Evidence check

Post-acute and subacute COVID-19 care

Evidence check question
What published advice and models of care are available regarding post-acute and subacute care for COVID-19 patients?

In brief

- Providing care for COVID-19 patients as they move from critical and acute care settings is complex and a range of models of care have been described.
- The burden post severe COVID-19 and prolonged ICU stay is considerable in patients, affecting both functional status and biological parameters, suggesting the need for close follow-up for critically ill COVID-19 survivors.¹
- National COVID-19 Clinical Evidence Taskforce recommendations for the care of people with post-acute COVID-19 encompass assessment; managing infection; diagnosis; red flags and symptoms; as well as goals of care such as communication, access and coordination.²
- The UK’s NICE guideline includes assessment of 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.³
- The World Health Organization provides recommendations for policy makers regarding post-acute COVID-19 including:
  - the need for multi-disciplinary, multi-specialty approaches to assessment and management
  - development of new care pathways and contextually appropriate guidelines for health professionals
  - creation of appropriate services, including rehabilitation and online support tools.⁴
- A review of models of care available for long COVID-19 found the following:
  - The rehabilitation needs of patients are varied and multi-faceted, and post COVID-19 clinics should offer multi-disciplinary assessments.
  - Emerging literature emphasises the importance of assessment of post-acute COVID-19 patients after discharge; and of preparedness with appropriate clinical rehabilitation pathways.
  - Initial multi-disciplinary 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.⁵
Post ICU and post discharge care models

- There are two main types of models focused on stepping down care: those in a ward-based environment, and those outside of hospital.
- Almost all models include the following elements: assessment following a point in time; a referral pathway; subsequent care; discharge; describe the importance of interdisciplinary management.
- There are different permutations of the models, with examples below and further detail described in Table 1.6

  - Ward based models:
    - A US model encompasses three subspecialists as the core consulting team including neurology.7 As part of the model a 30-bed COVID-19 recovery unit was established to provide a multi-disciplinary, comprehensive treatment model for those recovering from COVID-19 critical illness.

  - Home based models:
    - A model developed in the UK for respiratory follow-up of patients with clinic radiological confirmation of COVID-19 pneumonia after discharge. It includes assessment within 4-6 weeks post discharge and at 12 weeks post discharge. If normal, patients are discharged and if not, further assessment is undertaken with consideration of referral to specialist services.8
    - A model developed in the US post hospital discharge includes psychiatry, psychology, neurology, cardiology, infectious diseases, nephrology, dermatology, haematology, hepatology and otolaryngology.9 Referral criteria for COVID-19 positive hospital discharges is based on length in ICU, whether the patient has post-discharge rehabilitation recommendations and pre-existing lung disease.

        - For the management of post-acute sequelae of COVID-19 (PASC), patients are managed pragmatically and symptomatically with an emphasis on holistic support while avoiding over-investigation. Models of care encompass clinical assessment; investigations; managing comorbidities; medical management; self-management; safety netting and referral; social financial and cultural support; and mental health.12

Limitations

Evidence on the longer-term impact of COVID-19 on infected patients is rapidly emerging. Comprehensive data is not yet available on all aspects involved. Guidance on models of care for people should be interpreted in the context of individual disease staging and underlying comorbidities, as well as disease prevalence in the local context. The literature search strategy for this evidence check focused on post infection with SARS-CoV-2, but not on individual conditions.
Background

COVID-19 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 more than twelve weeks, and are not explained by an alternative diagnosis. Significant physical, psychological and cognitive impairments may persist despite clinical resolution of the infection.

The World Health Organisation has initiated a planned response to long-COVID, including new clinical guidelines and pathways, and the creation of post-COVID clinics and online support tools.

Methods (Appendix 1)

PubMed and Google were searched on the 13 September 2021.

Results

Table 1. Peer reviewed literature

<table>
<thead>
<tr>
<th>Source</th>
<th>Summary</th>
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</thead>
<tbody>
<tr>
<td><strong>Post-acute care</strong></td>
<td></td>
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<tr>
<td>A Paradigm for the Pandemic: A Covid-19 Recovery Unit*</td>
<td>• Commentary describes a dedicated multi-disciplinary post-ICU recovery unit for COVID-19 patients which addresses their unique complexities and allows them to begin rehabilitation earlier.</td>
</tr>
<tr>
<td>Gupta, et al. May 2020</td>
<td><strong>1 Lead Hospitalist</strong></td>
</tr>
<tr>
<td></td>
<td><strong>3 Hospitals</strong></td>
</tr>
<tr>
<td></td>
<td>2 Onsite, 1 Virtual Primary attending of record</td>
</tr>
<tr>
<td></td>
<td><strong>Advanced Practitioners</strong></td>
</tr>
<tr>
<td></td>
<td>3 NP/PA</td>
</tr>
<tr>
<td></td>
<td><strong>1 Nurse Director</strong></td>
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<tr>
<td></td>
<td>1 Charge Nurse</td>
</tr>
<tr>
<td></td>
<td>9 RN (1:4 ratio)</td>
</tr>
<tr>
<td></td>
<td>2-3 Nursing Aides</td>
</tr>
<tr>
<td></td>
<td><strong>3 Subspecialists</strong></td>
</tr>
<tr>
<td></td>
<td>Neurologist</td>
</tr>
<tr>
<td></td>
<td>Psychiatrist</td>
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<tr>
<td></td>
<td>Neuropsychologist</td>
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<tr>
<td></td>
<td><strong>1 Lead Physiatrist</strong></td>
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<tr>
<td></td>
<td><strong>1 Physiatrist Resident</strong></td>
</tr>
<tr>
<td></td>
<td>2 Senior Therapists</td>
</tr>
<tr>
<td></td>
<td><strong>10-12 Therapists</strong></td>
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<tr>
<td></td>
<td>5-6 PT</td>
</tr>
<tr>
<td></td>
<td>4-5 OT</td>
</tr>
<tr>
<td></td>
<td>1 SLP</td>
</tr>
<tr>
<td>O’Brien, et al. Sep 2020</td>
<td><strong>Core Consulting Team</strong></td>
</tr>
<tr>
<td></td>
<td>Neurology</td>
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<tr>
<td></td>
<td>Neuropsychologist</td>
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<tr>
<td></td>
<td>Psychiatry</td>
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</table>

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**Post-acute care**

**Respiratory follow-up of patients with COVID-19 pneumonia**

George, et al. Aug 2020

- Article provides a suggested structure for the respiratory follow-up of patients with clinic radiological confirmation of COVID-19 pneumonia.
- There are two separate algorithms integrating disease severity, likelihood of long-term respiratory complications and functional capacity on discharge.
<table>
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<td><strong>Post-acute care</strong></td>
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</table>
|  | **Post-COVID-19 follow-up clinic:** depicting chronicity of a new disease⁹  
The team comprises internists, neurologists, psychiatrists, cardiologists, nutritionists and nephrologists.  
The multi-disciplinary assessment comprises a complete physical examination, respiratory, cardiovascular assessment, nutritional assessment, neurological examination including cognitive tests, and mental health assessment. |
|  | **A Clinic Blueprint for Post-Coronavirus Disease 2019** | *Article discusses the aims, general principles, elements of design, and challenges of a successful multi-disciplinary model to address the needs of COVID-19 survivors.* |
### Source

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<td>Post-acute care</td>
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#### RECOVERY: Learning From the Past, Looking to the Future

Lutchmansingh, et al. Mar 2021

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![Diagram of RECOVERY model](attachment:RECOVERY.png)

*Figure 2 – The RECOVERY clinic model. 6MWT = 6-min walk test; COVID-19 = coronavirus disease 2019; CPET = cardiopulmonary exercise testing; CTA = CT angiogram; Echo = echocardiogram; HRCT = high-resolution CT; OT = occupational therapy; PFT = pulmonary function test; PT = physiotherapy; RECOVERY = Comprehensive Post-COVID Center at Yale; sx = symptoms; VQ = ventilation-perfusion scan.*

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### Implementation and evaluation of a COVID-19 rapid follow-up service for patients discharged from the emergency department

- Framework for a remote follow-up service for patients discharged from ED with suspected COVID-19 to:
  - support patient self-management in the community
  - proactively identify deteriorating patients requiring reassessment
  - form a pathway for patients requiring specialist follow-up.
- Rapid remote follow-up pathway:
<table>
<thead>
<tr>
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<th>Summary</th>
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</thead>
</table>
| Post-acute care                                                       | **ED attender with suspected COVID-19**  
> Safe for discharge from ED (all of): O₂ saturation ≥94 % and exercise desaturation < 2 %, HR < 110, RR < 23  
> Criteria for considering pulse oximeter (any of): CRP > 50, RR > 20, O₂ saturation 94 % or 95 %; exercise desaturation > 2 %; typical significant COVID-19 radiological abnormalities  
**EHRS report**  
> Identifies all ED discharges with COVID-19-related diagnosis and/or tested for SARS-CoV-2 in the ED  
> Clinic doctor triages list and schedules patients for follow-up call within 36 hours of attendance  
**Telephone assessment**  
Patient calls into clinic via safety-net number provided in ED or during follow up  
**COVID-19 confirmed or probable (determined on swab result and/or clinical history and other results)**  
High risk of deterioration (based on day of illness and clinical features)  
> Further follow-up call(s) scheduled  
**COVID-19 unlikely or uncertain (determined on swab result, clinical history and other results)**  
**High risk of deterioration (based on day of illness and clinical features)**  
> Discharged from regular follow-up, but ensure has safety-net number  
**Low risk of deterioration**  
> Recall for face-to-face assessment  
**Deteriorating or concerning symptoms**  
> Ensure appropriate follow-up plan in place  
> Discharge from COVID-19 service  
All patients with confirmed or probable COVID-19 with radiological changes or ongoing shortness of breath at day 28 – referred to long-term respiratory follow-up  
- A narrative review article focusing on recovered COVID-19 patients, their complications, precautionary methods and post care.  
__Retrospective and prospective monitoring in post COVID-19 complications and an approach for vigilance in Post-recovery period__  
Rao, et al. Jun 2021
A unique integrated rehabilitation pathway was developed in the NHS.

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).

Entry criteria: Patients with prolonged COVID-19 symptoms, typically persisting for over 3 months (or less than 3 months with complex cases indicating a multidisciplinary (MDT) approach required); symptoms with considerable impact on daily life and functioning, requiring input from 2 or more professionals; patients who discharge with complex care needs.

Interventions: Home visits for assessments and reviews, nurse-led rehabilitation service, facilitated virtual COVID-19 rehabilitation groups.

Entry criteria: Post COVID-19 hospital discharges with symptoms that have persisted for 1-2 weeks.

Interventions: Therapy for bone, joint, heart, lung, rehabilitation, and social support.

Entry criteria: Typical symptoms lasting 1-2 months and likely to resolve with supported self-management.

### Source

**Post-acute care**

**Management of post-acute covid-19 in primary care**

Greenhalgh et al, Aug 2020

**Post-acute COVID-19 syndrome**

Nalbandian, et al. March 2021

- Inter-disciplinary management of post-acute COVID-19.
### Source Summary

**Post-acute care**

- **Early rehabilitation in post-acute COVID-19 patients: data from an Italian COVID-19 Rehabilitation Unit and proposal of a treatment protocol**
  - Curci, et al. Jul 2020
  - Study proposed a post-acute COVID-19 rehabilitation protocol.
  - The early rehabilitation protocol consists of 2 sessions per day of 30 minutes each, for 2 to 3 weeks, that should be adapted to the 2 subgroups based on ventilatory support and estimated FIO2 needs at the admission: 1) patients wearing non-rebreather mask, Venturi mask or oxygen mask (FiO2 ≥40% and <60%); 2) patients without oxygen support devices or wearing nasal cannula (FiO2 ≥21% and <40%)

- **Post-Acute Care Preparedness in a COVID-19 World**
  - Tumlinson, et al. Jun 2020
  - Framework of post-acute care identifying four stages:

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### Framework for Post-Acute Care Preparedness in a COVID-19 World: Key Strategies

<table>
<thead>
<tr>
<th>Stage 1: Survive the Surge</th>
<th>Stage 2: Regroup and Prepare</th>
<th>Stage 3: Restructure to Recovery</th>
<th>Stage 4: Redesign to Reality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outplace non-COVID patients in non-acute hospitals</td>
<td>1. Protect vulnerable populations from COVID infection</td>
<td>1. Tap post-acute providers to participate in front lines of distribution and administration of prophylaxis, vaccinations</td>
<td>1. Create local hospital/post-acute/public health advisory bodies</td>
</tr>
<tr>
<td>2. Assess capacity of SNFs and HHAIs and other sources of care to enable hospital discharges for non-COVID patients</td>
<td>2. Prepare treat-in-place protocols for non-COVID admissions</td>
<td>2. Continue and deepen strategies to deliver non(on)COVID-related medical care at home and in residential care communities</td>
<td>2. Identify opportunities to optimize post-acute care at market level for system performance moving forward</td>
</tr>
<tr>
<td>3. Direct regional post-acute care providers to identify separate, specialized capacity for COVID-positive discharges</td>
<td>3. Create and formalize post-acute care COVID designations and create transfer protocols for various designations</td>
<td>3. Prepare strategic plan for transition</td>
<td>3. Create, revise, and revisit pandemic response plan to include optimal use of all delivery system resources, supplies/equipment, and staff necessary to meet demand</td>
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- Dedicated outpatient service to follow-up patients with COVID-19.
- Two-step assessment:
  - Step 1: nurse assessment, blood tests (including full blood count, liver function tests, renal function tests, D-dimer, coagulation tests, thyroid function tests and thyroid antibodies, glucose, glycated haemoglobin, lactate dehydrogenase, brain natriuretic peptide, C-reactive protein), chest-X-ray, electrocardiogram, full pulmonary function testing with diffusion, psychological evaluation, assessment of rehabilitation needs.
  - Step 2 (three days later): infectious diseases consultation and subsequent referral to primary care or to other specialists (mainly respiratory medicine, cardiology, neurology, endocrinology, physical and rehabilitation medicine, haematology) as deemed appropriate.

### Surviving COVID-19 in Bergamo province: a post-acute outpatient re-evaluation22

Venturelli, et al. Jan 2021

- Post-acute COVID-19 team (PACT) referral criteria for COVID-19+ hospital discharges:

### The Johns Hopkins Post-Acute COVID-19 Team (PACT): A Multidisciplinary, Collaborative, Ambulatory Framework Supporting COVID-19 Survivors23

Brigham, et al. Apr 2021

- Key services and staff of the PACT team:

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### Post-acute care

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</table>
| Establishment of a COVID-19 Recovery Unit in a Veterans Affairs Post- | - Post-acute care recovery unit for clinically stable patients with COVID-19 in a long-term care facility at a Department of Veterans Affairs medical center.  
- Patients are monitored with vital signs every eight hours, blood tests performed biweekly, and infectious diseases nurse practitioner liaises with CRU team on daily basis.  
- Deteriorating patients transfer back to acute care unit (hospital).  
- Recovering patients repeat tested for COVID-19 weekly; when two consecutive tests performed 24-hours apart are negative, patient is discharged.  
- Two wings, 25 beds each – one wing initial COVID-19 recovery unit and opposite wing reserved for ‘surge’. |
| How a Barcelona Post-Acute Facility became a Referral Center for     | - Geriatric post-acute care (PAC) can be a key resource for responding to the COVID-19 pandemic as it offers:  
  o an alternative to conventional hospitalisation, reducing burden on acute care  
  o active treatment for COVID-19, rehabilitation and palliative care  
  o better isolation of frail persons.  
- Overview of the older COVID-19 patient pathway in a post-acute care facility: |
<p>| Comprehensive Management of Subacute                                 |                                                                                                                                          |</p>
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**Patients With COVID-19**
Inzatari, et al. Jul 2020

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**Source (mainly 75+ years old)**

**Acute hospital**
Confirmed PCR+

From COVID-19 wards
Stable, any CFS1 degree or post-COVID
From the Emergency Department
• Mainly CFS1 5+: mild frailty to terminal disease
• Mainly intensity of Care 3-5: maximum treatment in the facility or comfort care

**Nursing Home, Home or PAC**
Suspicious symptoms or PCR+
• CFS1 5+: mild frailty to terminal disease
• Mainly intensity of Care 3-5: maximum treatment in the facility or comfort care

**COVID-19 patients’ management at the post-acute care facility**

**Assess**
• Mini-Comprehensive Geriatric Assessment (functional, mental, social), CFS1
• PCR, X-Ray/blood testing, if needed

**Revise Advanced Care Planning (ACP)**
Mark desired intensity of care2 in the Health Electronic Records

**Treat (balanced options)**
• Active treatment
• Symptom control
• Management of geriatric syndromes (delirium, immobility)
• Intensity of Care 4-5 (CFS1 8–9) → Palliative care (family visits allowed)

**Communication, staff-caregiver (phone), patient-family/friends (phone, video)**

**Psychological support**

**Ethical framework**

**Care of staff (PPE, training, PCR testing, psychological support)**

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1Clinical Frailty Scale (CFS), 0-9, no frailty-terminal disease (Rockwood K, et al., CMAJ 2005)
2Levels of desired intensity of Care, 1-5, any possible option-comfort care (Sache GA, et al., JAGS 1998)

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**Table 1 Grey literature**

<table>
<thead>
<tr>
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<th>Summary</th>
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<tbody>
<tr>
<td><strong>Peer reviewed sources</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Care of People with Post-Acute COVID</strong></td>
<td>These recommendations provide guidance for the goals of care, assessment and management of symptoms post-acute COVID-19.</td>
</tr>
<tr>
<td><strong>Physiotherapy management for COVID-19 in the acute hospital setting:</strong> Recommendations to guide clinical practice</td>
<td>This document outlines recommendations for physiotherapy management for COVID-19 in the acute hospital setting. It includes recommendations for physiotherapy workforce planning and preparation; a screening tool for determining requirement of physiotherapy; recommendations for the selection of physiotherapy treatments and personal protective equipment.</td>
</tr>
<tr>
<td>Australian Physiotherapy Association. March, 2020</td>
<td></td>
</tr>
</tbody>
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<td></td>
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</tbody>
</table>
| COVID-19: Evaluation and management of adults following acute viral illness<sup>13</sup>                                                                                                         | This report describes in detail the evaluation and management of adults during the post-acute and chronic recovery phase from COVID-19. The definitions used agree with the CDC:  
- Acute COVID-19: up to four weeks following the onset of illness.  
- Post-COVID conditions: broad range of symptoms (physical and mental) that develop during or after COVID-19, continue for ≥4 weeks, and are not explained by an alternative diagnosis. |
| Up to date. August, 2021                                                                                                                                                                        |                                                                                                                                                                                                         |
| Caring for adult patients with post-COVID-19 conditions<sup>27</sup>                                                                                                                           | This guide contains information for general practitioners (GPs) who are providing care for adult patients who have previously tested positive to COVID-19 or have a history suggestive of undiagnosed COVID-19, and have (or are at risk of) post-COVID-19 conditions. |
| The Royal Australian College of General Practitioners. October, 2020                                                                     |                                                                                                                                                                                                         |
| COVID-19 rapid guideline: managing the long-term effects of COVID-19<sup>3</sup>                                                                                                          | A guideline on managing the long-term effects of COVID-19 which 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. |
| National Institute for Health and Care Excellence, December 2020                                                                       |                                                                                                                                                                                                         |
| National guidance for post-COVID syndrome assessment clinics<sup>28</sup>                                                                                                                         | The purpose of this guidance is to inform the commissioning of post-COVID-19 syndrome assessment clinics.                                                                                               |
| National Health Service, UK Government. April, 2020                                                                                                                                            | This report is designed to assist local healthcare systems in establishing and maintaining post-COVID-19 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. These services should support those who need them, irrespective of whether they were hospitalised and regardless of whether clinically diagnosed by a SARS-CoV-2 test. |
| In the wake of the pandemic: preparing for Long COVID<sup>4</sup>                                                                           | A policy brief which raises awareness of long COVID-19 and provides recommendation for policy makers on the:  
- need for multi-disciplinary, multispecialty approaches to assessment and management  
- development, in association with patients and their families, of new care pathways and contextually appropriate guidelines for health professionals. |
| World Health Organisation, May 2021                                                                                                     |                                                                                                                                                                                                         |
Peer reviewed sources

- creation of appropriate services, including rehabilitation and online support tools
- action to tackle the wider consequences of long COVID-19, including attention to employment rights, sick pay policies, and access to benefit and disability benefit packages
- involving patients both to foster self-care and self-help
- implementing well-functioning patient registers and other surveillance systems; creating cohorts of patients; and following-up those affected to support the research which is so critical to understanding and treating long COVID.

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?


An evidence review conducted by the National Health Library and Knowledge Service Evidence Virtual Team looking at models of care available for long COVID-19. The main points of the review are:

- 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.
- Post-acute COVID-19 rehabilitation will assume increasing importance as a surge of patients are discharged from hospital, placing a burden on health systems.
- The rehabilitation needs of patients are varied and multi-faceted, and post COVID-19 clinics should offer multi-disciplinary 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 multi-disciplinary teams should integrate respiratory, cardiology, rheumatology, radiology, psychology and immunology services into a holistic post-discharge model of follow-up.
- Emerging literature emphasises the importance of assessment of post-acute COVID-19 patients after discharge; and of preparedness with appropriate clinical rehabilitation pathways.
- Initial multi-disciplinary 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.

Appendix

PubMed search terms

Search 1:

((((follow-up[title] OR recovery*[title]) AND (algorithm*[title/abstract] OR program*[title/abstract] OR model*[title/abstract] OR framework*[title/abstract]))) AND (english[Filter]) AND (COVID-
COVID-19 Critical Intelligence Unit

19[Title/Abstract] AND (acute[Title/Abstract] OR subacute[Title/Abstract] OR postacute[Title/Abstract]))
NOT (animal)

Search 2:
post-acute[Title] AND COVID-19

Google search terms
To inform this brief, Google searches were conducted using terms related to post-COVID-19, long COVID-19, model of care, acute, post-acute, sub-acute, rehabilitation on 13 September 2021.

Inclusion and exclusion criteria

<table>
<thead>
<tr>
<th>Inclusion</th>
<th>Exclusion</th>
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<tbody>
<tr>
<td>• Published advice / models of care for COVID-19 patient journeys in the subacute and post-acute setting</td>
<td>• Opinion letter, case reports</td>
</tr>
<tr>
<td>• Post discharge from acute care</td>
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</tbody>
</table>

References


