



Koninklijk Nederlands
Genootschap voor Fysiotherapie

KNGF position statement

Recommendations for physiotherapy in patients with COVID-19

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Development

This position statement has been developed by the Royal Dutch Society for Physical Therapy (KNGF) together with a national working group of experts in the field of physiotherapy, from a patient association (Longfonds) and the Dutch Lung Association (Long Alliantie Nederland).

This position statement describes recommendations regarding physiotherapy services for patients with confirmed or suspected COVID-19 after hospital discharge or patients who have been ill at home.

Recommendations in this position statement are based on international evidence and guidelines on COVID-19, expert opinion and patient preferences.

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Summary of the recommendations

General recommendations

- The principles of 'social distancing' (1.5 meters distance or e-health) should be considered and adhered to as much as possible for physiotherapy sessions. Always refer to the national guidelines on safety, infection control and transmission prevention.
- If the patient has been tested positive for COVID-19 and/or has symptoms consistent with COVID-19 symptoms in the 14 days prior to triage, the physiotherapist should use personal protective equipment (surgical face mask (type IIR), glasses or face shield and disposable gloves)

Physiotherapy treatment

- The patient's personal needs and request for guidance and the perceived limitations in physical functioning are the main focus of physiotherapy.
- There is still uncertainty about the course of recovery, the physical capacity and physical limitations in patients who have had an active COVID-19 infection. Therefore, caution is required when assessing and treating these patients.
- Based on time after illness and experienced physical abilities of the patient, the clinical recommendations are divided into two main phases: the initial six weeks after hospital discharge or illness at home, and the period after these six weeks.

Initial six weeks after hospital discharge or COVID-19 illness at home

- During the first two weeks, contact the patient by telephone, e-consult or e-health to determine if they experience any limitations in daily physical functioning and if there is an indication for physiotherapy.
- Screen for red and yellow flags.
- Use the following clinical outcome measures: the Patient Specific Functioning Scale, oxygen saturation and heart rate frequency, Short Physical Performance Battery, hand-held dynamometer for grip strength and the Borg Scale CR10 for Shortness of Breath and Fatigue. Use the SNAQ65+ to identify potential malnutrition.
- Provide information and education about the disease process, the expected course of recovery and physiotherapy approach
- Advise and coach the patient to gradually resume their activities of daily living and physical functioning. Ensure adequate monitoring of their daily physical functioning.
- Patient who have (very) low exercise tolerance levels, should perform their activities of daily living and additional exercise therapy at low to moderate intensity and with short interval durations.
- Use a score of 4 (out of 10) on the Borg Scale CR10 for both shortness of breath and fatigue as maximum threshold for exercise intensity. Emphasis of the treatment is on promoting physical functioning for improved social interaction and participation.

- Monitor oxygen saturation and heart rate at rest, during and after exercise. Use 90% as lower limit of transcutaneous oxygen saturation levels at rest, and, during physical exertion an absolute minimum of 85%. In case the saturation level is decreasing, it is important that the saturation level reaches its pre-activity level, measured at rest, within two minutes.
- Therapy focuses on promoting activities of daily living, increasing muscle strength and balance, physical endurance and relaxation.
- When indicated, physiotherapy treatment may also be focused on improving breathing/respiration.
- Which (combination of) form(s) of therapy is chosen depends on the patient's request for guidance, experienced limitations and exercise tolerance levels.
- Be alert for signs of physical and/or psychological overload.

After six weeks

- Determine whether physiotherapy is indicated based on the current patient's needs and their actual level of physical functioning.
- Set further treatment goals related to physical activity and/or exercise capacity based on the exercise test and/or physical activity measurement (e.g. derived from hospital based exercise tests, lung/heart function tests or field tests).
- Use the following clinical outcome measures: the Patient Specific Functioning Scale, oxygen saturation and heart rate frequency, Short Physical Performance Battery, hand-held dynamometer for grip strength, Borg Scale CR10 for Shortness of Breath and Fatigue, 6-Minute Walk Test, 1RM for strength and a pedometer/accelerometer to assess and evaluate the patient's daily physical functioning.
- Emphasis of the treatment is on promoting physical functioning for improved social interaction and participation. Therapy focuses on promoting activities of daily living and participation, muscle strength and balance, physical endurance and/or relaxation.
- When indicated, physiotherapy treatment may also be focused on improving breathing/respiration.
- During exercise, a maximum score of 6 (out of 10) on the Borg Scale CR10 for Shortness of Breath and Fatigue and/or an intensity of 60-80% of the tested maximum exercise performance (e.g. bicycle test, 6MWT and/or the 1 RM) is recommended.
- Ensure a gradual increase in training frequency, intensity and time/duration based on the patient's needs, treatment goals and physical abilities.

1. Introduction

COVID-19

Since the outbreak of the novel coronavirus (SARS-CoV-2/COVID-19) in Wuhan, China (December 2019), the virus has rapidly spread worldwide. Late February 2020 the pandemic was a fact.[1,2] Currently (early June 2020) the daily number of new infections is decreasing in China and Europe, although areas with new infections are also being reported. In all these regions, strict measures are in place to control and limit the spread of the virus. In North and South America and parts of Asia and Africa, however, the number of infections is increasing sharply at this moment of writing.[3] Around 15.7 million people worldwide, in 188 countries, have been tested positive for COVID-19 (reference date July 24th, 2020). The largest number of infections has occurred in North America, approximately 4.1 million, followed by Brazil, India and Russia (reference date July 24th, 2020). In the Netherlands, the registered number of people being infected has risen to 52,834 and 6,158 COVID-19 related deaths have been registered (reference date July 24th, 2020).[4] These numbers are probably underestimations, because not all people with complaints are being tested for COVID-19, due to the high demand on the healthcare system and its resources, the available testing capacity and the high demand for tests globally.[5] COVID-19 is a virus in the family of coronaviruses and is related to other coronaviruses, such as the virus that caused the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 and the virus that caused the outbreak in 2012 of the Middle East Respiratory Syndrome (MERS).[5] COVID-19 is a beta-coronavirus, and consists of a strand of ribonucleic acid (RNA) with a protein shell. These proteins can bind to a cell's angiotensin converting enzyme 2 (ACE2) receptors and allow the RNA to enter the cell. Cells with ACE2 receptors are located in various places in the body, including the lungs, oesophagus, blood vessels, bile duct, heart, kidney and bladder. All of these organs and tissues can potentially become infected with the virus.[6,7] The RNA enters the cell, where it starts to divide.[8] The virus has an incubation period of 2 to 14 days (5-6 days on average).[9] COVID-19 is transmitted through small airborne drops ("aerosols" and "droplets"), for example during coughing, sneezing or speaking. Infection mainly occurs from person to person.

At the moment, there is still uncertainty about the period of contagiousness. The Dutch National Institute of Public Health and Environment recommends to stay indoors with flu complaints until you are at least 24 hours free of symptoms and complaints, in order to minimize the chance of reinfection or infecting others. [9] However, a study has been published reporting contagiousness of 20 days on average (range 8-37 days).[1] In another study, 50% of patients were still contagious after being symptom-free for eight days.[10]

Climate and weather type seem to have little impact on the spread of the virus. This means that the spread of the virus may not be less when it gets warmer or in warmer areas.[8] Although (inter)national measures taken do seem to have an effect on the spread of the virus, it is likely that it will flare up again given the specific properties of the virus. The extent to which this may occur is depending on measures taken to limit the spread of the virus and whether an effective vaccine will be found. In previous comparable pandemics the virus remained active for a prolonged time [11].

COVID-19 and symptoms

In infected symptomatic people, COVID-19 often presents itself as a respiratory infection. The disease leads to mild or moderate symptoms in 80% of the patients. 15% of patients develop severe symptoms and 5% develop critical symptoms, which requires an intensive care unit (ICU) admission. [12-15]

Characteristics of people with higher risk of developing severe symptoms are men, persons older than 70 years of age and persons with comorbidity (hypertension, diabetes, cardiovascular diseases, cancer and chronic lung diseases).[16]

The most common symptoms are fever (83-99%), (dry) cough (59-82%), fatigue (44-70%) and shortness of breath (31-40%). In severe and critical cases, complications can present at cardiovascular, respiratory, gastrointestinal and neurological systems (e.g. pulmonary embolism, myocarditis and neurological involvement in respiratory failure), and in the immune system (cytokine storm). Patients admitted to the ICU often show symptoms of acute respiratory distress syndrome (ARDS).[16] COVID-19 should therefore be viewed as a systemic condition in which the mechanism of these complications has not yet been fully understood. The physiotherapist has a signalling role for systemic complications.[17-19]

Although long term effects of COVID-19 are not yet clear, we know that there are residual COVID-19 symptoms, such as coughing or fatigue. In patients who have been admitted to ICU there is also a risk of developing ICU-acquired muscle weakness and post-intensive care syndrome (PICS).[20, 21]

Post-acute care

Due to the limited hospital capacity, patients who have been hospitalised, whether or not admitted to the ICU, are currently discharged from hospital earlier than expected under normal circumstances. A criterion for discharge is independence in basic functional activities of daily living, such as being able to sit upright independently, to make transfers and to stand and walk. An important factor for discharge to the patient's home is the level of assistance that these patients need and can receive in their home setting. For example, care or assistance from relatives or other caregivers. Patients can also be discharged to a nursing home, a post-clinical hospital department or a rehabilitation centre. Physiotherapists can assist patients in their recovery in all settings.

Purpose of the position statement

This position statement describes recommendations regarding physiotherapy services for patients with COVID-19 after hospital discharge or patients who have been ill at home. It focuses in particular on physiotherapy and rehabilitation of patients in their home situation and supports physiotherapists in clinical reasoning and decision making in physiotherapy assessment, treatment and evaluation. The recommendations are based on international evidence and guidelines,[22] expert opinion and patient preferences. This document will be updated when new relevant information comes available from clinical experience and scientific publications that warrants revision of the content.

The position statement provides information and guidance, but cannot be considered a treatment guideline, as it has not been developed according to KNGF treatment guideline development methodology.[23]

For recommendations regarding physiotherapy treatment for COVID-19 patients during hospital admission, please refer to the guideline 'Physiotherapy management for COVID-19 in the acute hospital setting'^a.

It is acknowledged that physiotherapy services and practice vary around the world. Therefore, the local context, including national guidelines on safety, infection control and transmission prevention should be taken into account when interpreting and using these recommendations.

Role of the physiotherapist

The physiotherapist can play an important role in the rehabilitation of patients with COVID-19 who experience limitations in daily physical functioning. This specifically relates to patients who experience reduced functional capacity and/or reduced physical activity levels after active infection of COVID-19. Patients who have been severely or critically ill can have (very) low exercise capacity. They need time to recover from illness and time to rehabilitate from the related limitations they (may) experience. It is therefore important to assess the severity of limitations and need for physiotherapy care, and provide guidance to gradually increase the patient's physical functioning and monitor physical function and activity levels in the first six weeks after discharge from the hospital or after the active COVID-19 illness infection at home.

It is important to note here, that it still remains largely unclear to what extent COVID-19 may affect organ function (potentially cause organ tissue damage or multiple organs failure) in the short and long term and the course of recovery from organ tissue damage. Currently, experts have identified possible risk of (irreversible) tissue damage to organs, such as the lung and heart, with restrictive lung disease, myocarditis, cardiomyopathy and/or polyneuropathy. However, uncertainty about this phenomenon remains. Monitoring a patient's bodily functions in the short and long term is therefore important.

Target population

The recommendations in this position statement are written for physiotherapists who may treat patients with confirmed or suspected COVID-19 after being discharged from hospital (with or without admission to ICU) or patients who were ill at home. Patients with prolonged ICU admission most likely can be considered a vulnerable group with very low functional capacity for physical activity, possibly in combination with mental and/or cognitive problems. Beside this group of patients, it is expected that a strongly reduced physical functioning can also occur in patients with COVID-19 who have been hospitalised without having been to ICU and in patients who have been ill in their home environment.

a <https://www.kngf.nl/kennisplatform/guidelines>

General points of attention for infection risk and safety for the physiotherapist and patient

Currently, it remains unknown how long patients can be infectious to others after symptoms of the active COVID-19 infection have subsided. There are indications that infectiousness can persist while being free of symptoms.[1, 10] Not only the patient, but also the physiotherapist can spread the virus, either directly, even when the physiotherapist is free of symptoms, or indirectly, when the physiotherapist has visited a patient with COVID-19.

Triage

Given the current uncertainty regarding COVID-19 contagiousness and the importance of safety of the physiotherapist, patient and their environments, triaging of patients is important. We recommend to triage patients according to the national guidelines in health care for people with COVID-19.

- The principles of 'social distancing' (1.5 meters distance or e-health) should be considered and adhered to as much as possible for physiotherapy sessions
- If the patient has been tested positive for COVID-19 and/or has symptoms consistent with COVID-19 symptoms in the 14 days prior to triage, the physiotherapist should use personal protective equipment (surgical face mask (type IIR), glasses or face shield and disposable gloves)

It is essential that the physiotherapist is familiar with their national guidelines on safety, infection control and transmission prevention and recommended organisation of physiotherapy services. These may indicate the need for specific infection risk assessment, physical distancing and personal protective equipment.

Infection risk and safety for the physiotherapist and patient

- The principles of 'social distancing' (1.5 meters distance or e-health) should be considered and adhered to as much as possible for physiotherapy sessions
- If the patient has been tested positive for COVID-19 and/or has symptoms consistent with COVID-19 symptoms in the 14 days prior to triage, the physiotherapist should use personal protective equipment (surgical face mask (type IIR), glasses or face shield and disposable gloves)

2. Limitations in functioning and indication for physiotherapy

Patients who have been severely or critically ill and/or have been hospitalised (for a prolonged time) may have (severe) limitations in physical, emotional, cognitive and/or social functioning.

Physiotherapy can play an important role in the rehabilitation of these patients and focuses mainly on limitations in physical functioning. It is important that the physiotherapist is aware of and identifies other potential limitations that the patient may experience. In these cases, intra- or interdisciplinary collaboration may be required.

Not all patients with COVID-19 will have an indication for physiotherapy. Only

patients with a request for guidance and presenting with limitations in physical functioning, e.g. activities of daily living, physical activity or exercise capacity, are eligible for physiotherapy.

Intra- and/or interdisciplinary collaboration is important for patients with a complex clinical situation and need for health care services. Patients with multiple and severe problems (physical, mental, cognitive and/or social) may benefit from other health care providers during their rehabilitation. In these patients, physiotherapy as a sole health care service is not sufficient. See chapter 4 for more information about the organisation of health care and intra- and interdisciplinary collaboration.

Functional limitations and indication for physiotherapy

- Patients with a request for guidance and limitations in physical functioning have an indication for physiotherapy.
- In complex cases, such as post-ICU patients with severe limitation and/or co-morbidities, intra- and interdisciplinary collaboration is required.

3. Recommendations for physiotherapy

The patient's personal needs and request for guidance and their perceived limitations in physical functioning are always the main focus of physiotherapy. There is still little known about the course of recovery, physical capacity to load and physical limitations in patients who have had an active COVID-19 infection. Patients planned to be discharged from hospital will not undergo an exercise test around the time of discharge, which normally provides an indication of lung and/or heart function. Therefore, there is lack of clinical information on the patient's physical function and exercise capability. Hence, the physiotherapist has no specific clinical information to determine parameters for exercise prescription.

Globally, the organisation of healthcare and clinical follow-up may be considerably different. In some countries, such as the Netherlands, most patients who have been hospitalised receive a medical follow-up in the hospital after approximately six weeks of discharge. During the follow-up appointment physical functions (including lung and/or heart function) can be tested and physical activity and performance levels can be assessed.[24,25] Based on these test results, the physiotherapist can determine more adequately the patient's exercise capacity and how to gradually increase their physical activity levels (using exercise prescription principles: frequency, intensity, time/duration and type). Patients who have experienced COVID-19 at home have not had and will not have tests in the hospital. With lack of information, their exercise capacity and tolerance levels remain more uncertain. In the following sections of this position statement, the clinical recommendations are divided into two main sections, based on time after illness and experienced physical abilities: the first six weeks after hospital discharge or illness at home, and the period after these six weeks.

Physiotherapy treatment

- The patient's personal needs and request for guidance and the perceived limitations in physical functioning are the main focus of physiotherapy.
- There is still little known about the course of recovery, the physical capacity to load and physical limitations in patients who have had an active COVID-19 infection. Therefore, caution is needed when assessing and treating these patients.
- Based on time after illness and experienced physical abilities the clinical recommendations are divided into two main sections: the first six weeks after hospital discharge or illness at home, and the period after these six weeks

3.1 The first six weeks after hospital discharge / or illness from COVID-19 at home

Patients who are discharged from the hospital often receive advice to gradually increase their activities of daily living, and are given functional physical exercises to perform at home. When there is an indication for physiotherapy at discharge, it is expected that patients will receive transfer information from the hospital. In some cases, patients will be contacted by telephone by (the physiotherapist of) the hospital after approximately two weeks. The aim of this consultation is to assess the progress of these patients' daily functioning after discharge. When the patient still has (severe) limitations in their daily physical functioning there is an indication for physiotherapy. The hospital may refer the patient to a physiotherapist who can provide physiotherapy care to the patient in their home environment. However, the follow-up and organisation of assessment may differ per hospital, region and country.

If a patient has been admitted to a hospital, but there is no transfer, the physiotherapist is recommended to contact (the physiotherapy department of) the hospital for further information.

Patients who were ill from COVID-19 at home will often have been and/or be in contact with their general practitioner (GP).[25] This may also apply to patients who have been discharged from hospital and transferred to the GP for medical follow-up. The GP can consult with and inform a physiotherapist if deemed necessary. Patients, their relatives or other caregivers can also contact the physiotherapist directly. This group is expected to be small given the coordinating role of medical health care service providers, i.e. hospitals and GPs. In case of direct access to physiotherapy, it is strongly recommended to contact the patient's GP prior to commencement of treatment. Interdisciplinary communication and collaboration are of great importance in delivery of adequate health care services.

3.1.1 First consultation and indication for physiotherapy

Within two weeks after hospital discharge or after symptoms of active COVID-19 infection have subsided the physiotherapist contacts the patient, in case a referral from the hospital or GP was received or in case of direct access. The aim of this first contact is to understand how the patient is feeling and what possible (physical) limitations the patient is experiencing – in all the domains of the World Health Organisation's International Classification of Functioning, Disability and Health (WHO-ICF) model. The physiotherapist should preferably use remote communication, such as telephone contact or video calling, as much as possible.

Besides, recording existing and newly acquired comorbidities prior to or from

COVID-19 including possibly affected organs, such as lungs and/or heart, is essential to be able to assess the patient's current health status. When the patient is referred from a hospital or by a GP, such information is expected to be described in a transferal/referral note.

Based on the obtained information from health care providers and the patient, the physiotherapist assesses the severity of limitations in the patient's physical functioning using all the domains of the WHO-ICF model. Together with the patient's specific needs and request for guidance, the physiotherapist decides whether there is an indication for physiotherapy.

Patients who have been admitted to the ICU may have ICU-acquired weakness (ICU-AW) and/or may experience Post Intensive Care Syndrome (PICS). These patients may experience severe physical deconditioning and malnutrition, with physical, mental and/or cognitive impairment. The capacity to exercise and perform (daily) activities is very low in these patients and the risk to overload is high. In these patients it is highly recommended to refer them (via the GP) to a rehabilitation centre.

When the patient experiences functional limitations and/or limitations in activities and/or participation in daily life and has a request for guidance, physiotherapy is indicated.

First consultation

- Within the first two weeks after hospital discharge or after symptoms of active COVID-19 infection have subsided, contact the patient by telephone or video calling to assess the perceived limitations in physical functioning and determine whether there is an indication for physiotherapy.
- Patients with a request for guidance and limitations in physical functioning have an indication for physiotherapy.
- Be aware of existing or newly acquired comorbidities.

3.1.2 Red and yellow flags

Screening for red flags prior to further assessment and treatment in COVID-19 patients is very important. From some red flags, when present, the assessment or treatment must be temporarily discontinued. For other red flags, the physiotherapist should consult with the GP or other referring doctor.

Red flags

Discontinue the assessment/treatment and consult a doctor in case of:

- Heart frequency in rest is <40 or >130 beats per minute
- Respiratory rate of >40 per minute
- Oxygen saturation in rest of $\leq 90\%$ and/or during exercise/activity of $<85\%$
- Heart arrhythmia
- Painful and swollen limbs (suspicion of deep vein thrombosis)
- Acute dyspnea (due to suspicion of pulmonary embolism)
- Recent myocardial ischemia
- Excessive sweating, facial cues of feeling unwell (incl colour), anxiety

Discontinue the assessment/treatment and repeat measurements at a later stage in case of:

- Fever (core temperature $>38.0^{\circ}$ Celsius)
- Exhaustion (Borg Scale score for fatigue ≥ 5 out of 10 while resting)
- High blood pressure while resting ($\geq 180/100$ mmHg)

Yellow flags are also important to take into account during assessment and treatment sessions. Yellow flags are factors that may negatively influence recovery. The physiotherapist is advised to carefully screen for factors that may require the involvement of other health professionals, such as the GP, psychologist, social work, occupational therapist, dietician, or specialised physiotherapists (e.g. psychosomatic physiotherapist). See Appendix 1 for advice on yellow flags. Black flags are also included in Appendix 1.

Yellow flags

- Dysfunctional breathing
- Delirium in recent medical history*
- Fear of physical activity/exercise
- Fear for shortness of breath
- Sleeping problems
- Post-traumatic stress syndrome**
- External locus of control
- Negative beliefs and/or concerns about symptoms

* *Almost 100% of patients with COVID-19 waking at ICU have delirium.*

** *Many patients with COVID-19 experience anxiety after hospital discharge.*

3.1.3 Clinical outcome measures for the first six weeks

It is important to identify factors that can influence recovery and/or can guide clinical decision making. The WHO-ICF can serve as a model to capture and organise several constructs from subjective and objective assessment. Clinical outcome measures are used to assess and evaluate the functioning of patients, guide clinical decision making and optimise treatment.

The core set of clinical outcome measures for the first six weeks after hospital discharge or illness from COVID-19 at home consists of:

- **Patient Specific Functioning Scale (PSFS)** to determine the perceived physical limitations in participation and activities of daily living.
- **Borg Scale CR10 for Shortness of Breath and Fatigue** indicating shortness of breath and fatigue experienced by the patient. A maximum threshold score for exercise intensity of 4 out of 10 on the Borg Scale CR10 applies at this time after illness.
- **Oxygen saturation (SpO₂)** at rest, during and after physical activity and therapeutic exercise. If the physiotherapist has a pulse oximeter, it can be delivered to the patient's home, when treatment is provided remotely.
- **Heart rate (HR)** at rest, during and after physical activity and therapeutic exercise. In case of e-health consultation, heart rate can be measured by instructing the patient on how to measure it himself, for example using the

pulse oximeter or by instructing the patient how to measure it themselves with the heart rate indicated by the patient ('counting strokes aloud'). The physiotherapist should be aware that outcomes can be influenced by medication.

- **Short Physical Performance Battery (SPPB)** to measure balance, muscle strength and mobility. The SPPB consists of a balance test, walking speed over 4 meters and 5 times repeated standing up from a chair test. The physiotherapist must at all times ensure the safety of the patient if they are (seriously) weakened. In case of e-health consultation, the SPPB cannot be performed.
- **Grip Strength** to estimate overall peripheral muscle strength. If possible and available, a hand-held dynamometer is used.
- **6-Minute Walk Test (6MWT)** to estimate the exercise capacity. In case of e-health consultation or the patient has (very) low exercise tolerance levels, the 6MWT should not be attempted.
- **Short Nutritional Assessment Questionnaire (SNAQ⁶⁵⁺)** for early detection of malnutrition in patients who have been hospitalised. The physiotherapist uses the SNAQ⁶⁵⁺ to identify a potential malnutrition status of the patient. A dietician should be consulted or referred to in case of signs of malnutrition. It is important that the physiotherapist and dietician have good communication and collaboration.

In this position statement, the clinical outcome measures focus on physical functioning. Optionally, during the first six weeks, a pedometer/accelerometer can be used to determine and monitor daily physical activity levels. Also, one-repetition maximum (1RM) tests can be used to determine muscle strength of specific muscle groups and to determine initial intensities of exercises which improve muscle strength (Table 1).

Table 1. Overview of clinical outcome measures for the first six weeks.

Construct	Patient with (very) low exercise tolerance levels*	Patient with increased exercise tolerance levels*
Activities and participation in ADL	PSFS	PSK
Perceived fatigue	Borg Scale CR10 for Shortness of Breath and Fatigue	Borg Scale CR10 for Shortness of Breath and Fatigue
Perceived breathlessness (dyspnea)	Borg Scale CR10 for Shortness of Breath and Fatigue	Borg Scale CR10 for Shortness of Breath and Fatigue
Oxygen saturation	transcutaneous oxygen saturation (SpO ₂)	transcutaneous oxygen saturation (SpO ₂)
Heart rate	Heart rate measurement	Heart rate measurement
Muscle strength lower extremity	SPPB; repeated stand up from chair test (5x)	SPPB; repeated stand up from chair test (5x), 1 RM ^δ
Muscle strength upper extremity	Grip strength	Grip strength, 1 RM ^δ
Balance	SPPB; balance test	SPPB; balance test
Mobility	SPPB; 4-meter timed walk test	SPPB; 4-meter timed walk test
Physical activity level	pedometer/accelerometer ^δ	pedometer/accelerometer ^δ
Exercise capacity	-	6MWT
Nutritional status	SNAQ ⁶⁵⁺	SNAQ ⁶⁵⁺

1RM: One-Repetition Maximum Test; 6MWT: 6-minutes walk test; ADL: Activities of Daily Living; PSFS: Patient Specific Functioning Scale; SNAQ⁶⁵⁺: Short Nutritional Assessment Questionnaire; SPPB: Short Physical Performance Battery

* A maximum threshold score for exercise intensity of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue applies. This provides relevant clinical information about the exercise tolerance levels of the patient.

δ Optional clinical outcome measure.

Besides physiotherapy specific assessment and treatment, the physiotherapist plays an important role in identifying factors that may limit (the speed of) recovery, in particular in case the patient is not also monitored by the GP or hospital. Factors to be aware of include nutritional status, cognitive and emotional functioning and psychosocial functioning. A multidisciplinary approach may be necessary when such factors are present.

The decision on specific clinical outcome measures also depends on collaboration with other healthcare disciplines.[27] Use of different clinical outcomes for the same constructs by different healthcare professionals should be avoided to facilitate interdisciplinary communication and monitoring of the patient, and not burden the patient unnecessarily.

See Appendix 2 for information on the recommended clinical outcome measures.

Core set of clinical outcome measures 'first six weeks'

- Use the Patient Specific Functioning Scale to identify perceived limitations in activities of daily living.
- Use the Borg Scale CR10 to monitor shortness of breath and fatigue.
- Before, during and after physical activity and exercises, monitor the patient's oxygen saturation and heart rate.
- Use the Short Physical Performance Battery (SPPB) to measure balance, muscle strength and mobility.
- Use grip strength measurements (hand held dynamometer) to estimate overall peripheral muscle strength.
- Use, when safe, 6-minutes walk test (6MWT) to estimate the exercise capacity.
- Use the Short Nutritional Assessment Questionnaire (SNAQ⁶⁵⁺) for early identification of potential malnutrition in patients who have been hospitalised.

3.1.4 Advice and coaching

It is important to provide information and educate the patient about the disease process, the expected course of recovery and physiotherapy treatment plan. If physical functioning of the patient is limited, the physiotherapist advises and coaches the patient to gradually increase physical functioning. For example, postural advice to promote breathing and to reduce tightness, mobilising exercises aimed at activities of daily living, and exercise to improve strength of large muscle groups. In patients with (very) low exercise tolerance, for example those with PICS, resuming daily activities in the home environment should be gradual and well monitored. Activities of daily living and supporting therapeutic exercises should be performed at low to moderate intensity and be of limited duration at this stage. See further recommendations for exercise prescription below (see section 3.1.5).

Advice and coaching

- Provide information and educate the patient about the disease process, the expected course of recovery and physiotherapy treatment plan
- Advise and coach the patient to gradually increase activities of daily living and physical activity, such as therapeutic exercises. Monitor the patient's levels of daily functioning.
- In patients with (very) low exercise tolerance, activities of daily living and additional exercise therapy should be performed at low to moderate intensity and be of short duration (see further recommendations for exercise prescription below).

3.1.5 Exercise prescription

Specific parameters for exercise prescription depend on activity levels of the patient prior to the COVID-19 infection, the patient's needs and current physical abilities of the patient. In the first six weeks, the emphasis is on returning to activities of daily living. A maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue is recommended. Reasons for this recommendation are:

- COVID-19 can severely impact lung function (including oxygen desaturation during exercise due to virus-induced and/or pre-existing lung disease).
- COVID-19 can severely affect cardiac function (including virus-induced myocarditis, arrhythmia and/or pre-existing cardiac disease).
- After the active COVID-19 infection, no maximal exercise testing is done, partly due to organisational limitations in hospitals due to the corona crisis. Adequate clinical information to determine patient specific training parameters for exercise prescription is therefore not available, nor is it possible to estimate the possible risk of physical training at a moderate/high intensity.

Physiotherapy focuses on activities of daily living and aims to gradually increase of muscle strength, balance, endurance and/or relaxation. To ensure energy for daily activities throughout the day, it is important to consider the patient current status and their wishes, and to help them plan their activities, therapeutic exercises and resting periods over the length of day. The recommendations in this Position statement are generic and need to be tailored to the patient's ability and needs.

During exercise, it is important that oxygen saturation (SpO_2) is monitored to identify potential desaturation. Therefore, measure oxygen saturation prior to, during and immediately after exercise training or physical activity in the home situation, in particular when patients experience breathlessness or fatigue.

Whenever possible, the patient should use a pulse oximeter at home. The physiotherapist can provide guidance on the correct use of the pulse oximeter by the patient themselves. Use 90% of SpO_2 at rest and 85% of SpO_2 during exercise or physical activities as lower limits. Stop physical activities or exercises when desaturation ($SpO_2 < 85\%$ during exercise) occurs. In case the saturation level is decreasing, it is important that the saturation level reaches its pre-activity level, measured at rest, within two minutes. Intensive monitoring of oxygen saturation is not indicated when patients have no signs of desaturation in the first two weeks of increasing exercise intensity.

Treatment focuses on gradually increasing activities of daily living, muscle strength, balance, exercise endurance and/or relaxation. For each therapy goal, recommendations are given for frequency, intensity, type and time/duration (FITT components). The recommendations describe different types of exercise. These are

mere examples, and should not be considered as a protocol. The physiotherapist must consider for each individual patient their goals, related types of exercise and their parameters.

Exercise prescription

- Focus on activities of daily living.
- In the first six weeks focus on a gradual increase in physical functioning; use a maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue.
- Monitor oxygen saturation and heart rate prior to, during and immediately after exercise training.
- Stop physical activities or exercises when desaturation ($SpO_2 < 85\%$ during exercise) occurs. In case the saturation level is decreasing, it is important that the saturation level reaches its pre-activity level, measured at rest, within two minutes.
- Let patients only perform physical exercises in the home situation with prescribed training parameters regarding frequency, intensity, time/duration and type.

Improving level of activities of daily living

Exercise prescription to increase activities of daily living depends on the patient's request for guidance and their physical abilities. For example, the first step could be moving in bed and getting out of bed independently. The second step could focus on exercises to improve independent physical functioning in their home environment. The third step is to help independent physical functioning outside their home environment. At which step to start highly depends on the patient's current abilities. Therefore, the exercise plan can differ for each patient.

Examples of exercises to gradually increase activities of daily living	
Step 1 (very low exercise tolerance)	
Frequency	daily
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	bridging, rolling onto one side, sitting on the bed (potentially with assistance)
Time/duration	Total duration of the session: 5-20 minutes
Step 2 (low exercise tolerance)	
Frequency	daily
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	Standing up from a chair, walking (e.g. to the toilet) (with walking aid if necessary), walking stairs (a few steps)
Time/duration	Total duration of the session: 5-20 minutes
Step 3 (increased exercise tolerance)	
Frequency	daily
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue

Examples of exercises to gradually increase activities of daily living	
Type	Walking short distances or use a (stationary) bike with low resistance, activities outdoors (e.g. grocery shopping)
Time/duration	Start with a total duration of 5–20 minutes, gradually increase duration depending on the patient's abilities

Improving muscle strength and balance

Exercise prescription to increase muscle strength and balance highly depends on the abilities and tolerance levels of the patient. Muscle strength exercises should focus on large muscle groups of the lower extremities and upper extremities and core stability.

Examples of exercises to gradually increase muscle strength and balance	
lower extremities	
Frequency	2–3 days per week, to increase and maintain muscle strength
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, estimation: 40–60% of 1RM
Type	Closed chain, open chain and dynamic exercises, possibly with own body weight as resistance.
Time/duration	per exercise 2–5 sets of 8–15 repetitions with at least 2 minutes rest between sets
upper extremities	
Frequency	2–3 days per week, to increase and maintain muscle strength
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, estimation: 40–60% of 1RM
Type	Closed chain, open chain and dynamic exercises, possibly with own body weight as resistance.
Time/duration	per exercise 2–5 sets of 8–15 repetitions with at least 2 minutes rest between sets
Core stability	
Frequency	2–3 days per week, to increase and maintain muscle strength
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	Closed chain
Time/duration	per exercise 2–5 sets of 8–15 repetitions with at least 2 minutes rest between sets
Balance	
Frequency	2–3 days per week, to increase and maintain balance
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	Balance exercise in sitting or standing position
Time/duration	Total duration of the session: 5–20 minutes

Improving exercise endurance

Exercise prescription to increase exercise endurance highly depends on the abilities and exercise tolerance levels of the patient. The frequency, intensity, type and duration can therefore differ per patient.

Examples of exercises to gradually increase exercise endurance	
Frequency	2-3 days per week, to increase and maintain exercise endurance
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, lower limit of oxygen saturation level of 85% during exercise and/or physical activity
Type	endurance, preferably on a treadmill or stationary bike*
Time/duration	Total duration of the session: 5-20 minutes
* In case a treadmill or stationary bike is not available, walking outdoors can be considered if deemed safe. In patients with (very) low exercise tolerance levels in-bed cycling can be considered.	

Improving breathing

Exercise prescription to improve breathing is dependent whether the patient has breathing problems. Only if there is an indication, breathing exercises should be prescribed. There are two types of breathing exercises: control of breathing and respiratory muscle strength.

Control of breathing

Consider these breathing exercises in patients with shallow or paradoxical breathing. Shallow breathing is characterised by an increased respiratory rate (> 25 breaths/minute) and incomplete exhalation. Signs of paradoxical breathing are retraction of the abdomen on inhalation and expansion of the abdomen on exhalation.

Note: Consider pursed lip breathing in patients with COPD and hyperinflation and/or Hoover's sign.[28]

Respiratory muscle strength

This type of exercise should be performed in patients with reduced muscle strength of respiratory muscles. [29] Whether a patient has reduced respiratory muscle strength has often been determined during hospitalisation and physiotherapy has commenced there. In these patients, exercise prescription should be continued using the previously determined maximum respiratory muscle strength values and existing training advice. This type of breathing exercises should not be started if maximum values of the respiratory muscle strength are not known. During respiratory muscle training, the inspiratory and expiratory pressures may be equivalent to those performed during a pulmonary function assessment. Therefore, contraindications for respiratory muscle training are the same as those for respiratory muscle testing.[30,31] It is important to contact the referring hospital or GP if there are any concerns or doubts about (relative) contraindications for respiratory muscle training and measurement.

Examples of exercises to improve breathing	
Control of breathing	
Frequency	daily
Intensity	Maximum relaxation, minimal shortness of breath and fatigue respiratory rate 6-12 breaths per minute
Type	Diaphragmatic breathing or respiratory volume exercises
Time/duration	Total duration of the session: 5-20 minutes

Examples of exercises to improve breathing	
Respiratory muscle strength	
Frequency	3 times per day, preferably in the morning, afternoon and evening
Intensity	maximum score of 4 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, respiratory rate < 15 breaths per minute, estimation: 30–50% of maximum respiratory muscle strength
Type	inspiratory and expiratory muscle strength training
Time/duration	Total duration of the session: 5–20 minutes, up to 30 breaths per session

Improving relaxation

Prescription of exercises to improve relaxation depends on the patient's request for help. Patients who experience shortness of breath, have sleeping problems, are stressed and/or have high muscle tone may benefit from relaxation exercises. Such exercises help to relax the whole body and to facilitate good posture; these relaxation exercises are not specific for breathing control.

Examples of exercises to improve relaxation	
Relaxation exercises	
Frequency	daily
Intensity	Maximum relaxation, minimal shortness of breath and fatigue
Type	Simple relaxation according to Mitchell's method[32], or progressive relaxation according to Jacobson's method [33]
Time/duration	Total duration of the session: 20 minutes
Mobilisation and relaxation exercises	
Frequency	daily
Intensity	Maximum relaxation, minimal shortness of breath and fatigue
Type	Exercises according to Dixhoorn 's method
Time/duration	per exercise: 2–5 sets of 8–15 repetitions, with at least 2 minutes rest after each set

Exercise prescription

- Treatment focuses on gradually increasing activities of daily living, muscle strength, balance, exercise endurance and/or relaxation.
- If there is an indication, breathing exercises can also be prescribed.
- The physiotherapist must consider for each individual patient their request for guidance, individual goals and experienced limitations. Based on this, types of exercise and their parameters should be chosen. Therefore, the exercise plan can differ of each patient.

3.1.6 Signs of physical and/or psychological distress

Signs of physical and/or psychological distress in the patient can be noted during physiotherapy treatment. In these cases, the physiotherapist should act adequately and adjust the treatment accordingly. Possible signs of distress and how the physiotherapist can act if such signs are present are shown in the table below.

Signs	How to act
Not able to talk during exercises/ physical activity	Lower the intensity, use adequate resting periods
Borgscale score of 5 (out of 10) prior to the treatment session or at the end of the day, could indicate 'extreme fatigue'	Advise the patient to not perform exercises or physical activity at those moments
Dysfunctional breathing; changes in breathing pattern can occur when coming to an erect/vertical position or when exercising. This can trigger fear of acute breathlessness	Consider relaxation and breathing exercises, cognitive therapy and/or psychoeducation
Confusion, residual cognitive problems (memory, concentration, processing stimuli)	When patients expect or experience difficulty resuming or increasing work (activities) and/or maintain energy for daily activities throughout the day, consider collaboration with or referral to an occupational therapist.
Anxiety or trauma-related distress: nightmares, flashbacks, feeling rushed or nervous, sleeping problems, worrying, feeling tense, quickly emotional, indeterminate anxiety, anxiety or panic attacks	Assess these potential signs, for example using the GPS or the 4-DSQ. Consult with the GP or a psychosomatic physiotherapist if the signs indicate anxiety or trauma-related complaints.
Mood changes: feeling sad, depressed, dreary, without energy, nervous, worthless; decreased interest or pleasure in activities, decreased concentration; recurring thoughts about death	Assess these potential signs, for example using the 4-DSQ. Consult with the GP or a psychosomatic physiotherapist if the signs indicate serious mood changes.
Psychological distress/overload: feeling irritable, restless, rushed and/or tense, worried, mentally unstable; not being able to cope with crowds/noise	Assess these potential signs. Consult with the GP or a psychosomatic physiotherapist if the signs indicate psychological distress/overload.
4-DSQ = Four-dimensional symptom questionnaire; GPS = 'Global Psychotrauma Screen'	

3.2 Six weeks after hospital discharge / COVID-19 illness at home

3.2.1 Evaluation and (continued) indication

Some hospitals organise a six week follow-up after discharge. Patients will visit a medical specialist (e.g. pulmonologist, internal medicine, cardiologist) and undergo additional lung and heart function assessment and exercise testing. [24,25] Based on these test results, exercise capacity and current physical exercise tolerance levels can be determined to adequately determine physical functioning. With this information the physiotherapist can more specifically prescribe exercises and guide patients based on their needs and goals.

Treatment goals may aim at further improvement of activities of daily living, increase physical activity levels and/or capacity to exercise, e.g. muscle strength and exercise endurance. Clinical outcome measures should be used to evaluate current and set new or adjusted treatment goals.

It is recommended that patients who have been hospitalised also have an outpatient follow-up in the hospital after three months.[25]

Evaluation and (continued) indication after six weeks

- Determine any further treatment goals based on the patient's needs and their current levels of physical functioning (using the results from function tests and/or exercise testing).
- Formulate treatment goals aiming at further improving performance of activities of daily living, increase physical activity levels and/or capacity to exercise.

3.2.2 Clinical outcome measures after six weeks

After six weeks, clinical outcome measures can assist the physiotherapist in assessing and evaluating the patient's physical capacity, clinical decision making, re-establishing treatment goals and optimising further treatment.

In this Position statement, clinical outcome measures focus on physical functioning (Table 2). The core set is intended as a minimal set of clinical outcome measures to be used in all patients.

The core set of clinical outcome measures from six weeks onwards consists of:

- **Patient Specific Functioning Scale (PSFS)** to determine the perceived physical limitations in participation and activities of daily living.
- **Borg Scale CR10 for Shortness of Breath and Fatigue** indicating shortness of breath and fatigue experienced by the patient. A maximum threshold score for exercise intensity of 6 out of 10 on the Borg Scale CR10 applies at this time after illness.
- **Oxygen saturation (SpO₂)** at rest, during and after physical activity and therapeutic exercise.
- **Heart rate (HR)** at rest, during and after physical activity and therapeutic exercise. The physiotherapist should be aware that outcomes can be influenced by medication.
- **Short Physical Performance Battery (SPPB)** to measure balance, muscle strength and mobility. The SPPB consists of a balance test, walking speed over 4 meters and 5 times repeated standing up from a chair test. The physiotherapist must at all times ensure the safety of the patient if they are (seriously) weakened.
- **Grip Strength** to estimate overall peripheral muscle strength. If possible and available, a hand-held dynamometer is used.
- **'One-Repetition' Maximum test (1RM)** of large muscle groups to measure muscle strength.
- **6-minutes walk test (6MWT)** to estimate the exercise capacity. In case the patient has (very) low exercise tolerance levels, the 6MWT should not be attempted. The physiotherapist must at all times ensure the safety of the patient if they are (seriously) weakened.
- **Pedometer/accelerometer**, to assess physical activity levels (optional).
- **Maximum respiratory muscle strength tests**, if indicated (see section 3.2.3)

If improvement of the exercise capacity slows or stops after six weeks, contact the GP. They may decide to further assess the patient and/or refer the patient for a Cardiopulmonary Exercise Test (CPET) to determine whether it is safe to exercise and to determine adequate intensity levels for exercise prescription.

Table 2. Overview of clinical outcome measures after six weeks

Construct	Clinical outcome measures
Activities and participation in ADL	PSFS
Perceived fatigue	Borg Scale CR10 for Shortness of Breath and Fatigue
Perceived breathlessness (dyspnea)	Borg Scale CR10 for Shortness of Breath and Fatigue
Oxygen saturation	transcutaneous oxygen saturation (SpO ₂)
Heart rate	Heart rate measurement
Muscle strength lower extremity	SPPB; repeated stand up from chair test (5x), 1 RM [§]
Muscle strength upper extremity	Grip strength, 1 RM [§]
Balance	SPPB; balance test
Mobility	SPPB; 4-meter timed walk test
Physical activity level	Pedometer/accelerometer
Exercise capacity	6MWT, CPET*
respiratory muscle strength tests	MIP and MEP measurements [§]

1RM: One-Repetition Maximum test; 6MWT: 6-Minutes Walk test; CPET: Cardiopulmonary exercise test; MEP: Maximal Expiratory Pressure; MIP: Maximal Inspiratory Pressure¹; PSFS: Patient Specific Functioning Scale; SPPB: Short Physical Performance Battery.
 * Referral for a CPET can only be given by a GP or medical specialist.
 § Only relevant when respiratory muscle strength training is indicated.

See Appendix 2 for information on the recommended clinical outcome measures.

Core set of clinical outcome measures after six weeks

- Use the Patient Specific Functioning Scale to identify perceived limitations in activities of daily living.
- Use the Borg Scale CR10 to monitor shortness of breath and fatigue. A maximum score of 6 out of 10 applies.
- Before, during and after physical activity and exercises, monitor the patient's oxygen saturation and heart rate.
- Use the Short Physical Performance Battery (SPPB) to measure balance, muscle strength and mobility.
- Use grip strength measurements (hand-held dynamometer) to estimate overall peripheral muscle strength. Use 1RM tests to assess more specific muscle strength of large muscle groups.
- Use the 6-Minute Walk Test (6MWT) to assess and evaluate the exercise capacity.

3.2.3 Exercise prescription

The specifics of the treatment plan depend on activity levels of the patient prior to the COVID-19 infection, their recovery of physical functioning in the first 6 weeks, their request for guidance and their current physical abilities. Currently, it seems reasonable to apply common training principles, such as those that are also used in patients with chronic lung diseases, based on the perceived intensity or severity of symptoms (e.g. shortness of breath and fatigue).

From 6 weeks onwards, the focus of physiotherapy treatment is on continued improvement of physical functioning (exercise capacity and physical activity) to help the patient return to social and community participation. The treatment includes exercises to improve muscle strength, balance, endurance and/or relaxation. To ensure energy for daily activities throughout the day, it is important to consider the patient current status, their wishes and to help them plan their activities, therapeutic exercises and resting periods over the length of day. The recommendations in this Position statement are generic and need to be tailored to the patient's ability and needs.

Patients may have pre-existing and/or newly acquired comorbidities that may affect their physical functioning and capacity to exercise. It is possible that (serious) exercise-induced oxygen desaturation occurs during a treatment session or when a patient performs home exercises or is physically active in another way. Therefore, it is important that oxygen saturation (SpO_2) is monitored to identify potential desaturation. Measure oxygen saturation prior to, during and immediately after exercise training or physical activity, in particular when the patient experiences breathlessness or fatigue. The physiotherapist can provide guidance on the correct use of the pulse oximeter by the patient themselves. Use 90% of SpO_2 as lower limit at rest and 85% of SpO_2 during exercise or physical activities. Stop physical activities or exercises when desaturation ($SpO_2 < 85\%$ during exercise) occurs. In case the saturation level decreased, it is important that the saturation level reaches its pre-activity level, measured at rest, within two minutes. Intensive monitoring of oxygen saturation is not indicated when patients have no signs of desaturation in the first two weeks of increasing exercise intensity.

Improving the capacity to exercise

- The specifics of the treatment plan depend on activity levels of the patient prior to the COVID-19 infection, their recovery of physical functioning in the first 6 weeks, their request for guidance and their current physical abilities
- Where possible, apply common training principles based on signs and symptoms (shortness of breath and fatigue), as used in patients with chronic lung diseases.
- From 6 weeks onwards, the focus of physiotherapy treatment is on continued improvement of physical functioning (exercise capacity and physical activity) to help the patient return to social and community participation.
- The treatment includes exercises to improve muscle strength, balance, endurance and/or relaxation.
- Ensure a gradual increase in training frequency, intensity, time/duration and type of exercises.
- During exercise, a maximum threshold of 6 (out of 10) on the Borg Scale CR10 for Shortness of Breath and Fatigue and/or an intensity of 60–80% of the tested maximum exercise performance (e.g. bicycle test, 6MWT and/or the 1 RM) is recommended.

Treatment focuses on gradually increasing activities of daily living, muscle strength, balance, (aerobic) exercise capacity, breathing and/or relaxation. For each therapy goal, recommendations are given for frequency, intensity, type and time/duration (FITT components). The recommendations describe different types of exercises. These are mere examples, and should not be considered as a protocol or an exhaustive list of possible exercises. The physiotherapist must consider for each individual patient their goals, related types of exercise and their parameters.

Improving level of activities of daily living

Exercise prescription to increase activities of daily living and participation levels depends on the patient's request for guidance and their physical abilities. First, the step-by-step structure as in the first 6 weeks applies. Then, after improvements in and around the home environment have been made, aim towards social and community participation, such as participating in social activities and resuming (voluntary) work. It depends on the patient's ability to cope with and the social context itself when this step can be commenced.

<i>Examples of exercises to gradually increase activities of daily living</i>	
Step 3 (increased exercise tolerance)	
Frequency	daily
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	Walking short distances or use a (stationary) bike with low resistance, activities outdoors (e.g. grocery shopping)
Time/duration	Total duration of the session: 20 minutes, gradually increase duration depending on the patient's abilities
Step 4 (high exercise tolerance)	
Frequency	daily
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	social participation (e.g. (voluntary) work, sports and (other) pastime activities)
Time/duration	Total duration of the session: 20–60 minutes

Improving muscle strength and balance

Exercise prescription to increase muscle strength and balance highly depends on the abilities and tolerance levels of the patient. Muscle strength exercises should focus on large muscle groups of the lower extremities and upper extremities and core stability.

<i>Examples of exercises to gradually increase muscle strength and balance</i>	
Lower extremities	
Frequency	2–3 days per week, to increase and maintain muscle strength
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, estimation: 60–80% of 1RM
Type	Closed chain, open chain and dynamic exercises, likely with additional weight as resistance.
Time/duration	per exercise 2–5 sets of 8–15 repetitions with at least 2 minutes rest between sets
Upper extremities	
Frequency	2–3 days per week, to increase and maintain muscle strength
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, estimation: 60–80% of 1RM
Type	Closed chain, open chain and dynamic exercises, likely with additional weight as resistance.

Examples of exercises to gradually increase muscle strength and balance	
Time/duration	per exercise 2–5 sets of 8–15 repetitions with at least 2 minutes rest between sets
Core stability	
Frequency	2–3 days per week, to increase and maintain muscle strength
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	Closed chain
Time/duration	per exercise 2–5 sets of 8–15 repetitions with at least 2 minutes rest between sets
Balance	
Frequency	2–3 days per week, to increase and maintain balance
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue
Type	Balance exercise in sitting or standing position
Time/duration	Total duration of the session: 5–20 minutes

Improving exercise capacity

Exercise prescription to increase exercise capacity highly depends on the abilities and exercise tolerance levels of the patient during and recovery after exercise. Two types of endurance training are distinguished: aerobic endurance training and interval training. Consider interval training if the patient cannot maintain more than 10 minutes of aerobic endurance training after six weeks of endurance training.

Examples of exercises to gradually increase exercise capacity	
Aerobic endurance training	
Frequency	2–3 days per week, to increase and maintain exercise endurance
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, lower limit of oxygen saturation level of 85% during exercise and/or physical activity; estimation: 60–80% of maximum bike or walk test result
Type	endurance, preferably on a treadmill or stationary bike*
Time/duration	Total duration of the session: 20–60 minutes Per session at least 10 minutes of continuous activity
Interval training	
Frequency	2–3 days per week, to increase and maintain exercise endurance
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, lower limit of oxygen saturation level of 85% during exercise and/or physical activity; estimation: 75% of maximum bike or walk test result
Type	endurance, preferably on a treadmill or stationary bike*
Interval training	
Time/duration	Total duration of the session: 20–60 minutes 30–60 seconds intervals with 1–2 minutes rest
* In case a treadmill or stationary bike is not available, walking outdoors can be considered if deemed safe.	

Improving breathing

Exercise prescription to improve breathing depends on whether the patient (still) has breathing problems at this stage. An indication for respiratory muscle strength training can be expected in patients who have been hospitalised, including those not admitted to ICU. In case respiratory muscle strength seems to impede (recovery of) physical functioning, respiratory muscle strength training should be prescribed. If this type of training has been commenced earlier, continue or increase the intensity of exercises.

Symptoms of decreased respiratory muscle strength can include:

- difficulty coughing up sputum;
- unexplained dyspnea (shortness of breath) during (low level) physical activity;
- persistent dyspnea (shortness of breath) at rest or during (low level) physical activity.

Use findings from the hospital's lung function assessment of maximum respiratory muscle strength to identify the need for additional exercises. A maximum inspiratory pressure of less than 70% of normal values is an indication for respiratory muscle strength training.

During respiratory muscle training, the inspiratory and expiratory pressures may be equivalent to those performed during a pulmonary function assessment. It is therefore important to contact the GP if there are any concerns or doubts about (relative) contraindications for respiratory muscle training and measurement [30,31].

Examples of exercises to improve breathing

Respiratory muscle strength

Frequency	3 times per day, preferably in the morning, afternoon and evening
Intensity	maximum score of 6 out of 10 on the Borg Scale CR10 for Shortness of Breath and Fatigue, respiratory rate 6 to 12 breaths per minute, estimation: 30-50% of maximum respiratory muscle strength
Type	inspiratory and expiratory muscle strength training
Time/duration	Total duration of the session: 5-20 minutes, up to 30 breaths per session

Improving relaxation

Prescription of exercises to improve relaxation depends on the patient's request for help. At this time after (severe or critical) illness from the acute COVID-19 infection, feelings of control of the situation may slowly return. However, feelings of tension, anxiety and depression may be present or develop. These patients may experience shortness of breath, have sleeping problems, are stressed or anxious and/or have high muscle tone. Relaxation exercises may help to relax the whole body and to facilitate good posture; these relaxation exercises are not specific for breathing control.

Examples of exercises to improve relaxation

relaxation exercises

Frequency	daily
Intensity	Maximum relaxation, minimal shortness of breath and fatigue

Examples of exercises to improve relaxation	
Type	Simple relaxation according to Mitchell's method [32], or
Time/duration	Total duration of the session: 20 minutes
Mobilisation and relaxation exercises	
Frequency	daily
Intensity	Maximum relaxation, minimal shortness of breath and fatigue
Type	Exercises according to Dixhoorn 's method
Time/duration	per exercise: 2-5 sets of 8-15 repetitions, with at least 2 minutes rest after each set

4. Organisation of care

The physiotherapist works together with colleagues within their own discipline and with health professionals from other disciplines to ensure adequate treatment for COVID-19 patients.

Intradisciplinary collaboration

Intradisciplinary collaboration is recommended depending on the patient's needs, limitations and comorbidities. Collaboration between physiotherapists specialised in cardio-respiratory rehabilitation, geriatric rehabilitation, or in the field of psychosomatic medicine may need to be established. For example, for frail elderly patients with comorbidities who are deconditioned from hospitalisation expertise of a physiotherapist specialised in geriatric rehabilitation may be required. For patients with limited cognitive functions or those with anxiety or reduced body awareness, the expertise of a physiotherapist with specialisation in the field of psychosomatic medicine may be required.

Interdisciplinary collaboration

The GP generally plays a coordinating role in the organisation of health care services for patients in the home situation. The GP is therefore the central point of contact for the patient with COVID-19. The physiotherapist should keep in close contact with the GP and report on the progression of the patient's health status.

When identified limitations cannot be considered within the field of physiotherapy, referring the patient to or collaborating with other health care disciplines, such as dieticians, occupational therapists, speech and language therapists and/or psychologists is important. For example, in prolonged hospitalised patients with COVID-19 who have an abnormal body composition, which may include malnutrition, sarcopenia or sarcopenic obesity, interdisciplinary treatment by a dietician and a physiotherapist is important.

Occupational therapists can support a patient to make optimal use of their available energy during daily activities. Speech therapy can provide support for problems with chewing, eating and swallowing.

Patients with multiple problems (i.e. multiple physical, mental and/or cognitive problems) will often be referred to a rehabilitation centre upon discharge from the hospital. If patients are not directly referred to a rehabilitation centre (e.g. no beds are available or the patient's preference is to go home) and multiple problems remain and severely affect a patient's daily functioning after discharge from the hospital, delayed referral should be made. The physiotherapist has a signalling function and must always communicate with the patient's GP.

5. The physiotherapist, recommended specialisation for complex patients

Before assessing and/or treating a patient, ensure you have sufficient knowledge about and understanding of all aspects related to COVID-19, including (but not limited to) the disease, signs and symptoms, variable course of recovery, systemic impact, impact on body functions, activities and participation, personal and environmental factors.

It is recommended that patients with chronic lung/heart disease prior to the active COVID-19 infection and/or who have lung/heart damage from COVID-19 are treated by physiotherapists with specific expertise in the treatment of patients with other chronic lung/heart conditions (such as COPD, asthma, idiopathic pulmonary fibrosis, heart failure, etc.).

Footnote

This position statement contains information and recommendations based on scientific and clinical knowledge and experiences at the time of publication. The content of this statement will be refined and updated based on new scientific insights and clinical experiences. Further iterations will be then published. Next versions may elaborate on specific health care settings (first line, rehabilitation centre, nursing home) and subgroups within the patient group (patients with COVID-19 after hospital discharge with/without ICU admission, COVID-19 illness at home, presence of comorbidities). Various position statements and guidelines for patients with COVID-19 are currently being developed by other health disciplines. When making further iterations of this position statement we will look for (draft) versions of documents from other professions.

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Appendix

Appendix 1 Advice when yellow or black flags are present

Yellow flags	Advice
Dysfunctional breathing	Be aware of anxiety, trigger for trauma.
Delirium in recent medical history	Be aware of residual cognitive problems, reduced psychological resilience
Fear of physical activity/exercise and/or breathlessness	Assess avoidance behaviour, disease perceptions, behavioural patterns. Be aware of possible limiting factors for recovery. Take time to explain about exercise physiology.
Sleeping problems	Assess sleeping problems such as insomnia, staying asleep, early wakening, restlessness, dreaming, waking fatigued
Post-traumatic stress syndrome (PTSS)	Assess anxiety or trauma-related distress, including nightmares and flashbacks. When present consult with the GP for potential referral to a psychologist. Be aware that referring to physiotherapist with specialisation in the field of psychosomatic medicine may not be sufficient.
External locus of control	Be aware of delayed recovery. Potentially consult a physiotherapist with specialisation in the field of psychosomatic medicine.
Negative beliefs and/or concerns about symptoms	Be aware of delayed recovery. Potentially consult a physiotherapist with specialisation in the field of psychosomatic medicine.
Black flags	
Little support at home, or overprotective behaviour or anxiety in family/ caregivers	Be aware of delayed recovery. Potentially consult a physiotherapist with specialisation in the field of psychosomatic medicine.
Low social-economic status	Be aware of additional/collateral problems.
Continuing distress	Be aware of additional/collateral problems.

Appendix 2 Information on clinical outcome measures of the core sets

Patient Specific Functioning Scale (PSFS)

The PSFS assesses the main physical limitations in activities as perceived by the patient.

Available from: https://www.physio-pedia.com/Patient_Specific_Functional_Scale

Borg Scale CR10 for Shortness of Breath and Fatigue

The Borg Scale for Shortness of Breath and Fatigue is a scale ranging from 0 to 10, which provides clinical information on the patient-experience on shortness of breath and fatigue.

Available from: https://www.physio-pedia.com/Borg_Rating_Of_Perceived_Exertion

Borg Scale CR10 for Shortness of Breath/Dyspneu		Borg Scale CR10 for Shortness of Breath/Dyspneu	
0	nothing at all	0	nothing at all
0,5	very very slight	0,5	just noticeable
1	very slight	1	very light
2	slight	2	light
3	moderate	3	moderate
4	somewhat severe	4	somewhat heavy
5	severe	5	heavy
6		6	
7	very severe	7	very heavy
8		8	
9	very very severe	9	very very heavy
10	extremely severe, maximal	10	extremely heavy, maximal

Short Physical Performance Battery (SPPB)

The SPPB consists of essential tasks for independent living. It assesses balance, walking speed and functional leg strength. The three lower extremity function tests are: a standing balance test, a timed walk test and repeated chair stands.

Available from: <https://www.nia.nih.gov/research/labs/leps/short-physical-performance-battery-sppb>

Grip strength

Using a hand-held dynamometer, isometric grip strength can be assessed.

Maximum grip strength provides a clinically relevant indication of muscle function and is related to total lean body mass.

Six Minute Walk Test (6MWT)

The 6MWT assesses walking speed. This gives relevant clinical information on gait and endurance.

Available from: https://www.physio-pedia.com/Six_Minute_Walk_Test/_6_Minute_Walk_Test

Short Nutritional Assessment Questionnaire (SNAQ⁶⁵⁺)

The SNAQ⁶⁵⁺ is a screening tool for malnutrition

Available from: <https://www.fightmalnutrition.eu/toolkits/summary-screening-tools>

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