The following information resources have been selected by the National Health Library and Knowledge Service Evidence Virtual Team in response to your question. The resources are listed in our estimated order of relevance to practicing healthcare professionals confronted with this scenario in an Irish context. In respect of the evolving global situation and rapidly changing evidence base, it is advised to use hyperlinked sources in this document to ensure that the information you are disseminating to the public or applying in clinical practice is the most current, valid and accurate. For further information on the methodology used in the compilation of this document—including a complete list of sources consulted—please see our National Health Library and Knowledge Service Summary of Evidence Protocol.

QUESTION 209

What models of care are available for patients recovering from COVID-19 with persisting symptoms? What models of care are available for long COVID, or post-acute sequelae of COVID-19?

Main Points

1. COVID-19 has resulted in a growing population of individuals with a range of persistent symptoms that develop during or after SARS-CoV-2 infection, continue for ≥ 12 weeks, and are not explained by an alternative diagnosis. Significant physical, psychological, and cognitive impairments may persist despite clinical resolution of the infection.
2. Post-acute COVID-19 rehabilitation will assume increasing importance as a surge of patients are discharged from hospital, placing a burden on health systems.
3. The rehabilitation needs of patients are varied and multi-faceted, and post COVID-19 clinics should offer multidisciplinary assessments. Experience from recently established COVID-19 recovery services in Ireland and Britain suggests that significant physical, psychological and cognitive impairments may persist; and that multidisciplinary teams should integrate respiratory, cardiology, rheumatology, radiology, psychology and immunology services into an holistic post-discharge model of follow-up.
4. Emerging literature emphasizes the importance of assessment of post-acute COVID-19 patients after discharge; and of preparedness with appropriate clinical rehabilitation pathways.
5. Initial multidisciplinary assessment post-COVID-19 may play a role in reducing unnecessary chest X-rays and clinic appointments, and in helping to focus on those most likely to require follow-up.

Please refer to the National Health Library Levels of Evidence Table used to grade the levels of evidence included below.

☑	Inclusion criteria:	All levels.
☒	Exclusion criteria:	None.

Please note that individual studies may not have been critically appraised and that designation at a certain level is not a final determination of the quality of a given study.

Summary of Evidence

Rehabilitation has been identified by the World Health Organization (WHO) as a core component of universal health coverage and a central target of the United Nations Sustainable Development Goal 3: Ensure healthy lives and promote wellbeing for all at all ages[4]. The longer-term impact of COVID -19 on infected patients is a rapidly emerging body of evidence, and comprehensive data is not yet available on all aspects involved[3].

The COVID-19 pandemic has resulted in a growing population of individuals with a wide range of persistent symptoms that develop during or after SARS-CoV-2 infection, continue for ≥ 12 weeks, and are not explained by an alternative diagnosis[6]. Several terms have been used to describe prolonged symptoms following COVID-19 illness, such as "long-COVID," "post-acute sequelae of SARS-CoV-2 infection" (PASC), "post-acute COVID-19," "chronic COVID-19," and "post-COVID syndrome." Becket et al propose a classification of COVID-19 sequelae subtypes[23]. Whether the constellation of symptoms represents a new syndrome unique to COVID-19, or if there is overlap with the recovery from similar illnesses has not been determined[6]. Significant physical, psychological, and cognitive impairments may persist despite clinical resolution of the infection[6, 13]. Oronsky et al[12] predict that potential long-term effects from post-COVID syndrome will assume increasing importance as a surge of treated patients are discharged from hospital, placing a burden on

healthcare systems, patients' families and society in general to care for these medically devastated COVID-19 survivors.

The UpToDate® review entitled *Evaluation and management of adults following acute viral illness* is valuable in detailing the specific treatment approaches that should be employed for each category of post-acute COVID-19 patient. However, as Nalbandian et al[22] observe, COVID-19 is now recognised as a multi-organ disease with a broad spectrum of manifestations; Lutchmansingh et al[21] assert that health care systems may need develop clinical infrastructures in response to the multi-faceted demands of COVID-19.

A recently published NICE guideline[1] on managing the long-term effects of COVID-19 includes recommendations on: assessing people with new or ongoing symptoms after acute COVID-19; investigations and referral; planning care; management; follow-up and monitoring; sharing information and continuity of care; and health service organisation.

Post COVID-19 clinics should offer physical, cognitive, psychological and psychiatric assessments, irrespective of whether people were hospitalised or clinically diagnosed[2]. Evidence is emerging of increased demand on health services in the community, primary care and mental health services. Supports are required to meet the increase in demand on health services with multidisciplinary teams and virtual patient outreach services[3].

Several European countries are have initiated a planned response to long-COVID, including new clinical guidelines and pathways, and the creation of post-COVID clinics and online support tools[5].

The emerging literature on post-acute COVID-19 emphasizes the importance of assessment of patients after discharge[7 - 10]; and of preparedness with appropriate clinical rehabilitation pathways and early rehabilitation with multidisciplinary interventions. Oronsky et al[12] presents a framework of strategies for the diagnosis and management of patients with suspected or confirmed persistent post-COVID syndrome. O'Brien et al[13] describe the establishment of a COVID Recovery Service in Ireland, a multidisciplinary service for comprehensive follow-up of patients with a hospital diagnosis of

COVID-19 pneumonia. The authors initial experience suggests that significant physical, psychological, and cognitive impairments may persist despite clinical resolution of the infection.

Donaldson et al[14] aimed to assess and address the immediate rehabilitation needs of those leaving hospital following admission for respiratory complications of COVID-19 using a virtual rehabilitation service. The authors concluded that utilising the skills of pulmonary rehabilitation staff to deliver holistic rehabilitation and treatment services to those discharged from hospital after suffering respiratory complications of COVID-19 was feasible, safe and well tolerated by staff and patients[14]. Taylor et al[15] give insight into their early experiences with a virtual post-acute COVID-19 follow-up clinic where a multidisciplinary team integrated respiratory, cardiology, rheumatology, radiology, psychology and immunology services into their post-discharge model of follow-up care.

Pre follow-up assessments are highlighted in Rossdale et al[18]. The authors state that the establishment of a post-COVID-19 Pre-Follow Up Multi-Disciplinary Team (pre-FU-MDT) has had a significant clinical impact; redistributing clinicians' time has reduced unnecessary chest X-rays and clinic appointments, and helped focus on those most likely to require follow-up.

There is a dearth of evidence on a single health system model to deal with the multi-faceted rehabilitation needs of post-acute COVID-19 patients. Studies and guidance published to date suggest that a patient-centred, multidisciplinary rehabilitation model is required for follow-up[20–23]. Gorna et al[25] criticize the recently published NICE guideline for failing to adequately address the following issues: the clinical case definition of long COVID in the guideline does not adequately describe the varied symptoms experienced, and gives insufficient consideration of the apparent relapsing–remitting nature of the condition; the guideline does not sufficiently describe what is known about the underlying pathology and the natural history of long COVID; and the authors assert that a more thorough participative and open process is needed to consider and determine

appropriate terminology by involving a broad range of experts, including people with lived experience[25].

There is an emerging consensus in the literature of the importance of multi-disciplinary team rehabilitation processes to support post-acute COVID-19 patents[9, 18, 21, 22, 25, 27, 28, 29].

Irish and/or International Guidance

Level 1

National Institute of Health and Care Excellence (NICE) (Great Britain) (2020) COVID-19 rapid guideline: managing the long-term effects of COVID-19[1]

This guideline covers the identification, assessment and management of the long-term effects of COVID-19, often described as 'long COVID'. It makes recommendations about care in all healthcare settings for adults, children and young people who have new or ongoing symptoms 4 weeks or more after the start of acute COVID-19. It also includes advice on organising services for long COVID.

This guideline has been developed jointly by NICE, the Scottish Intercollegiate Guidelines Network (SIGN) and the Royal College of General Practitioners (RCGP).

[1] NICE (2020) COVID-19 rapid guideline: managing the long-term effects of COVID-19. NICE guideline 188. https://www.nice.org.uk/guidance/ng188#:~:text=Guidance,-Next&text=This%20guideline%20covers%20identifying%2C%20assessing,start%20of%20acute%20COVID%2D19. Accessed 6 May 2021.

To develop the recommendations, we have used the following clinical definitions for the initial illness and long COVID at different times:

- 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.

In addition to the clinical case definitions, 'long COVID' is commonly used to describe signs and symptoms that continue or develop after acute COVID-19. It includes both ongoing symptomatic COVID-19 and post-COVID-19 syndrome

Recommendations

This guideline includes recommendations on:

- identifying people with ongoing symptomatic COVID-19 or post-COVID-19 syndrome
- assessing people with new or ongoing symptoms after acute COVID-19
- investigations and referral
- planning care
- management
- follow-up and monitoring
- sharing information and continuity of care
- service organisation

Level 1

National Health Service (Great Britain) (2021) National guidance for post-COVID syndrome assessment clinics[2]

The purpose of this document is to inform the commissioning of post-COVID syndrome assessment clinics. This guidance will assist local healthcare systems in establishing and maintaining post-COVID assessment services for patients experiencing long-term health effects following COVID-19 infection.

Clinics should offer physical, cognitive, psychological and psychiatric assessments with the aim of providing consistent services for people with post-COVID syndrome ('long COVID'). These services should support those who need them, irrespective of whether they were hospitalised and regardless of whether clinically diagnosed or by a SARS-CoV-2 test.

Level 1

National Health Service (Great Britain) (2021) After-care needs of inpatients recovering from COVID-19[3]

This guidance supports primary care and community health services to meet the immediate and longer-term care needs of patients discharged following an acute episode of COVID-19, by describing the typical expected health care needs of these patients, post-discharge. More than 95,000 COVID positive patients have been looked after in hospitals across England, and most have been able to recover and leave hospital. However, it is clear that for many of those who have survived, the virus and the treatment required to combat it will have a lasting impact on their health. As we move past the first peak of this

[2] NHS (Great Britain) (2021) National guidance for post-COVID syndrome assessment clinics. https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/11/C1248-national-guidance-post-covid-syndrome-assessment-clinics-v2.pdf. Accessed 6 May 2021.
[3] NHS (Great Britain) (2021) After-care needs of inpatients recovering from COVID-19. https://www.cambscommunityservices.nhs.uk/docs/default-source/luton-adults-general/c0388_after_care_needs_of_inpatients_recovering_from_covid-19_5_june_2020.pdf. Accessed 6 May 2021.

virus, we are going to see increased demand for aftercare and support in community health services, primary care, and mental health.

Community health services — working together with other providers of physical and mental health care — will need to support the increase in patients who have recovered from COVID-19 and who, having been discharged from hospital, need ongoing health support that rehabilitates them both physically and mentally. Meeting these challenges will be a joint endeavour, working seamlessly together including through multidisciplinary teams and/or virtual ward arrangements. It is important to note that the impact of COVID-19 on patients is a rapidly-evolving picture and comprehensive data is not yet available on all aspects.

Level 1

Cochrane Library (2021) Coronavirus (COVID-19): Evidence Relevant to Clinical Rehabilitation[4]

Rehabilitation has been identified by the World Health Organization (WHO) as an essential health strategy, alongside promotion, prevention, treatment, and palliative care. For the WHO, rehabilitation is a core component of universal health coverage and a central target of the United Nations Sustainable Development Goal 3: Ensure healthy lives and promote wellbeing for all at all ages.

Rehabilitation focuses on the overall functioning of the whole person, including comorbidities. Consequently, rehabilitation of individuals who have experienced COVID-19 must consider not only the consequences of the disease but also the effects of treatments applied during the acute phase. For the WHO, functioning (the target of rehabilitation) is a key indicator of health, alongside mortality and morbidity, capturing the impact of diseases and injuries on body functions, human activities and participation. Rehabilitation inherently serves to reduce disability, with broad health, social, and economic impacts.

This Cochrane Library Special Collection is the result of collaboration within Cochrane Rehabilitation, with rigorous involvement from

[4] Cochrane Library (2021) Coronavirus (COVID-19): Evidence Relevant to Clinical Rehabilitation. https://www.cochranelibrary.com/collections/doi/SC000047/full. Accessed 6 May 2021.

stakeholders: the Steering Committee of the REH-COVER (Rehabilitation COVID-19 Evidence-based Response) Action and the Cochrane Rehabilitation Advisory Board. The agreed list of relevant conditions is the product of a structured prioritization process for identifying the list of conditions, and subsequently review inclusion, except post-traumatic stress disorder (PTSD), for which Cochrane Mental Health and Neuroscience was consulted.

The Special Collection includes sections on:

- Acute respiratory distress syndrome (ARDS) and pulmonary restrictive syndromes
- Post-intensive care syndrome (PICS)
- Post-extubation swallowing disorders
- Multiple organ failure
- PTSD in the context of rehabilitation

Level 1

World Health Organization (2021) In the wake of the pandemic: preparing for long COVID[5]

Different European countries have been responding to the emergence of this new condition via organized health systems responses. This policy brief lists a number of responses that have been adopted in different European countries. These include development of new guidelines for assessing and managing long COVID, development of new care pathways, as well as creation of post-COVID clinics and online support tools. There are also examples of initiatives undertaken by local service providers and professional bodies that other countries can learn from.

[5] World Health Organization (2021) In the wake of the pandemic: preparing for Long COVID. https://apps.who.int/iris/bitstream/handle/10665/339629/Policy-brief-39-1997-8073-eng.pdf. Accessed 5 May 2021.

Point-of-Care Tools

Level 2

[UpToDate (2021) Evaluation and management of adults following acute viral illness[6]]

See entire document, and especially Section: SUMMARY AND RECOMMENDATIONS.

Terminology

The Coronavirus disease 2019 (COVID-19) pandemic has resulted in a growing population of individuals with a wide range of persistent symptoms after acute SARS-CoV-2 infection. This comprises patients with symptoms that develop during or after COVID-19, continue for ≥ 12 weeks, and are not explained by an alternative diagnosis. Several terms have been used to describe prolonged symptoms following COVID-19 illness, such as "long-COVID," "post-acute sequelae of SARS-CoV-2 infection" (PASC), "post-acute COVID-19," "chronic COVID-19," and "post-COVID syndrome". Whether the constellation of symptoms represents a new syndrome unique to COVID-19, or if there is overlap with the recovery from similar illnesses has not been determined.

Recovery Symptoms and Course

Physical and psychological symptoms are common following COVID-19. Persistent physical symptoms are common, and typically include fatigue, dyspnea, chest pain, and cough. Less common persistent physical symptoms include anosmia, joint pain, headache, sicca syndrome, rhinitis, dysgeusia, poor appetite, dizziness, myalgias, insomnia, alopecia, sweating, and diarrhea.

[6] UpToDate (2021) Evaluation and management of adults following acute viral illness. https://www.uptodate.com/contents/covid-19-evaluation-and-management-of-adults-following-acute-viral-illness. Accessed 4 May 2021.

Patients may also experience psychological or cognitive complaints including post-traumatic stress disorder, anxiety, depression, and poor memory and concentration.

While most patients with mild acute COVID-19 disease are expected to recover quickly, a longer recovery should be expected in those with moderate to severe acute disease (eg two to three months, sometimes longer in those who survive critical illness). The wide variability in time to symptom resolution likely also depends upon premorbid risk factors as well as illness severity during acute COVID-19.

General Evaluation

The recovery process exists on a continuum; evaluation early in the course of acute COVID-19 is focused on detecting and managing acute COVID-19-related complications, while later follow-up focuses on the evaluation and management of persistent symptoms after recovery from the acute phase. We assess the patient's symptom severity, duration, and trajectory to determine the timing and setting of follow-up evaluation. We typically follow-up all hospitalized patients within one week of discharge; for patients who were not hospitalized, but who are older or who have comorbidities (eg diabetes, hypertension), we follow-up within three weeks. We do not typically evaluate patients with mild acute COVID-19 disease unless they have new, persistent, or progressive symptoms.

During the initial follow-up evaluation, we obtain a comprehensive history of the patient's COVID-19 illness, including the illness timeline, duration and severity of symptoms, types and severity of complications, COVID-19 testing results, and any management strategies. The need for laboratory testing is determined by illness severity, prior abnormal testing during their illness, and current symptoms. We do not routinely re-test patients for active infection with SARS-CoV-2 at the time of follow-up outpatient evaluation. Instead, we follow a non-test-based approach to removing infectious precautions.

Cardiopulmonary Issues

We perform a comprehensive cardiopulmonary evaluation, including a comprehensive history and physical examination. We inquire about

ongoing dyspnea (at rest and exertion), cough, chest discomfort, pleuritic pain, and wheezing, orthopnea, chest pain (exertional, positional), peripheral edema, palpitations, dizziness, orthostasis, and pre-syncope or syncope.

Based on clinical history and findings, the following cardiopulmonary testing strategy is appropriate:

- For all patients who had a pulmonary infiltrate or other abnormality identified on imaging during the acute course of COVID-19 illness, we obtain follow-up chest imaging, typically chest radiography, at 12 weeks. For patients with new or progressive symptoms, earlier imaging is indicated. Chest computed tomography (CT) is preferred for patients in whom another etiology (eg malignancy) is suspected, and high resolution CT (HRCT) is an appropriate imaging study for patients with suspected interstitial lung disease from severe pulmonary involvement (eg acute respiratory distress syndrome [ARDS]).
- For patients with intermittent or persistent cardiopulmonary symptoms, including palpitations, or those with generalized, constitutional complaints such as weakness or fatigue, we typically perform a 12-lead electrocardiogram. We do not routinely perform transthoracic echocardiography (TTE). However, we have a low threshold to obtain a TTE in patients with a history or biochemical evidence of myocardial injury or myocarditis, or in patients with dyspnea and other signs and symptoms suggestive of a potential cardiac disorder.
- For patients with persistent, progressive, or new respiratory symptoms, and patients recovering from ARDS, we obtain pulmonary function tests (PFTs), including spirometry, lung volumes, and diffusion capacity and a six-minute walk test.
- If cardiopulmonary symptoms remain unexplained, we typically refer the patient to a cardiologist or pulmonologist for further evaluation and testing.

Our approach to management is based upon the management of symptoms following similar illnesses: dyspnea, cough, chest

discomfort, cardiac injury or myocarditis. Some patients may benefit from cardiac or pulmonary rehabilitation.

Neurologic or Neurocognitive Issues

We perform a complete neurological history and examination and evaluate any deficits and their impact on the patient's functional status. Patients are managed in a similar way to non-COVID-19 patients with the same issues. We do not typically obtain neurological imaging unless there is an unexplained neurologic deficit or concern for a focal lesion or other condition.

We screen for cognitive impairment using the Montreal Cognitive Assessment (MoCA). We typically refer patients with scores indicating moderate to severe cognitive impairment (ie score <18) for neuropsychological or speech-language evaluation.

Hypercoagulability

We evaluate all patients for signs and symptoms of deep venous thromboses (DVT) of the upper and lower extremities, pulmonary embolism, or arterial thromboses (eg digital ischemia). For patients taking anticoagulants, we review the duration and indication for anticoagulation, confirming appropriateness and safety. Patients with documented thromboses are treated in a similar fashion to thrombosis in non-COVID-19 patients.

Olfactory/Gustatory

In most cases, these symptoms resolve slowly over several weeks and do not require intervention except for education regarding food and home safety. Patients with persistent gustatory and/or olfactory dysfunction may benefit from further evaluation and management, including olfactory training by referral to an otolaryngologist or a taste and smell clinic, if available.

Fatigue and Functional Assessment

We typically screen patients for functional impairment using the six-minute walk test and one or more of the following: EuroQol-5D-5L, Timed Up and Go (TUG), and Short Physical Performance Battery (SPPB). For patients with limitations of endurance or exercise tolerance due to muscle weakness or deconditioning, we typically

refer for physical therapy or cardiopulmonary rehabilitation. For patients with fatigue, we encourage adequate rest, good sleep hygiene, and specific fatigue management strategies. If patients have symptoms consistent with myalgic encephalomyelitis/chronic fatigue syndrome, a similar management strategy is warranted.

Other

Other conditions which may persist following recovery from COVID-19 can include renal failure, hepatic injury, endocrine disorders (diabetes, bone loss, adrenal insufficiency), gastrointestinal symptoms (diarrhea, weight loss, malnutrition), dermatologic conditions (alopecia, skin lesions, decubitus ulcers), impaired sleep (eg insomnia), psychological effects (anxiety, depression, post-traumatic stress disorder), quality of life, and social and economic concerns.

Outpatient Rehabilitation

When rehabilitation services are indicated, we typically refer patients within 30 days of recovery from initial infection. All patients should be screened for cardiac symptoms prior to beginning any exercise program; if necessary, a full cardiac evaluation may be warranted before commencing rehabilitation therapy. While we prefer in-person rehabilitation programs that last six to eight weeks, outpatient and web-based programs are also available, although the latter are less well-validated.

Inpatient Rehabilitation

The evaluation and management of patients recovering from acute COVID-19 who are admitted to a long-term acute care facility (LTAC), an inpatient rehabilitation facility (IRF), or a skilled nursing facility (SNF) are similar to those described in the outpatient population. In addition, such patients commonly have a tracheostomy and most suffer from post-intensive care unit syndrome (PICS), which includes physical impairment from intensive care unit (ICU)-acquired neuromuscular weakness, cognitive, and neuropsychological impairment. If there is a delay in transferring the patient to an inpatient facility, ventilator weaning should begin in the acute care facility. If the patient remains infectious, appropriate precautions

should be taken during tracheostomy collar weaning. Most patients in inpatient facilities require venous thromboembolism prophylaxis until the acute illness fully resolves and/or the patient becomes fully mobile.

Irish and/or International Literature

Level 2

Baricich et al (2021) [Cross-Sectional Study] Midterm functional sequelae and implications in rehabilitation after COVID19. A cross-sectional study[7]

BACKGROUND: To date, COVID-19 has been mainly investigated concerning the acute and subacute phase implications and management. Few studies focused on the mid-term sequelae, which still remain largely unknown.

AIM: To assess the physical performance of COVID-19 survivors at 3 to 6 months from hospital discharge.

DESIGN: A cross-sectional study focused on mid-term functional outcomes evaluation in COVID-19 survivors.

SETTING: Outpatients who had been previously hospitalized due to COVID-19 from March to May 2020 at the University Hospital of Novara (Italy).

POPULATION: 204 patients, of which 60% were men, with the mean age of 57.9 years.

[7] Baricich A, Borg MB, Cuneo D, Cadario E, Azzolina D, Balbo PE, Bellan M, Zeppegno P, Pirisi M, Cisari C; NO-MORE COVID Group. Midterm functional sequelae and implications in rehabilitation after COVID19. A cross-sectional study. Eur J Phys Rehabil Med. 2021 Feb 10. doi: 10.23736/S1973-9087.21.06699-5. Epub ahead of print. PMID: 33565741.

METHOD(S): Patients firstly underwent the Short Physical Performance Battery test (SPPB), which is composed of a series of physical tests assessing the lower limb function and the functional status of the subjects. Subsequently, based on SPPB results, patients' cardiorespiratory fitness performance was further investigated. Patients with normal SPPB score (SPPB > 10) underwent the 2-Minute Walking test (2MWT); in order to safely test the cardiorespiratory function, in patients with abnormal SPPB score (SPPB ≤10) the 1-Minute-Sit-to-Stand Test (1MSTST) was performed.

RESULT(S): Overall, 66 patients (32% of our sample) showed an impaired physical performance at 3 to 6 months after hospital discharge. In particular, 29 patients presented an SPPB score ≤10, and the 1MSTST confirmed this status in the whole group (100%) compared to the reference values for age and sex. Among patients with a normal SPPB score, 37 showed a lower sex- and age-matched 2MWT score. Finally, a significant association between Intensive Care Unit hospitalization or mechanical ventilation and physical impairment was observed together with a significant association between walking ability [measured with SPPB and 2MWT] and the number of comorbidities.

CONCLUSION(S): A residual physical and functional impairment was observed in COVID-19 survivors at mid-term evaluation after hospitalization.

CLINICAL REHABILITATION IMPACT: Considering the current COVID-19 epidemiology, a tremendous burden of disability might be expected in the near future. An appropriate clinical rehabilitation pathway must be implemented.

Level 2

Whyatt et al (2021) [Cross-Sectional Study] Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: A cross-sectional evaluation[8]

BACKGROUND: There is currently very limited information on the nature and prevalence of post-COVID-19 symptoms after hospital discharge.

METHOD(S): A purposive sample of 100 survivors discharged from a large University hospital were assessed 4 to 8 weeks after discharge by a multidisciplinary team of rehabilitation professionals using a specialist telephone screening tool designed to capture symptoms and impact on daily life. EQ-5D-5L telephone version was also completed.

RESULT(S): Participants were between 29 and 71 days (mean 48 days) post-discharge from hospital. Thirty-two participants required treatment in intensive care unit (ICU group) and 68 were managed in hospital wards without needing ICU care (ward group). New illness-related fatigue was the most common reported symptom by 72% participants in ICU group and 60.3% in ward group. The next most common symptoms were breathlessness (65.6% in ICU group and 42.6% in ward group) and psychological distress (46.9% in ICU group and 23.5% in ward group). There was a clinically significant drop in EQ5D in 68.8% in ICU group and in 45.6% in ward group.

CONCLUSION(S): This is the first study from the United Kingdom reporting on post-discharge symptoms. We recommend planning rehabilitation services to manage these symptoms appropriately and maximize the functional return of COVID-19 survivors.

[8] Halpin SJ, McIvor C, Whyatt G, Adams A, Harvey O, McLean L, Walshaw C, Kemp S, Corrado J, Singh R, Collins T, O'Connor RJ, Sivan M. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: A cross-sectional evaluation. J Med Virol. 2021 Feb;93(2):1013-1022. doi: 10.1002/jmv.26368. Epub 2020 Aug 17. PMID: 32729939.

Level 4

Kirchmair et al (2021) [Cohort Study] Beneficial effects of multi-disciplinary rehabilitation in post-acute COVID-19 - an observational cohort study[9]

BACKGROUND: The COVID-19 pandemic increases the demand for post-acute care in patients after a severe disease course. Various long-term sequelae are expected and rehabilitation medicine is challenged to support physical and cognitive recovery.

AIM: To explore the dysfunctions and outcome of COVID-19 survivors after early post-acute rehabilitation.

DESIGN: Observational cohort study.

METHOD(S): This study evaluated the post-acute sequelae of patients hospitalized for SARS-Cov-2 infection and analyzed rehabilitative outcomes of a subgroup of patients included in the prospective observational multicenter CovILD study.

RESULT(S): A total of 23 subjects discharged after severe to critical COVID-19 infection underwent an individualized, multi-professional rehabilitation. At the start of post-acute rehabilitation, impairment of pulmonary function (87%), symptoms related to post-intensive care syndrome, and neuropsychological dysfunction (85%) were frequently found, whereas cardiac function appeared to be largely unaffected. Of interest, multidisciplinary rehabilitation resulted in a significant improvement in lung function, as reflected by an increase of forced vital capacity (p=0.007) and forced expiratory volume in one second (p=0.014), total lung capacity (p=0.003), and diffusion capacity for carbon monoxide (p=0.002). Accordingly, physical performance status significantly improved as reflected by a mean increase of six-minute walking distance by 176 (SD +/- 137) meters. Contrarily, a considerable proportion of patients still had limited diffusion capacity (83%) or neurological symptoms including peripheral neuropathy at the end of rehabilitation.

[9] Puchner B, Sahanic S, Kirchmair R, Pizzini A, Sonnweber B, WÖll E, MÜhlbacher A, Garimorth K, Dareb B, Ehling R, Wenter J, Schneider S, Brenneis C, Weiss G, Tancevski I, Sonnweber T, LÖeffler-Ragg J. Beneficial effects of multi-disciplinary rehabilitation in post-acute COVID-19 - an observational cohort study. Eur J Phys Rehabil Med. 2021 Jan 15. doi: 10.23736/S1973-9087.21.06549-7. Epub ahead of print. PMID: 33448756.

CONCLUSION(S): Individuals discharged after a severe course of COVID-19 frequently present with persisting physical and cognitive dysfunctions after hospital discharge. Those patients significantly benefit from multi-disciplinary inpatient rehabilitation.

CLINICAL REHABILITATION IMPACT: Our data demonstrate the highly promising effects of early post-acute rehabilitation in survivors of severe or critical COVID-19. These findings illustrate the need for further prospective evaluations and may impact future treatment and rehabilitation strategies.

Level 4

D'Cruz et al (2021) [Cohort Study] Clinical, radiological, functional and psychological characteristics of severe COVID-19 pneumonia survivors: A prospective observational cohort study[10]

INTRODUCTION: 'Long COVID' syndrome, where symptoms persist beyond acute illness with SARS-CoV-2/COVID-19, is anecdotally described. However, a comprehensive report of clinical, radiological, functional and psychological recovery from COVID-19 is currently lacking. We present a detailed radiological, patient-reported and physiological characterisation of patients attending face-to-face assessment following hospitalisation with COVID-19 pneumonia.

METHODS: Prospective single-centre observational cohort study at an inner-city South London teaching hospital. All patients admitted with severe COVID-19 pneumonia (admission duration-48 hours, oxygen requirement-40% or critical care admission) were invited to attend a post-COVID clinic 6-8 weeks following hospital discharge.

PRIMARY OUTCOME: Radiological resolution of COVID-19 pneumonitis.

SECONDARY OUTCOMES: Demographics and anthropometrics, inpatient clinical course, patient-reported and physiological outcomes at follow-up (symptoms, functional disability, mental

[10] D'Cruz et al (2021) Clinical, radiological, functional and psychological characteristics of severe COVID-19 pneumonia survivors: A prospective observational cohort study. https://thorax.bmj.com/content/thoraxjnl/76/Suppl_1/A34.full.pdf. Accessed May 2021.

health screening, 4-metre gait speed (4MGS), 1-minute sit-to-stand (STS) test).

RESULTS: 119 consecutive patients attended clinic between 3 June and 2 July 2020, at median (IQR) 61 (51-67) days post discharge. Despite apparent radiographic resolution of lung infiltrates in the majority (RALE score <5 in 87% of patients), patients commonly reported persistent fatigue (78/115 (67.8%;95%CI 60.0-76.5)), sleep disturbance (65/115 (56.5;47.3-66.1)) and breathlessness (37/115 (32.2;25.2-40.0)). mMRC breathlessness score was above pre-COVID baseline in 55/115 (46.2;37.8-54.6). Burdensome cough was less common (8/115 (7.0; 3.5-10.4)). 56 thoracic computed tomography scans were performed, of which 75% demonstrated COVID-related interstitial lung disease and/or airways disease. Significant depression (PHQ-9-9) or anxiety (GAD-7-9) were present in 20/111 (18.0;11.7-23.4) and 25/113 (22.1;15.0-29.8), respectively. The Trauma Screening Questionnaire was positive (-6) in 28/113 (24.8;18.1-31.9). Post-COVID functional scale was-2 in 47/115 (40.9;33.0-47.8). 4MGS was <0.8 m/s in 44/115 (38.3;29.6-46.1), 39/109 (34.5;26.5-41.6) desaturated by-4% during STS, 25/32 (78.1;62.5-93.1) who desaturated also had abnormal CT findings.

CONCLUSIONS: Persistent symptoms, functional limitation and adverse mental health outcomes are common 8 weeks after severe COVID-19 pneumonia. Follow-up chest radiograph is a poor marker of recovery. Physiological testing to identify oxygen desaturation is useful for triaging patients for further investigation. Face-to-face or virtual clinical assessments are recommended to facilitate early recognition and management of post-COVID sequelae in this vulnerable cohort.

Level 4

Cassar et al (2021) [Cohort Study] Medium-term effects of SARS-CoV-2 infection on multiple vital organs, exercise capacity, cognition, quality of life and mental health, post-hospital discharge[11]

BACKGROUND: The medium-term effects of COVID-19 on organ health, exercise capacity, cognition, quality of life and mental health are poorly understood.

METHOD(S): Fifty-eight COVID-19 patients post-hospital discharge and 30 age-, sex-, body mass index- and comorbidity-matched controls were enrolled for multi-organ (brain, lungs, heart, liver and kidneys) magnetic resonance imaging (MRI), spirometry, six-minute walk test, cardiopulmonary exercise test (CPET), quality of life, cognitive and mental health assessments.

FINDING(S): At 2-3 months from disease-onset, 64% of patients experienced breathlessness and 55% reported fatigue. On MRI, abnormalities were seen in lungs (60%), heart (26%), liver (10%) and kidneys (29%). Patients exhibited changes in the thalamus, posterior thalamic radiations and sagittal stratum on brain MRI and demonstrated impaired cognitive performance, specifically in the executive and visuospatial domains. Exercise tolerance (maximal oxygen consumption and ventilatory efficiency on CPET) and six-minute walk distance were significantly reduced. The extent of extra-pulmonary MRI abnormalities and exercise intolerance correlated with serum markers of inflammation and acute illness severity. Patients had a higher burden of self-reported symptoms of depression and experienced significant impairment in all domains of quality of life compared to controls ($p<0.0001$ to 0.044).

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[11] Raman B, Cassar MP, Tunnicliffe EM, Filippini N, Griffanti L, Alfaro-Almagro F, Okell T, Sheerin F, Xie C, Mahmod M, Mózes FE, Lewandowski AJ, Ohuma EO, Holdsworth D, Lamlum H, Woodman MJ, Krasopoulos C, Mills R, McConnell FAK, Wang C, Arthofer C, Lange FJ, Andersson J, Jenkinson M, Antoniades C, Channon KM, Shanmuganathan M, Ferreira VM, Piechnik SK, Klenerman P, Brightling C, Talbot NP, Petousi N, Rahman NM, Ho LP, Saunders K, Geddes JR, Harrison PJ, Pattinson K, Rowland MJ, Angus BJ, Gleeson F, Pavlides M, Koychev I, Miller KL, Mackay C, Jezzard P, Smith SM, Neubauer S. Medium-term effects of SARS-CoV-2 infection on multiple vital organs, exercise capacity, cognition, quality of life and mental health, post-hospital discharge. EClinicalMedicine. 2021 Jan 7;31:100683. doi: 10.1016/j.eclinm.2020.100683. PMID: 33490928; PMCID: PMC7808914.

INTERPRETATION(S): A significant proportion of patients discharged from hospital reported symptoms of breathlessness, fatigue, depression and had limited exercise capacity. Persistent lung and extra-pulmonary organ MRI findings are common in patients and linked to inflammation and severity of acute illness.

Level 5

Oronsky et al (2021) [Narrative Review] A Review of Persistent Post-COVID Syndrome (PPCS)[12]

Persistent post-COVID syndrome, also referred to as long COVID, is a pathologic entity, which involves persistent physical, medical, and cognitive sequelae following COVID-19, including persistent immunosuppression as well as pulmonary, cardiac and vascular fibrosis. Pathologic fibrosis of organs and vasculature leads to increased mortality and severely worsened quality of life. Inhibiting transforming growth factor beta (TGF-beta), an immuno- and a fibrosis modulator, may attenuate these post-COVID sequelae. Current preclinical and clinical efforts are centred on the mechanisms and manifestations of COVID-19 and its pre-symptomatic and prodromal periods; by comparison, the postdrome, which occurs in the aftermath of COVID-19, which we refer to as persistent post-COVID-syndrome, has received little attention. Potential long-term effects from post-COVID syndrome will assume increasing importance as a surge of treated patients are discharged from the hospital, placing a burden on healthcare systems, patients' families and society in general to care for these medically devastated COVID-19 survivors. This review explores underlying mechanisms and possible manifestations of persistent post-COVID syndrome, and presents a framework of strategies for the diagnosis and management of patients with suspected or confirmed persistent post-COVID syndrome.

[12] Oronsky B, Larson C, Hammond TC, Oronsky A, Kesari S, Lybeck M, Reid TR. A Review of Persistent Post-COVID Syndrome (PPCS). Clin Rev Allergy Immunol. 2021 Feb 20:1–9. doi: 10.1007/s12016-021-08848-3. Epub ahead of print. PMID: 33609255; PMCID: PMC7896544.

Level 6

O'Brien et al (2021) [Descriptive Study] An integrated multidisciplinary model of COVID-19 recovery care[13]

BACKGROUND: To date in Ireland, over 3300 patients have been admitted to acute hospitals as a result of infection with COVID-19.

AIM(S): To describe the establishment of a COVID Recovery Service, a multidisciplinary service for comprehensive follow-up of patients with a hospital diagnosis of COVID-19 pneumonia.

METHOD(S): A hybrid model of virtual and in-person clinics was established, supported by a multidisciplinary team consisting of respiratory, critical care, infectious diseases, psychiatry, and psychology services. This model identifies patients who need enhanced follow-up following COVID-19 pneumonia and aims to support patients with complications of COVID-19 and those who require integrated community care.

RESULT(S): We describe a post-COVID-19 service structure together with detailed protocols for multidisciplinary follow-up. One hundred seventy-four patients were discharged from Beaumont Hospital after COVID-19 pneumonia. Sixty-seven percent were male with a median age (IQR) of 66.5 (51-97). Twenty-two percent were admitted to the ICU for mechanical ventilation, 11% had non-invasive ventilation or high flow oxygen, and 67% did not have specialist respiratory support. Early data suggests that 48% of these patients will require medium to long-term specialist follow-up.

CONCLUSION(S): We demonstrate the implementation of an integrated multidisciplinary approach to patients with COVID-19, identifying those with increased physical and mental healthcare needs. Our initial experience suggests that significant physical, psychological, and cognitive impairments may persist despite clinical resolution of the infection.

[13] O'Brien H, Tracey MJ, Ottewill C, O'Brien ME, Morgan RK, Costello RW, Gunaratnam C, Ryan D, McElvaney NG, McConkey SJ, McNally C, Curley GF, MacHale S, Gillan D, Pender N, Barry H, de Barra E, Kiernan FM, Sulaiman I, Hurley K. An integrated multidisciplinary model of COVID-19 recovery care. Ir J Med Sci. 2021 May;190(2):461-468. doi: 10.1007/s11845-020-02354-9. Epub 2020 Sep 7. PMID: 32894436; PMCID: PMC7475726.

Level 6

Donaldson et al (2021) [Descriptive Study] Delivering a community-based COVID-19 rehabilitation service using existing pulmonary rehabilitation teams is safe and feasible[14]

BACKGROUND: University Hospitals of Morecambe Bay NHS Trust witnessed an early peak of COVID-19 with related hospital admissions in early 2020 which created a need for a coordinated approach to post COVID-19 rehabilitation needs across the area.

OBJECTIVE(S): A three-armed COVID-19 rehabilitation pathway was devised in March 2020 with Arm 1 aiming to assess and address the immediate rehabilitation needs of those leaving hospital following an admission for respiratory complications of COVID-19.

METHOD(S): Existing pulmonary rehabilitation teams were repurposed by integrated care network (MBRN) to be a new 'virtual' rehabilitation service. A register of patients discharged from hospital sites was remotely screened for pathway suitability. Then, using a multi-professional template, a holistic needs assessment was conducted using telephone and/or home visit consultations. Weekly acute-community virtual in-service training sessions and multi-disciplinary case discussions supported the clinicians.

RESULTS: To date, 207 patients have entered the service for virtual triage. 138 patients were deemed suitable for further assessment and interventions. 427 direct clinician consultations were delivered to these 138 patients [122 initial telephone assessments; 53 initial home visit assessments; 168 follow-up telephone consultations; 84 follow-up home visits]. Two of the 138 patients assessed died; both were expected deaths. No clinical incidents occurred and no staff contracted COVID-19 during this period. Feedback from the services' staff survey was very positive, highlighting the supportive value of virtual training and MDT, and the enjoyment of being part of creating and delivering this new service to patients recovering from COVID-19.

[14] Donaldson et al (2021) Delivering a community-based COVID-19 rehabilitation service using existing pulmonary rehabilitation teams is safe and feasible. https://thorax.bmj.com/content/thoraxjnl/76/Suppl_1/A103.2.full.pdf. Accessed 5 May 2021.

CONCLUSION(S): Utilising the skills of pulmonary rehabilitation staff to deliver a holistic rehabilitation and treatment service to those discharged from hospital after suffering respiratory complications of COVID-19 was feasible, safe and well tolerated by staff and patients. This service is now being used to address the needs of post-COVID-19 patients presenting with respiratory needs in the community.

Level 6

Taylor et al (2021) [Descriptive Study] Early clinical experience of a large hospital trust virtual COVID-19 follow-up clinic[15]

INTRODUCTION: A Virtual COVID-19 Follow-up Clinic was designed in response to the need to review a large number of in-patients at a large hospital Trust recovering from COVID-19, but without any significant increase in resources.

METHOD(S): Patients complete a structured online/telephone symptom and psychological health questionnaire and have a chest x-ray 12 weeks after their illness. These results, and their medical records, are reviewed asynchronously by the medical team in a virtual clinic. Patients are then triaged to further virtual review, telephone review, face-to-face review, or are discharged. All patients receive comprehensive written information to aid their recovery.

RESULT(S): During the first 8 weeks of the service, 388 patients have completed the questionnaire (63% online) and have been reviewed. The questionnaire has identified the holistic needs of patients and allowed triaged follow-up with 122 discharged and 53 urgent face-to-face review appointments. 25 CT pulmonary angiogram scans were arranged for patients with typical symptoms of pulmonary emboli; no thromboembolic disease was identified.

CONCLUSION(S): This early experience of a new service has highlighted 5 learning points:

[15] Taylor et al (2021) Early clinical experience of a large hospital trust virtual COVID-19 follow up clinic. https://thorax.bmj.com/content/thoraxjnl/76/Suppl_1/A182.2.full.pdf. Accessed May 2021.

- Virtual review is not necessarily quicker than clinic review in person, with holistic review taking 15 minutes per patient (excluding phone calls).
- Patients appreciate clinical contact and this is particularly relevant in the post-COVID era of restricted healthcare attendance. All patients who attend for face-to-face review are extremely grateful.
- A multidisciplinary team is necessary bringing together respiratory, cardiology, rheumatology, radiology, psychology and immunology in one holistic review. Patients benefit from therapy input, with 13 of 49 patients assessed by the physiotherapist in clinic diagnosed with breathing pattern disorders.
- Medical staff redeployment during the pandemic, and the extreme pressures at that time, meant aspects of planned care were not arranged at discharge. Virtual review of medical records has addressed this deficiency.
- Regular multi-disciplinary strategy meetings have allowed guidelines to be revised weekly, based on increasing evidence, and experience disseminated.

Level 6

Hall et al (2021) [Descriptive Study] Identifying patients at risk of post-discharge complications related to COVID-19 infection[16]

We report early follow-up data from one UK hospital of the initial 200 hospital inpatients with slow recovery from SARS-CoV-2 infection. At 4 weeks post-discharge, 321/957 survivors (34%) had persistent symptoms. A structured outpatient clinical assessment protocol was designed, and outcomes from the first 200 patients seen 4-6 weeks post-discharge are presented here. In 80/200 (40%), we identified at follow-up a cardiorespiratory cause of breathlessness, including persistent parenchymal abnormality (64 patients), pulmonary embolism (four patients) and cardiac complications (eight patients).

[16] Hall J, Myall K, Lam JL, Mason T, Mukherjee B, West A, Dewar A. Identifying patients at risk of post-discharge complications related to COVID-19 infection. Thorax. 2021 Feb 4:thoraxjnl-2020-215861. doi: 10.1136/thoraxjnl-2020-215861. Epub ahead of print. PMID: 33542090; PMCID: PMC7871224.

These findings occurred both in patients who had intensive care unit (ICU) admissions and those who had been managed on the ward, although patients requiring ICU admissions were more likely to have a significant cardiorespiratory cause found for their breathlessness, risk ratio 2.8 (95% CI 1.5 to 5.1).

Level 6

O'Kelly et al (2021) [Descriptive Study] Persistent Poor Health Post-COVID-19 Is Not Associated with Respiratory Complications or Initial Disease Severity[17]

RATIONALE: Much is known about the acute infective process of SARS-CoV-2, the causative virus of the COVID-19 pandemic. The marked inflammatory response and coagulopathic state in acute SARS-CoV-2 may promote pulmonary fibrosis. However, little is known of the incidence and seriousness of post-COVID pulmonary pathology.

OBJECTIVE(S): To describe respiratory recovery and self-reported health following infection at time of outpatient attendance.

METHOD(S): Infection severity was graded into three groups: 1. not requiring admission; 2. requiring hospital admission; and 3. requiring ICU care. Participants underwent chest radiography and six-minute-walk test (6MWT). Fatigue and subjective return to health were assessed and levels of C-reactive protein (CRP), interleukin-6, soluble CD25 and D-dimer were measured. The association between initial illness and abnormal chest x-ray, 6MWT distance and perception of maximal exertion was investigated.

RESULT(S): 487 patients were offered an outpatient appointment, of which 153 (31%) attended for assessment at a median of 75 days after diagnosis. 74 (48%) had required hospital admission during acute infection. Persistently abnormal chest x-rays were seen in 4%. The median 6MWT distance covered was 460m. Reduced distance covered

[17] Townsend L, Dowds J, O'Brien K, Sheill G, Dyer AH, O'Kelly B, Hynes JP, Mooney A, Dunne J, Ni Cheallaigh C, O'Farrelly C, Bourke NM, Conlon N, Martin-Loeches I, Bergin C, Nadarajan P, Bannan C. Persistent Poor Health Post-COVID-19 Is Not Associated with Respiratory Complications or Initial Disease Severity. Ann Am Thorac Soc. 2021 Jan 8. doi: 10.1513/AnnalsATS.202009-1175OC. Epub ahead of print. PMID: 33413026.

was associated with frailty and length of inpatient stay. 95 (62%) felt that they had not returned to full health, while 47% met the case definition for fatigue. Ongoing ill-health and fatigue were associated with increased perception of exertion. None of the measures of persistent respiratory disease were associated with initial disease severity.

CONCLUSION(S): This study highlights the rates of objective respiratory disease and subjective respiratory symptoms following COVID-19 and the complex multifactorial nature of post-COVID ill-health.

Level 6

Rossdale et al (2021) [Descriptive Study] 'Uncovered COVID': The addition of a clinico-radiological pre-follow up multidisciplinary team review improves the provision of follow-up pathways in COVID-19[18]

INTRODUCTION AND OBJECTIVES: BTS guidelines advise that patients with a clinico-radiological diagnosis of COVID-19 undergo follow-up based on severity of disease: either Group 1, required ICU/HDU admission or significant respiratory support; or Group 2, any other admitted patients. The BTS guidelines themselves address concerns that delivering this follow-up might prove difficult due to disrupted working patterns and large caseloads. To address these concerns, we established a post-COVID-19 Pre-Follow Up Multi-Disciplinary Team (pre-FU-MDT). We have reviewed its impact on COVID-19 follow-up streams.

METHOD(S): To capture all relevant patients we cross-referenced a list of all RT-PCR swabs sent for symptomatic purposes against those who had a recent CXR. The CXR reports, coded in real time, were used to establish a list of patients who had CXRs consistent with or indeterminate for COVID-19 pneumonia. The database was screened by a specialist respiratory nurse who assigned follow-up streams

[18] Rossdale et al (2021) 'Uncovered COVID': The addition of a clinico-radiological pre-follow up multidisciplinary team review improves the provision of follow-up pathways in COVID-19. https://thorax.bmj.com/content/thoraxjnl/76/Suppl_1/A184.full.pdf. Accessed 5 May 2021.

based on level of respiratory support required and CXR report. All Group 1, Group 2 and Indeterminate cases were discussed at MDT, which consisted of a consultant respiratory physician and a thoracic radiologist. Cases were discussed with discharge summaries, results and imaging. Follow-up streams were reallocated as necessary. Time for MDT was re-allocated from services reduced during the pandemic.

RESULTS: Of 1532 'symptomatic' swabs, there were 495 patients with a potential clinico-radiological diagnosis of COVID-19 pneumonia discussed at the Pre-FU-MDT. We performed a subgroup analysis on 392 consecutive cases. The pre-FU-MDT changed the follow-up pathway in 21% of non-indeterminate cases (23/108). Follow up was ceased in 5% (17/108). Patients with indeterminate CXRs represented the largest cohort. The pre-FU-MDT ceased follow-up in 57% (150/261) and the remaining 43% (111/261) were stratified to Group 1, Group 2 or other appropriate non-COVID follow up.

CONCLUSION(S): A Pre-FU-MDT has significant clinical impact. By redistributing clinicians' time, an efficient mechanism has been created to reduce unnecessary CXRs and clinic appointments, and focus on those most likely to require follow-up. Review of our follow-up outcomes is ongoing and the results will be available at the time of the BTS meeting.

Level 6

Alagingi (2021) [Narrative Review] Musculoskeletal physiotherapy strategies in post COVID-19 infection: A narrative review[19]

Cardiac and pulmonary complications of COVID-19 such as shortness of breath and oxygen saturation have been documented, but recent reports mention that musculoskeletal symptoms such as myalgia, arthralgia and fatigue are also prevalent in people with post-COVID-19 infection. Due to the reoccurrence of symptoms and vulnerability of people, post-COVID-19 has forced healthcare workers and hospitals to adopt alternative strategies in treating people. Of those strategies telerehabilitation, patient education, self-management and pain management are the most used rehabilitation options in treating post-COVID-19 infection. In this literature review, the strategies for treating people with post-COVID-19 infection are summarised.

Level 6

Curci et al (2021) [Retrospective Study] Functional outcome after inpatient rehabilitation in post-intensive care unit COVID-19 patients: findings and clinical implications from a real-practice retrospective study[20]

AIM: To describe the role of a patient-tailored rehabilitation plan on functional outcome in hospitalized COVID-19 patients.

DESIGN: Real-practice retrospective study.

SETTING: Inpatient Rehabilitation Unit.

POPULATION: Post-acute COVID-19 patients.

METHOD(S): Medical records of patients referred to an Italian COVID-19 Rehabilitation Unit from March 10th, 2020 to April 30th, 2020 were collected. All patients underwent a rehabilitation plan (30

[19] Alagingi (2021) [Narrative Review] Musculoskeletal physiotherapy strategies in post COVID-19 infection: A narrative review. https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/COVIDwho-1187137. Accessed 5 May 2021.

[20] Curci C, Negrini F, Ferrillo M, Bergonzi R, Bonacci E, Camozzi DM, Ceravolo C, De Franceschi S, Guarnieri R, Moro P, Pisano F, De Sire A. Functional outcome after inpatient rehabilitation in post-intensive care unit COVID-19 patients: findings and clinical implications from a real-practice retrospective study. Eur J Phys Rehabil Med. 2021 Jan 4. doi: 10.23736/S1973-9087.20.06660-5. Epub ahead of print. PMID: 33393278.

minutes/set, 2 times/day) to improve gas exchanges, reduce dyspnoea and improve muscle function. At admission (T0) and at discharge (T1), we evaluated as outcome measures: Barthel Index (BI), Modified Medical Research Council Dyspnoea Scale, 6-Minute Walking Test (6-MWT) and the Borg Rating of Perceived Exertion (RPE) Scale. We also assessed: type of respiratory supports needed, pulmonary function, coagulation and inflammation markers, and length of stay (LOS) in the Rehabilitation Unit.

RESULT(S): We included 41 post-acute COVID-19 patients (25 male and 19 female), mean age 72.15+/-11.07 years. Their mean LOS in the Rehabilitation Unit was 31.97+/-9.06 days, as 39 successfully completed the rehabilitation treatment and 2 deceased. We found a statistically significant improvement in BI (84.87+/-15.56 vs 43.37+/-26.00; p<0.0001), 6-MWT (303.37+/-112.18 vs 240.0+/-81.31 meters; p=0.028), and Borg RPE scale (12.23+/-2.51 vs 16.03+/-2.28; p<0.0001).

CONCLUSION(S): These findings suggest that post-acute COVID-19 patients might benefit from a motor and respiratory rehabilitation programme.

CLINICAL REHABILITATION IMPACT: This study provides evidence on the role of rehabilitation COVID-19 post-acute inpatients through a patient-tailored treatment.

Level 6

Lutchmansingh et al (2021) [Narrative Review] A Clinic Blueprint for Post-Coronavirus Disease 2019 RECOVERY[21]

The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has devastated patients, communities and health-care systems. More than 170 countries have been affected by the COVID-19 pandemic, with over 6.8 million cases and 200,000 deaths in the United States as

[21] Lutchmansingh DD, Knauert MP, Antin-Ozerkis DE, Chupp G, Cohn L, Dela Cruz CS, Ferrante LE, Herzog EL, Koff J, Rochester CL, Ryu C, Singh I, Tickoo M, Winks V, Gulati M, Possick JD. A Clinic Blueprint for Post-Coronavirus Disease 2019 RECOVERY: Learning From the Past, Looking to the Future. Chest. 2021 Mar;159(3):949-958. doi: 10.1016/j.chest.2020.10.067. Epub 2020 Nov 4. PMID: 33159907; PMCID: PMC7641526.

of September 23, 2020. Although efforts to manage the ongoing pandemic must remain a priority, our clinical response must also address the needs of a large COVID-19 survivorship. Health-care systems must develop clinical infrastructures to address the complex needs of COVID-19 survivors experiencing significant persistent respiratory symptoms and must anticipate potential long-term pulmonary and non-pulmonary sequelae. In this review, we touch on individual risk factors and features of acute disease that impact post-COVID-19 care, explore potential post-COVID-19 complications, and propose a clinical model for the multidisciplinary care of COVID-19 survivors.

Level 6

Nalbandian et al (2021) [Narrative Review] Post-acute COVID-19 syndrome[22]

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the pathogen responsible for the coronavirus disease 2019 (COVID-19) pandemic, which has resulted in global healthcare crises and strained health resources. As the population of patients recovering from COVID-19 grows, it is paramount to establish an understanding of the healthcare issues surrounding them. COVID-19 is now recognized as a multi-organ disease with a broad spectrum of manifestations. Similar to post-acute viral syndromes described in survivors of other virulent coronavirus epidemics, there are increasing reports of persistent and prolonged effects after acute COVID-19. Patient advocacy groups have helped contribute to the recognition of post-acute COVID-19, a syndrome characterized by persistent symptoms and/or delayed or long-term complications beyond 4 weeks from the onset of symptoms. Here, we provide a comprehensive review of the current literature on post-acute COVID-19, its pathophysiology and its organ-specific sequelae. Finally, we discuss relevant considerations for the multidisciplinary care of COVID-19 survivors and propose a

[22] Nalbandian A, Sehgal K, Gupta A, Madhavan MV, McGroder C, Stevens JS, Cook JR, Nordvig AS, Shalev D, Sehrawat TS, Ahluwalia N, Bikdeli B, Dietz D, Der-Nigoghossian C, Liyanage-Don N, Rosner GF, Bernstein EJ, Mohan S, Beckley AA, Seres DS, Choueiri TK, Uriel N, Ausiello JC, Accili D, Freedberg DE, Baldwin M, Schwartz A, Brodie D, Garcia CK, Elkind MSV, Connors JM, Bilezikian JP, Landry DW, Wan EY. Post-acute COVID-19 syndrome. Nat Med. 2021 Apr;27(4):601-615. doi: 10.1038/s41591-021-01283-z. Epub 2021 Mar 22. PMID: 33753937.

framework for the identification of those at high risk for post-acute COVID-19 and their coordinated management through dedicated COVID-19 clinics.

Level 7

Becker et al (2021) [Expert Opinion] COVID-19 and its sequelae: a platform for optimal patient care, discovery and training[23]

The sequelae of COVID-19 include acute, subacute and chronic stages of the condition. Up to 20% of patients surviving an initial hospitalization require readmission within 60 days of discharge. The most common readmission diagnoses are COVID-19 (30.2%), sepsis (8.5%), pneumonia (3.1%) and heart failure (3.1%). Nearly one-in-four patients require ICU-level care and the overall mortality rate approaches 20.0%.

COVID-19 Sequelae Subtypes

- Type 1: Long COVID-19 syndrome includes patients with varying lengths of recovery and rehabilitation that directly correlate with the severity of infection, target organ damage and pre-existing medical conditions at the time of initial infection.
- Type 2: Long COVID-19 syndrome is characterized by symptoms persisting 6 weeks from the time of initial infection.
- Type 3: Long COVID-19 syndrome features a period of quiescence or near-complete recovery following initial infection, followed by a return of symptoms that persist for≥3 months (Type 3A) or≥6 months (Type 3B).
- Type 4: Long COVID-19 syndrome includes patients who are initially asymptomatic at the time of a positive SARS-CoV-2 test but develop symptoms beginning 1–3 months (Type 4A) or≥3 months (Type 4B) later that persist for varying lengths of time.

[23] Becker RC. COVID-19 and its sequelae: a platform for optimal patient care, discovery and training. J Thromb Thrombolysis. 2021 Apr;51(3):587-594. doi: 10.1007/s11239-021-02375-w. Epub 2021 Jan 27. PMID: 33501596; PMCID: PMC7838017.

— Type 5: Long COVID-19 syndrome includes patients who are initially asymptomatic or minimally symptomatic at the time of a positive SARS-CoV-2 test and experience sudden death within the next 12 months. Subclinical myocarditis with fibrosis and malignant arrhythmias are likely responsible.

We expect the COVID Sequelae Subtype criteria to evolve further and include organ specific subtypes: heart and circulatory system; pulmonary system; central and peripheral nervous system; musculoskeletal system; gastrointestinal and hepatobiliary system; and integumentary system.

Processes of Care

It is in our opinion that optimal care for persons with COVID-19 includes a follow-up evaluation. This applies to all laboratory documented cases, as well as those with compelling signs and symptoms of SARS-CoV-2 infection in the absence of testing or in some instances a negative antigen-based test or inappropriately timed PCR test.

Level 7

Mendelson et al (2021) [Expert Opinion] Long-COVID: An evolving problem with an extensive impact[24]

Persistence of symptoms or development of new symptoms relating to SARS-CoV-2 infection late in the course of COVID-19 is an increasingly recognised problem facing the globally infected population and its health systems. 'Long-COVID' generally describes those persons with COVID-19 who experience symptoms for >28 days after diagnosis, whether laboratory confirmed or clinical. Symptoms are as markedly heterogeneous as seen in acute COVID-19 and may be constant, fluctuate, or appear and be replaced by symptoms relating to other systems with varying frequency. Such multisystem involvement requires a holistic approach to management of long-

[24] Mendelson M, Nel J, Blumberg L, Madhi SA, Dryden M, Stevens W, Venter FWD. Long-COVID: An evolving problem with an extensive impact. S Afr Med J. 2020 Nov 23;111(1):10-12. doi: 10.7196/SAMJ.2020.v111i11.15433. PMID: 33403997.

COVID, and descriptions of cohorts from low- and middle-income countries are eagerly awaited. Although many persons with long-COVID will be managed in primary care, others will require greater input from rehabilitation medicine experts. For both eventualities, planning is urgently required to ensure that the South African public health service is ready and able to respond.

Level 7

Gorna et al (2021) [Expert Opinion] Long COVID guidelines need to reflect lived experience[25]

The final NICE–SIGN–RCGP guideline, published on 18 December 2020, should provide clear information on what is and is not known about the natural history of long COVID, provide guidance for health-care workers to identify cases, and inform clinical practice for the correct management of people with symptoms. Accurate assessment, diagnosis, treatment and rehabilitation are especially important given the increasing evidence of organ pathology and impairment, with preliminary findings from 201 patients in a prospective, longitudinal, observational study suggesting up to 66% of people with long COVID have organ damage and 25% have damage to multiple organs. In our view, the NICE guideline does not do this sufficiently. We are disappointed that the guideline does not adequately address the following issues.

First, the guideline needs to provide a more comprehensive description of the clinical features and physical nature of long COVID. Although we recognise that this is a "living guideline" that will evolve with increasing information on the condition, the clinical case definition of long COVID in the guideline does not adequately describe the varied symptoms experienced beyond the limited number of symptoms and signs listed in an annex toward the end of the guideline. Although the guideline notes that symptoms may fluctuate and often present as overlapping clusters, there is insufficient consideration of the apparent relapsing–remitting nature of the

[25] Gorna R, MacDermott N, Rayner C, O'Hara M, Evans S, Agyen L, Nutland W, Rogers N, Hastie C. Long COVID guidelines need to reflect lived experience. Lancet. 2021 Feb 6;397(10273):455-457. doi: 10.1016/S0140-6736(20)32705-7. Epub 2020 Dec 23. PMID: 33357467; PMCID: PMC7755576.

condition, which risks patients being discharged from clinics during a time of remittance of symptoms but before resolution of the condition. Although we value the holistic and multidisciplinary approach of the guideline, a greater emphasis on the broad range of symptoms would assist clinicians in the assessment, diagnosis, and treatment of physical complaints associated with long COVID, and the need for ongoing monitoring and repeated investigations of symptoms. The guideline is overly focused on self-management, psychological support, and rehabilitation, resulting in the potential for "watered-down" versions of NHS long COVID clinics that do not provide thorough physical assessment of patients.

Second, the guideline does not sufficiently describe what is known about the underlying pathology and the natural history of long COVID. There is no mention of the three theories of persistent virus in immune-privileged sites, aberrant immune response, or autoimmunity. In the guideline there are implicit assumptions about the nature of long COVID, which could result in some equating it with post-viral fatigue and may lead to providers over-emphasising a psychological component. At the very early stage of any new disease, it is unwise to presume parallels with other conditions. This approach risks mismanagement and missed pathology. Research into the natural history of long COVID is in its infancy, yet the guideline does not satisfactorily address what is known about the complexities of the disease course, including development of new symptoms and severe abnormalities months after the acute phase of COVID-19. Instead, the guideline introduces new definitions and nomenclature for different phases of COVID-19 without any clear rationale, defining acute COVID-19 (signs and symptoms of COVID-19 for up to 4 weeks), ongoing symptomatic COVID-19 infection (signs and symptoms of COVID-19 from 4 to 12 weeks), and post-COVID-19 syndrome (signs and symptoms that develop during or after an infection consistent with COVID-19 continuing for more than 12 weeks, and not explained by an alternative diagnosis). This seemingly arbitrary construct implies a linear course and risks damaging patient care by creating barriers to services and investigations.

Third, in developing the guideline we believe a more thorough participative and open process was needed to consider and determine appropriate terminology by involving a broad range of experts, including people with lived experience.

Level 7

Gutenbrunner et al (2021) [Expert Opinion] Phase-adapted Rehabilitation for acute corona virus disease-19 (COVID-19) patients and patient with long-term sequelae of COVID-19[26]

Since the beginning of the COVID-19 pandemic in early 2020, many studies have highlighted the need for the rehabilitation of patients with SARS-CoV-2 infection. Most studies refer to the need for respiratory rehabilitation in the acute phase; however, the fact that the infection also affects other organ systems has to be considered in rehabilitation interventions. Long-term symptoms in many cases severely limit activity and participation and alter quality of life, leading to rehabilitation needs. This paper proposes a phase-adapted model of linking the acute, post-acute, and long-term symptoms of COVID-19 with the well-established matrix of acute, post-acute, and long-term rehabilitation services. A review of currently available recommendations for phase-adapted rehabilitation strategies, including the relevance of prehabilitation within this context, is provided.

Level 7

Parkin et al (2021) [Expert Opinion] A Multidisciplinary NHS COVID-19 Service to Manage Post-COVID-19 Syndrome in the Community[27]

The National Institute for Health and Care Excellence (NICE) describe "post COVID-19 syndrome" or "long COVID" as a set of persistent physical, cognitive and/or psychological symptoms that continue for

[26] Gutenbrunner C, Nugraha B, Martin LT. Phase-adapted Rehabilitation for acute corona virus disease-19 (COVID-19) patients and patient with long-term sequelae of COVID-19. Am J Phys Med Rehabil. 2021 Apr 13. doi: 10.1097/PHM.0000000000001762. Epub ahead of print. PMID: 33901039.
[27] Parkin A, Davison J, Tarrant R, Ross D, Halpin S, Simms A, Salman R, Sivan M. A Multidisciplinary NHS COVID-19 Service to Manage Post-COVID-19 Syndrome in the Community. J Prim Care Community Health. 2021 Jan-Dec;12:21501327211010994. doi: 10.1177/21501327211010994. PMID: 33880955.

more than 12 weeks after illness and which are not explained by an alternative diagnosis. These symptoms are experienced not only by patients discharged from hospital but also those in the community who did not require inpatient care. To support the recovery of this group of people, a unique integrated rehabilitation pathway was developed following extensive service evaluations by Leeds Primary Care Services, Leeds Community Healthcare NHS Trust and Leeds Teaching Hospital NHS Trust. The pathway aligns itself to the NHS England five-point plan to embed post-COVID-19 syndrome assessment clinics across England, supporting the comprehensive medical assessment and rehabilitation intervention for patients in the community. The pathway was first of its kind to be set up in the UK and comprises of a three-tier service model: level 1 - specialist MDT service; level 2 - community therapy teams; and level 3 - self-management. The MDT service brings together various disciplines with specialist skillsets to provide targeted individualized interventions using a specific core set of outcome measures including C19-YRS (Yorkshire Rehabilitation Scale). Community and primary care teams worldwide need an integrated multidisciplinary model of care to deal with the growing number of cases of post-COVID-19 syndrome effectively and in a timely manner.

Level 7

Sisó-Almirall et al (2021) [Expert Opinion] Long COVID-19: Proposed Primary Care Clinical Guidelines for Diagnosis and Disease Management[28]

Long COVID-19 may be defined as patients who, four weeks after the diagnosis of SARS-Cov-2 infection, continue to have signs and symptoms not explainable by other causes. The estimated frequency is around 10% and signs and symptoms may last for months. The main long-term manifestations observed in other coronaviruses (Severe Acute Respiratory Syndrome (SARS), Middle East respiratory

[28] Sisó-Almirall A, Brito-Zerón P, Conangla Ferrín L, Kostov B, Moragas Moreno A, Mestres J, Sellarès J, Galindo G, Morera R, Basora J, Trilla A, Ramos-Casals M, On Behalf Of The CAMFiC Long Covid-Study Group. Long Covid-19: Proposed Primary Care Clinical Guidelines for Diagnosis and Disease Management. Int J Environ Res Public Health. 2021 Apr 20;18(8):4350. doi: 10.3390/ijerph18084350. PMID: 33923972; PMCID: PMC8073248.

syndrome (MERS)) are very similar to and have clear clinical parallels with SARS-CoV-2: mainly respiratory, musculoskeletal, and neuropsychiatric. The growing number of patients worldwide will have an impact on health systems. Therefore, the main objective of these clinical practice guidelines is to identify patients with signs and symptoms of long COVID-19 in primary care through a protocolized diagnostic process that studies possible etiologies and establishes an accurate differential diagnosis. These guidelines have been developed pragmatically by compiling the few studies published so far on long COVID-19, editorials and expert opinions, press releases, and the authors' clinical experience. Patients with long COVID-19 should be managed using structured primary care visits based on the time from diagnosis of SARS-CoV-2 infection. Based on the current limited evidence, disease management of long COVID-19 signs and symptoms will require a holistic, longitudinal follow up in primary care, multidisciplinary rehabilitation services, and the empowerment of affected patient groups.

Level 7

Bringham et al (2021) [Expert Opinion] The Johns Hopkins Post-Acute COVID-19 Team (PACT): A Multidisciplinary, Collaborative, Ambulatory Framework Supporting COVID-19 Survivors - The American Journal of Medicine[29]

The Coronavirus Disease 2019 (COVID-19) pandemic has rapidly shifted health care needs and delivery internationally, with about 1 in 5 people with COVID-19 requiring hospitalization, including in the intensive care unit (ICU), at pandemic onset. ICU survivors in general are at risk for impairments in mental, cognitive, and physical health, collectively known as post-intensive care syndrome; similar challenges have been described in post-acute hospitalization (post-hospital syndrome). Risks may be higher among COVID-19 survivors. Given recognized acute pulmonary complications associated with

[29] Brigham E, O'Toole J, Kim SY, Friedman M, Daly L, Kaplin A, Swarthout M, Hasselfeld B, Lantz-Garnish M, Vannorsdall T, Agranovich A, Raju S, Parker A. The Johns Hopkins Post-Acute COVID-19 Team (PACT): A Multidisciplinary, Collaborative, Ambulatory Framework Supporting COVID-19 Survivors. Am J Med. 2021 Apr;134(4):462-467.e1. doi: 10.1016/j.amjmed.2020.12.009. Epub 2021 Jan 12. PMID: 33444589; PMCID: PMC7801819.

COVID-19, pulmonary sequelae are a prominent concern, although COVID-19 has demonstrated an ability to impact multiple organ systems. Further, emerging scientific data describe a potential for lingering symptoms post-COVID-19 infection even among those who do not require hospitalization.

The etiology and physiologic correlates of potential persistent symptoms require sufficient resource infrastructure for comprehensive supportive care and further insight into the natural history of COVID-19.

We provide a description of early need recognition, resource redistribution, operational experience, and refined multidisciplinary clinic structure to support COVID-19 survivors: the Johns Hopkins Post-Acute COVID-19 Team (JH PACT).

Level 8: UNCLASSIFIED

Duncan et al (2021) A national survey of community rehabilitation service provision for people with long COVID in Scotland[30]

BACKGROUND: Evidence is rapidly emerging on the epidemiology of COVID-19, and its impact on individuals and potential burden on health services and society. Between 10-35% of people with COVID-19 may experience post-acute long COVID. This currently equates to between 8,129 and 28,453 people in Scotland. Some of these people will require rehabilitation to support their recovery. Currently, we do not know how to optimally configure community rehabilitation services for people with long COVID.

METHODS: This national survey aimed to provide a detailed description of current community rehabilitation provision for people with long COVID in Scotland. We developed, piloted, and conducted a national electronic survey of current community rehabilitation service provision for people presenting with long COVID symptomatology. Our sample were the Allied Health Professions Directors of all 14

[30] Duncan et al (2021) A national survey of community rehabilitation service provision for people with long COVID in Scotland. https://f1000research.com/articles/9-1416. Accessed 5 May 2021.

territorial NHS Health Boards in Scotland. Fixed response and narrative data were analysed descriptively.

RESULTS: Responses were received from all respondents (14/14), enabling a national picture to be gained. Almost all Health Boards (13/14) currently deliver rehabilitation for people with long COVID within pre-existing services. Fatigue (11/14) and respiratory conditions (9/14) were the two most common presenting problems of patients. Most long COVID community rehabilitation services are delivered through a combination of face-to-face and digital contact (13/14).

CONCLUSIONS: Community rehabilitation for people with long COVID is an emerging reality. This survey provides a national picture of current community rehabilitation for people with long COVID. We do not know how community rehabilitation can be optimally delivered for this population. This is vital as community rehabilitation services were already under pressure prior to the emergence of COVID-19. Further research is urgently required to investigate the implementation, outcomes and cost-effectiveness of differing models of community rehabilitation for this patient population.

Forthcoming Research

Level 4

Grund et al (2021) [Cohort Study] Pan-European Study on Functional and Medical Recovery and Geriatric Rehabilitation Services of Post-COVID-19 Patients: Protocol of the EU-COGER Study[31]

OBJECTIVES: There is insufficient knowledge about the functional and medical recovery of older people infected with SARS-CoV-2. This study aims to gain insight into the course of functional and medical recovery of persons who receive geriatric rehabilitation (GR) following

[31] Grund et al (2021) Pan-European Study on Functional and Medical Recovery and Geriatric Rehabilitation Services of Post-COVID-19 Patients: Protocol of the EU-COGER Study. https://www.lumc.nl/org/unc-zh/English/Research/EU_COGER_ENGLISHpage/. Accessed 5 May 2021.

SARS-CoV-2 infection across Europe. Special attention will be paid to the recovery of activities of daily living (ADL) and to the GR services offered to these patients.

DESIGN(S): A multi-center observational cohort study.

SETTING AND PARTICIPANTS: This study will include several European countries (EuGMS member states) each providing at least 52 comparable routine datasets (core dataset) of persons recovering from a SARS-CoV-2 infection and receiving geriatric rehabilitation. The routine data will be anonymously collected in an online CASTOR database. The ethical regulations of each participating country will be followed.

PRIMARY OUTCOME: ADL functioning.

SECONDARY OUTCOMES: Length of stay, discharge destination, hospital readmission and mortality. Other variables that will be collected are quality of life, treatment modalities, complications, cognition, frailty, mood/anxiety, BMI, nutrition and pain. All variables will be reported at admission and compared with follow-up scores (discharge, 6 weeks and 6 months follow-up).

CONCLUSION(S): This study will explore the effect of geriatric rehabilitation on post-COVID-19 patients, especially on ADL recovery, and the variety of geriatric rehabilitation services across Europe. Information from this study may help improve recovery of older persons infected with SARS-CoV-2 and improve geriatric rehabilitation services in the ongoing COVID-19 pandemic.

Level 6

Sigfrid et al (2021) [Observational Study] What is the recovery rate and risk of long-term consequences following a diagnosis of COVID-19? A harmonised, global longitudinal observational study protocol[32]

INTRODUCTION: Very little is known about possible clinical sequelae that may persist after resolution of acute COVID-19. A recent longitudinal cohort from Italy including 143 patients followed up after hospitalisation with COVID-19 reported that 87% had at least one ongoing symptom at 60-day follow-up. Early indications suggest that patients with COVID-19 may need even more psychological support than typical intensive care unit patients. The assessment of risk factors for longer term consequences requires a longitudinal study linked to data on pre-existing conditions and care received during the acute phase of illness. The primary aim of this study is to characterise physical and psychosocial sequelae in patients post-COVID-19 hospital discharge.

METHODS AND ANALYSIS: This is an international open-access prospective, observational multisite study. This protocol is linked with the International Severe Acute Respiratory and emerging Infection Consortium (ISARIC) and the WHO's Clinical Characterisation Protocol, which includes patients with suspected or confirmed COVID-19 during hospitalisation. This protocol will follow-up a subset of patients with confirmed COVID-19 using standardised surveys to measure longer term physical and psychosocial sequelae. The data will be linked with the acute phase data. Statistical analyses will be undertaken to characterise groups most likely to be affected by sequelae of COVID-19. The open-access follow-up survey can be used as a data collection tool by other follow-up studies, to facilitate data harmonisation and to identify subsets of patients for further in-depth follow-up. The outcomes of this study will inform strategies to

[32] Sigfrid L, Cevik M, Jesudason E, Lim WS, Rello J, Amuasi J, Bozza F, Palmieri C, Munblit D, Holter JC, Kildal AB, Reyes LF, Russell CD, Ho A, Turtle L, Drake TM, Beltrame A, Hann K, Bangura IR, Fowler R, Lakoh S, Berry C, Lowe DJ, McPeake J, Hashmi M, Dyrhol-Riise AM, Donohue C, Plotkin D, Hardwick H, Elkheir N, Lone NI, Docherty A, Harrison E, Baille JK, Carson G, Semple MG, Scott JT. What is the recovery rate and risk of long-term consequences following a diagnosis of COVID-19? A harmonised, global longitudinal observational study protocol. BMJ Open. 2021 Mar 10;11(3):e043887. doi: 10.1136/bmjopen-2020-043887. PMID: 33692181; PMCID: PMC7948153.

prevent long-term consequences; inform clinical management, interventional studies, rehabilitation and public health management to reduce overall morbidity; and improve long-term outcomes of COVID-19.

ETHICS AND DISSEMINATION: The protocol and survey are open access to enable low-resourced sites to join the study to facilitate global standardised, longitudinal data collection. Ethical approval has been given by sites in Colombia, Ghana, Italy, Norway, Russia, the UK and South Africa. New sites are welcome to join this collaborative study at any time. Sites interested in adopting the protocol as it is or in an adapted version are responsible for ensuring that local sponsorship and ethical approvals in place as appropriate.

Produced by the members of the National Health Library and Knowledge Service Evidence Team†. Current as at 06 May 2021. This evidence summary collates the best available evidence at the time of writing and does not replace clinical judgement or guidance. Emerging literature or subsequent developments in respect of COVID-19 may require amendment to the information or sources listed in the document. Although all reasonable care has been taken in the compilation of content, the National Health Library and Knowledge Service Evidence Team makes no representations or warranties expressed or implied as to the accuracy or suitability of the information or sources listed in the document. This evidence summary is the property of the National Health Library and Knowledge Service and subsequent re-use or distribution in whole or in part should include acknowledgement of the service.

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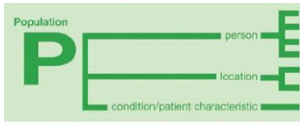
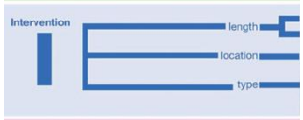
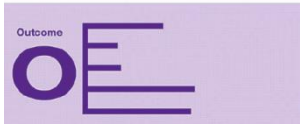
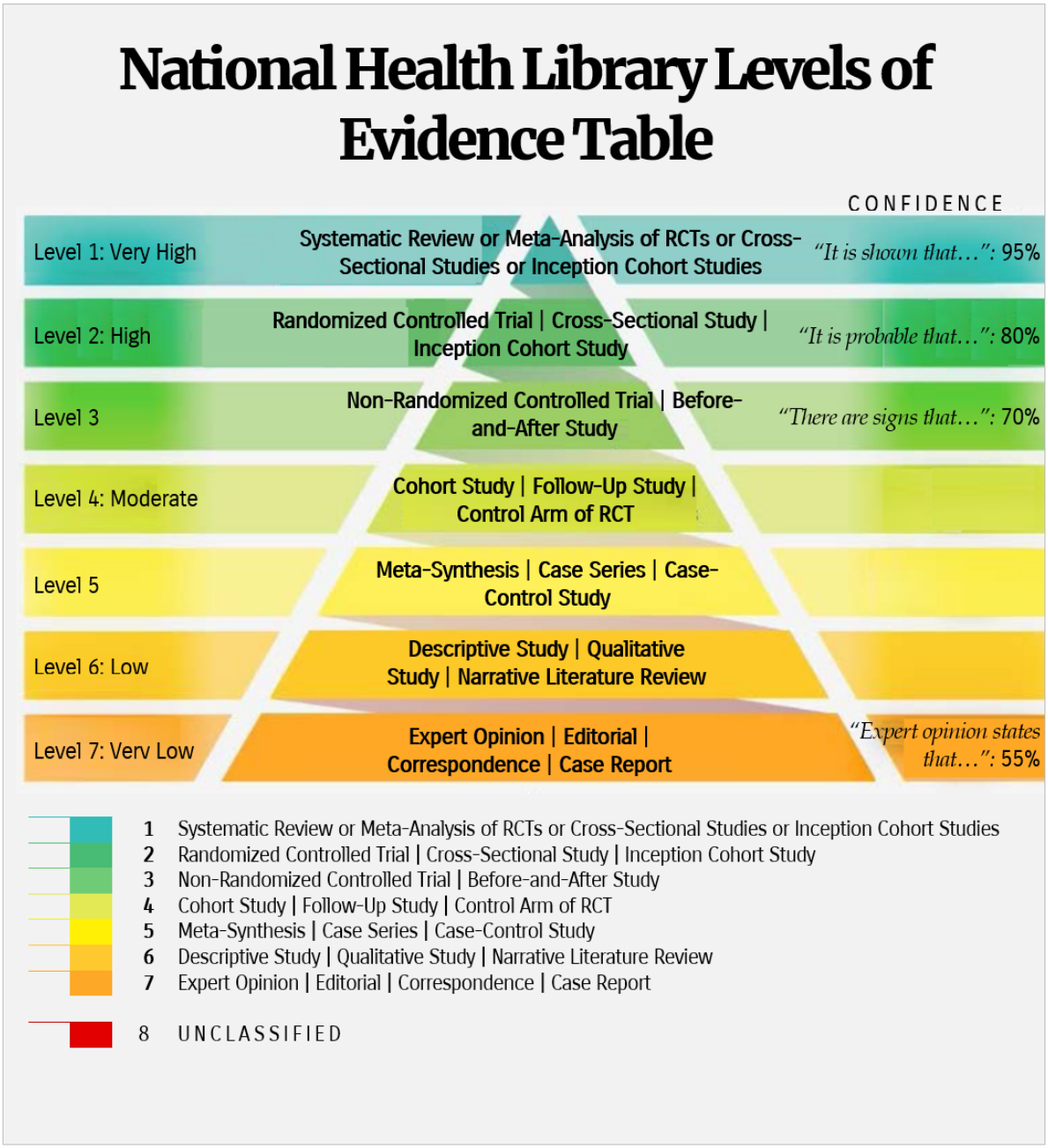
The following PICO(T) was used as a basis for the evidence summary:

	PATIENT FOLLOWING ACUTE EPISODE OF COVID-19 ILLNESS; LONG COVID OR POST-ACUTE SEQUELAE OF COVID-19
	PHARMACOLOGICAL AND NON-PHARMACOLOGICAL INTERVENTIONS AIMED AT TREATMENT AND/OR REHABILITATION – SPECIFICALLY A FOCUS ON HOW CARE IS ORGANISED OR MODEL OF CARE
	SYMPTOM REDUCTION; IMPROVED QUALITY OF LIFE; IMPROVED FUNCTIONAL CAPABILITY

The following search strategy was used:

1 exp Coronavirinae/ (53860)
2 COVID-19.ab,ti. (122079)
3 coronavirus.ab,ti. (59505)
4 "corona virus".ab,ti. (2072)
5 (Wuhan adj3 virus).ab,ti. (116)
6 ("2019-nCoV" or "2019 ncov").ab,ti. (1292)
7 "severe acute respiratory syndrome coronavirus 2".ab,ti. (12922)
8 ("2019" and (new or novel) and coronavirus).ab,ti. (10075)
9 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 (155565)
10 (long adj2 (covid* or coronavir*)).ab,ti. (305)
11 ((prolong* or persist* or long-term) adj3 (covid* or coronavir*)).ab,ti. (787)
12 (post* adj3 (covid* or coronavir*)).ab,ti. (2079)
13 sequelae.mp. (82696)
14 9 and 13 (816)
15 10 or 11 or 12 or 14 (3651)
16 9 and 15 (3439)
17 exp therapy/ (8982339)
18 (recover* or rehabilitat* or therap* or follow-up).ab,ti. (6312955)
19 exp follow up/ or exp aftercare/ or exp long term care/ (1926315)
20 17 or 18 or 19 (12297014)
21 16 and 20 (1960)
22 exp health care organization/ (1603793)
23 exp health care utilization/ (77896)
24 exp health care management/ (1379922)
25 22 or 23 or 24 (2723090)
26 21 and 25 (697)
27 26 and 2021:2021.(sa_year). (380)
28 exp Systematic Review/ or exp Meta Analysis/ or ((systematic* adj2 (review* or overview*)) or (meta analys* or meta analyz*) or (literature adj3 (review* or overview*))).ti,ab. (827650)
29 27 and 28 (23)
30 exp Randomized Controlled Trial/ or randomized controlled trial.pt. or ((random* adj3 trial) or (placebo* or single blind* or double blind* or triple blind*)).ti,ab. (983312)
31 27 and 30 (10)
32 exp Cross Sectional Study/ or ((cross sectional or transverse or prevalence) adj2 (study or analys* or design or method*)).ti,ab. (526922)
33 27 and 32 (13)
34 exp Cohort Analysis/ or exp Longitudinal Study/ or exp Prospective Study/ or exp Follow Up/ or exp Retrospective Study/ or ((cohort or longitudinal or prospective or follow up or retrospective) adj2 (study or analys* or design or method*)).ti,ab. (3762479)
35 27 and 34 (204)
36 29 or 31 or 33 or 35 (224)

The following schema was used to grade the levels of evidence included:



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