10–12 repetitions
HI 4 min 50% peak WR (4×) Borg 4–6	50–85% of RM
MI 3 min 20–30% peak WR (3×)	3 rounds per device
Cooling-down 3 min at 15% peakWR	Adjustment of weight when more or less than 10–12 repetition achieved
Continuous mode	
30 min, 20–30% peakWR	

Illustration of the training dose and intensity used in the present study based on the recommendation paper [16]; 50% peakWR of the SRT corresponds 60–80% peak WR recommended by Gloeckl et al. (2013) [16] obtained from cardiopulmonary exercise testing with maximal oxygen uptake. HI = high intensity, MI = Moderate Intensity, RM = repetition maximum.



(a)

Betschart, M.; Rezek, S.; Unger, I.; Beyer, S.; Gisi, D.; Shannon, H.; Sieber, C. Feasibility of an Outpatient Training Program after COVID-19. *Int. J. Environ. Res. Public Health* 2021, 18, 3978. <https://doi.org/10.3390/ijerph18083978>

Early experiences of rehabilitation for individuals post-COVID to improve fatigue, breathlessness exercise capacity and cognition – A cohort study

[Enya Daynes](#)  , [Charlotte Gerlis](#), [...], and [Sally J. Singh](#)   [View all authors and affiliations](#)

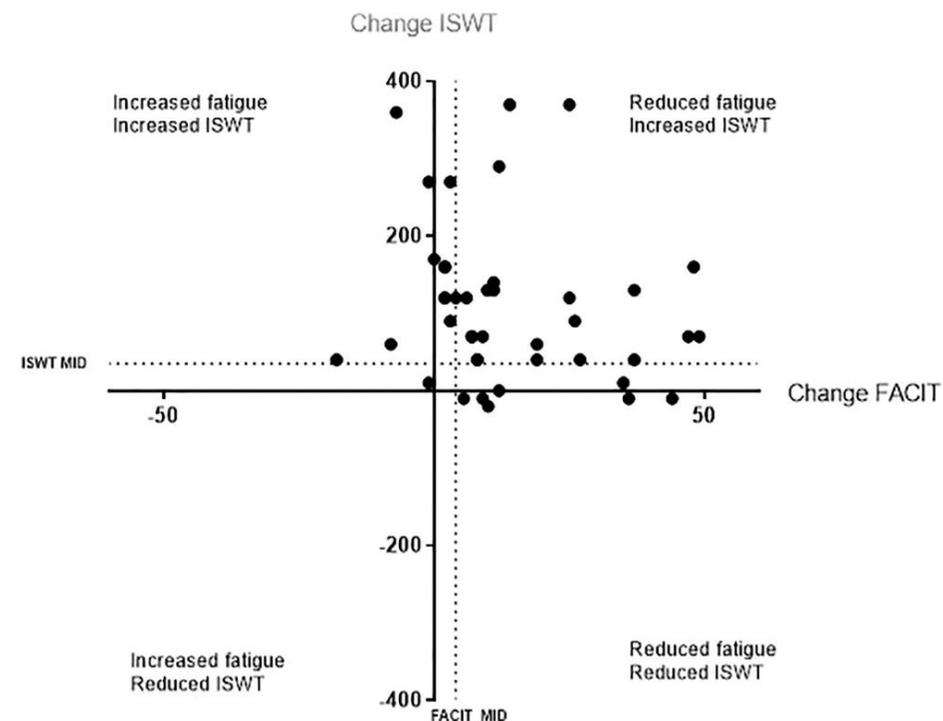
All Articles | <https://doi.org/10.1177/14799731211015691>

- Twice weekly rehabilitation programme
- Statistically significant improvements in exercise capacity, symptom burden, fatigue, cognitive capacity
- In this population, rehabilitation was found to be safe and demonstrated improvements.

Table 1. Clinical outcomes pre and post-COVID rehabilitation.

N = 30	Pre rehabilitation	Post rehabilitation	Change	
ISWT (m)	300[198]	413[229]	112[105]	<0.01
ESWT (seconds)	292[260]	837[406]	544[377]	<0.01
CAT	16[7]	13[7]	-3[6]	<0.05
FACIT	29[14]	34[13]	5[7]	<0.01
EQ5D Thermometer	62[18]	70[21]	8[19]	0.05
MoCA	25[3]	27[3]	2[2]	<0.01
HADS A	6[4]	6[5]	0[4]	0.5
HADS D	6[4]	5[4]	-1[4]	0.1

Mean[SD] of clinical outcomes pre and post-COVID rehabilitation. ISWT Incremental Shuttle Walking Test, ESWT Endurance Shuttle Walking Test, CAT COPD Assessment Test, FACIT Functional Assessment of Chronic Illness Therapy (fatigue score), EQ5D EuroQual 5 Domain, MoCA Montreal Cognitive Assessment, HADS Hospital Anxiety and Depression Scale (A Anxiety and D Depression domain).



Daynes E, Gerlis C, Chaplin E, Gardiner N, Singh SJ. Early experiences of rehabilitation for individuals post-COVID to improve fatigue, breathlessness exercise capacity and cognition – A cohort study. *Chronic Respiratory Disease*. 2021;18. doi:10.1177/14799731211015691



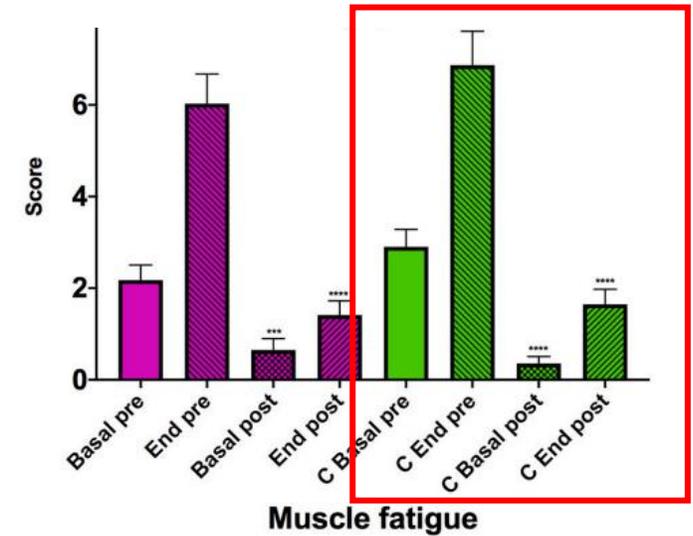
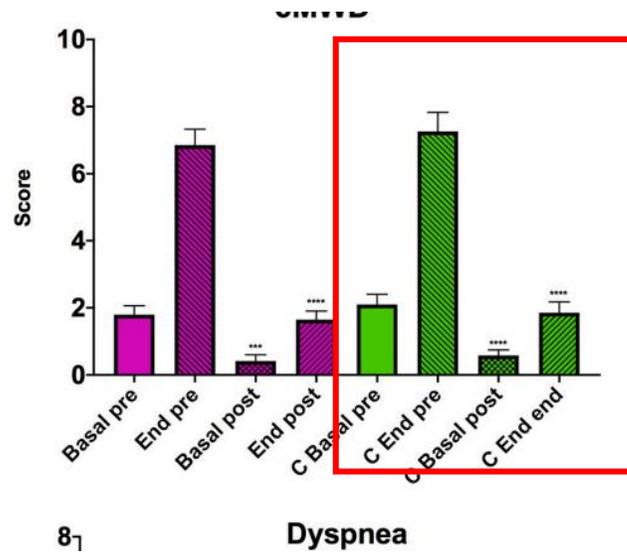
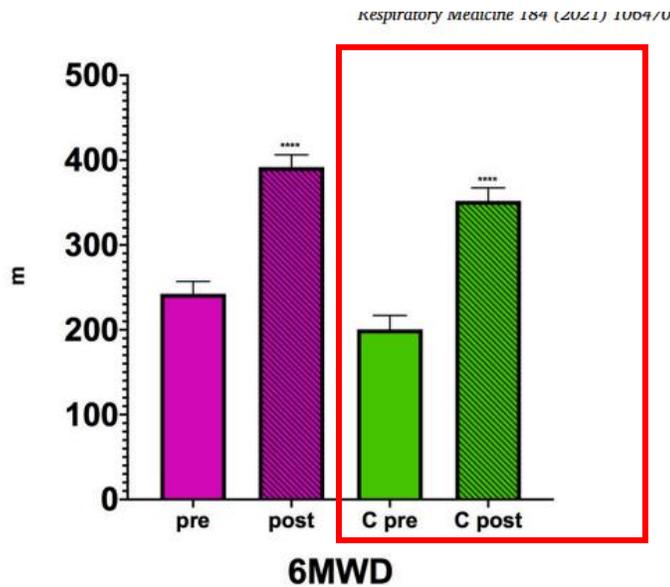
Preexisting cardiorespiratory comorbidity does not preclude the success of multidisciplinary rehabilitation in post-COVID-19 patients

Mauro Maniscalco ^a, Salvatore Fuschillo ^a, Pasquale Ambrosino ^a, Michele Martucci ^a, Antimo Papa ^a, Maria Gabriella Matera ^b, Mario Cazzola ^{c,*}

^a Istituti Clinici Scientifici Maugeri IRCCS, Pavia, Italy

^b Unit of Pharmacology, Department of Experimental Medicine, University of Campania "Luigi Vanvitelli", Naples, Italy

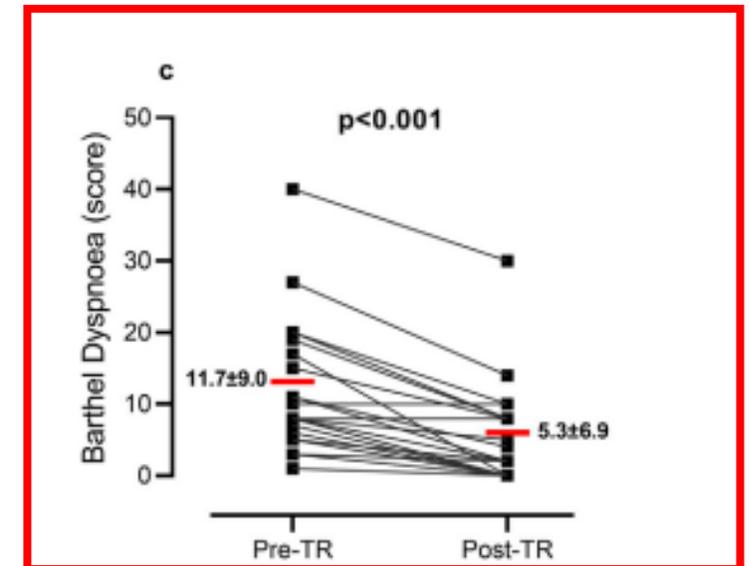
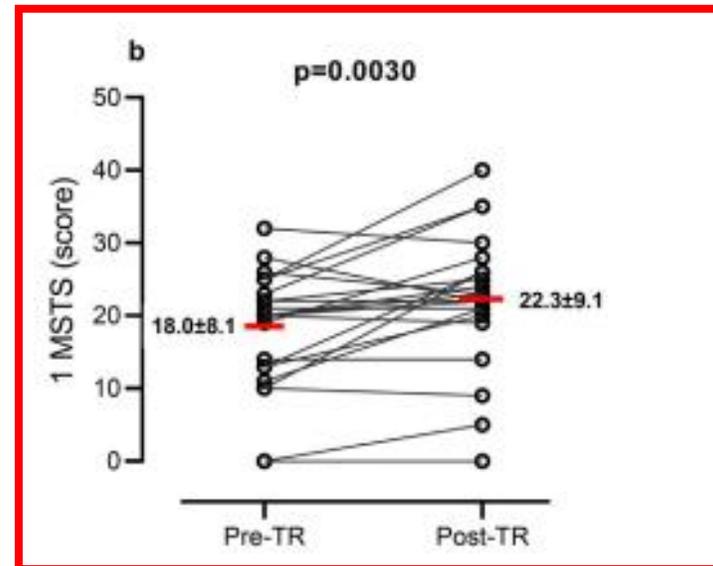
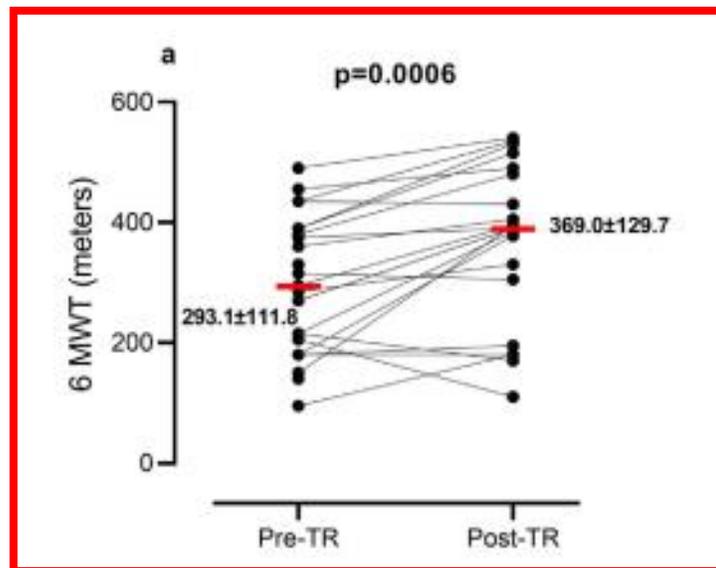
^c Unit of Respiratory Medicine, Department of Experimental Medicine, University of Rome "Tor Vergata", Rome, Italy



- 5 week programme, following discharge from hospital with COVID-19
- 95 participants, 46 pre-existing cardiorespiratory disease
- Post PR there were clinically and statistically significant changes in exercise capacity, breathlessness and muscle fatigue

Feasibility of tele-rehabilitation in survivors of COVID-19 pneumonia

[M. Paneroni](#),^{a,*} [M. Vitacca](#),^a [P. Bernocchi](#),^b [L. Bertacchini](#),^a and [S. Scalvini](#)^{b,c}



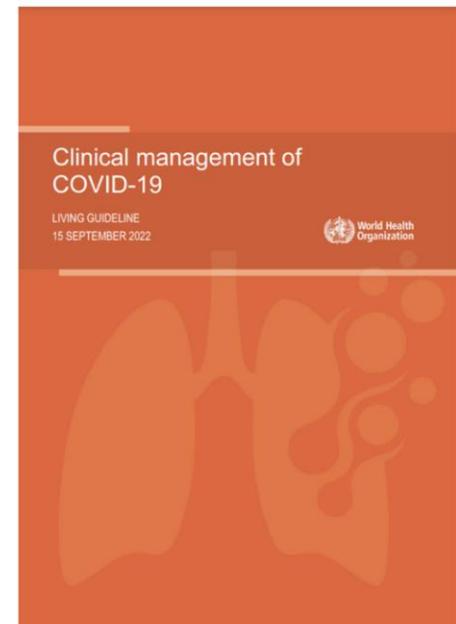
Paneroni M, Vitacca M, Bernocchi P, Bertacchini L, Scalvini S. Feasibility of tele-rehabilitation in survivors of COVID-19 pneumonia. *Pulmonology*. 2022 Mar-Apr;28(2):152-154. doi: [10.1016/j.pulmoe.2021.03.009](https://doi.org/10.1016/j.pulmoe.2021.03.009). Epub 2021 Apr 14. PMID: 33893061; PMCID: PMC8045455.

Delivering rehabilitation to patients surviving COVID-19 using an adapted pulmonary rehabilitation approach – BTS guidance

- Safety checklist
- Inclusion/exclusion criteria
- Face to face assessment
- Exercise capacity test – Shuttle walk test or 6 minute walk test
- Patient reported outcomes – HRQoL, Mental Health, Fatigue, Return to work status
- Consideration of referrals to other services for symptom management
 - Fatigue, Cognitive function, mood disturbances, support for return to work
- Same principles of exercise prescription as for PR cohort – consideration for fatigue
- Adapted education programme

Considerations for rehabilitation of the post COVID patient – World Health Organisation (2022)

- **16 recommendations for the rehabilitation of adults with Post COVID-19 Condition**
 - Components and functions of rehabilitation care
 - Red flags for safe rehabilitation
 - Referral principles
 - Service delivery
 - Workforce
 - Symptom management



Inclusion

- Post COVID Syndrome – confirmed diagnosis
- New Lung Disease
- Exercise or functional limitation
- Managed in hospital or in the community

• Exclusion/Caution

- Unstable Cardiac Disease
- Pulmonary Embolism (<4 weeks)
- Myocarditis (within 6 months)
- Oxygen Desaturation – without investigation
- Mobility limited <10m unaided
- Care palliative or nursing care needs

Caution:

- Post Exertional symptom exacerbation
- Orthostatic Intolerance
- Another predominant condition – best managed under another service

Post COVID Rehabilitation Programme

- At least Twice weekly
- Include a Home Exercise programme
- Comprehensive Assessment as per PR programme
- **Outcome measures** – exercise capacity, symptom burden must include fatigue, cognitive impairment, mental health,
- Screen for PTSD, PESE and orthostatic intolerance
- **Exercise prescription** – from Exercise capacity test, 50-75%
- Progress based on symptoms – BORG, RPE – particularly fatigue
- Education programme – Adapted
- **Discharge** – consideration of follow on services, enrolment to Your COVID recovery or other such programme

Potential Outcome Measures (not exclusive)

Symptom	Evaluation or Measure
Breathlessness	BORG Breathlessness scale MRC or mMRC Breathing Pattern Assessment Tool (BPAT) Nijmegen Dyspnoea 12
Fatigue	FACIT- Functional Assessment of Chronic Illness Therapy – Fatigue DePaul Symptom Questionnaire Brief Questionnaire to assess Post Exertional Malaise
Mental Health	Hospital Anxiety and Depression Scale (HADS) Patient Health Questionnaire (PHQ) 2 or 9 Generalised Anxiety Disorder Assessment (GAD 2 or 7)
Quality of Life	EuroQol 5 dimension (EQ-5D (including EQ 5D VAS) Work and Social adjustment Scale (WASA)
Exercise capacity	ISWT, ESWT, 6MWT
Activities of daily living/function	Post COVID functional Scale
Symptom burden	COPD Assessment Test C19-YRS – COVID-19 Yorkshire Rehabilitation Scale

COPD assessment test for the evaluation of COVID-19 symptoms

Enya Daynes ^{1,2}, Charlotte Gerlis ¹, Samuel Briggs-Price ¹, Paul Jones,³
Sally J Singh^{1,2}

Table 1 Mean (SD) for all patients and split by presence or absence of pre-existing respiratory disease	All	No pre-existing lung disease	Pre-existing lung disease	P value
	n=131	n=91	n=40	
CAT total	10 (5–16)	9 (5–14)	13 (8.75–18.75)	<0.01
Cough	1 (0–2)	1 (0–2)	1 (0–2)	0.42
Phlegm	0 (0–1)	0 (0–1)	1 (0–2)	0.05
Chest tightness	0 (0–1)	0 (0–1)	0 (0–2)	0.96
Breathlessness	2 (0–4)	2 (0–3)	3 (1–4)	0.02
Activity limitation	2 (0–3)	1 (0–3)	2 (0–4)	0.14
Confidence to leave home	0 (0–3)	0 (0–3)	0 (0–2)	0.82
Sleep	1 (0–3)	1 (0–3)	2 (0–4)	0.05
Energy	3 (2–4)	3 (1–4)	3 (2–3)	0.70

*Non-COPD persons—data from Raghavan *et al.*⁴ presented as mean (SD).
CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease.

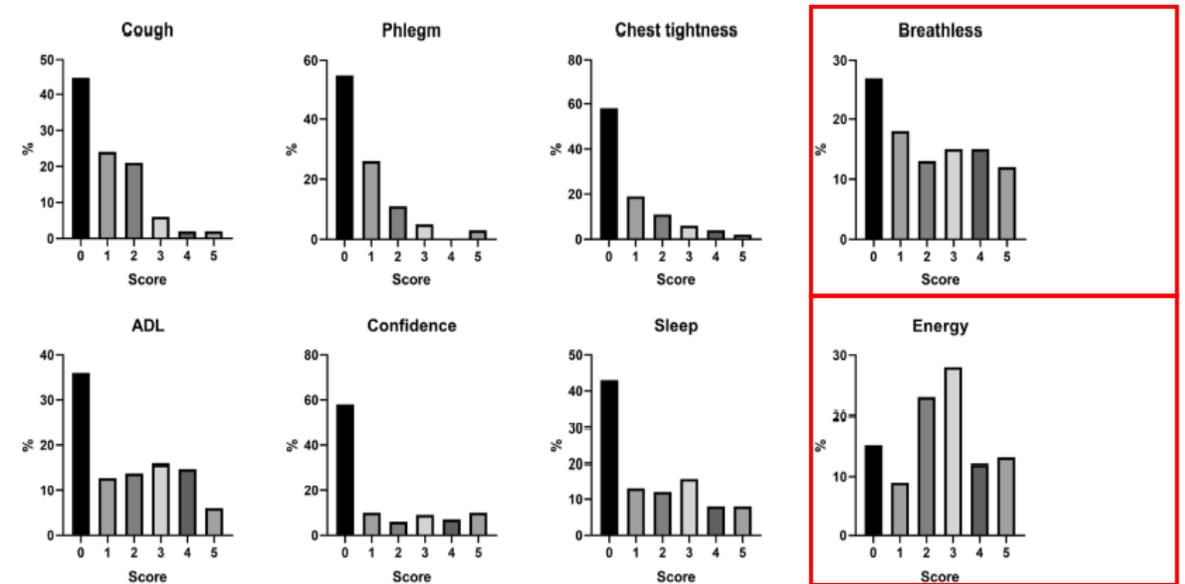


Figure 1 Percentage of participants scoring 0–5 per domain of the COPD assessment test. ADL, activities of daily living; COPD, chronic obstructive pulmonary disease.

Daynes E, Gerlis C, Briggs-Price S, et al. *Thorax* 2021;76:185–187.

Education Programme – already included in PR?

- Managing breathlessness/dysfunctional breathing pattern
- Managing fatigue
- Post exercise malaise or post exertional symptom exacerbation
- Managing nutrition
- Managing psychological distress
- Importance of exercise
- Managing Activities of daily living
- Management of Anosmia or managing sense of taste
- Management of cough
- Returning to work

Early experiences of the Your COVID Recovery[®] digital programme for individuals with long COVID



Your
COVID Recovery

Phoebe H I Lloyd-Evans ,¹ Molly M Baldwin,¹ Enya Daynes,^{1,2} Annabel Hong,¹ George Mills,¹ Amye C N Goddard,¹ Emma Chaplin ,¹ Nikki Gardiner,¹ Sally J Singh,^{1,2} on behalf of the Your COVID Recovery[®] Development Group

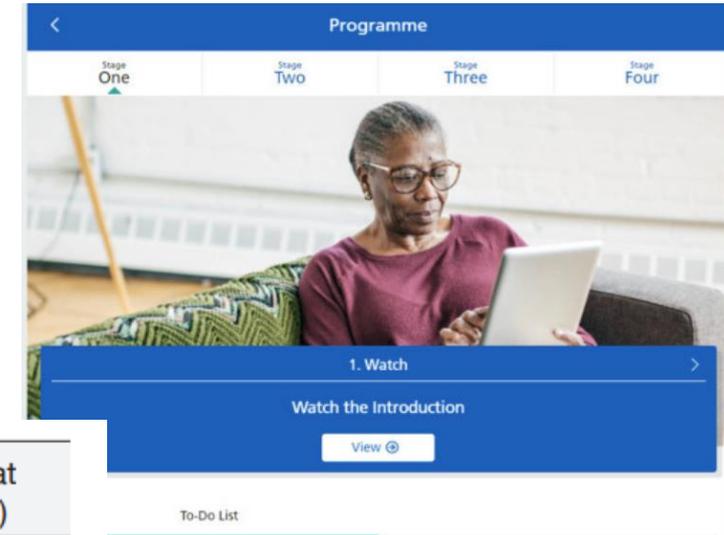


Table 1 Characteristics of 110 participants who completed the Your COVID Recovery[®] digital programme

Demographic characteristics	Mean (SD)
Age (years)	46.3 (10.8)
Weight (kg)	86.5 (21.1)
Height (cm)	169.9 (10.0)
Time on programme (weeks)	8.6 (4.3)
	Frequency of participants, n (%)
Gender (female)	75 (68.1)
Ethnicity (White British)	97 (88.1)
Confirmed diagnosis using a PCR test	70 (63.6)
Admitted to hospital for acute management	27 (24.5)

Table 2 Mean (SD) domain responses for all patients at baseline and follow-up for COPD assessment test (CAT)

Domain	Baseline (stage 1)	Follow-up (stage 2)	P value
Cough	1.7 (1.2)	1.2 (1.2)	<0.001
Phlegm	1.1 (1.4)	1.0 (1.3)	0.168
Chest tightness	2.1 (1.5)	1.7 (1.3)	0.002
Breathlessness	3.4 (1.2)	2.4 (1.3)	<0.001
Activity limitation	3.1 (1.5)	2.4 (1.3)	<0.001
Confidence to leave home	2.2 (1.6)	1.8 (1.4)	0.001
Sleep	2.7 (1.5)	2.3 (1.5)	0.006
Energy	3.5 (1.0)	3.0 (1.1)	<0.001

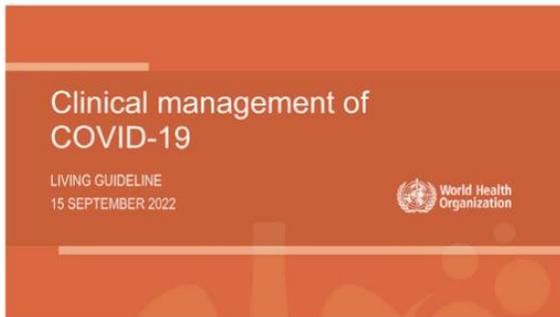
COPD, chronic obstructive pulmonary disease.

Lloyd-Evans PHI, Baldwin MM, Daynes E, et al. Early experiences of the Your COVID Recovery[®] digital programme for individuals with long COVID. *BMJ Open Res* 2022;9:e001237. doi:10.1136/bmjresp-2022-001237

Does PR have a role in the management of the Post COVID Patient?

- **Is there enough evidence?**
- Still a relatively new condition
- **Managing multiple sequelae – fatigue/Post exertional Malaise**
- Not just a respiratory disease – vascular component
- **Relapse/remitting condition**
- Long term support required for many
- **What are the discharge services available?**
- Education needs – how to meet all in one group
- **PR: UK Context currently – long waiting lists and workforce challenges**

Resources for patients and health professionals



Conclusion

- Pulmonary Rehabilitation maybe suitable for certain patients post COVID, however more research required
- Caution needs to be taken with patients who report Post COVID Symptom Exacerbation or those with Cardiovascular complications
- Education needs also need to be considered due to the wide range of reported symptoms

Thank you & Questions

Email: Laura.Graham5@nhs.net

Twitter: @goldens2482

References

- Singh SJ, Barradell AC, Greening NJ, *et al* British Thoracic Society survey of rehabilitation to support recovery of the post-COVID-19 population *BMJ Open* 2020;**10**:e040213. doi: 10.1136/bmjopen-2020-040213
- Lopez-Leon, S., Wegman-Ostrosky, T., Perelman, C. *et al*. More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. *Sci Rep* **11**, 16144 (2021). <https://doi.org/10.1038/s41598-021-95565-8>
- Soril LJJ, Damant RW, Lam GY, Smith MP, Weatherald J, Bourbeau J, Hernandez P, Stickland MK. The effectiveness of pulmonary rehabilitation for Post-COVID symptoms: A rapid review of the literature. *Respir Med*. 2022 Mar 2;**195**:106782. doi: 10.1016/j.rmed.2022.106782. Epub ahead of print. PMID: 35272262; PMCID: PMC8887973.
- Betschart M, Rezek S, Unger I, Beyer S, Gisi D, Shannon H, Sieber C. Feasibility of an Outpatient Training Program after COVID-19. *International Journal of Environmental Research and Public Health*. 2021; **18**(8):3978. <https://doi.org/10.3390/ijerph18083978>
- Daynes E, Gerlis C, Briggs-Price S, *et al*. *Thorax* 2021;**76**:185–187.
- Daynes E, Gerlis C, Chaplin E, Gardiner N, Singh SJ. Early experiences of rehabilitation for individuals post-COVID to improve fatigue, breathlessness exercise capacity and cognition – A cohort study. *Chronic Respiratory Disease*. 2021;**18**. doi:10.1177/14799731211015691
- Lloyd-Evans PHI, Baldwin MM, Daynes E, *et al*. Early experiences of the Your COVID Recovery® digital programme for individuals with long COVID. *BMJ Open Resp Res* 2022;**9**:e001237. doi:10.1136/bmjresp-2022-001237
- [Guideline COVID-19 rapid guideline: managing the long-term effects of COVID-19 \(nice.org.uk\)](https://www.nice.org.uk/guidance/ng195)
- <https://www.brit-thoracic.org.uk/covid-19/covid-19-information-for-the-respiratory-community/>
- Bickton, Fanuel Meckson BSc; Chisati, Enock MSc; Rylance, Jamie PhD; Morton, Ben PhD. An Improvised Pulmonary Telerehabilitation Program for Postacute COVID-19 Patients Would Be Feasible and Acceptable in a Low-Resource Setting. *American Journal of Physical Medicine & Rehabilitation*: March 2021 - Volume 100 - Issue 3 - p 209-212 doi: 10.1097/PHM.0000000000001666
- Mauro Maniscalco, Salvatore Fuschillo, Pasquale Ambrosino, Michele Martucci, Antimo Papa, Maria Gabriella Matera, Mario Cazzola,, Preexisting cardiorespiratory comorbidity does not preclude the success of multidisciplinary rehabilitation in post-COVID-19 patients, *Respiratory Medicine*, Volume 184,2021, 106470, ISSN 0954-6111, <https://doi.org/10.1016/j.rmed.2021.106470>
- Kai Liu, Weitong Zhang, Yadong Yang, Jinpeng Zhang, Yunqian Li, Ying Chen, Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study, *Complementary Therapies in Clinical Practice*, Volume 39, 2020, 101166, ISSN 1744-3881, <https://doi.org/10.1016/j.ctcp.2020.101166>
- World Health Organisation (WHO) Clinical Management of COVID-19 (2022) Accessed online [Clinical management of COVID-19 \(who.int\)](https://www.who.int/publications/m/item/clinical-management-of-covid-19)
- Paneroni M, Vitacca M, Bernocchi P, Bertacchini L, Scalvini S. Feasibility of tele-rehabilitation in survivors of COVID-19 pneumonia. *Pulmonology*. 2022 Mar-Apr;**28**(2):152-154. doi: 10.1016/j.pulmoe.2021.03.009. Epub 2021 Apr 14. PMID: 33893061; PMCID: PMC8045455.