Management of post-acute covid-19 in primary care
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PRACTICE POINTER

What you need to know
• Management of covid-19 after the first three weeks is currently based on limited evidence
• Approximately 10% of people experience prolonged illness after covid-19
• Many such patients recover spontaneously (if slowly) with holistic support, rest, symptomatic treatment, and gradual increase in activity
• Home pulse oximetry can be helpful in monitoring breathlessness
• Indications for specialist assessment include clinical concern along with respiratory, cardiac, or neurological symptoms that are new, persistent, or progressive

Post-acute covid-19 (“long covid”) seems to be a multisystem disease, sometimes occurring after a relatively mild acute illness. Clinical management requires a whole-patient perspective. This article, intended for primary care clinicians, relates to the patient who has a delayed recovery from an episode of covid-19 that was managed in the community or in a standard hospital ward. Broadly, such patients can be divided into those who may have serious sequelae (such as thromboembolic complications) and those with a non-specific clinical picture, often dominated by fatigue and breathlessness. The specialist rehabilitation needs of a third group, covid-19 patients whose acute illness required intensive care, have been covered elsewhere.

Defining post-acute covid-19

In the absence of agreed definitions, for the purposes of this article we define post-acute covid-19 as extending beyond three weeks from the onset of first symptoms and chronic covid-19 as extending beyond 12 weeks. Since many people were not tested, and false negative tests are common, we suggest that a positive test for covid-19 is not a prerequisite for diagnosis.

How common is it?

Around 10% of patients who have tested positive for SARS-CoV-2 virus remain unwell beyond three weeks, and a smaller proportion for months (see box 1). This is based on the UK COVID Symptom Study, in which people enter their ongoing symptoms on a smartphone app. This percentage is lower than that cited in many published observational studies, whose denominator populations were those admitted to hospital or attending specialist clinics. A recent US study found that only 65% of people had returned to their previous level of health 14-21 days after a positive test.

Box 1: A patient’s account

My wife, kids, and I all had symptoms of presumed covid-19 in early April 2020. They were soon fine, but I was more unwell and ended up in bed extremely fatigue, lethargic, and without appetite for four days. The only person whose symptoms persisted was myself, and the fatigue which I had experienced was still lingering in the background. From this point onwards, it became difficult to engage fully in day to day activities with my normal energy levels. Exercise, of which I do a fair amount, was not at all possible.

I continued to feel like this for another three weeks, before finally feeling completely overwhelmed. This happened very quickly and without warning, resulting in me heading for bed immediately as I felt so bad. For the next 72 hours, I felt unwell in a way that was bordering on not coping. I was feverish, soaked with sweat to the point of having to regularly towel myself down, and with a persistent headache that had no relief in spite of increased doses of paracetamol or ibuprofen.

My chest was painfully tight, and my breathing was slightly erratic; I began to experience a shortness of breath in random waves that didn’t leave me gasping for air but certainly made me uncomfortable and very worried. My glands were swollen to the point that it was physically challenging to swallow, and this was only possible with severe discomfort. I felt physically exhausted, mentally drained, and, for the first time in my life, began to consider asking for additional help.

It was at this point that I noticed I had also not had any sense of smell for the past week, and this has continued to be the case since.

Overall, I spent seven days feeling like I had been knocked sideways. I rarely get unwell, and if I do it’s a fleeting fling with something that is usually seasonal and easily self medicated. This felt very different and was particularly challenging as there were points during my sickness that I was completely overwhelmed.

As far as recovery goes, it has now taken a full seven to eight weeks to start feeling close to my normal self again. In the aftermath of this, I have continued to experience the following: fatigued to the point of having to sleep in the day, inability to exercise, continued shortness of breath both motionless and when exerting, small waves of anxiety, considerable depression, continued loss of smell. These are all post-symptoms that I have had no experience or medical history with, and so it has been difficult to wrestle with the unexpectedness of them.

I’m back out doing moderate exercise now and glad to be through what has been a very difficult 12 week cycle from start to end.

• 40 year old man, who was previously fit

We also recommend recent articles by a social scientist and clinical academic with prolonged covid-19 symptoms.
Why are some people affected?
It is not known why some people’s recovery is prolonged. Persistent viraemia due to weak or absent antibody response, relapse or reinfection, inflammatory and other immune reactions, deconditioning, and mental factors such as post-traumatic stress may all contribute. Long term respiratory, musculoskeletal, and neuropsychiatric sequelae have been described for other coronaviruses (SARS and MERS), and these have pathophysiological parallels with post-acute covid-19.

What are the symptoms?
Post-acute covid-19 symptoms vary widely. Even so-called mild covid-19 may be associated with long term symptoms, most commonly cough, low grade fever, and fatigue, all of which may relapse and remit. Other reported symptoms include shortness of breath, chest pain, headaches, neurocognitive difficulties, muscle pains and weakness, gastrointestinal upset, rashes, metabolic disruption (such as poor control of diabetes), thromboembolic conditions, and depression and other mental health conditions. Skin rashes can take many forms including vesicular, maculopapular, urticarial, or chilblain-like lesions on the extremities (so called covid toe). There seems to be no need to refer or investigate these if the patient is otherwise well.

What tests are required?
Blood tests should be ordered selectively and for specific clinical indications after a careful history and examination (see infographic); the patient may not need any. Anaemia should be excluded in the breathless patient. Lymphopenia is a feature of severe, acute covid-19. Elevated biomarkers may include C reactive protein (for example, acute infection), white cell count (infection or inflammatory response), natriuretic peptides (for example, heart failure), ferritin (inflammation and continuing prothrombotic state), troponin (acute coronary syndrome or myocarditis) and D-dimer (thromboembolic disease). Troponin and D-dimer tests may be falsely positive, but a negative result can reduce clinical uncertainty. Further research is likely to refine the indications for, and interpretation of, diagnostic and monitoring tests in follow-up of covid-19.

For patients who were not admitted to intensive care, British Thoracic Society guidance on follow-up of covid-19 patients who have had a significant respiratory illness proposes community follow-up with a chest x ray at 12 weeks and referral for new, persistent, or progressive symptoms. For those with evidence of lung damage (such as persistent abnormal chest x ray and oximeter readings), referral to a respiratory service is recommended; subsequent early referral to pulmonary rehabilitation probably aids recovery.
Supporting recovery from covid-19

After excluding serious ongoing complications or comorbidities, and until the results of long term follow-up studies are available, patients should be managed pragmatically and symptomatically with an emphasis on holistic support while avoiding over-investigation. Fever, for example, may be treated symptomatically with paracetamol or non-steroidal anti-inflammatory drugs. Monitoring functional status in post-acute covid-19 patients is not yet an exact science. A post-covid-19 functional status scale has been developed pragmatically but not...
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Breathlessness

Box 2: Breathing techniques

About 80% of the work of breathing is done by the diaphragm. After
illness or general deconditioning, the breathing pattern may be altered,
with reduced diaphragmatic movement and greater use of neck and
shoulder accessory muscles. This results in shallow breathing, increasing
fatigue and breathlessness, and higher energy expenditure. The
“breathing control” technique is aimed at normalising breathing patterns
and increasing the efficiency of the respiratory muscles (including the
diaphragm) resulting in less energy expenditure, less airway irritation,
reduced fatigue, and improvement in breathlessness.

The patient should sit in a supported position and breathe in and out
slowly, preferably in through the nose and out through the mouth, while
relaxing the chest and shoulders and allowing the tummy to rise. They
should aim for an inspiration to expiration ratio of 1:2. This technique
can be used frequently throughout the day, in 5-10 minute bursts (or
longer if helpful).

Other breathing techniques—such as diaphragmatic breathing, slow
deep breathing, pursed lip breathing, yoga techniques, Buteyko—are
used in strategies to manage patients’ breathing patterns and
breathlessness but require specialist advice to identify which technique
best suits each patient.

Breathlessness

A degree of breathlessness is common after acute covid-19. Severe
breathlessness, which is rare in patients who were not hospitalised,
may require urgent referral. Breathlessness tends to improve with
breathing exercises (box 2). Pulse oximeters may be extremely useful
for assessing and monitoring respiratory symptoms after covid-19,
and we could find no evidence that their use in the home leads to
increased anxiety (box 3).

Box 3: Use of pulse oximetry in post-acute covid-19

Hypoxia may reflect impaired oxygen diffusion and is a recognised feature
of covid-19. It may be asymptomatic (so called silent hypoxia) or
symptomatic (reflecting increased work of breathing, or secondary
pathology such as a bacterial pneumonia or thromboembolism). Oxygen
saturation probes (pulse oximeters) have been used as part of a package
of care for patients with covid-19 and are recommended as part of the
assessment of acute covid-19 in national and local guidelines.

Self monitoring of oxygen saturations over three to five days may be
useful in the assessment and reassurance of patients with persistent
dyspnoea in the post-acute phase, especially those in whom baseline
saturation is normal and no other cause for dyspnoea is found on
thorough evaluation. An exertional desaturation test should be performed
as part of baseline assessment for patients whose resting pulse oximeter
reading is 96% or above but whose symptoms suggest exertional
desaturation (such as light-headedness or severe breathlessness on
exercise). In the absence of contraindications, such patients should be
invited to repeat the oximeter reading after 40 steps on a flat surface
(if self testing remotely) and then after spending one minute doing
sit-to-stand as fast as they can (if supervised on site). A fall of 3% in
the saturation reading on mild exertion is abnormal and requires
investigation.

Patients should be provided with a pulse oximeter and an observations
diary and given instructions for how to self monitor. Typically, this
would be a daily reading taken on a clean, warm finger without nail polish,
after resting for 20 minutes; the device should be left to stabilise and
the highest reading obtained should be recorded. While the range of
commercially available oxygen saturation probes from healthcare
suppliers and pharmacies seem to work within normal ranges (92% and
above), smartphone apps that purport to measure oxygen saturations
using the phone camera and torch should not be used.

British Thoracic Society guidelines define the target range for oxygen
saturation as 94-98% and a level of 92% or below as requiring
supplementary oxygen (unless the patient is in chronic respiratory
failure). In the context of a normal assessment (history, examination,
and appropriate investigations) without red flags, an oxygen saturation
of 96% or above and the absence of desaturation on exertional tests is
very reassuring. Further investigation or referral in the first six weeks
after covid-19 in such patients is rarely indicated, though regular support
by telephone or video is likely to be appreciated. Oximeter readings
persistently in the 94-95% range or below (indicating substantially farther
down the oxygen-haemoglobin desaturation curve) require assessment
and investigation. The patient should be provided with safety-netting
advice (such as contacting their general practice or NHS111) in the event
of recurrent low saturation readings. Appropriate adjustments should be
made for patients with lung disease and known hypoxia—in whom the
range of 88-92% is considered acceptable.

Recovery after any severe debilitating illness may be prolonged.
Survivors of covid-19 acute respiratory distress syndrome are at risk
of long term impairment of lung function. Serious interstitial
lung disease seems to be rare in patients who are not hypoxic,
though data on long term outcomes are not yet available.

Pulmonary rehabilitation

Many patients are still recovering spontaneously in the first six
weeks after acute covid-19 and do not generally require fast-track
entry into a pulmonary rehabilitation programme. Those who have
had significant respiratory illness may benefit from pulmonary
rehabilitation, defined as “a multidisciplinary intervention based
on personalised evaluation and treatment which includes, but is
not limited to, exercise training, education, and behavioural
modification designed to improve the physical and psychological
condition of people with respiratory disease.”

In the context of covid-19, rehabilitation is being delivered by various virtual models,
including video linked classes and home education booklets with
additional telephone support. We describe one such programme in
the supplementary material on bmj.com.

Fatigue

The profound and prolonged nature of fatigue in some post-acute
covid-19 patients shares features with chronic fatigue syndrome
described after other serious infections including SARS, MERS, and
community acquired pneumonia. We found no published
research evidence on the efficacy of either pharmacological or
non-pharmacological interventions on fatigue after covid-19. Patient
resources on fatigue management and guidance for clinicians on
Covid-19 is an inflammatory and hypercoagulable state,\(^\text{50}\) with an increased risk of thromboembolic events.\(^{19,50}\) Many hospitalised patients receive prophylactic anticoagulation. Recommendations for anticoagulation after discharge vary, but higher risk patients are typically discharged from hospital with 10 days of extended thromboprophylaxis.\(^{50}\) If the patient has been diagnosed with a thrombotic episode, anticoagulation and further investigation and monitoring should follow standard guidelines.\(^{58}\) It is not known how long patients remain hypercoagulable following acute covid-19.

**Ventricular dysfunction**

Left ventricular systolic dysfunction and heart failure after covid-19 can be managed according to standard guidelines.\(^{59}\) Intense cardiovascular exercise must be avoided for three months in all patients after myocarditis or pericarditis; athletes are advised to take three to six months of complete rest from cardiovascular training followed by specialist follow-up, with return to sport guided by functional status, biomarkers, absence of dysrhythmias, and evidence of normal left ventricular systolic function.\(^{60}\)

**Neurological sequelae**

Ischaemic stroke, seizures, encephalitis, and cranial neuropathies have been described after covid-19, but these all seem to be rare.\(^{61}\) A patient suspected of these serious complications should be referred to a neurologist. Common non-specific neurological symptoms, which seem to co-occur with fatigue and breathlessness, include headaches, dizziness, and cognitive blunting (“brain fog”).\(^{4}\) Until evidence based guidance appears on how to manage or when to refer such symptoms, we recommend supportive management and symptom monitoring in primary care.

**The older patient**

Covid-19 tends to affect older patients more severely.\(^{62}\) Those who survive are at high risk of sarcopenia, malnutrition, depression, and delirium.\(^{7}\) Post-covid-19 chronic pain may affect patients of any age but seems to be commoner in elderly patients.\(^{63}\) Physical symptoms add to the psychosocial impact of disrupted access to health care (such as arrangements for obtaining regular medication), core personal routines (such as walking to local shops), social interactions (such as meeting friends), and lay and professional support networks.\(^{64}\) Support should be personalised with input from the multi-professional team (for example, general practitioner, district nurse, social worker, rehabilitation teams, and occupational therapist as needed).

**Mental health and wellbeing**

Most publications on covid-19 and mental health have emphasised individual reactions to the pandemic such as anxiety, stress, and discrimination, and social exclusion; mental health and wellbeing is strongly associated with social determinants such as poverty, isolation in uninfected individuals, conditions related to broken routines, loneliness, and social isolation in uninfected individuals;\(^{65,66}\) the World Health Organisation has issued guidance on these.\(^{67}\) Lay accounts suggest that post-acute covid-19 is often associated with low mood, hopelessness, heightened anxiety, and difficulty sleeping.\(^{6}\) Post-traumatic stress disorder may occur, especially in healthcare workers and others with caring responsibilities.\(^{15,16,43}\)

While a minority of patients may benefit from referral to mental health services, it is important not to pathologise the majority. Physical manifestations of covid-19 may distort responses to assessment tools (such as the PHQ9) designed to measure anxiety and depression in a physically healthy population, though these complications may occur. Patient organisations emphasise wellbeing, mindfulness, social connection, self-care (including diet and hydration), peer support, and symptom control. Mental illness is strongly associated with social determinants such as poverty, discrimination, and social exclusion; mental health and wellbeing are enhanced by increased social solidarity, informal social support, mutual aid, and other community based and collective measures.\(^{68,69}\) Given how pervasive and unequal the impact of covid-19 has been,\(^{69}\) community level, cross-sector collaborations may be needed to develop locally relevant solutions. A recent report

### Box 4: The sportsperson returning to exercise (summarised from Stanford-Hall statement\(^{43}\))

- After recovery from mild illness: 1 week of low level stretching and strengthening before targeted cardiovascular sessions
- Very mild symptoms: limit activity to slow walking or equivalent. Increase rest periods if symptoms worsen. Avoid high-intensity training
- Persistent symptoms (such as fatigue, cough, breathlessness, fever): limit activity to 60% maximum heart rate until 2-3 weeks after symptoms resolve
- Patients who had lymphopenia or required oxygen need respiratory assessment before resuming exercise
- Patients who had cardiac involvement need cardiac assessment before resuming exercise

There is much debate and controversy about the role of graded exercise in chronic fatigue generally (see patient responses to a recent Cochrane review\(^{77}\)) and in covid-19 in particular (see a recent statement from the National Institute for Health and Care Excellence (NICE)\(^{43}\)). Pending direct evidence from research studies, we suggest that exercise in such patients should be undertaken cautiously and cut back if the patient develops fever, breathlessness, severe fatigue, or muscle aches. Understanding, support, and reassurance from the primary care clinician are a crucial component of management.

**Cardiopulmonary complications, assessment and management**

Perhaps 20% of patients admitted with covid-19 have clinically significant cardiac involvement;\(^{43,50}\) occult involvement may be even commoner.\(^{51,52}\) Cardiopulmonary complications include myocarditis, pericarditis, myocardial infarction, dysrhythmias, and pulmonary embolus; they may present several weeks after acute covid-19. They are commoner in patients with pre-existing cardiovascular disease,\(^{43}\) but they have also been described in young, previously active patients.\(^{33,53,54}\) Various pathophysiological mechanisms have been proposed, including viral infiltration, inflammation and microthrombi, and down-regulation of ACE-2 receptors.\(^{31,33,54}\)

**Chest pain**

Chest pain is common in post-acute covid-19. The clinical priority is to separate musculoskeletal and other non-specific chest pain (for example, the symptom described by a large patient-led survey as “lung burn”\(^{46}\)) from serious cardiovascular conditions. Clinical assessment of the post-acute covid-19 patient with chest pain should follow similar principles to that for any chest pain: a careful history, taking account of past medical history and risk factors, a physical examination, back up as indicated by investigations (infographic).\(^{63}\) Where the diagnosis is uncertain, or the patient is acutely unwell, urgent cardiology referral may be needed for specialist assessment and investigations (including echocardiography, computed tomography of the chest, or cardiac magnetic resonance imaging).

**Thromboembolism**

Covid-19 is an inflammatory and hypercoagulable state,\(^{50}\) with an increased risk of thromboembolic events.\(^{19,50}\) Many hospitalised patients receive prophylactic anticoagulation. Recommendations for anticoagulation after discharge vary, but higher risk patients are typically discharged from hospital with 10 days of extended thromboprophylaxis.\(^{50}\) If the patient has been diagnosed with a thrombotic episode, anticoagulation and further investigation and clinical assessment before resuming exercise.
from general practice in a deprived area of Glasgow describes the importance of accessible, relationship-based care for patients with complex needs, and of system-level interventions such as attached financial advisers and outreach mental health services.69

Social and cultural considerations

Covid-19 is more common and has a worse prognosis in the acute phase in people who are poor, elderly, and from certain minority ethnic groups (notably black, south Asian, and Jewish70). It is too early to say whether these sociodemographic patterns persist in post-acute covid-19. Our own experience suggests that patients with post-acute covid-19 are from diverse social and cultural backgrounds. Many have comorbidities including diabetes, hypertension, kidney disease, or ischaemic heart disease. Some have experienced family bereavements as well as job losses and consequent financial stress and food poverty. Strain on many carers has been high. For an important few, lockdown has worsened safeguarding concerns such as the risk of child or intimate partner abuse. A detailed discussion of all these issues is beyond the scope of this article, but there are strong arguments for working with other agencies to develop local, system-level solutions. Box 5 provides some links to covid-19 advice from specialist social care, lay care, and faith organisations.

Box 5: Additional resources for patients and professionals

Advice for patients

- Royal College of Occupational Therapists. How to conserve your energy: Practical advice for people during and after having COVID-19. https://www.rcot.co.uk/conserving-energy
- Mental Health Foundation. How to look after your mental health during the coronavirus outbreak. https://www.mentalhealth.org.uk/coronavirus

Social, financial, and cultural support

- Faith organisations:
  - Jewish Care. Online and local resource library. https://www.jewishcare.org/informationduringcovid

Professional guidelines and resources


Implications for the primary care team

From the limited current evidence, we anticipate that many patients whose covid-19 illness is prolonged will recover without specialist input through a holistic and paced approach. Much can be achieved through interprofessional, community-facing rehabilitation services which embrace patient self management and peer support and harness the potential of video and other remote technologies. An information platform for the public has recently been launched, and a virtual rehabilitation platform is planned for later in 2020.72 Management of post-acute covid-19 must occur in conjunction with management of pre-existing or new comorbidities (see professional resources in box 5).

The natural history of post-acute and chronic covid-19 in a community population is unknown at the time of writing. The results of ongoing research studies73 74 are eagerly awaited. If 10% of covid-19 survivors experience post-acute disease, and we assume (conservatively) that half of all cases were not formally diagnosed, this translates to around 60 000 people in UK with post-acute covid-19 (around six per general practice). Patients, many of whom were young and fit before their illness, have described being dismissed or treated as hypochondriacs by health professionals.4 They have rightly contested the classification of non-hospitalised covid-19 as “mild.”75 In these uncertain times, one key role that the primary care practitioner can play is that of witness, “honouring
the story” of the patient whose protracted recovery was unexpected, alarming, and does not make sense.75

How this article was created

There are not yet definitive, evidence based recommendations for the management of post-acute covid-19. We therefore used a pragmatic approach based on published studies on SARS and MERS,17–72 early editorials and consensus based guidance on covid-19,73–76 76–80 a living systematic review,81 early reports of telerehabilitation (support and exercise via video link81 82), and our own clinical experience. Academic sources were identified using a systematic search of PubMed database up to 10 July 2020 with the following terms: management of chronic covid-19, long-term sequelae, rehabilitation, mental health, chronic and post-acute care; we supplemented this by citation chaining key papers in Google Scholar.

How patients were involved in the creation of this article

A patient contributed to the description in box 1. The paper was read by four additional lay people with experience of covid-19 in themselves or their friends or relatives, and extensively modified in response to their feedback before submission. Peer reviewers included people with post-acute covid-19. The main changes in response to patient feedback were in relation to management of fatigue.

Contributors: MK and TG jointly conceived the article and are guarantors. MK and MB provided a detailed service model and primary data on 1500 patients followed up in the Watford Virtual Ward service. Literature review was undertaken by TG and LH, supported by professional librarian Nia Roberts. TG wrote an initial draft of the paper and infographic, drawing on detail on rehabilitation provided by MB and cardiac complications by CAC. All authors provided additional information and references and contributed to several iterations of the paper and infographic.

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Finch D, Eastaugh A. How are changes to employment and finances impacting mental health during lockdown? Health Foundation, 2020.


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