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Early View

Task force report

European Respiratory Society Statement on Long COVID-19 Follow-Up

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Title: European Respiratory Society Statement on Long COVID-19 Follow-Up

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Abstract

Patients diagnosed with COVID-19 associated with SARS-CoV-2 infection frequently experience symptom burden post-acute infection or post-hospitalisation. We aim to identify optimal strategies for follow-up care that may positively impact the patient's quality-of-life (QOL).

A European Respiratory Society (ERS) Task Force (TF) convened and prioritised eight clinical questions. A targeted search of the literature defined the time line of long COVID-19 as one to six months post infection and identified clinical evidence in the follow-up of patients. Studies meeting the inclusion criteria report an association of characteristics of acute infection with persistent symptoms, thromboembolic events in the follow-up period and evaluations of pulmonary physiology and imaging. Importantly, this statement reviews QOL consequences, symptom burden, disability and home care follow-up. Overall, the evidence for follow-up care for patients with long COVID-19 is limited.

List of Abbreviations

ACE Angiotensin- Converting Enzyme 2
ADLs Activities of Daily Living
AIP Acute Interstitial Pneumonia
ARDS Acute Respiratory Distress Syndrome
BTS British Thoracic Society
CPET Cardiopulmonary Exercise Testing
CT Computed Tomography
Ct Cycle Threshold
CTEPH Chronic Thromboembolic Pulmonary Hypertension
DECT Dual-Energy Computed Tomography
DIC Disseminated Intravascular Coagulation
DL_{CO} Carbon Monoxide Lung Diffusing Capacity
DL_{NO} Nitric Oxide Lung Diffusing Capacity
DOACs Direct Oral Anticoagulants
ERS European Respiratory Society
FEV1 Forced Expiratory Volume in one second
FIM Functional Independence Measure
FVC Forced Vital Capacity
GGO Ground-Glass Opacity
GLI Global Lung Initiative
HADS Hospital Anxiety and Depression Scale
HRQOL Health-Related Quality-of-Life
ICU Intensive Care Unit
IQR Interquartile Range
LLN Lower Limits of Normal
LMWH Low Molecular Weight Heparin
MBS Modified Borg Dyspnoea Scale
mMRC modified Medical Research Council
NICE National Institute for Health and Care Excellence
NIH National Institute of Health
NIHR National Institute for Health Research
NIV Non Invasive Ventilation

PAH Pulmonary Arterial Hypertension

PE Pulmonary Embolism

PF Pulmonary Fibrosis

PFTs Pulmonary Function Tests

PICS Post-Intensive Care Syndrome

PR Pulmonary Rehabilitation

PRSF Pandemic-Related Stress Factors

PTSD Post-Traumatic Stress Disorder

PTSS Post Trauma Stress Syndrome

QOL Quality-Of-Life

RCT Randomized Controlled Trial

RCGP Royal College of General Practitioners

RV Residual Volume

SGRQ St George's Respiratory Questionnaire

SIGN Scottish Intercollegiate Guidelines Network

SF-36 Short Form-36

SPECT Single-Photon Emission Computed Tomography

SPPB Short Physical Performance Battery

TF Task Force

TLC Total Lung Capacity

V_A Alveolar Volume

VTE Venous Thromboembolism

1MSTST 1-minute sit-to-stand test

6MWD Six-Minute Walking Distance

6MWT Six-Minute Walking Test

Scope of document

The European Respiratory Society (ERS) Task Force (TF) identified the need for a statement to identify approaches to optimise clinical follow-up care in patients with long COVID.

The multidisciplinary TF of ERS members, specialists in pneumonology, radiology and outcomes assessment convened on 23 December 2020. Key clinical questions relating to the follow-up of patients with long COVID-19 were identified and prioritised by consensus. The TF was approved as part of ERS TF-2020-14 ("The European Respiratory Society Guideline for Management of COVID-19", chairs J. Chalmers, N. Roche) and follows other ERS COVID-19 initiatives (1–3). The TF reviewed features of acute disease that could predict long-term consequences, data on thromboembolic event risk, as well as infection control during the long COVID-19 period. Further, the TF reviewed the evidence for cardiopulmonary and imaging techniques and techniques for cognitive, psychological, disability and home care follow-up.

Introduction

The COVID-19 pandemic has infected almost 250 million people and resulted in the deaths of over five million (WHO)(4). The natural history of COVID-19 and the long-term sequelae, with adverse health outcomes and impact on health-related quality-of-life (HRQOL) are not fully understood (5,6).

Many patients suffered from COVID-19 recover their baseline health status, but, an uncertain proportion of COVID-19 survivors have persistent symptoms presenting a challenge for patients and physicians (7,8). These longer term consequences, thought to occur in approximately 10% of people infected (9) appear to vary in severity, often impacting multiple organs. Whilst the primary symptoms and often breathlessness, fatigue, and sleeping difficulties, low grade fever, depression, anxiety, cardiac, pulmonary and renal anomalies have been reported (5). There is no established nomenclature on how to define the lasting sequelae of COVID-19. Those proposed lack clear criteria of how to define this 'condition' or how to stratify patients (10–13).

Guidelines

The National Institute for Health and Care Excellence (NICE), Scottish Intercollegiate Guidelines Network (SIGN) and Royal College of General Practitioners (RCGP) in the UK published a rapid guideline on the management of the long-term effects of COVID-19 in December 2020 (updated November 2021) (14). This guideline defines Post-COVID-19 syndrome as "signs and symptoms that develop during or after an infection consistent with COVID-19, which continue for more than 12 weeks and are not explained by an alternative diagnosis". Referral to post-COVID-19 syndrome assessment clinics is recommended when symptoms persist for 6-12 weeks. Acute COVID-19 signs and symptoms are characterised to occur up to four weeks following diagnosis while 'Long COVID' describes signs and symptoms that continue or develop after acute COVID-19 and post-COVID-19 syndrome encapsulates those with symptoms persisting >12 weeks (14).

The National Institute for Health Research (NIHR) (15) suggest that people experiencing long COVID may exhibit distinct clinical entities, such as post-intensive care syndrome (PICS) (equivalent to the acute post-COVID phase), post-viral fatigue syndrome (if fatigue is the predominant post-COVID symptom), permanent organ damage (an underlying mechanism explaining long-term symptoms), and long-term COVID syndrome (equivalent to long and persistent post-COVID phases) based on the hypothesis that post-COVID symptoms vary in intensity and duration and are not linear or sequential (16). In this statement we use the term long COVID to incorporate elements most in need of clinical follow-up and to include subgroups with ongoing symptomatic COVID and post-COVID syndrome.

Guidelines for the follow-up of Long COVID

The clinical management of long COVID is challenging due to a lack of evidence-based guidelines and standardisation in the pulmonary definition/terminology of the post-COVID-19 'condition'. The French respiratory society (SPLF) propose a complete lung evaluation in patients with symptoms persisting ≥12 weeks following infection (day zero defined as day of hospital admission or beginning of symptoms) (17). The British Thoracic Society (BTS), guidance supports algorithms for evaluating COVID-19 survivors in the first three months after hospital discharge based on the severity of acute COVID-19 and whether Intensive Care Unit (ICU) level care was delivered (18). Algorithms for both severe and mild-to-moderate COVID-19 groups recommend clinical assessment and cardiopulmonary evaluation in all

patients at 12 weeks, according to clinical judgment. Based on the findings of the 12-week assessment, patients either have further evaluation, or are discharged. Prior to this, an earlier clinical assessment for respiratory, psychiatric and thromboembolic sequelae and rehabilitation needs, is recommended at four to six weeks post discharge for those with severe acute COVID-19, (defined as those needing ICU or high dependency unit (HDU) level care or those hospitalised with severe pneumonia, the elderly and all those with comorbidities (18). Parameters for 'elderly' were not defined. Interim guidance on rehabilitation in hospital and post-discharge published by an ERS-ATS coordinated international TF recommends early bedside rehabilitation for patients affected by severe COVID-19, assessment of oxygen needs at discharge and more comprehensive assessment of rehabilitation needs including physical as well as mental status six to eight weeks post-discharge (2).

Monitoring patients with COVID-19 after discharge is necessary to understand the extent and severity of long-term effects. In this statement, we will focus on long COVID-19 follow-up one to six months post-acute COVID-19 infection. We define day zero the day of discharge, or the day of the beginning of symptoms. We aim to address questions about potent predictors of long-term consequences, as well as optimal post-hospital assessment related to thromboembolic events, pulmonary physiology, imaging and infection control, based on current data. Further, we will appraise appropriate follow-up concerning cognitive, and psychological functioning, quality-of-life (QOL), disability and home-care.

Methods

The TF consisted of 12 members (including an Early Career Member), experts in respiratory medicine, pulmonary physiology, radiology and outcomes assessment. TF members were selected by the chairs based on their expertise and international representation.

The chairs composed a list of 16 clinically important topics relevant to the follow-up of COVID-19 infection. Two meetings of TF members were convened and eight topics were selected according to clinical urgency and by consensus of the TF (Table 1). TF members were divided into subgroups to address the topics. All questions were addressed following the ERS rules for Statements. Statements are based on systematic literature searches (conducted by information specialists). A full systematic review with meta-analyses and grading of the evidence was not performed and as a result this paper does not contain recommendations for clinical practice. Individual literature searches for every question were designed by professional librarians, with the input of TF members. Systematic searches were conducted

up to 26 March 2021 in MEDLINE and Cochrane CENTRAL. For the full search strategies see Appendix A.

Studies meeting the inclusion criteria were published in English, reporting in adult populations, and on outcomes one to six months post-discharge in hospitalised and non-hospitalised patients. Case reports and case series were excluded, unless otherwise specified (Appendix B). The study selection was finalised in April 2021. PRISMA diagrams for each question are in Appendix C. Preliminary individual subsections were further discussed in a virtual meeting (May 2021) and revised until consensus among all co-authors was reached (June 2021). All co-authors critically revised and approved the final statement.

This ERS statement combines an evidence-based approach, clinical expertise of TF members, systematic search of the literature and critical discussions from virtual meetings. The statement summarises relevant literature and current practice by topic. It does not provide de nuovo recommendations for clinical practice but indicates where the TF members are in agreement with published guidance. Figure 1 illustrates current practice of TF members. All members of the TF disclosed their conflicts of interest before initiation of the project and upon submission of the manuscript.

Clinical Question 1	Are there features of the acute disease characteristics which predict long-term consequences?
Clinical Question 2	Which follow-up strategies relate to thromboembolic events?
Clinical Question 3	Which follow-up strategies relate to pulmonary physiology?
Clinical Question 4	Which follow-up strategies relate to imaging?
Clinical Question 5	Which follow-up strategies relate to infection control?
Clinical Question 6	Which follow-up strategies relate to cognitive, psychological and quality-of-life consequences?
Clinical Question 7	Which follow-up strategies relate to disability?
Clinical Question 8	Which follow-up strategies relate to home care follow-up (tele-medicine/tele-rehabilitation)?

Table 1. The eight clinical priorities and questions addressed by this Task Force.

Clinical Question 1. Are there features of the acute disease characteristics which predict long-term consequences?

Evidence overview:

Few data are available on predictors of long-term consequences of COVID-19. They mainly include pulmonary fibrosis (PF), as described by reduced single breath carbon monoxide lung diffusing capacity (DL_{CO}), restrictive syndrome, and persistent ground glass, and fatigue and/or anxiety one to eight months post-COVID-19. Initially, 4524 records were identified. Twelve eligible studies were included (1 retrospective cohort study and 11 prospective) (8,19–29), focusing directly on predicting factors of PF and/or persistent symptoms after COVID-19 episode (Appendix C). Of the 12 studies, the majority reported on hospitalised patients and three reported on both hospitalised and non-hospitalised. No studies included non-hospitalised patients only.

The main persistent symptoms reported in the included studies were fatigue (50-65% of patients) and anxiety/depression (20-40%). Risk factors for COVID-19 persistent symptoms, especially fatigue, were not associated with initial severity (19), but with age, female gender and the number of symptoms during the first week of infection (19). These results were not found in all studies (20). Few studies focused on olfactory and gustatory late resolution. The initial grade of dysfunction (total or partial), gender, and presence of nasal congestion appeared as potential predictive factors (21).

The vast majority of the studies included in this analysis focused on PF and reduced DL_{CO}. The size of the cohorts and/or the design does not permit the calculation or estimation of the PF risk. Han reported (in 114 hospitalised patients) that one third of patients had fibrotic like lesions on a Computed Tomography (CT) scan done six months after discharge (22).

Age among all possible factors, was the most frequent predictor of long-term consequences (8,22), possibly because the aging lung is more susceptible to development of fibrotic response or elderly people may have a subclinical interstitial lung disease exacerbated by acute infection (30). Presence of acute respiratory distress syndrome (ARDS, OR: 13; 95% CI: 3.3, 55) at the acute phase of the SARS-CoV-2, and the severity of the initial disease (8,22,23) were two predictive factors of PF, but these data are also demonstrated in other causes of ARDS. According to these studies, COVID-19 severity, as a predictor of PF, is evaluated by need of mechanical ventilation, ventilation duration, opacity score at discharge and hospitalisation duration (8,22). Some biological parameters have been found to be associated with higher risk of PF: high LDH level on admission, low level of T-cells and, prolonged elevation of interleukin-6 (24). These parameters again reflect disease severity and

indicate the dysregulated immune response (25). LDH has already been considered as a marker of pulmonary injury (26).

In the studies focusing on DL_{CO} decrease, the time to evaluate pulmonary function was variable between one to eight months, and so the long-term outcome of these abnormalities remains unknown. As for PF, initial disease severity (23,27,28) often evaluated by oxygenation modalities, sometimes by intensive care severity score and/or by other organ failure (for instance renal failure), appeared as the main risk factor. High flow oxygen therapy, and mechanical ventilation (invasive and non-invasive ventilation) are associated to a higher risk of diffusion impairment (OR 4.6 in Huang study) (16). Biologically, a higher level of D-Dimer at admission in a small cohort of 55 patients, was an independent predictor of abnormal DL_{CO} at three months (29).

Concluding remarks:

Age, severity of COVID-19 (evaluated by a range of variables: oxygenation and ventilator modalities, ARDS, radiological data, and some biological parameters; D Dimers, T cell count, LDH, Interleukin-6) appeared to be the best predictors of abnormal DL_{CO} and PF occurrence. On the contrary, severity of initial disease was not associated with the persistence of symptoms, factors which appeared to be linked to gender, age and to the number of symptoms during the first week. These data are based on a few small studies and will need to be confirmed in new larger studies.

Clinical Question 2. Which follow-up strategies relate to thromboembolic events?

Evidence overview:

Hypercoagulability is a frequent haematological alteration in hospitalised patients with COVID-19. Clinical manifestations include venous thromboembolism (VTE), disseminated intravascular coagulation (DIC), thrombosis of the lung microvascular circulation, and arterial thrombosis. The systematic literature search identified 1181 studies on long-term consequences and patient follow-up. Six eligible studies (3 prospective, 2 retrospective, 1 strategy proposition) were included (Appendix C) (31–36).

Four studies examined the rate of thrombosis after discharge. In an Italian follow-up study of 767 patients with COVID-19, 51% still reported symptoms at a median time of 81 days after discharge, with 38% of those having an elevated D-dimer level (31) including two

asymptomatic pulmonary thrombosis discovered by investigating striking D-dimer elevation. In a retrospective cohort study of 163 post-discharge patients with confirmed COVID-19 not receiving anticoagulation, the cumulative incidence of thrombosis (including arterial and venous events) at day 30 following discharge was 2.5% (95% CI, 0.8-7.6); the cumulative incidence of VTE alone was 0.6% (95% CI, 0.1-4.6). As the rate of haemorrhage appeared to be of the same magnitude, universal post discharge thromboprophylaxis was not recommended (32). Similar figures were demonstrated at 42 days follow-up in a 152-patient cohort (33). In a six week follow-up study of 33 patients discharged without anticoagulation, all patients with elevated D-dimer levels underwent ultrasound duplex scanning and ventilation/perfusion (V/Q) scan to rule out VTE (34). There were no thromboembolic complications and no echocardiographic impairments. Consequently, in the absence of other thrombotic risk factors, patients with COVID-19 are mostly discharged without prophylactic anticoagulation. If diagnosed with pulmonary embolism (PE) de novo during follow-up, patients should be treated in line with PE guidelines (37).

Only one of the identified studies reported on the long-term outcomes of patients with COVID-19 and VTE. This prospective observational study evaluated a composite of major bleeding and death at 90 days in 100 consecutive patients with VTE in the setting of COVID-19 (2/3 hospitalised, 1/4 in ICU; 64% PE) (35). Mortality (24%) and major bleeding (11%) were high. The majority of complications occurred in the first 30 days. Most patients received Direct Oral Anticoagulants (DOACs) (52%) or Low Molecular Weight Heparin (LMWH) (28%) at discharge. There were no VTE recurrences. The follow-up evaluation of patients with PE during acute COVID-19 draws from PE guidelines (37).

Concluding remarks:

At this stage, it is still unclear if pulmonary thromboembolism and inflammatory pulmonary microangiopathy (36) demonstrated in patients with severe COVID-19 will lead to sequelae such as chronic thromboembolic pulmonary hypertension (CTEPH) or pulmonary arterial hypertension (PAH). In patients with persistent exertional dyspnoea without evidence of parenchymal lung opacities on high resolution CT three to six months after discharge and with pulmonary function tests documenting preserved lung volumes and normal or reduced DL_{CO}, follow-up evaluation should include echocardiogram and contrast enhanced CT to identify significant pulmonary vascular involvement, as per proposed guidance (18). As contrast enhanced CT cannot exclude CTEPH (38), lung perfusion studies with single-photon

emission computed tomography (SPECT) or dual-energy CT (DECT) are proposed to exclude vascular involvement in symptomatic post-COVID patients, even in absence of PE history during the acute illness (39). As suggested by previous guidelines, if there is evidence of significant Pulmonary Hypertension (PH), patients should be considered for referral to a specialist PH centre (40,41).

Clinical Question 3. Which follow-up strategies relate to pulmonary physiology?

Evidence overview:

Although SARS-CoV-2 can theoretically infect various organs after binding to the ubiquitous ACE-2 cell membrane receptor, the respiratory system is the most frequently impacted due to the airborne nature of the infective agent. Regarding pulmonary function tests (PFTs) after the acute phase, 1578 records were identified (Appendix C). Thirty-nine eligible studies (1 Randomized Controlled Trial (RCT), 3 systematic reviews, 11 prospective cohort studies, 7 retrospective studies, 15 cross-sectional, 2 case series) were included (8,23,27–29,34,42–74). Two studies were longitudinal (56,57), 11 were prospective (23,44–48,56,57,59,60,74), including four multicenter (23,45,46,56) .

When measuring PFTs at rest, all investigators sought three main features, i.e. the existence of (1) obstructive pattern, (2) restrictive pattern, and (3) lung gas exchange impairment (27,42,43,52–54,29,55–57,28,58–60,44–46,23,47,48,34,8,49–51,66–68,73,74). Some investigators also looked at more integrative responses to physical exercise, either using six-minute walking test (6MWT) (8,23,34,42–51,61,62,73,74) or cardiopulmonary exercise testing (CPET) (51,63–65). The main parameter used to define bronchial obstructive pattern is the ratio of Forced Expiratory Volume in one second (FEV_1) over Forced Vital Capacity (FVC). Restrictive pattern was deemed to be present based on either reduction of Total Lung Capacity (TLC) or the combination of low FVC and high FEV_1/FVC ratio when TLC could not be measured. In some studies, reduced Residual Volume (RV) was also considered as part of the restrictive pattern. Lung gas exchange was mostly assessed using the DL_{CO} (27,73,42,43,74,52–54,29,55–57,28,58–60,44–46,23,47,48,34,8,49,50). Only one study examined nitric oxide lung diffusing capacity (DL_{NO}) combined with DL_{CO} (69). The earliest time point after the acute phase of the disease is one month (27,42,73), with a majority of the studies reporting PFTs from six weeks to four months (42,43,53,54,29,55–57,28,58–60,44–46,23,47–51,66,67), with very few at six months (8,52,64) post discharge or onset of disease.

Patient inclusion criteria were inconsistent between studies. The majority of the studies included hospitalised patients, while two studies involved both hospitalised and non hospitalised, and only one has been performed on non hospitalised patients. Patients with pre-existing chronic lung disease were not differentiated, thus making it difficult to relate abnormal PFTs results to either COVID-19 lung injury or possible pre-existing disease. There were disparities in reporting data either as absolute values, percentage of predicted values, with only a few reporting both absolute and percentage. Few studies adopted the Global Lung Initiative (GLI) approach using the lower limits of normal (LLN) threshold to distinguish abnormal values, whilst the majority retained 80% of predicted values for TLC, FVC and DL_{CO}. Correcting DL_{CO} for hemoglobin was not consistent. All studies reported a relatively high prevalence of reduced DL_{CO} in 40 -65% of patients as compared with the medium to high prevalence of restrictive pattern and the exceptionally low prevalence, if not absence, of obstructive pattern. If the high prevalence of altered DL_{CO} found at one month after discharge, or the onset of the disease partly result from ongoing residual inflammation related to the initial lung injury, the persistent low values of DL_{CO} at three and six months, even in patients with normalised chest CT, raise the need for further discussion (75). DL_{CO} is the product of the accessible alveolar volume (V_A) and the transfer coefficient K_{CO}; altered DL_{CO} can theoretically occur when either V_A or K_{CO}, or both, are reduced (76). Deciphering between V_A and K_{CO} as the causal factor for reduced DL_{CO} is therefore critical to infer the underlying lung structural changes with either interstitial abnormalities or pulmonary vascular abnormalities. If DL_{CO} had been measured in all studies assessing PFTs, V_A and K_{CO} were seldom reported, thus compromising key messages regarding the pathological nature of impaired lung gas transfer. Another way to dissect the underlying mechanisms of reduced DL_{CO} could be the simultaneous measurement of DL_{NO} and DL_{CO}. This test is only available in a small number of centers, which may explain the scarcity of DL_{NO} papers in patients with COVID-19.

Concluding remarks:

From the currently available literature (70–72), PFT's were performed on average three months after onset of COVID-19. PFT measurement including at least static lung volumes with ideally TLC measurement, expiratory flow rates and DL_{CO} assessment are regarded as useful tools to assess long-term lung function sequelae in patients with COVID-19 by most investigators. An effort of global harmonization to (1) express results, (2) choose criteria defining anomaly, (3) refine patients' inclusion criteria, (4) prospectively investigate lung

function in (5) multiple centers is still insufficient. There is agreement in all studies on the high prevalence of altered lung gas exchange in patients with COVID-19 as the main feature of PFTs anomalies. Most TF members provide DL_{CO} results after correction for hemoglobin, and together with V_A and K_{CO}, it helps the readers to decipher the underlying causes of altered lung gas exchange. A large, international multicenter trial using DL_{NO} and DL_{CO} simultaneous measurement could provide more useful information.

Clinical Question 4. Which follow-up strategies relate to imaging?

Evidence overview:

Fourteen eligible studies (9 prospective cohort studies, 4 retrospective, and 1 cross-sectional) (22,43,45,47,77–84,52,19) were included on imaging follow-up of patients with COVID-19, following a search of 1300 initial records (Appendix C). A small number of studies reported high rates of persisting abnormalities on radiology at discharge, despite absence of symptoms (52,77–80,19). Indeed, we know that radiological healing of pneumonitis is slower than clinical conversion. Further studies aimed to report the frequency of pulmonary abnormalities at three and six-month CT scan (22,43,45,52,81,82). Studies of radiological abnormalities on CT at three to six months may overestimate the true frequency of persistent abnormalities as studies without systematic follow-up will be biased towards patients with severe disease and persistent symptoms. Only four of the studies included also non-hospitalised patients. In fact, residual lung lesions are more frequently observed in CT scans of patients who had extensive imaging abnormalities as well as severely altered clinical-laboratory markers of disease severity (including ICU admission, longer hospitalisation) during the acute phase (22,52,83).

The longitudinal behavior of CT abnormalities mostly reflects the temporal evolution of diffuse alveolar damage and organising pneumonia, namely the main pathologic patterns underlying COVID-19 pneumonia (84). Ground-glass opacity (GGO) is the most frequent finding at three-month CT, followed by parenchymal bands, peri-lobular opacities, and scant interlobular septal thickening. It was observed that these CT abnormalities diminish with time (22), while complete waning is still under investigation as more longitudinal data accumulates. Intriguingly, GGO may gradually increase in extent and reduce in density (22). Terms such as “fibrosis” or "fibrotic-like" changes entered the literature, yet are still not justified for practical use and interpretation of the patient management. CT features of lung

fibrosis were interpreted in up to 47.1% at the three-month follow-up (47). Han et al reported a prospective cohort of 114 patients undergoing a six-month follow-up CT scan (22). This included 35% of the total cohort with “fibrotic- like” features (e.g. parenchymal bands, traction bronchiectasis etc.). Indeed, it is unlikely that lung fibrosis occurs in such a large proportion of subjects who have had COVID-19 pneumonia, and most of those "fibrotic-like" changes might be reversible at later follow-up.

Concluding remarks:

Despite the current data, it is unclear if ‘fibrotic-like’ CT features represent irreversible disease (e.g. post-ARDS), or slowly regressive infiltrate secondary to organising pneumonia, also seen with mild distortion mimicking actual fibrosis. The risk of over-calling lung fibrosis in follow-up CT scan seems more frequent in the presence of bronchial distortion within the areas of organising pneumonia features. TF members do not call such bronchial distortion traction bronchiectasis, which, by definition, represents an established CT feature of irreversible lung fibrosis. Therefore, most TF members are cautious when calling out fibrosis, especially in the early follow-up CT where parenchymal changes are encountered frequently and are more prone to resolve. Given the high proportion of subjects who either develop ARDS or undergo mechanical ventilation, the development of lung fibrosis remains a concern. More imaging data are needed to clearly distinguish between COVID-pneumonia sequelae and ventilator-induced lung injury. Guidelines are awaited to inform when and how imaging should be referred. TF members consider imaging follow-up in patients that were hospitalised and/or showed a more severe clinical disease course, or in patients presenting with new or progressive respiratory symptoms in the mid-long-term after acute COVID-19 syndrome. There are recommendations to repeat CT scan at 12 weeks post-discharge in patients with persistent symptoms, to complement clinical assessment (18).

CT is the most utilised imaging technique to follow-up subjects who had COVID-19 pneumonia. In fact, it is undisputed that fine residual abnormalities such as GGO are best depicted with CT, rather than chest X-ray or lung ultrasound. As this disease involves a sizeable proportion of younger subjects who might need repeated follow-up, it is worth underscoring that low-dose thin-section CT protocol is used by the TF members.

Clinical Question 5. Which follow-up strategies relate to infection control?

Evidence overview:

A large number of reports on COVID-19 have been published within the past 17 months, yet evidence regarding the dynamics of SARS-CoV-2 shedding in patients with COVID-19 in general and in specific patient subgroups in particular, is scarce. Five eligible studies were included (2 retrospective studies, 2 case studies, 1 guideline) (85–89) following a search of 815 initial studies (Appendix C). A further systematic review and meta-analysis identified by the authors after completion of the literature searches is also included in this review (90).

In susceptible individuals, viral replication starts to increase rapidly only a few days after SARS-CoV-2 exposure. Viral load usually peaks about a week after infection, in most patients approximately 24-hours before COVID-19 symptoms commence. In immune-competent patients, replication-competent SARS-CoV-2 can be isolated from the respiratory tract for one to several weeks after the onset of symptoms. More specifically, a recent meta-analysis of 79 reports on SARS-CoV-2 found that mean duration of SARS-CoV-2 RNA shedding was 17.0 days (95% CI 15.5–18.6) in upper respiratory tract, 14.6 days (9.3–20.0) in lower respiratory tract, 17.2 days (14.4–20.1) in stool, and 16.6 days (3.6–29.7) in serum samples (90). SARS-CoV-2 shedding duration was positively associated with age and COVID-19 severity. While these numbers suggest that after three weeks viral shedding usually concludes, it is noteworthy that the same meta-analysis reports maximum shedding duration of 83 days in the upper respiratory tract, 59 days in the lower respiratory tract, 126 days in stools, and 60 days in serum (90). Importantly, viral shedding does not necessarily provide active infectious virus. Many studies did not detect live virus beyond day nine of illness despite persistently high viral mRNA loads. One study observed shedding of infectious SARS-CoV-2 up to 70 days after initial diagnosis from an asymptomatic immunocompromised patient with cancer (85). Other conditions of constitutive or acquired immunosuppression may predispose to prolonged shedding of live SARS-CoV-2 or reactivation of infection, such as cancer-directed therapies (86). Further, time to SARS-CoV-2 clearance among cancer patients varies substantially depending on the criteria used (87). Most evidence has been derived from other virus variants than the currently wide-spread delta-variant, however, there is no evidence available for significant differences in the time course of viral load between SARS-CoV-2 variants.

Of note, positive SARS-CoV-2 PCR tests following temporary PCR negativity have been described in recovered patients with COVID-19. Several causes of recurrent positive tests for SARS-CoV-2 are suggested, including false-negative, and false-positive PCR tests, detection

of viral particles rather than replication-competent virus, reactivation, and re-infection with SARS-CoV-2, the latter two being more likely in immunocompromised patients than in healthy individuals. Depending on the specific healthcare setting, recurrent SARS-CoV-2 test positivity may preclude patients from treatment of underlying diseases over a longer time period. Considering the risk of increased morbidity and mortality of the underlying disease resulting from treatment delay, the TF members advocate for interpretation of the Cycle Threshold (Ct) value of Real Time-PCR in the clinical context. This will enable treatment of high risk underlying disease, despite ongoing positive SARS-CoV-2 testing (88,89).

Concluding remarks:

The majority of TF members perform recurrent PCR testing after acute COVID-19 in specific subgroups of patients, on a case-by-case decision, given the lack of scientific evidence and universally agreed follow-up strategies for infection control in COVID-19. Particularly immunodeficient patients including, but not restricted to, hematologic, oncologic, T- or B-cell incompetent patients is useful to undergo repetitive testing with individual frequency (e.g., once weekly) due to protracted high risk status or recurrent viral shedding.

Clinical Question 6. Which follow-up strategies relate to cognitive, psychological and quality-of-life consequences?

Evidence overview:

Published studies attempt to measure a range of symptoms occurring as a consequence of COVID-19, the impact of long COVID and evaluate outcome measures used. One thousand, four hundred and two studies were screened (Appendix C) and 19 studies were included (8,34,49,61,74,91–104) (2 reviews; 1 systematic, 9 prospective cohort studies, 3 survey design, 3 retrospective studies, 1 ambi-directional cohort study / 1 cross-sectional) reporting on symptom burden and QOL. All studies included hospitalised patients. The survey conducted by Machado et al (98) extended to non-hospitalised patients and a small RCT (n=72) investigating the impact of rehabilitation on the elderly post-COVID did not differentiation hospitalisation status (74).

The spectrum of symptoms reported include fatigue (8,61,92–94); dyspnoea; cough (34,92,94); dysphagia (96); frailty (97); loss of memory (93); concentration (93); sleep

disorders (8,93,98); anxiety, and/or depression (8,34,74,92,99,100); pandemic-related stress factors (PRSF) (92,95,99); with several studies reporting on HRQOL (34,49,74,94,95,100–102), specifically functional status (98,103) or level of independence with activities of daily living (ADLs) (96). A prospective cohort study of 183 patients (median age 57 years; 61.5% male, 54.1% white) reported older participants (65 to 75 years) (OR 8.666 [95% CI: 2.216, 33.884], p=0.0019), and women (male versus female [OR 0.462 {0.225, 0.949}, p=0.0356]), had statistically significant higher odds of experiencing persistent symptoms at 5 weeks post discharge (94).

At six months post-acute COVID-19 survivors continued to experience fatigue, muscle weakness, sleep difficulties, and anxiety or depression. A cross-sectional study of 1,696 consecutive patients, age 71.8±13.0 years-old; 56.1% of females; 82.3% with comorbidities reported that independence for ADLs was lower in those admitted to the ICU than the ward group (61.1% [95%CI 55.8-66.2%] vs. 72.7% [95%CI 70.3-75.1], p<0.001). Conversely dependence for ADLs was also more frequent in the ICU group (84.6%, 95%CI [80.4-88.2%], vs. 74.5%, [95%CI 72.0-76.8%], p<0.001) (96). Patients who were more severely ill during hospital stay had more impaired DL_{CO} and were the main target population for interventions of long-term recovery (8). Those admitted to ICU required more oxygen therapy (25.5% vs 12.6%, p<0.001), and experienced more dyspnoea during routine (45.2% vs 34.5%, p<0.001) and non-routine activities (66.3% vs 48.2%, p<0.001) (96).

Persistent symptoms of fatigue and sleep disturbance following severe COVID-19 pneumonia impacted HRQOL, productivity, physical activity and mental ill-health, associated with high rates of positive screening tests for anxiety, depression and Post-Traumatic Stress Disorder (PTSD) (92,95,99). A systematic review and narrative synthesis recommended a prompt ‘general clinical’ evaluation and risk assessment of patients presenting with neurological symptoms to minimise cognitive impairment and mental health thereby improving prognosis and outcomes (104). Causative mechanisms for adverse mental health outcomes following COVID-19 infection have not yet been established. Biological pathophysiological mechanisms, relating to cerebral vascular inflammation and thrombosis, survivor guilt and isolation in COVID-19 survivors are cited as contributory factors of adverse mental health outcomes (92).

There is a lack of consistency in the selection of instruments to measure symptom burden, cognitive impairment, psychological well-being and QOL. A systematic review identified 33

outcome measures from 36 studies (70). Most commonly used were the Hospital Anxiety and Depression Scale (HADS); Short Form-36 (SF-36) and St George's Respiratory Questionnaire (SGRQ). A summary of broad range of instruments reported on in this review is summarised in supplementary Table 2. According to standardised questionnaires, patients experienced reduced QOL mainly due to decreased mobility (SGRQ activity score: 54 [19-78]) (34).

The battery of outcome measures implemented in some studies is recognised as being impractical for routine clinical use. Focussed patient interviews were suggested as an alternative substitute for questionnaires (92). Further, recommendations included a call to rationalise the approach to the selection of / combination of outcome measures to capture all elements of COVID-19 to better understand the impact on survivors and to plan timely and appropriate interventions to maximize functional return (70).

Few differences were observed between HRQOL for patients cared for on the ward and ICU (93). Hospitalised individuals presented high levels of disability, dyspnoea, dysphagia, and dependence (96). Social disconnect appeared to predict the presence of Post Trauma Stress Syndrome (PTSS) (beta 0.59, 95% CI 0.37-0.81, $p<0.001$) a month after hospitalisation but the severity of COVID symptoms was not predicative for PTSS (99). Depressive and anxiety symptoms decreased one-month following hospitalisation. However, higher levels of anxiety (standardised beta 1.15, 95% CI 0.81-1.49, $p< 0.001$) and depression (beta 0.97, 95% CI 0.63-1.31 $p< 0.001$) during the first week of hospitalisation, feelings of social disconnected and longer hospitalisation period (beta 0.25, 95% CI0.03-0.47 $p=0.026$) predicted higher PTSS scores one month post-hospitalisation (106). The need for social support during hospitalisation with a more robust approach to managing uncertainty regarding health status and family concerns is identified. Few studies explored the cognitive, psychological and QOL consequences of long COVID in non-hospitalised patients**.**

Concluding remarks:

Few differences were observed between HRQOL for patients cared for on the ward and ICU, more in depth exploration in larger cohorts of patients including more severe ICU patients is needed. A need was identified to target the reduction and avoidance of PTSD. The long-term psychosocial effects (e.g. depression, anxiety, psychosomatic preoccupations, insomnia) and an awareness of symptoms indicative of PTSD, require prompt clinical follow up as suggested by earlier guidelines (95). Early rehabilitation helps to reduce PTSD and mitigates

the long-term sequelae (103). To date Pulmonary Rehabilitation has been informed by experiences in other chronic respiratory conditions. Further studies and consensus on the approach are needed. Consensus is also needed on the selection of outcome measures to minimise clinical burden and standardise research.

Psychosocial implications should not be ignored and particular attention paid to the caregiver burden, family support and impact of recurrent and cross infection.

HRQOL captures symptom experience and disease impacts that may result in disability. Further discussions on symptoms associated with disability are reviewed in Q8.

Clinical Question 7. Which follow-up strategies relate to disability?

Evidence overview:

One thousand one hundred and twenty-one studies were screened (Appendix C) and 15 eligible studies (23,28,43,45,47,56,74,92,105–111) were included (1 RCT, 1 systematic review, 12 prospective studies, and 1 retrospective). Nine studies included hospitalised patients, two included non-hospitalised patients, and four both hospitalised and non-hospitalised. All studies report on disability (a physical or mental condition that limits a person's movements, senses, or activities) due to persistent symptoms after recovering from acute COVID-19 infection, including fatigue and dyspnoea. Evidence is emerging of patients experiencing more than one symptom resulting in disability with psychological and cognitive symptoms reported to affect functional abilities in the long-term (23,28,43,45,47,56,74,92,105–111).

In COVID-19 survivors, dyspnoea and associated disability is the most frequent persistent respiratory symptom regardless of the need for hospitalisation ranging from 5.5% to 54% at one to four months (28,45,47,56,92,106–108). Tenforde (109) reported shortness of breath at three weeks in 29% of patients never hospitalised. The most used measure to assess dyspnoea was the modified Medical Research Council (mMRC) scale (19,23,43,45,47,56) followed by the modified Borg dyspnoea scale (MBS) (19) and the Borg category dyspnoea scale (92,107).

Follow-up and management of COVID-19 survivors presenting symptoms and subsequent disability is an urgent priority. There is emerging evidence of debilitating disability months after COVID-19 infection. Disability with limited physical performance due to dyspnoea, fatigue or both was measured with at least one of the following tests: the Short Physical

Performance Battery (SPPB) score, 2-minute walking test or 1-minute sit-to-stand test (1MSTST) was found in 35% of COVID-19 survivors at six weeks (92), in 14% at three months (106), in 53,8% at four months (28), in 32% at six months (110). Six-MWD was within normal values at 75 days with only 3% of patients experiencing documented oxygen saturation below 90% (median [IQR] MBS 3[2-5]) (105). At three months follow-up, 6MWD was within normal values (45) and only one out of 62 patients had oxygen saturation below 90% (47). Six-MWT showed a significant reduction in distance walked and oxygen saturation levels in severely impaired COVID-19 patients compared to those with mild/moderate disease (23). In a prospective observational study at three months after discharge (43) 22% of patients had 6MWD <80% of predicted and 16% de-saturated on exertion.

Disability persisted after a multidisciplinary rehabilitation programme:1MSTST below normal value in 33.3% and SPPB in 53.3%. Barthel Index showed poor performance in ADLs in 47.5% of COVID-19 survivors (111). In a RCT (74) , exercise capacity (6MWD) and ADLs (assessed with Functional Independence Measure [FIM] scale) were evaluated six months after the COVID-19 infection: patients undergoing a six-week rehabilitation programme (including respiratory muscle training, cough exercise, diaphragmatic training, stretching exercise and home exercise but without specific training and whole body exercises) showed improvement in 6MWD when compared to the control group. Results on ADLs have been also reported in a prospective follow-up study (107) on 116 post-COVID ICU patients which documented no limitations after two months from infection.

Concluding remarks:

Evidence on follow-up of COVID-19 survivors suggests that patients recovering after the acute phase may present with prolonged symptoms for more than four weeks causing disability with reduced functional performance and ADLs. This impacts some if not all aspects of HRQOL. Most TF members evaluate and systematically follow-up COVID survivors with unresolved or new or progressive symptoms with related disability. Decline in exercise tolerance, weakness, or reduced mobility define the assistance needed for ADLs (e.g, feeding, dressing, bathing, toileting, driving, housekeeping, and grocery shopping) and help clinicians to develop appropriate disability management strategies of pulmonary sequelae. Rehabilitation programmes including exercise training could mitigate longer term disability. Long COVID clinics offer a one stop shop for assessment and monitoring

disability. Longitudinal cohort studies are needed to determine the most effective interventions.

Clinical Question 8. Which follow-up strategies relate to home care follow-up (tele-medicine/ tele-rehabilitation)?

Evidence overview:

Patients with post-acute COVID-19 are at risk of long-term functional impairment, and the rehabilitation community is calling for action preparing for a large increase of rehabilitation needs in this patient population (95). We screened 2057 records that were initially identified (Appendix C). According to the 29 eligible studies included (4 systematic reviews, 15 prospective cohort studies, 8 retrospective, and 2 suggestion documents) (95,96,112–138), tele-health, often used a broad term to include tele-visit, telemedicine, tele-coaching, tele-nursing and tele-rehabilitation offers an opportunity to follow-up patients whilst reducing the burden of travel for those patients affected by COVID-19, those with positive COVID tests and those with COVID sequelae. Virtual services may include: asynchronous clinical communications, real-time virtual care, messaging, telephony or video conferencing, virtual health assessments, and medication review. The COVID-19 pandemic forced a rapid adoption of tele/digital approaches over traditional in-person visits although uptake is reported to be lower in communities with higher rates of poverty (112). Telemedicine and tele-rehabilitation have been proposed in COVID patients who suffer from exercise dyspnea, adequate stable condition, residual disability, displaced or isolated (113) provided they can ambulate independently, use technology, require minimal supplemental oxygen, and were cognitively intact (114). Tele-health may improve access and reduce barriers to healthcare access, overcome financial costs, increase medical care and follow-ups, and, most importantly, reduces the risk of COVID-19 transmission (115). Approaches can monitor vital parameters (SpO2, heart rate, blood pressure, respiratory rate). Specifically pocket oximeters and smart phone-based systems need particular accuracy to avoid error in pulse oximetry (116). In selected cases, breath sounds can be analysed using advanced signal processing and analysis in tandem with new deep/machine learning (117). Tele-health implemented in response to the COVID-19 pandemic in general resulted in high patient and provider satisfaction (115,118–125). Telemedicine/tele-rehabilitation acceptance is related to increased accessibility, enhanced care, usefulness, ease of use, and privacy/discomfort,

whereas anxiety about COVID-19 is not (126). Being male, having a history of both depression and anxiety, lower patient activation (121) technical and administrative challenges (122) were significantly associated with a poor telehealth experience.

Mobile apps have been proposed for citizens, health professionals and decision-makers to reduce the burden on hospitals, provide access to credible information, track the symptoms and mental health of individuals (127–129), help patients to improve their emotional resilience and subsequently their ability to cope with the trauma of their COVID-19 experiences (130). During the pandemic the percentage of visits via telemedicine increased twenty-three-fold compared with the pre-pandemic period (112,131). As a majority of chronic respiratory patients are elderly and have multiple co-morbidities, they are notably susceptible to severe complications of COVID-19 and as such, have been advised to minimise social contact. This increased patients' vulnerability to physical deconditioning, depression, and social isolation. To address this major gap in care, some clinic-centered Pulmonary Rehabilitation programs converted some or all of their educational packages to home-based tele-rehabilitation (132). Tele-rehabilitation offers positive clinical results, even comparable to conventional face-to-face rehabilitation approaches (133) with general guides prepared in some countries (134). In post ICU patients tele-rehabilitation consisted mostly of second opinions of psychologists (11.8%), physical therapists (8.0%), dietitians (6.8%), and speech-language pathologists (4.6%) (96). Tele-health has been used for patients experiencing depression and isolation to maintain sufficient relationships (135). Barriers to medicine at distance have been described as: advanced age, poor confidence with technology, lack of communication, reduced confidence in doctors, additional burden for complex care, ethical issues, and skepticism (121) (115,136–138). Several obstacles must be overcome for a wide use of tele-health: 1) the technology must be usable by the largest possible number of patients, 2) clarity on medico-legal liability and data privacy, 3) lack of the economic reimbursement, 4) proper training of health professionals involved, 5) adequate caregiver support, 6) infrastructure, operational challenges, regulatory, communication and legislative barriers (113,119,132).

Concluding remarks:

Telehealth appointment experiences were often comparable to traditional in-person medical appointment experiences. Although telemedicine/tele-rehabilitation appear to be acceptable, the level of agreement on standardisation remains unclear in particular the ratio of cost-

effectiveness. Telehealth was effective as a mode of health care delivery during the pandemic and may be sustainable (113,121). Careful attention will be needed to integrate these services into current health care delivery systems whilst preserving patient-centered and quality care (123). Further high-quality studies to enable the successful implementation of these modalities are needed (132).

Discussion

It is evident that long COVID is a substantial global public health problem with severe consequences for affected individuals. Emotional well-being and QOL are particularly impacted (104). A standardised minimum set of outcomes for clinical care of patients with COVID-19 has recently been published by the International Consortium for Health Outcomes Measurement (ICHOM), and is categorised into five domains: (1) functional status and quality of life, (2) mental functioning, (3) social functioning, (4) clinical outcomes and (5) symptoms (139). Whilst these outcomes may need some adjustment for specific co-morbidities, treatment approaches and demographics, consensus recommendations could help guide clinical services and enabling data comparison of patient-centric clinical outcomes.

Active management and strategies for the prevention of persistent symptoms and potential long-term complications continue to be explored as a more comprehensive understanding of COVID-19 sequelae emerges. The Post-hospitalisation COVID-19 study (PHOSP-COVID), a multicentre, long-term follow-up study of adults discharged in the UK with a clinical diagnosis of COVID-19 published in October 2021(140). PHOSP-COVID determined that severe mental and physical impairments are independent of the degree of acute lung injury and could be related to persisting systemic inflammation. The investigators suggest a proactive approach and holistic clinical care that is stratified and personalised with access to interventions to improve mental, physical, and cognitive health. At six-months post-discharge, morbidity was more prevalent in females, middle age, those with two or more comorbidities, and more acute severe illness. Given the multi-systemic nature of the post-COVID-19 condition, a multidisciplinary response is likely to be the optimal approach. Many post-COVID-19 multidisciplinary clinics are emerging globally (104) with post-COVID-19 clinical programs designed to meet the needs of individuals characterised according to previous hospitalisation with COVID-19, non-hospitalisation with persistent respiratory symptoms post-COVID-19, and pre-existing lung disease complicated by COVID-19 (141).

Long COVID-19 appears to overlap with complications of acute COVID-19 making it hard to define. Further evidence and research from multi-disciplinary teams is crucial to understanding the causes, mechanisms, risks and consequences of long COVID-19 (142). The ultimate goal is to develop preventive measures, rehabilitation techniques, and clinical management strategies. Individualised interventions in long COVID clinics with multiple specialties, including graded exercise, physical therapy, continuous check-ups, and cognitive behavioural therapy should be designed to address long COVID-19 care (143). Sensitivity to gender, age and screening all patients regardless of COVID-19 severity across a range of physical and mental-health symptoms particularly anxiety, and cognitive impairment will be required to target interventions at an individual level and to groups of patients with similar post-COVID profiles.

Preliminary reports confirm the feasibility and safety of a dedicated tele-rehabilitation program for survivors of COVID-19 pneumonia with a clear improvement in exercise tolerance and dyspnoea (144). Adapting tele-rehabilitation to the usual practice of physical therapy can be achieved through a change of paradigm to ensure an effective patient-based tele-rehabilitation (145).

From the clinical perspective, physicians should be aware of the symptoms, signs, and biomarkers present in patients previously affected by COVID-19 to promptly assess, identify and halt long COVID-19 progression, and minimise the risk of chronic effects. Identification of possible biomarkers or laboratory tests would be useful, similar to those we have for acute infection or post-acute hyper-inflammatory illness (146). Data showing that almost one third of COVID survivors will present with lung abnormalities six-months after initial infection (22) raises questions. Does this high proportion of patients have clinically significant interstitial lung disease, or we should interpret these findings with more scepticism (147)? Ongoing monitoring and regular follow-up will enable physicians to assess clinically significant pulmonary sequelae identifying long COVID manifestations early and improving management.

This Statement intended to describe the evidence regarding eight clinical questions about long COVID-19 consequences. The systematic search was completed in March 2021. Papers meeting the inclusion criteria but published after the cutoff date are not included. The aim of this document was to provide a rapid first overview of the clinical questions identified to help clinicians consider important aspects of follow-up care for patient with COVID-19. This Statement is primarily focused on the respiratory system. Given the volume of publications

related to COVID-19, we plan to update this statement and to further inform a clinical practice guideline with recommendations.

Recommendations for Research

Post-acute sequelae COVID-19 research is a global priority with the US National Institute of Health (NIH) investing US $1.15 billion over four years and the NIHR in the UK investing £38.5 million. Predisposing factors and symptom patterns associated with long-term sequelae remain difficult to determine. Importantly, the COVID-19 ERS Clinical Research Collaboration (CRC), END-COVID, aims to merge national long COVID initiatives in Europe. END-COVID intends to study the long-term effects of COVID-19 in post-hospitalisation survivors, both in those with premorbid lung conditions, and in those with no previous lung disease and co-morbidities.

It is a priority to identify determinants of those more likely to experience prolonged sequelae following SARS-CoV-2 infection. Some studies are under way to identify those at greatest risk (148) but the existence of intrinsic, extrinsic (biological, psychological, and social), and factors associated with hospitalisation and interventions, require deeper investigation. Research on the respective contributions of physical/biological and functional somatic mechanisms to the expression of long COVID-19 depending on the characteristics of this expression and of the acute disease is urgently needed. Histopathological phenotyping and genotyping are crucial, enabling deeper insights into the differences in pathogenesis and underlying immunological and tissue regenerative response patterns. The design of genetic association studies may unravel potent genetic correlations (149) .
Large, multicenter studies will evaluate the long-term consequences of pulmonary physiology, imaging, alongside patient factors particularly disability and QOL. Further data is needed to determine the impact of COVID vaccines for those diagnosed with long COVID.

Summary Statements

- Age and initial disease severity appear to correlate with long-term consequences, but not necessarily with the persistence of symptoms (larger studies required).
- In patients with persistent exertional dyspnoea not explained by CT or PFTs abnormalities 3-6 months after discharge, most TF members include echocardiogram and contrast

enhanced CT in the follow-up evaluation to identify pulmonary vascular involvement.

- PFTs measurement including static lung volumes, expiratory flow rates and DL_{CO} assessment are regarded as useful tools to assess long-term lung function sequelae in patients with COVID-19.
- TF members agree with the proposed recommendations to repeat CT scan at 12 weeks after discharge in patients with persistent symptoms, as a complement to clinical-functional assessment. However, TF members are cautious when interpreting CT abnormalities taking into consideration the risk of over-calling lung fibrosis.
- The majority of TF members perform recurrent PCR testing after acute COVID-19 in specific subgroups of patients, on a case-by-case decision, given the lack of scientific evidence.
- Based on current evidence, patients recovering after the acute phase may present prolonged symptoms affecting functional performance and daily life activities. Most TF members evaluate and systematically follow-up COVID survivors with unresolved or new or progressive symptoms.
- Telemedicine/tele-rehabilitation appear to be acceptable and telehealth was effective during the pandemic. Integration of these services into current health care delivery systems must preserve patient-centered and quality care.

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Author contributions

KM Antoniou and A Spanevello coordinated the project and collated the contributions from all authors. EV and AMR had an equally major contribution in writing the manuscript. All the other authors contributed equally to the production of this Task Force report.

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Conflict of interest

Committee members disclosed all potential conflicts of interest according to ERS policy.

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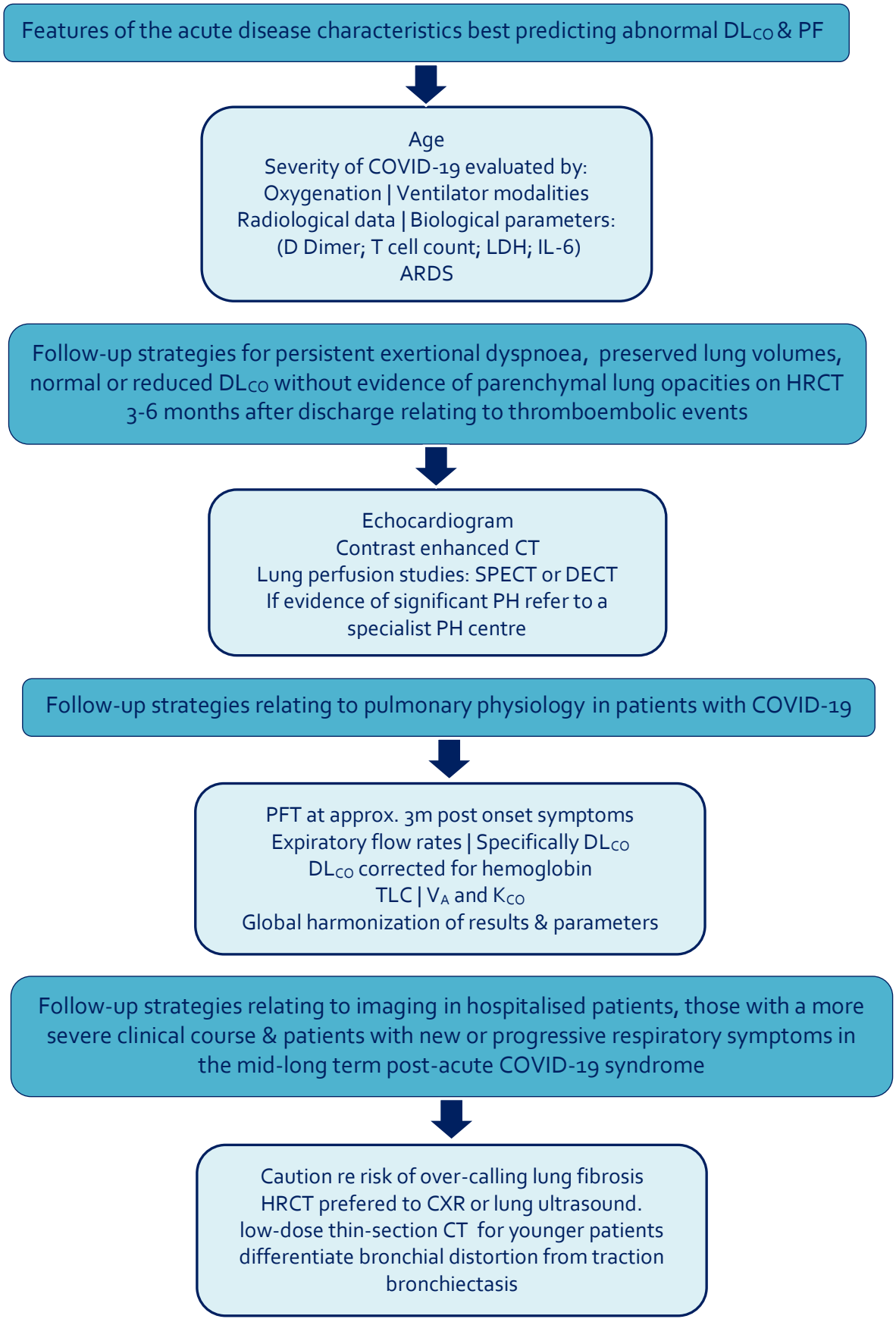
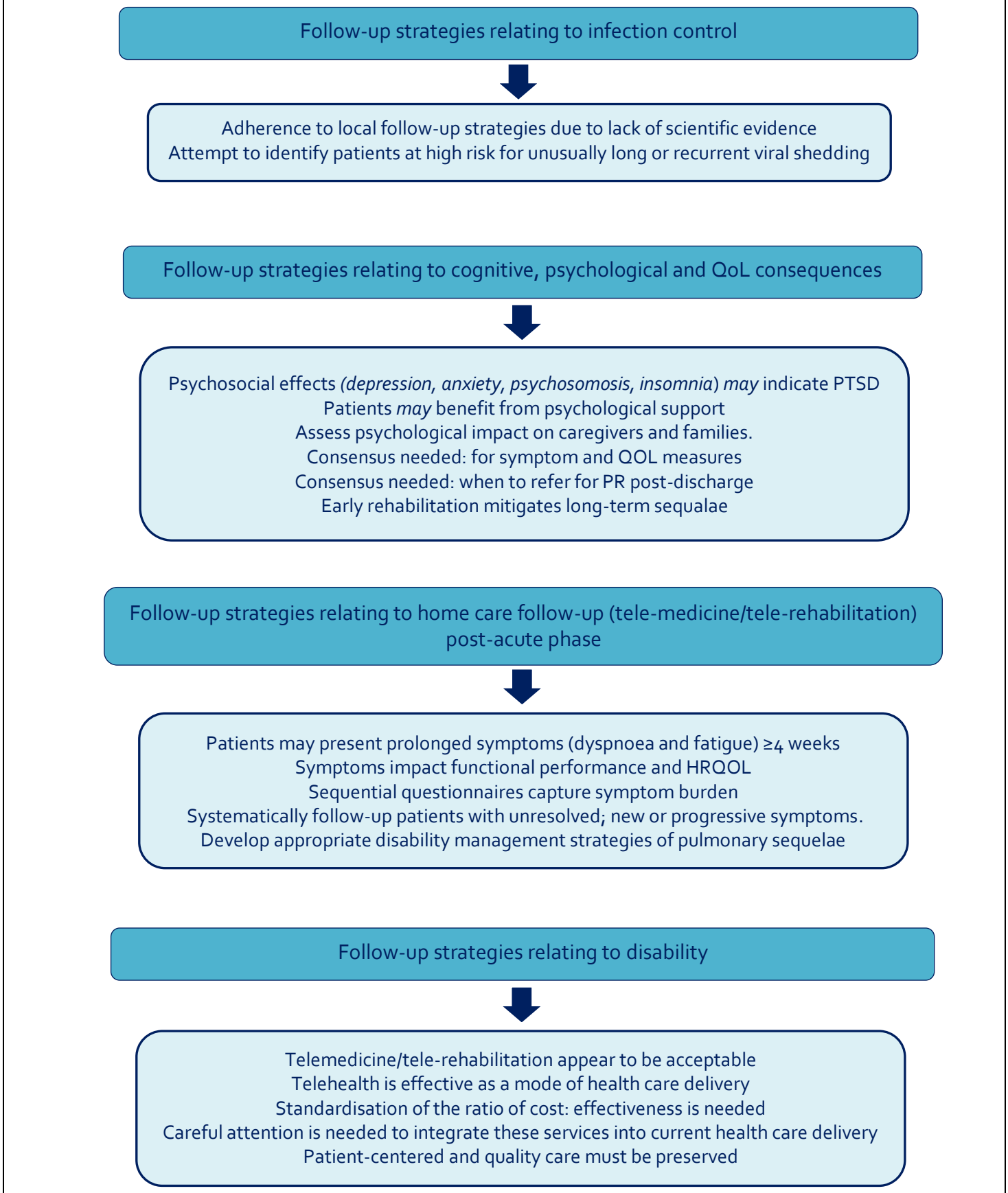
Figure 1. Current practice of the TF members on their management of patients with Long COVID-19, 1 to 6 months post-acute COVID-19 infection

**** This figure describes the current practice of how the members of the Task Force treat patients with COVID-19 and is not intended as a recommendation for clinical practice***



**More imaging data needed to distinguish COVID-pneumonia sequelae & ventilator-induced lung injury.*


Follow-up strategies relating to infection control
Adherence to local follow-up strategies due to lack of scientific evidence
Attempt to identify patients at high risk for unusually long or recurrent viral shedding
Follow-up strategies relating to cognitive, psychological and QoL consequences
Psychosocial effects (depression, anxiety, psychosomosis, insomnia) may indicate PTSD
Patients may benefit from psychological support
Assess psychological impact on caregivers and families.
Consensus needed: for symptom and QOL measures
Consensus needed: when to refer for PR post-discharge
Early rehabilitation mitigates long-term sequalae
Follow-up strategies relating to home care follow-up (tele-medicine/tele-rehabilitation) post-acute phase
Patients may present prolonged symptoms (dyspnoea and fatigue) ≥4 weeks
Symptoms impact functional performance and HRQOL
Sequential questionnaires capture symptom burden
Systematically follow-up patients with unresolved; new or progressive symptoms.
Develop appropriate disability management strategies of pulmonary sequelae
Follow-up strategies relating to disability
Telemedicine/tele-rehabilitation appear to be acceptable
Telehealth is effective as a mode of health care delivery
Standardisation of the ratio of cost: effectiveness is needed
Careful attention is needed to integrate these services into current health care delivery
Patient-centered and quality care must be preserved

European Respiratory Society Statement on Long COVID-19 Follow-Up

Appendix A - Search strategies for each question

Question 1: Are there features of the acute disease characteristics which predict long term consequences?

Literature searching was conducted on 25.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	3922
Cochrane CENTRAL	602
Total	4524
Duplicates Removed	138
Unique to Screen	4386

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 24, 2021
Date Searched: 25.03.21
Hits: 3922
Strategy:

#	Searches	Results
1	exp COVID-19/	66505
2	exp SARS-CoV-2/	51748
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	124989
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	1001
5	1 or 2 or 3 or 4	127580
6	exp "Severity of Illness Index"/	261312
7	risk factors/	857901
8	critical care outcomes/ or patient reported outcome measures/	7867
9	Prognosis/	528576
10	(severe disease or disease severity or severity of disease or patient characteristic* or disease characteristic* or short term outcome* or short-term outcome* or short term prognos* or short-term prognos* or long term outcome* or long-term outcome* or long term prognos* or long-term prognos* or risk factor* or health correlates or risk score* or population* at risk or outcome measure* or critical care outcome*).ti,ab,kw.	1042515
11	6 or 7 or 8 or 9 or 10	2168626
12	exp Overweight/	228188
13	exp Body Fat Distribution/	15448
14	body mass index/	131726
15	(obese or obesity or overweight or excess* body fat or excess* fat or adipos* or body fat or visceral fat or BMI or body mass index).ti,ab,kw.	579970

16	Diabetes Mellitus/	120622
17	(Diabetes or diabetes Mellitus or type 2 diabetes or diabetes type 2 or type 1 diabetes or diabetes type 1 or diabetic*).ti,ab,kw.	664149
18	Dyslipidemias/	12260
19	(Dyslipidemia* or dyslipoproteinemia*).ti,ab,kw.	31594
20	Smoking/	142173
21	(Smoking or smoker*).ti,ab,kw.	263237
22	Hypertension, Pulmonary/ or Pulmonary Arterial Hypertension/	35783
23	(Pulmonary arterial hypertension or PAH or arterial hypertension or high blood pressure).ti,ab,kw.	72259
24	exp Pulmonary Disease, Chronic Obstructive/	57727
25	(Chronic Obstructive Lung Disease* or Chronic Obstructive Pulmonary Disease* or COAD or COPD or Chronic Obstructive Airway Disease* or Chronic Airflow Obstruction*).ti,ab,kw.	71329
26	exp Continental Population Groups/	226865
27	(race* or racial or ethnicit*).ti,ab,kw.	219273
28	Sex Factors/	269954
29	(Male* or female* or gender*).ti,ab,kw.	1932450
30	Age Factors/	459971
31	(age* or old* or young* or adult* or child* or adolescen* or youth* or senior* or elderly).ti,ab,kw.	6697497
32	Neoplasms/	436474
33	Carcinoma/	90213
34	Sarcoma/	31583
35	Leukemia/	57815
36	Lymphoma/	51717
37	Multiple Myeloma/	41578
38	Melanoma/	86548
39	(malignant disease* or malignan* or carcinoma or cancer or sarcoma or leukemia or melanoma or lymphoma or multiple myeloma or melanoma or malignant tumor or malignant tumour).ti,ab,kw.	2896317
40	Comorbidity/	113758
41	comorbidit*.ti,ab,kw.	139767
42	Critical Care/	54275
43	(critical care or intensive care).ti,ab,kw.	176447
44	12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43	10782973
45	5 and 11 and 44	8844
46	Cohort Studies/	279867
47	incidence.tw.	782126
48	Mortality/	46218
49	Follow-Up Studies/	658634
50	prognos*.tw.	643067
51	predict*.tw.	1678985
52	course.tw.	574056
53	Survival Analysis/	139120
54	46 or 47 or 48 or 49 or 50 or 51 or 52 or 53	4020951
55	45 and 54	3922

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 25.03.21
Hits: 634 - Cochrane Central Register of Controlled Trials: 602
Strategy:

ID	Search	Hits
#1	MeSH descriptor: [COVID-19] explode all trees	257
#2	MeSH descriptor: [SARS-CoV-2] explode all trees	204
#3	((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched)	4522
#4	((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)	501
#5	#1 OR #2 OR #3 OR #4	4526
#6	MeSH descriptor: [Severity of Illness Index] explode all trees	20203
#7	MeSH descriptor: [Risk Factors] this term only	24693
#8	MeSH descriptor: [Critical Care Outcomes] this term only	2
#9	MeSH descriptor: [Patient Reported Outcome Measures] this term only	679
#10	MeSH descriptor: [Prognosis] this term only	13685
#11	((severe disease or disease severity or severity of disease or patient characteristic* or disease characteristic* or short term outcome* or short-term outcome* or short term prognos* or short-term prognos* or long term outcome* or long-term outcome* or long term prognos* or long-term prognos* or risk factor* or health correlates or risk score* or population* at risk or outcome measure* or critical care outcome*)):ti,ab,kw (Word variations have been searched)	537728
#12	#6 or #7 or #8 or #9 or #10 or #11	549298
#13	MeSH descriptor: [Overweight] explode all trees	16785
#14	MeSH descriptor: [Body Fat Distribution] explode all trees	934
#15	MeSH descriptor: [Body Mass Index] this term only	10238
#16	((obese or obesity or overweight or excess* body fat or excess* fat or adipos* or body fat or visceral fat or BMI or body mass index)):ti,ab,kw (Word variations have been searched)	100132
#17	MeSH descriptor: [Diabetes Mellitus] this term only	9852
#18	((Diabetes or diabetes Mellitus or type 2 diabetes or diabetes type 2 or type 1 diabetes or diabetes type 1 or diabetic*)):ti,ab,kw (Word variations have been searched)	96418
#19	MeSH descriptor: [Dyslipidemias] this term only	1253
#20	((Dyslipidemia* or dyslipoproteinemia*)):ti,ab,kw (Word variations have been searched)	5547
#21	MeSH descriptor: [Dyslipidemias] this term only	1253
#22	((Smoking or smoker*)):ti,ab,kw (Word variations have been searched)	37190
#23	MeSH descriptor: [Hypertension, Pulmonary] this term only	981
#24	MeSH descriptor: [Pulmonary Arterial Hypertension] this term only	15
#25	((Pulmonary arterial hypertension or PAH or arterial hypertension or high blood pressure)):ti,ab,kw (Word variations have been searched)	37805
#26	MeSH descriptor: [Pulmonary Disease, Chronic Obstructive] explode all trees	5838
#27	((Chronic Obstructive Lung Disease* or Chronic Obstructive Pulmonary Disease* or COAD or COPD or Chronic Obstructive Airway Disease* or Chronic Airflow Obstruction*)):ti,ab,kw (Word variations have been searched)	21851
#28	MeSH descriptor: [Continental Population Groups] explode all trees	6593

#29 ((race* or racial or ethnicit*)):ti,ab,kw (Word variations have been searched) 17043
#30 MeSH descriptor: [Sex Factors] this term only 5906
#31 ((Male* or female* or gender*)):ti,ab,kw (Word variations have been searched) 871081
#32 MeSH descriptor: [Age Factors] this term only 9185
#33 ((age* or old* or young* or adult* or child* or adolescen* or youth* or senior* or elderly)):ti,ab,kw (Word variations have been searched) 1115441
#34 MeSH descriptor: [Neoplasms] this term only 6242
#35 MeSH descriptor: [Carcinoma] this term only 2850
#36 MeSH descriptor: [Sarcoma] this term only 542
#37 MeSH descriptor: [Leukemia] this term only 1690
#38 MeSH descriptor: [Lymphoma] this term only 1349
#39 MeSH descriptor: [Multiple Myeloma] this term only 1624
#40 MeSH descriptor: [Melanoma] this term only 1829
#41 ((malignant disease* or malignan* or carcinoma or cancer or sarcoma or leukemia or melanoma or lymphoma or multiple myeloma or melanoma or malignant tumor or malignant tumour)):ti,ab,kw (Word variations have been searched) 207931
#42 MeSH descriptor: [Comorbidity] this term only 3560
#43 ((comorbidit*)):ti,ab,kw (Word variations have been searched) 19377
#44 MeSH descriptor: [Critical Care] this term only 1753
#45 ((critical care or intensive care)):ti,ab,kw (Word variations have been searched) 45510
#46 #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 1301461
#47 #5 AND #12 AND #46 2071
#48 MeSH descriptor: [Cohort Studies] this term only 7230
#49 (incidence) (Word variations have been searched) 130605
#50 MeSH descriptor: [Mortality] this term only 586
#51 MeSH descriptor: [Follow-Up Studies] this term only 59600
#52 ((prognos* or predict* or course)) (Word variations have been searched) 197325
#53 MeSH descriptor: [Survival Analysis] this term only 8203
#54 #48 or #49 or #50 or #51 or #52 or #53 344335
#55 #47 AND #54 634

Question 2: What are the follow-up strategies related to thromboembolic events?

Literature searching was conducted on 19.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	1078
Cochrane CENTRAL	103
Total	1181
Duplicates Removed	23
Unique to Screen	1158

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 18, 2021
Date Searched: 19.03.21
Hits: 1078
Strategy:

#	Searches	Results
1	exp COVID-19/	65527
2	exp SARS-CoV-2/	51064
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	123165
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	981
5	1 or 2 or 3 or 4	125683
6	exp Pulmonary Embolism/	39805
7	exp Hypertension, Pulmonary/	37283
8	exp Thromboembolism/	57877
9	(pulmonary thrombo* or pulmonary emboli* or deep vein thrombo* or deep venous thrombo* or DVT or chronic thromboembolic pulmonary hypertension or thromboembolic pulmonary hypertension or CTEPH or post-PE syndrome or post PE syndrome or post-pulmonary embolism syndrome or post pulmonary embolism syndrome or blood clot* or thromboemboli*).ti,ab,kw.	119603
10	6 or 7 or 8 or 9	194490
11	exp Anticoagulants/	225807
12	exp Thrombelastography/	5409
13	(anticoagulant* or anticoagulant management or thrombelastograph* or thromboelastograph* or TEG or heparin* or LMWH or dalteparin* or tedelparin* or FR-860 or FR860 or Kabi-2165 or Kabi2165 or fragmin* or enoxaparin* or PK-10-169 or PK-10169 or PK10169 or EMT-967 or lovenox or clexan* or EMT-966 or nadroparin* or fraxiparin* or CY-216 or CY216 or Tinzaparin* or 3-phenyl-2-propenoic-acid or innohep or anticoagula* or anti coagula* or bm-2123 or bm2123 or choay or ebpm* or ff1034 or ff-1034 or gag-869 or gag869 or pk-007 or pk007 or sandoz 5100 or sandoz 6700 or traxyparin* or adomiparin* or m118 or m-118 or antixarin* or ardeparin* or normifio or normiflo or wy-90493 or wy90493 or bemiparin* or entervit or hepadren* or hibor or ivor or ivorat or ivormax or phivor or zibor or certoparin* or arteven or badyket or einecs 232-681-7 or eparina or mono embolex or monoembolex or op-622 or op622 or op-386 or op386 or pabyrin* or pulari or sandoparin* or sublingual or troparin* or vitrum a or cy-222 or cy222 or k-2165 or k2165 or low liquemin* or danaparoid or danaproid or kb-101 or kb101 or lomoparan or lomoparin* or mucoglucuronan or org-10172 or org10172 or orgaran or deligoparin* or op-2000 or op2000 or embolex or inhixa or klexane or ledraxen or neoparin* or qualiop klinik or thorinane or fondaparin* or arixtra or ic-851589 or ic851589 or org-31540 or org31540 or quixidar or sr-90107 or sr-90107a or sr90107 or sr90107a or idrabiotaparinux or ssr-126517 or ssr-126517-e or ssr126517 or ssr126517e or idraparinux or org-34006 or org34006 or sanorg 34006 or sanorg34006 or sr-34006 or sr34006 or livaraparin calcium or minolteparin* or cy-216d or cy216d or fraxodi or seledie or seleparin* or tedegliparin* or necuparanib or df-01 or df01 or m-402 or m402 or tafoxiparin* or parnaparin* or fluxum or lohepa or lowhepa or minidalton or op-2123 or op2123 or parvoparin* or rd-11885 or rd11885 or reviparin* or clivarin* or clivarodi or lomorin* or lu-47311 or lu47311 or semuloparin* or ave-5026 or ave5026 or mulsevo or visamerin* or sevuparin* or lhn1 or lhn-1 or logiparin*).ti,ab,kw.	189629
14	11 or 12 or 13	320140

15	Tomography/	10834
16	exp Tomography, X-Ray/	451345
17	Ultrasonography/	184082
18	((chest or lung or thorax or thoracic) adj3 (CT or CT scan* or computerized tomography or computerised tomography or computerized tomography scan* or computerised tomography scan* or CAT or CAT scan* or computerized axial tomography or computerised axial tomography or computerized axial tomography scan* or computerised axial tomography scan* or HRCT or high resolution CT or high resolution computerised tomography or high resolution computerized tomography or high resolution computerised tomography scan* or high resolution computerized tomography scan* or imag* or radiograph* or x-ray or X-radiation)).ti,ab,kw.	72820
19	((chest or lung or thorax or thoracic) adj3 (ultrasound or ultrasonogra* or ultrasonic* or sonograph* or sonogram*)).ti,ab,kw.	4535
20	Echocardiography/	90705
21	(echocardiogra* or ventilation scan* or perfusion scan* or CT pulmonary angiogra* or pulmonary angiogra* or computed tomography pulmonary angiogra* or computed tomography angiogra*).ti,ab,kw.	172489
22	(cardiopulmonary exercise test* or exercise capacity or d-dimer* or CTPA or CTPE or pulmonary function test* or PFT* or lung function test* or pulmonary physiolog* test* or CPET or cardiopulmonary exercise testing or 6-min walk* test or 6 min walk* test or 6min walk* test or 6 mwt or CPX or DLCO or diffusing capacity for carbon monoxide or diffusing capacity of the lungs for carbon monoxide or TLCO or gas transfer or spirometr*).ti,ab,kw.	75212
23	15 or 16 or 17 or 18 or 19 or 20 or 21 or 22	912610
24	14 or 23	1210170
25	5 and 10 and 24	1078

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 19.03.21
Hits: 104 - Cochrane Central Register of Controlled Trials: 103
Strategy:
ID Search Hits
#1 MeSH descriptor: [COVID-19] explode all trees 257
#2 MeSH descriptor: [SARS-CoV-2] explode all trees 204
#3 ((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched) 4521
#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)500
#5 #1 OR #2 OR #3 OR #4 4525
#6 MeSH descriptor: [Pulmonary Embolism] explode all trees 1043
#7 MeSH descriptor: [Hypertension, Pulmonary] explode all trees 1189
#8 MeSH descriptor: [Thromboembolism] explode all trees 2125
#9 ((pulmonary thrombo* or pulmonary emboli* or deep vein thrombo* or deep venous thrombo* or DVT or chronic thromboembolic pulmonary hypertension or thromboembolic pulmonary hypertension or CTEPH or post-PE syndrome or post PE syndrome or post-

pulmonary embolism syndrome or post pulmonary embolism syndrome or blood clot* or thromboemboli*)):ti,ab,kw (Word variations have been searched) 23781
#10 #6 OR #7 OR #8 OR #9 25120
#11 MeSH descriptor: [Anticoagulants] explode all trees 4699
#12 MeSH descriptor: [Thrombelastography] explode all trees 246
#13 ((anticoagulant* OR “anticoagulant management” OR thrombelastograph* OR thromboelastograph* OR TEG OR heparin* OR LMWH OR dalteparin* OR tedelparin* OR FR-860 OR FR860 OR Kabi-2165 OR Kabi2165 OR fragmin* OR enoxaparin* OR "PK-10-169" OR PK-10169 OR PK10169 OR EMT-967 OR lovenox OR clexan* OR EMT-966 OR nadroparin* OR fraxiparin* OR CY-216 OR CY216 OR Tinzaparin* OR "3-phenyl-2-propenoic-acid" OR innohep OR anticoagula* OR anti coagula* OR bm-2123 OR bm2123 OR choay OR ebpm* OR ff1034 OR ff-1034 OR gag-869 OR gag869 OR pk-007 OR pk007 OR sandoz 5100 OR sandoz 6700 OR traxyparin* OR adomiparin* OR m118 OR m-118 OR antixarin* OR ardeparin* OR normifio OR normiflo OR wy-90493 OR wy90493 OR bemiparin* OR entervit OR hepadren* OR hibor OR ivor OR ivorat OR ivormax OR phivor OR zibor OR certoparin* OR arteven OR badyket OR "einecs 232-681-7" OR eparina OR “mono embolex” OR monoembolex OR op-622 OR op622 OR op-386 OR op386 OR pabyrin* OR pulari OR sandoparin* OR sublingula OR troparin* OR "vitrum a" OR “cy-222” OR cy222 OR “k-2165” OR k2165 OR “low liquemin*” OR danaparoid OR danaproid OR “kb-101” OR kb101 OR lomoparan OR lomoparin* OR mucoglucuronan OR “org-10172” OR org10172 OR orgaran OR deligoparin* OR “op-2000” OR op2000 OR embolex OR inhixa OR klexane OR ledraxen OR neoparin* OR “qualiop klinik” OR thorinane OR fondaparin* OR arixtra OR “ic-851589” OR ic851589 OR “org-31540” OR org31540 OR quixidar OR “sr-90107” OR “sr-90107a” OR sr90107 OR "sr90107a" OR idrabiotaparinux OR "ssr-126517" OR "ssr-126517-e" OR "ssr126517" OR "ssr126517e" OR idraparinux OR “org-34006” OR org34006 OR “sanorg 34006” OR sanorg34006 OR “sr-34006” OR sr34006 OR “livaraparin calcium” OR minolteparin* OR “cy-216d” OR cy216d OR fraxodi OR seledie OR seleparin* OR tedegliparin* OR necuparanib OR “df-01” OR df01 OR “m-402” OR m402 OR tafoxiparin* OR parnaparin* OR fluxum OR lohepa OR lowhepa OR minidalton OR “op-2123” OR op2123 OR parvoparin* OR “rd-11885” OR rd11885 OR reviparin* OR clivarin* OR clivarodi OR lomorin* OR “lu-47311” OR lu47311 OR semuloparin* OR “ave-5026” OR ave5026 OR mulsevo OR visamerin* OR sevuparin* OR lhn1 OR “lhn-1” OR logiparin*)):ti,ab,kw (Word variations have been searched) 25371
#14 #11 OR #12 OR #13 25557
#15 MeSH descriptor: [Tomography] this term only 94
#16 MeSH descriptor: [Tomography Scanners, X-Ray Computed] explode all trees 41
#17 MeSH descriptor: [Ultrasonography] this term only 4777
#18 (((chest or lung or thorax or thoracic) NEAR/3 (CT or CT scan* or computerized tomography or computerised tomography or computerized tomography scan* or computerised tomography scan* or CAT or CAT scan* or computerized axial tomography or computerised axial tomography or computerized axial tomography scan* or computerised axial tomography scan* or HRCT or high resolution CT or high resolution computerised tomography or high resolution computerized tomography or high resolution computerised tomography scan* or high resolution computerized tomography scan* or imag* or radiograph* or x-ray or X-radiation))):ti,ab,kw (Word variations have been searched) 8467
#19 (((chest or lung or thorax or thoracic) NEAR/3 (ultrasound or ultrasonogra* or ultrasonic* or sonograph* or sonogram*))):ti,ab,kw (Word variations have been searched) 775
#20 MeSH descriptor: [Echocardiography] this term only 2638
#21 ((echocardiogra* or ventilation scan* or perfusion scan* or CT pulmonary angiogra* or pulmonary angiogra* or computed tomography pulmonary angiogra* or computed tomography angiogra*)):ti,ab,kw (Word variations have been searched) 18273
#22 ((cardiopulmonary exercise test* or exercise capacity or d-dimer* or CTPA or CTPE or pulmonary function test* or PFT* or lung function test* or pulmonary physiolog* test* or CPET or cardiopulmonary exercise testing or "6-min walk* test" or "6 min walk* test" or

"6min walk* test" or 6 mwt or CPX or DLCO or diffusing capacity for carbon monoxide or diffusing capacity of the lungs for carbon monoxide or TLCO or gas transfer or spirometr*)):ti,ab,kw (Word variations have been searched) 37818
#23 #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 65242
#24 #14 or #23 88529
#25 #5 and #10 and #24 104

Question 3: What are the follow-up strategies related to pulmonary physiology?

Literature searching was conducted on 24.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	1178
Cochrane CENTRAL	400
Total	1578
Duplicates Removed	48
Unique to Screen	1530

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 23, 2021
Date Searched: 24.03.21
Hits: 1178
Strategy:

#	Searches	Results
1	exp COVID-19/	66643
2	exp SARS-CoV-2/	51893
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	124877
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	996
5	1 or 2 or 3 or 4	127470
6	Physiology/	24037
7	exp Respiratory Physiological Phenomena/	234780
8	(physiolog* or pathophysiolog* or ((lung* or pulmonary or airway* or respiratory or breath* or alveol*) adj8 (complian* or ventilat* or circulat* or elimination or function* or mechan* or control* or fail* or process* or system* or properties or physiolog* or impair* or abnormal*))).ti,ab,kw.	1320620
9	6 or 7 or 8	1468628
10	exp Respiratory Function Tests/	238245
11	(pulmonary function test* or PFT* or lung function test* or respiratory management or pulmonary management or lung management or airway management or pulmonary physiolog* test* or CPET or cardiopulmonary exercise test* or 6-min walk* test or 6 min walk* test* or 6min walk* test* or 6 mwt or exercise test* or CPX or DLCO or diffusing capacity or TLCO or gas transfer or airway resistance or blood gas analysis or bronchial provocation	195513

	test* or bronchial challenge test* or airway provocation test* or exercise test* or lung compliance or lung volume* or total lung capacity or maximal respiratory pressures or plethysmograph* or gas exchange or diffus* capacity or spirometr* or valsalva maneuver or ventilation-perfusion scan or ventilation perfusion scan or ventilation-perfusion ratio or ventilation perfusion ratio or oximetry or bronchospirometry or scintigraph*).ti,ab,kw.	
12	10 or 11	356073
13	Tomography/	10840
14	exp Tomography, X-Ray/	451581
15	Ultrasonography/	184174
16	((chest or lung or thorax or thoracic) adj3 (CT or CT scan* or computerized tomography or computerised tomography or computerized tomography scan* or computerised tomography scan* or CAT or CAT scan* or computerized axial tomography or computerised axial tomography or computerized axial tomography scan* or computerised axial tomography scan* or HRCT or high resolution CT or high resolution computerised tomography or high resolution computerized tomography or high resolution computerised tomography scan* or high resolution computerized tomography scan* or imag* or radiograph* or x-ray or X-radiation)).ti,ab,kw.	72934
17	((chest or lung or thorax or thoracic) adj3 (ultrasound or ultrasonogra* or ultrasonic* or sonograph* or sonogram*)).ti,ab,kw.	4549
18	13 or 14 or 15 or 16 or 17	675308
19	12 or 18	1007680
20	5 and 9 and 19	1178

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 24.03.21
Hits: 404 - Cochrane Central Register of Controlled Trials: 400
Strategy:
ID Search Hits
#1 MeSH descriptor: [COVID-19] explode all trees 257
#2 MeSH descriptor: [SARS-CoV-2] explode all trees 204
#3 ((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched) 4521
#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)500
#5 #1 OR #2 OR #3 OR #4 4525
#6 MeSH descriptor: [Physiology] this term only 39
#7 MeSH descriptor: [Respiratory Physiological Phenomena] explode all trees 16231
#8 ((physiolog* or pathophysiolog* or ((lung* or pulmonary or airway* or respiratory or breath* or alveol*) NEAR/8 (complian* or ventilat* or circulat* or elimination or function* or mechan* or control* or fail* or process* or system* or properties or physiolog* or impair* or abnormal*)))):ti,ab,kw (Word variations have been searched) 191916
#9 #6 or #7 or #8 197534

#10 MeSH descriptor: [Respiratory Function Tests] explode all trees 24056
#11 ((pulmonary function test* or PFT* or lung function test* or respiratory management or pulmonary management or lung management or airway management or pulmonary physiolog* test* or CPET or cardiopulmonary exercise test* or "6-min walk* test" or "6 min walk* test*" or "6min walk* test*" or 6 mwt or exercise test* or CPX or DLCO or diffusing capacity or TLCO or gas transfer or airway resistance or blood gas analysis or bronchial provocation test* or bronchial challenge test* or airway provocation test* or exercise test* or lung compliance or lung volume* or total lung capacity or maximal respiratory pressures or plethysmograph* or gas exchange or diffus* capacity or spirometr* or valsalva maneuver or ventilation-perfusion scan or ventilation perfusion scan or ventilation-perfusion ratio or ventilation perfusion ratio or oximetry or bronchospirometry or scintigraph*)):ti,ab,kw (Word variations have been searched) 103908
#12 #10 or #11 107280
#13 MeSH descriptor: [Tomography] this term only 94
#14 MeSH descriptor: [Tomography, X-Ray] explode all trees 5094
#15 MeSH descriptor: [Ultrasonography] this term only 4777
#16 (((chest or lung or thorax or thoracic) NEAR/3 (CT or CT scan* or computerized tomography or computerised tomography or computerized tomography scan* or computerised tomography scan* or CAT or CAT scan* or computerized axial tomography or computerised axial tomography or computerized axial tomography scan* or computerised axial tomography scan* or HRCT or high resolution CT or high resolution computerised tomography or high resolution computerized tomography or high resolution computerised tomography scan* or high resolution computerized tomography scan* or imag* or radiograph* or x-ray or X-radiation))):ti,ab,kw (Word variations have been searched) 8467
#17 (((chest or lung or thorax or thoracic) NEAR/3 (ultrasound or ultrasonogra* or ultrasonic* or sonograph* or sonogram*))):ti,ab,kw (Word variations have been searched) 775
#18 #13 or #14 or #15 or #16 or #17 18024
#19 #12 or #18 121718
#20 #5 and #9 and #19 404

Question 4: What are the follow-up strategies related to imaging?

Literature searching was conducted on 20.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	1110
Cochrane CENTRAL	190
Total	1300
Duplicates Removed	37
Unique to Screen	1263

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 19, 2021
Date Searched: 20.03.21
Hits: 1110
Strategy:

#	Searches	Results
1	exp COVID-19/	65973
2	exp SARS-CoV-2/	51401
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or	123557

	coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	985
5	1 or 2 or 3 or 4	126094
6	Tomography/	10836
7	exp Tomography, X-Ray/	451427
8	Ultrasonography/	184105
9	((chest or lung or thorax or thoracic) adj3 (CT or CT scan* or computerized tomography or computerised tomography or computerized tomography scan* or computerised tomography scan* or CAT or CAT scan* or computerized axial tomography or computerised axial tomography or computerized axial tomography scan* or computerised axial tomography scan* or HRCT or high resolution CT or high resolution computerised tomography or high resolution computerized tomography or high resolution computerised tomography scan* or high resolution computerized tomography scan* or imag* or radiograph* or x-ray or X-radiation)).ti,ab,kw.	72855
10	((chest or lung or thorax or thoracic) adj3 (ultrasound or ultrasonogra* or ultrasonic* or sonograph* or sonogram*)).ti,ab,kw.	4539
11	6 or 7 or 8 or 9 or 10	675012
12	exp Pulmonary Fibrosis/	24328
13	exp Lung Diseases, Interstitial/	56919
14	(pulmonary fibros* or lung fibros* or lung disease or interstitial lung disease or lung damage or pulmonary damage or fibros* or pulmonary vascular or pulmonary vascular lesion* or pulmonary lesion* or vascular lesion* or lung lesion* or alveol* or parenchymal bands or irregular interfaces or traction bronchiectasis or honeycombing or honeycomb lung or ground-glass or ground glass or ground-glass opaci* or ground glass opaci* or interstitial thickening or ILD or inflammatory interstitial lung disease).ti,ab,kw.	396269
15	12 or 13 or 14	444239
16	5 and 11 and 15	1110

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 20.03.21
Hits: 192 - Cochrane Central Register of Controlled Trials: 190
Strategy:

ID	Search	Hits
#1	MeSH descriptor: [COVID-19] explode all trees	257
#2	MeSH descriptor: [SARS-CoV-2] explode all trees	204
#3	((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched)	4521

#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)500
#5 #1 OR #2 OR #3 OR #4 4525
#6 MeSH descriptor: [Tomography] this term only 94
#7 MeSH descriptor: [Tomography Scanners, X-Ray Computed] explode all trees 41
#8 MeSH descriptor: [Ultrasonography] this term only 4777
#9 (((chest or lung or thorax or thoracic) NEAR/3 (CT or CT scan* or computerized tomography or computerised tomography or computerized tomography scan* or computerised tomography scan* or CAT or CAT scan* or computerized axial tomography or computerised axial tomography or computerized axial tomography scan* or computerised axial tomography scan* or HRCT or high resolution CT or high resolution computerised tomography or high resolution computerized tomography or high resolution computerised tomography scan* or high resolution computerized tomography scan* or imag* or radiograph* or x-ray or X-radiation))):ti,ab,kw (Word variations have been searched) 8467
#10 (((chest or lung or thorax or thoracic) NEAR/3 (ultrasound or ultrasonogra* or ultrasonic* or sonograph* or sonogram*))):ti,ab,kw (Word variations have been searched) 775
#11 #6 or #7 or #8 or #9 or #10 13754
#12 MeSH descriptor: [Pulmonary Fibrosis] explode all trees 564
#13 MeSH descriptor: [Lung Diseases, Interstitial] explode all trees 778
#14 ((pulmonary fibros* or lung fibros* or lung disease or interstitial lung disease or lung damage or pulmonary damage or fibros* or pulmonary vascular or pulmonary vascular lesion* or pulmonary lesion* or vascular lesion* or lung lesion* or alveol* or parenchymal bands or irregular interfaces or traction bronchiectasis or honeycombing or honeycomb lung or ground-glass or ground glass or ground glass opaci* or ground glass opaci* or interstitial thickening or ILD or inflammatory interstitial lung disease)):ti,ab,kw (Word variations have been searched)64200
#15 #12 or #13 or #14 64438
#16 #5 and #11 and #15 192

Question 5: What are the follow-up strategies related to infection control?

Literature searching was conducted on 26.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	817
Cochrane CENTRAL	17
Total	834
Duplicates Removed	19
Unique to Screen	815

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 25, 2021
Date Searched: 26.03.21
Hits: 817
Strategy:

#	**Searches**	**Results**
1	exp COVID-19/	66730
2	exp SARS-CoV-2/	51921
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or	125387

	coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	1007
5	1 or 2 or 3 or 4	127992
6	exp COVID-19 Testing/	4673
7	Serologic Tests/	20881
8	Serology/	944
9	Viral Load/	35028
10	antibodies/ or antibodies, viral/	177999
11	exp T-Lymphocytes/	335495
12	(serolog* or antibod* or viral load or t-cell* or t cell* or t-lymphocyte* or t lymphocyte* or immunodiagnostic* or immune-diagnostic or immunoglobulins or IgG or IgM or nucleic acid amplification or nucleic acid test* or NAT or NAATS).ti,ab,kw.	1397816
13	(polymerase chain reaction or PCR or RT-PCR or reverse transcription polymerase chain reaction or home test* or rapid lateral flow or rapid antigen test* or nasal swab* or nasopharyngeal swab* or throat swab* or saliva or upper respiratory tract specimen* or self-swab* or self swab*).ti,ab,kw.	717260
14	exp Polymerase Chain Reaction/	453819
15	(contact trac* or immunis* or immuniz* or vacinat* or antisepsis or patient isolation or physical distanc* or quarantin* or self isolat* or self-isolat* or shield* or protect* or lock down or lockdown).ti,ab,kw.	1000228
16	exp Disease Transmission, Infectious/	73324
17	exp communicable disease control/ or exp infection control/	359385
18	primary prevention/	19015
19	Reinfection/	85
20	Cross Infection/	57924
21	((infectio* or disease or virus or viral) adj6 (control* or battle* or prevent* or surveil* or precaution* or transmission or spread*)).ti,ab,kw.	432264
22	((control* or prevent*) adj3 measur*).ti,ab,kw.	98352
23	(immunity or reinfection or re-infection or quantif*).ti,ab,kw.	711332
24	6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23	4307457
25	exp Immunosuppression/	61367
26	(immunosuppress* or anti-reject* therap* or anti reject* therap* or antireject* therap*).ti,ab,kw.	156348
27	exp Transplantation/	525682
28	(transplant* or living donor* or tissue donor* or histocompatability test* or organ preservation solution*).ti,ab,kw.	484508
29	drug therapy/ or chemotherapy, adjuvant/ or consolidation chemotherapy/ or induction chemotherapy/	75846
30	Antineoplastic Agents/	288259
31	(chemotherap* or chemo or oncolog* or drug* therap* or cancer treatment* or antineoplastic* or anti tumor drug* or anti-tumor drug* or antitumor drug* or anti tumor agent* or anti-tumor agent* or antitumor agent* or pharmacotherap* or chemotherapeutic* or anticancer drug* or anti cancer	777228

	drug* or anticancer drug* or anticancer agent* or anti cancer agent* or anti-cancer agent* or anti tumour drug* or anti-tumour drug* or antitumour drug* or anti tumour agent* or anti-tumour agent* or antitumour agent*).ti,ab,kw.	
32	exp Autoimmune Diseases/	488479
33	(Autoimmune Disease* or rheumatolog* or addison disease or autoimmune hemolytic anemia or anti-glomerular basement membrane disease or antineutrophil cytoplasmic antibody associated vasculitis or antiphospholipid syndrome or juvenile arthritis or rheumatoid arthritis or autoimmune hypophysitis or autoimmune lymphoproliferative syndrome or autoimmune pancreatitis or birdshot chorioretinopathy or dermatitis herpetiformis or diabetes mellitus type 1 or type 1 diabetes mellitus or diabetes mellitus insulin-dependent, 1 or insulin-dependent diabetes mellitus 1 or insulin dependent diabetes mellitus 1 or type 1 diabetes or glomerulonephritis or graves disease or autoimmune hepatitis or immunoglobulin G4-related disease or latent autoimmune diabetes or linear IgA bullous dermatosis or lupus or sympathetic ophthalmia or bullous pemphigoid or autoimmune polyendocrinopathies or idiopathic thrombocytopenic purpura or autoimmune thyroiditis or undifferentiated connective tissue disease*).ti,ab,kw.	356782
34	exp Immunologic Deficiency Syndromes/	337720
35	(immune deficienc* or Immunodeficienc* or Agammaglobulinemia or CVID or Dysgammaglobulinemia or IgA Deficiency or IgG Deficiency or HIV or Acute Retroviral Syndrome or AIDS or Deltaretrovirus or Enzootic Bovine Leukosis or HTLV-I Infections or HTLV-II Infections or Lymphopenia or Idiopathic CD4-Positive T-Lymphocytopenia or Wiskott-Aldrich Syndrome or Phagocyte Bactericidal Dysfunction or Ataxia Telangiectasia or Bloom Syndrome or Chediak-Higashi Syndrome or Hereditary Complement Deficiency Disease* or Job Syndrome or Leukocyte-Adhesion Deficiency Syndrome).ti,ab,kw.	471458
36	exp Hematologic Diseases/	566766
37	(Haematologic* disease* or Hematologic* disease* or hematolog* or haematolog* or anemia or anaemia or blood coagulation disorder* or blood platelet disorder* or blood protein disorder* or bone marrow disease* or fetal erythroblastosis or hemoglobinopath* or haemoglobinopath* or hemorrhagic disorder* or haemorrhagic disorder* or leukocyte disorder* or methemoglobinemia or pancytopenia or polycythemia or preleukemia or sulfhemoglobinemia or thrombophilia or transfusion reaction*).ti,ab,kw.	302388
38	25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37	3320647
39	5 and 24 and 38	4458
40	(guideline* or guidance or recommend* or (practice adj2 (guide*1 or recommend* or standard*)) or (decision* adj2 (making or make*)) or (evidence-based adj2 (practice* or medicine or nursing))).ti,ab. or exp Guidelines as topic/ or exp Guideline/	1334148
41	39 and 40	817

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 26.03.21
Hits: 25 - Cochrane Central Register of Controlled Trials: 17
Strategy:

ID	Search	Hits
#1	MeSH descriptor: [COVID-19] explode all trees	257
#2	MeSH descriptor: [SARS-CoV-2] explode all trees	204

#3 ((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched) 4523
#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)501
#5 #1 OR #2 OR #3 OR #4 4527
#6 MeSH descriptor: [COVID-19 Testing] explode all trees 7
#7 MeSH descriptor: [Serologic Tests] this term only 198
#8 MeSH descriptor: [Serology] this term only 5
#9 MeSH descriptor: [Viral Load] this term only 2381
#10 MeSH descriptor: [Antibodies] this term only 1677
#11 MeSH descriptor: [Antibodies, Viral] this term only 2435
#12 MeSH descriptor: [T-Lymphocytes] explode all trees 3385
#13 ((serolog* or antibod* or viral load or t-cell* or t cell* or t-lymphocyte* or t lymphocyte* or immunodiagnostic* or immune-diagnostic or immunoglobulins or IgG or IgM or nucleic acid amplification or nucleic acid test* or NAT or NAATS)):ti,ab,kw (Word variations have been searched) 78187
#14 ((polymerase chain reaction or PCR or RT-PCR or reverse transcription polymerase chain reaction or home test* or rapid lateral flow or rapid antigen test* or nasal swab* or nasopharyngeal swab* or throat swab* or saliva or upper respiratory tract specimen* or self-swab* or self swab*)):ti,ab,kw (Word variations have been searched) 40239
#15 MeSH descriptor: [Polymerase Chain Reaction] explode all trees 2076
#16 ((contact trac* or immunis* or immuniz* or vacinat* or antisepsis or patient isolation or physical distanc* or quarantin* or self isolat* or self-isolat* or shield* or protect* or lock down or lockdown)):ti,ab,kw (Word variations have been searched) 73596
#17 MeSH descriptor: [Disease Transmission, Infectious] explode all trees 866
#18 MeSH descriptor: [Communicable Disease Control] explode all trees 5056
#19 MeSH descriptor: [Infection Control] explode all trees 1186
#20 MeSH descriptor: [Primary Prevention] this term only 875
#21 MeSH descriptor: [Reinfection] this term only 1
#22 MeSH descriptor: [Cross Infection] this term only 1170
#23 (((infectio* or disease or virus or viral) NEAR/6 (control* or battle* or prevent* or surveil* or precaution* or transmission or spread*))):ti,ab,kw (Word variations have been searched) 140791
#24 (((control* or prevent*) NEAR/3 measur*)):ti,ab,kw (Word variations have been searched) 12290
#25 ((immunity or reinfection or re-infection or quantif*)):ti,ab,kw (Word variations have been searched)62003
#26 #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 324379
#27 MeSH descriptor: [Immunosuppression] explode all trees 2061
#28 ((immunosuppress* or anti-reject* therap* or anti reject* therap* or antireject* therap*)):ti,ab,kw (Word variations have been searched) 15007
#29 MeSH descriptor: [Transplantation] explode all trees 11847
#30 ((transplant* or living donor* or tissue donor* or histocompatability test* or organ preservation solution*)):ti,ab,kw (Word variations have been searched) 40233
#31 MeSH descriptor: [Drug Therapy] this term only 348
#32 MeSH descriptor: [Chemotherapy, Adjuvant] this term only3894
#33 MeSH descriptor: [Consolidation Chemotherapy] this term only 95
#34 MeSH descriptor: [Induction Chemotherapy] this term only 395
#35 MeSH descriptor: [Antineoplastic Agents] this term only 6791

#36 ((chemotherap* or chemo or oncolog* or drug* therap* or cancer treatment* or antineoplastic* or anti tumor drug* or anti-tumor drug* or antitumor drug* or anti tumor agent* or anti-tumor agent* or antitumor agent* or pharmacotherap* or chemotherapeutic* or anticancer drug* or anti cancer drug* or anticancer drug* or anticancer agent* or anti cancer agent* or anti-cancer agent* or anti tumour drug* or anti-tumour drug* or antitumour drug* or anti tumour agent* or anti-tumour agent* or antitumour agent*)):ti,ab,kw (Word variations have been searched) 554359
#37 MeSH descriptor: [Autoimmune Diseases] explode all trees 18922
#38 ((Autoimmune Disease* or rheumatolog* or addison disease or autoimmune hemolytic anemia or anti-glomerular basement membrane disease or antineutrophil cytoplasmic antibody associated vasculitis or antiphospholipid syndrome or juvenile arthritis or rheumatoid arthritis or autoimmune hypophysitis or autoimmune lymphoproliferative syndrome or autoimmune pancreatitis or birdshot chorioretinopathy or dermatitis herpetiformis or diabetes mellitus type 1 or type 1 diabetes mellitus or diabetes mellitus insulin-dependent, 1 or insulin-dependent diabetes mellitus 1 or insulin dependent diabetes mellitus 1 or type 1 diabetes or glomerulonephritis or graves disease or autoimmune hepatitis or "immunoglobulin G4-related disease" or latent autoimmune diabetes or linear IgA bullous dermatosis or lupus or sympathetic ophthalmia or bullous pemphigoid or autoimmune polyendocrinopathies or idiopathic thrombocytopenic purpura or autoimmune thyroiditis or undifferentiated connective tissue disease*)):ti,ab,kw (Word variations have been searched) 76593
#39 MeSH descriptor: [Immunologic Deficiency Syndromes] explode all trees 13054
#40 ((immune deficienc* or Immunodeficienc* or Agammaglobulinemia or CVID or Dysgammaglobulinemia or IgA Deficiency or IgG Deficiency or HIV or Acute Retroviral Syndrome or AIDS or Deltaretrovirus or Enzootic Bovine Leukosis or "HTLV-I Infections" or "HTLV-II Infections" or Lymphopenia or "Idiopathic CD4-Positive T-Lymphocytopenia" or Wiskott-Aldrich Syndrome or Phagocyte Bactericidal Dysfunction or Ataxia Telangiectasia or Bloom Syndrome or Chediak-Higashi Syndrome or Hereditary Complement Deficiency Disease* or Job Syndrome or Leukocyte-Adhesion Deficiency Syndrome)):ti,ab,kw (Word variations have been searched) 47481
#41 MeSH descriptor: [Hematologic Diseases] explode all trees 14656
#42 ((Haematologic* disease* or Hematologic* disease* or hematolog* or haematolog* or anemia or anaemia or blood coagulation disorder* or blood platelet disorder* or blood protein disorder* or bone marrow disease* or fetal erythroblastosis or hemoglobinopath* or haemoglobinopath* or hemorrhagic disorder* or haemorrhagic disorder* or leukocyte disorder* or methemoglobinemia or pancytopenia or polycythemia or preleukemia or sulfhemoglobinemia or thrombophilia or transfusion reaction*)):ti,ab,kw (Word variations have been searched) 53703
#43 #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 667449
#44 #5 AND #26 AND 43 113
#45 ((guideline* or guidance or recommend* or (practice NEAR/2 (guide*1 or recommend* or standard*)) or (decision* NEAR/2 (making or make*)) or (evidence-based NEAR/2 (practice* or medicine or nursing)))):ti,ab,kw (Word variations have been searched) 132452
#46 MeSH descriptor: [Guidelines as Topic] explode all trees 1918
#47 MeSH descriptor: [Guideline] explode all trees 0
#48 #45 or #46 or #47 132453
#49 #44 AND #48 25

Question 6: What are the follow-up strategies related to cognitive, psychological and quality of life consequences?

Literature searching was conducted on 20.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	852
Cochrane CENTRAL	550
Total	1402
Duplicates Removed	45
Unique to Screen	1357

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 19, 2021
Date Searched: 20.03.21
Hits: 852
Strategy:

#	Searches	Results
1	exp COVID-19/	65973
2	exp SARS-CoV-2/	51401
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	123557
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	985
5	1 or 2 or 3 or 4	126094
6	exp Psychology/	67972
7	exp psychological phenomena/	1912115
8	exp Emotions/	255177
9	Stress, Psychological/	124135
10	exp Stress Disorders, Traumatic/	38147
11	Anhedonia/	1109
12	Depression/	125390
13	Frailty/	3777
14	Psychophysics/	14193
15	psychosocial functioning/	70
16	patient reported outcome measures/	7727
17	(cogniti* or psycholog* or frailty or depress* or anxiety or functional impairment* or mental health or psychophysics* or psychosocial or posttraumatic or post-traumatic stress or post traumatic stress or PTSD or post traumatic stress disorder* or post-traumatic stress disorder* or mental wellbeing or mental well-being or anhedonia* or stress disorder* or emotion* or feel* or debilit* or trauma* or quality of life or QOL or health-related quality of life or HRQOL or patient-reported outcome* or patient reported outcome* or PROMS).ti,ab,kw.	2070329
18	6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17	3568145
19	health status indicators/	23735
20	"Outcome and Process Assessment, Health Care"/	27787
21	Outcome Assessment, Health Care/	75358
22	quality of life/	205980
23	outcome measure*.tw.	238320

24	health outcome*.tw.	57119
25	19 or 20 or 21 or 22 or 23 or 24	579040
26	5 and 18 and 25	852

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 20.03.21
Hits: 578 - Cochrane Central Register of Controlled Trials: 550
Strategy:

ID Search Hits

#1 MeSH descriptor: [COVID-19] explode all trees 257

#2 MeSH descriptor: [SARS-CoV-2] explode all trees 204

#3 ((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched) 4521

#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)500

#5 #1 OR #2 OR #3 OR #4 4525

#6 MeSH descriptor: [Psychology] explode all trees 1068

#7 MeSH descriptor: [Psychological Phenomena] explode all trees 90089

#8 MeSH descriptor: [Emotions] explode all trees 17515

#9 MeSH descriptor: [Stress, Psychological] this term only 5881

#10 MeSH descriptor: [Stress Disorders, Traumatic] explode all trees 2828

#11 MeSH descriptor: [Anhedonia] this term only 58

#12 MeSH descriptor: [Depression] this term only 12583

#13 MeSH descriptor: [Frailty] this term only 152

#14 MeSH descriptor: [Psychophysics] this term only 438

#15 MeSH descriptor: [Psychosocial Functioning] this term only 0

#16 MeSH descriptor: [Patient Reported Outcome Measures] this term only 679

#17 ((cogniti* or psycholog* or frailty or depress* or anxiety or functional impairment* or mental health or psychophysics* or psychosocial or posttraumatic or post-traumatic stress or post traumatic stress or PTSD or post traumatic stress disorder* or post-traumatic stress disorder* or mental wellbeing or mental well-being or anhedonia* or stress disorder* or emotion* or feel* or debilit* or trauma* or quality of life or QOL or health-related quality of life or HRQOL or patient-reported outcome* or patient reported outcome* or PROMS)):ti,ab,kw (Word variations have been searched) 422516

#18 #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 460190

#19 MeSH descriptor: [Health Status Indicators] this term only 977

#20 MeSH descriptor: [Outcome and Process Assessment, Health Care] this term only 2236

#21 MeSH descriptor: [Outcome Assessment, Health Care] this term only 7634

#22 MeSH descriptor: [Quality of Life] this term only 24676

#23 (outcome measure*) (Word variations have been searched) 244043

#24 (health outcome*) (Word variations have been searched) 159726

#25 #19 or #20 or #21 or #22 or #23 or #24 318372

#26 #5 AND #18 AND #25 578

Question 7: What are the follow-up strategies related to disability?

Literature searching was conducted on 21.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	1019
Cochrane CENTRAL	102
Total	1121
Duplicates Removed	33
Unique to Screen	1088

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 19, 2021
Date Searched: 21.03.21
Hits: 1019
Strategy:

#	Searches	Results
1	exp COVID-19/	65973
2	exp SARS-CoV-2/	51401
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	123557
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	985
5	1 or 2 or 3 or 4	126094
6	exp Disabled Persons/	66917
7	Health Services for Persons with Disabilities/	139
8	Frailty/	3777
9	frail*.ti,ab,kw.	25403
10	(disabilit* or disable*).ti,ab,kw.	217554
11	(physical* adj4 (impair* or function* or limitation*)).ti,ab,kw.	54645
12	(function* adj4 (impair* or limitation* or mobil*)).ti,ab,kw.	126491
13	(mobil* adj4 (limitation* or impair*)).ti,ab,kw.	5385
14	6 or 7 or 8 or 9 or 10 or 11 or 12 or 13	438183
15	exp "continuity of patient care"/ or exp rehabilitation/	377618
16	"Recovery of Function"/	54909
17	exp Physical Therapy Modalities/	158311
18	Rehabilitation Centers/	8326
19	Rehabilitation Nursing/	1427
20	(rehab* or recover* or physiotherap* or physical therap* or support* or care or caring or nursing or treatment* or telemedicine or tele-medicine or telerehabilitation or tele-rehabilitation or telehealth or tele-health or teleconsultation or tele-consultation).ti,ab,kw.	7704736
21	(activities of daily living or ADL).ti,ab,kw.	32321

22	15 or 16 or 17 or 18 or 19 or 20 or 21	7883920
23	5 and 14 and 22	1019

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 21.03.21
Hits: 108 - Cochrane Central Register of Controlled Trials: 102
Strategy:
ID Search Hits
#1 MeSH descriptor: [COVID-19] explode all trees 257
#2 MeSH descriptor: [SARS-CoV-2] explode all trees 204
#3 ((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched) 4521
#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)500
#5 #1 OR #2 OR #3 OR #4 4525
#6 MeSH descriptor: [Disabled Persons] explode all trees 1170
#7 MeSH descriptor: [Health Services for Persons with Disabilities] this term only 2
#8 MeSH descriptor: [Frailty] this term only 152
#9 (frail*) 4099
#10 ((disabilit* or disable*)):ti,ab,kw (Word variations have been searched) 38750
#11 ((physical* NEAR/4 (impair* or function* or limitation*))):ti,ab,kw (Word variations have been searched) 16397
#12 ((function* NEAR/4 (impair* or limitation* or mobil*))):ti,ab,kw (Word variations have been searched) 15204
#13 ((mobil* NEAR/4 (limitation* or impair*))):ti,ab,kw (Word variations have been searched) 1239
#14 #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 68428
#15 MeSH descriptor: [Continuity of Patient Care] explode all trees 25532
#16 MeSH descriptor: [Rehabilitation] explode all trees 36425
#17 MeSH descriptor: [Recovery of Function] this term only 5322
#18 MeSH descriptor: [Physical Therapy Modalities] explode all trees 26166
#19 MeSH descriptor: [Rehabilitation Centers] this term only 314
#20 MeSH descriptor: [Rehabilitation Nursing] this term only 55
#21 ((rehab* or recover* or physiotherap* or physical therap* or support* or care or caring or nursing or treatment* or telemedicine or tele-medicine or telerehabilitation or tele-rehabilitation or telehealth or tele-health or teleconsultation or tele-consultation)):ti,ab,kw (Word variations have been searched) 1007737
#22 ((activities of daily living or ADL)):ti,ab,kw (Word variations have been searched) 15097
#23 #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 1014577
#24 #5 and #14 and #23 108

Question 8: What are the follow-up strategies related to home care follow-up (tele-medicine/tele-rehabilitation)?

Literature searching was conducted on 21.03.21. The search was run from database inception without any form of search limit and the results are recorded below.

Database	N
Ovid MEDLINE and MEDLINE In Process	1819
Cochrane CENTRAL	238
Total	2057
Duplicates Removed	54
Unique to Screen	2003

Database: MEDLINE(R) ALL
Host: OVID
Data Parameters: 1946 to March 19, 2021
Date Searched: 21.03.21
Hits: 1819
Strategy:

#	**Searches**	**Results**
1	exp COVID-19/	65973
2	exp SARS-CoV-2/	51401
3	(Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or 2019nCoV or 2019-nCoV or 2019 nCoV or SARS-CoV-2 or SARS2 or SARS-CoV or SARS CoV 2 or SARS coronavirus 2 or SARS corona virus 2 or coronavirus disease 2019 or corona virus disease 2019).ti,ab,kw.	123557
4	(post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus).ti,ab,kw.	985
5	1 or 2 or 3 or 4	126094
6	exp Aftercare/	199451
7	exp Home Care Services/	48217
8	exp "continuity of patient care"/ or exp rehabilitation/	377618
9	exp Telemedicine/	33212
10	(homecare or home healthcare or home-visit or aftercare or continuity of care or continuity of patient care or telemedicine or tele-medicine or telerehabilitation or tele-rehabilitation or telehealth or tele-health or teleconsultation or tele-consultation or telepsychiatry or tele-psychiatry or telepractice or tele-practice or video consultation* or video visit* or video conferenc* or zoom or home nursing or mobile health or ehealth).ti,ab,kw.	50446
11	((home or home-based) adj6 (manag* or rehabilitat* or recover* or monitor* or support* or care*)).ti,ab,kw.	58934
12	6 or 7 or 8 or 9 or 10 or 11	501732
13	exp Disabled Persons/	66917
14	Health Services for Persons with Disabilities/	139
15	Frailty/	3777
16	(disabilit* or disable* or frail*).ti,ab,kw.	240373
17	(physical* adj4 (impair* or function* or limitation*)).ti,ab,kw.	54645
18	(function* adj4 (impair* or limitation* or mobil*)).ti,ab,kw.	126491
19	(mobil* adj4 (limitation* or impair*)).ti,ab,kw.	5385
20	13 or 14 or 15 or 16 or 17 or 18 or 19	438183
21	Ventilator Weaning/	4028

22	(ventilat* adj6 wean*).ti,ab,kw.	4661
23	ventilator-weaning.ti,ab,kw.	560
24	21 or 22 or 23	6870
25	exp Dyspnea/	22248
26	(dyspnea or dyspnoea or "air hunger" or breathless* or short* of breath).ti,ab,kw.	62772
27	25 or 26	71371
28	exp Fatigue/	31555
29	(fatigue* or tired* or lassitude).ti,ab,kw.	107326
30	28 or 29	115821
31	exp Sleep/	82219
32	exp Dyssomnias/	70681
33	(sleep* or dyssomina* or hypersom* or oxygen desaturation).ti,ab,kw.	196164
34	31 or 32 or 33	225712
35	exp Psychology/	67972
36	psychosocial functioning/	70
37	exp Psychological Phenomena/	1912115
38	exp Emotions/	255177
39	Stress, Psychological/	124135
40	exp Stress Disorders, Traumatic/	38147
41	Anhedonia/	1109
42	Depression/	125390
43	Psychophysics/	14193
44	(cogniti* or psycholog* or depress* or anxiety or mental health or psychophysics* or psychosocial or posttraumatic or post-traumatic stress or post traumatic stress or PTSD or post traumatic stress disorder* or post-traumatic stress disorder* or mental wellbeing or mental well-being or anhedonia* or stress disorder* or emotion* or feel*).ti,ab,kw.	1496954
45	35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44	3036458
46	20 or 24 or 27 or 30 or 34 or 45	3550222
47	5 and 12 and 46	1819

Database: Cochrane Library
Host: http://www.thecochranelibrary.com
Data Parameters: Issue 3 of 12, March 2021
Date Searched: 21.03.21
Hits: 245 - Cochrane Central Register of Controlled Trials: 238
Strategy:
ID Search Hits
#1 MeSH descriptor: [COVID-19] explode all trees 257
#2 MeSH descriptor: [SARS-CoV-2] explode all trees 204
#3 ((Coronavirus or corona virus or 2019 corona virus or corona virus disease or coronavirus disease or novel coronavirus or novel corona virus or wuhan coronavirus or wuhan corona virus or severe acute respiratory syndrome coronavirus 2 or covid-19 or covid19 or covid 19 or "2019nCoV" or "2019-nCoV" or "2019 nCoV" or "SARS-CoV-2" or "SARS2" or "SARS-CoV" or "SARS CoV 2" or "SARS coronavirus 2" or "SARS corona virus 2" or "coronavirus disease 2019" or "corona virus disease 2019")):ti,ab,kw (Word variations have been searched) 4521
#4 ((post-covid or postcovid or post covid or post SARS-CoV-2 or post-SARS-CoV-2 or post coronavirus or post corona virus or post-coronavirus)):ti,ab,kw (Word variations have been searched)500

#5 #1 OR #2 OR #3 OR #4 4525
#6 MeSH descriptor: [Aftercare] explode all trees 23683
#7 MeSH descriptor: [Home Care Services] explode all trees 2463
#8 MeSH descriptor: [Continuity of Patient Care] explode all trees 25532
#9 MeSH descriptor: [Rehabilitation] explode all trees 36425
#10 MeSH descriptor: [Telemedicine] explode all trees 2708
#11 ((homecare or home healthcare or home-visit or aftercare or continuity of care or continuity of patient care or telemedicine or tele-medicine or telerehabilitation or tele-rehabilitation or telehealth or tele-health or teleconsultation or tele-consultation or telepsychiatry or tele-psychiatry or telepractice or tele-practice or video consultation* or video visit* or video conferenc* or zoom or home nursing or mobile health or ehealth)):ti,ab,kw (Word variations have been searched) 59525
#12 (((home or home-based) NEAR/6 (manag* or rehabilitat* or recover* or monitor* or support* or care*))):ti,ab,kw (Word variations have been searched) 14741
#13 #6 or #7 or #8 or #9 or #10 or #11 or #12 99681
#14 MeSH descriptor: [Disabled Persons] explode all trees 1170
#15 MeSH descriptor: [Health Services for Persons with Disabilities] this term only 2
#16 MeSH descriptor: [Frailty] this term only 152
#17 ((disabilit* or disable* or frail*)):ti,ab,kw (Word variations have been searched) 42064
#18 ((physical* NEAR/4 (impair* or function* or limitation*))):ti,ab,kw (Word variations have been searched) 16397
#19 ((function* NEAR/4 (impair* or limitation* or mobil*))):ti,ab,kw (Word variations have been searched) 15204
#20 ((mobil* NEAR/4 (limitation* or impair*))):ti,ab,kw (Word variations have been searched) 1239
#21 #14 or #15 or #16 or #17 or #18 or #19 or #20 68120
#22 MeSH descriptor: [Ventilator Weaning] this term only 516
#23 ((ventilat* NEAR/6 wean*)):ti,ab,kw (Word variations have been searched) 1586
#24 ((ventilator-weaning)):ti,ab,kw (Word variations have been searched) 797
#25 #22 or #23 or #24 1586
#26 MeSH descriptor: [Dyspnea] explode all trees 1304
#27 ((dyspnea or dyspnoea or "air hunger" or breathless* or short* of breath)):ti,ab,kw (Word variations have been searched) 16829
#28 #26 or #27 16829
#29 MeSH descriptor: [Fatigue] explode all trees 3799
#30 ((fatigue* or tired* or lassitude)):ti,ab,kw (Word variations have been searched) 35752
#31 #29 or #30 35752
#32 MeSH descriptor: [Sleep] explode all trees 5764
#33 MeSH descriptor: [Dyssomnias] explode all trees 6817
#34 ((sleep* or dyssomina* or hypersom* or oxygen desaturation)):ti,ab,kw (Word variations have been searched) 42358
#35 #32 or #33 or #34 42685
#36 MeSH descriptor: [Psychology] explode all trees 1068
#37 MeSH descriptor: [Psychosocial Functioning] this term only 0
#38 MeSH descriptor: [Psychological Phenomena] explode all trees 90089
#39 MeSH descriptor: [Emotions] explode all trees 17515
#40 MeSH descriptor: [Stress, Psychological] this term only 5881
#41 MeSH descriptor: [Stress Disorders, Traumatic] explode all trees 2828
#42 MeSH descriptor: [Anhedonia] this term only 58
#43 MeSH descriptor: [Depression] this term only 12583
#44 MeSH descriptor: [Psychophysics] this term only 438
#45 ((cogniti* or psycholog* or depress* or anxiety or mental health or psychophysics* or psychosocial or posttraumatic or post-traumatic stress or post traumatic stress or PTSD or

post traumatic stress disorder* or post-traumatic stress disorder* or mental wellbeing or mental well-being or anhedonia* or stress disorder* or emotion* or feel*)):ti,ab,kw (Word variations have been searched) 258835
#46 #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45302385
#47 #21 or #25 or #28 or #31 or #35 or #46 394001
#48 #5 AND #13 AND #47 245

Appendix B – Eligibility criteria for each question

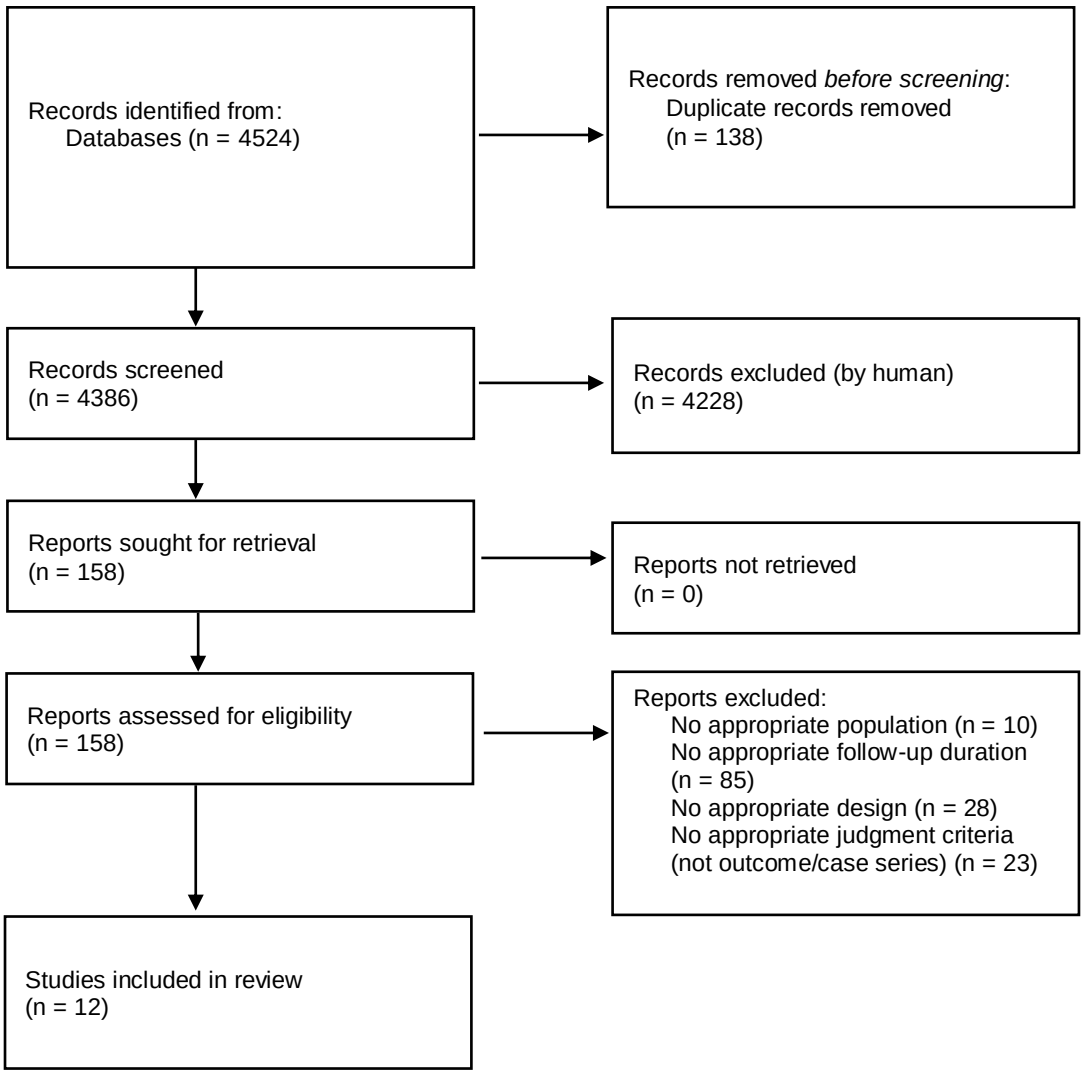
Supplementary Table 1. The inclusion and exclusion criteria for the studies screened by the authors. These criteria were decided by the authors, based on the available data for each clinical question, and they were not included in the initial search by the librarians (as it is described above- Appendix A).

Question	Inclusion criteria	Exclusion criteria
1	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Letters Review articles Case reports Studies not in English Laboratory/animal studies
2	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Letters Review articles Case reports Studies not in English Laboratory/animal studies
3	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Review articles Case reports Studies not in English Laboratory/animal studies
4	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Letters Review articles Case reports Studies not in English Laboratory/animal studies
5	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Case reports and case series Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Letters Review articles Studies not in English Laboratory/animal studies
6	Systematic reviews Meta-analyses Randomised controlled trials	Opinion pieces & editorials Letters Review articles

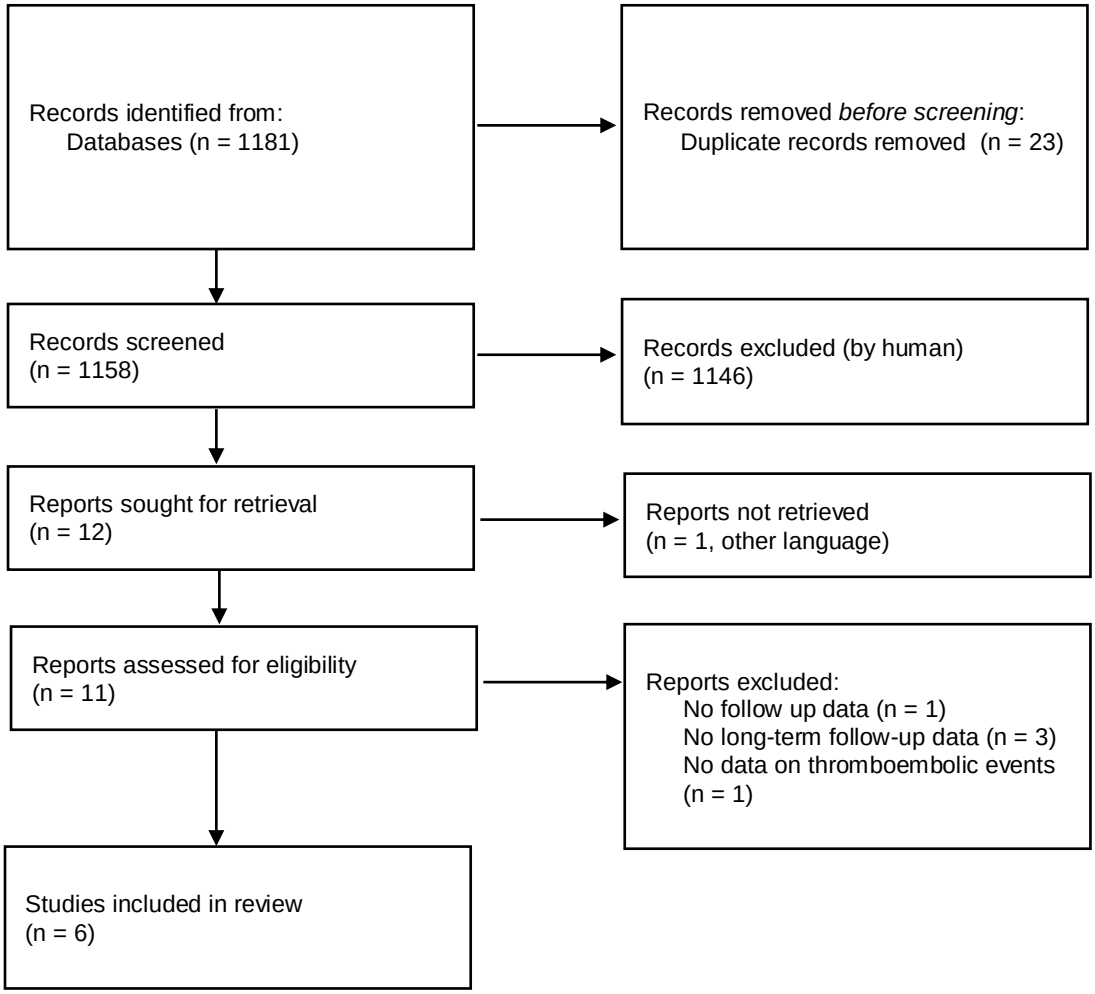
	Observational studies Adult population Follow-up period: 1 to 6 months	Case reports Studies not in English Laboratory/animal studies
7	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Review articles Case reports Studies not in English Laboratory/animal studies
8	Systematic reviews Meta-analyses Randomised controlled trials Observational studies Adult population Follow-up period: 1 to 6 months	Opinion pieces & editorials Letters Review articles Case reports Studies not in English Laboratory/animal studies

Appendix C – PRISMA diagram for each question

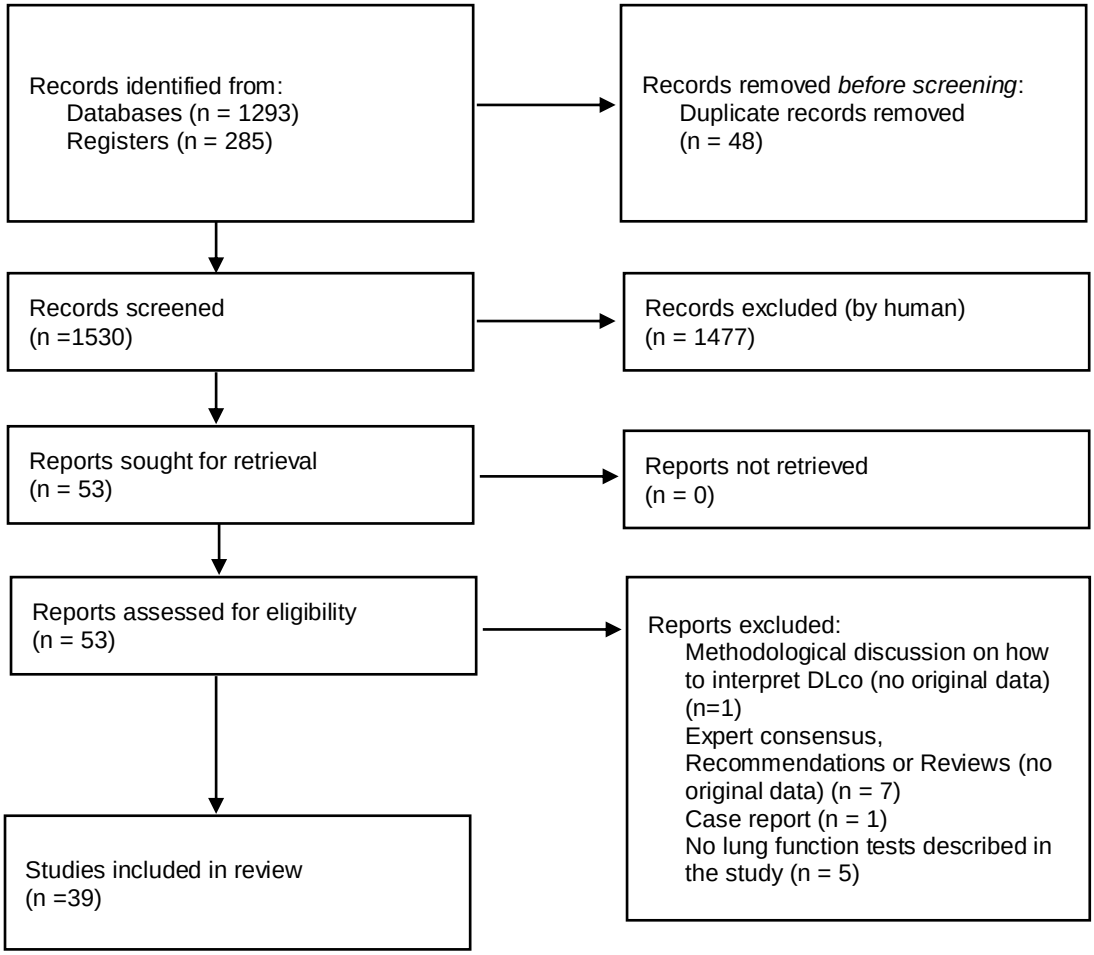
PRISMA diagram for question 1



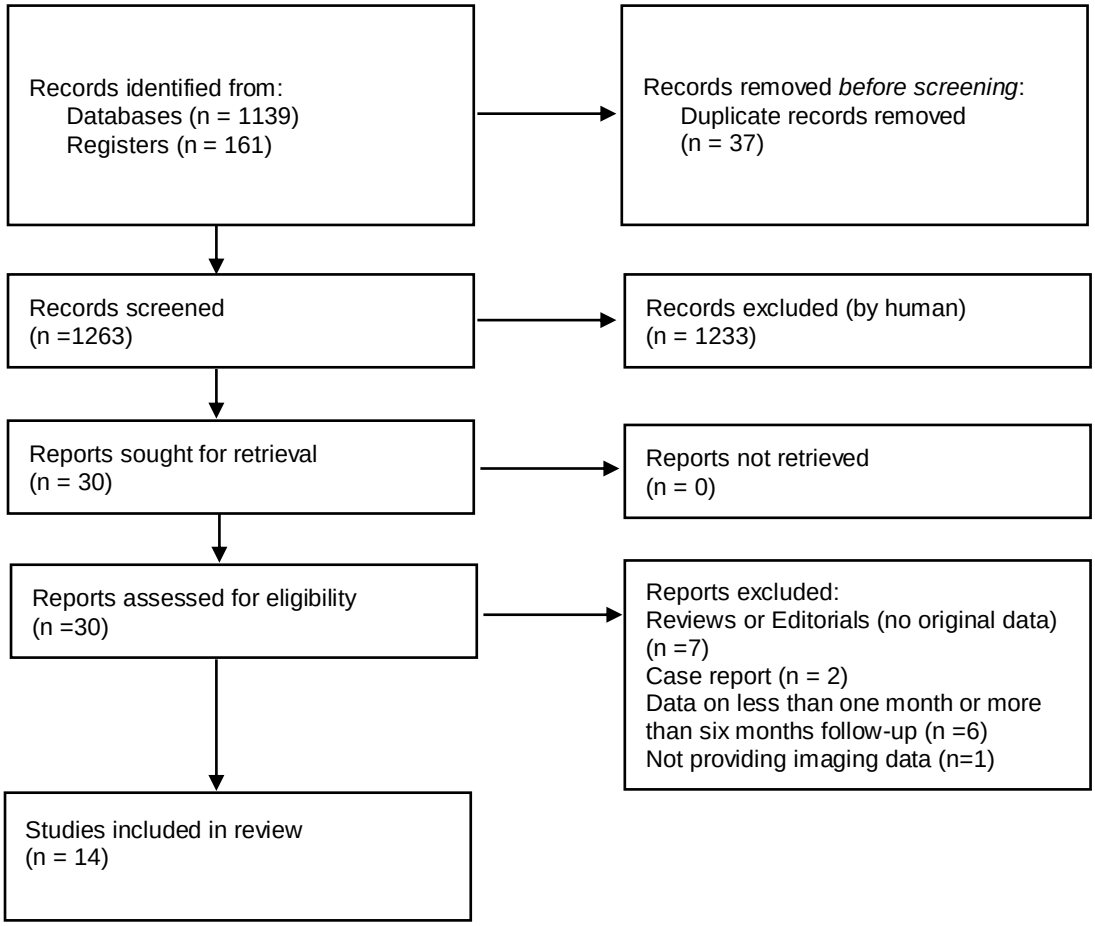
PRISMA diagram for question 2



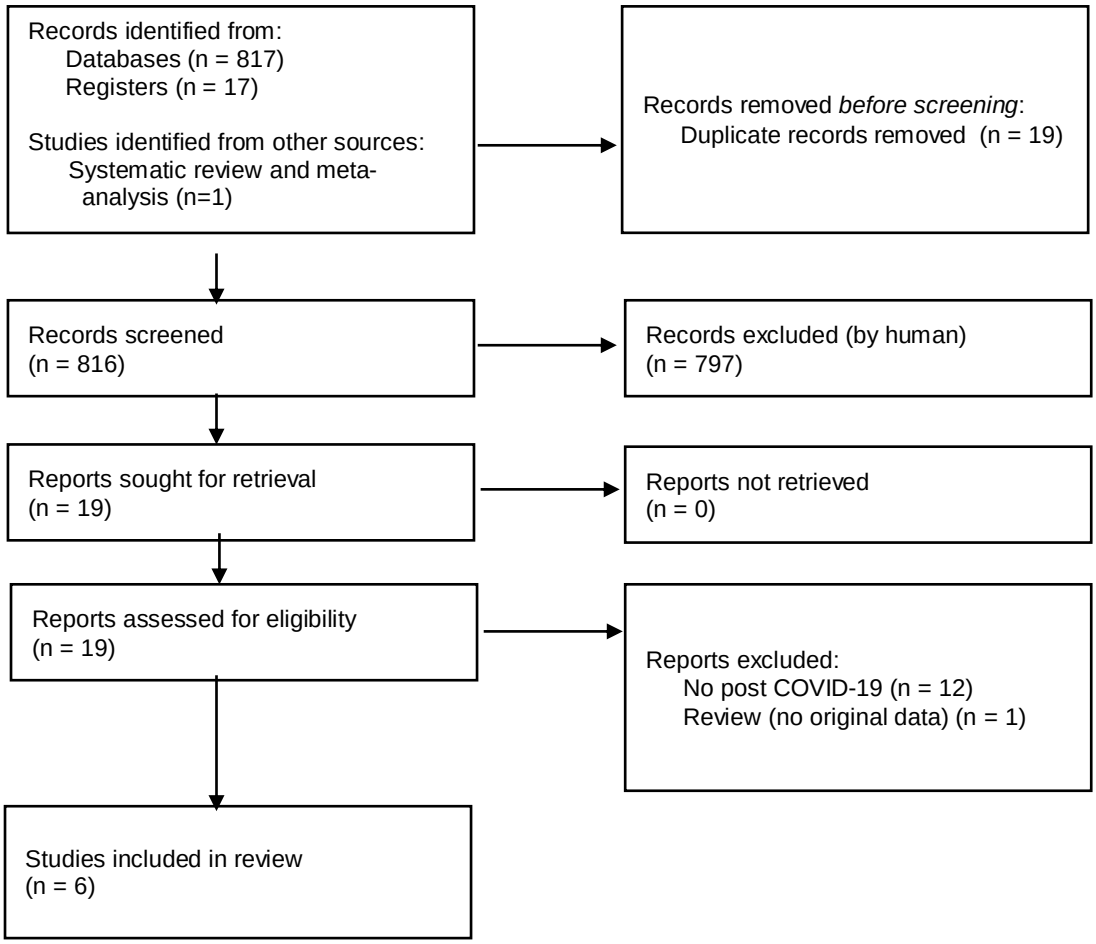
PRISMA diagram for question 3



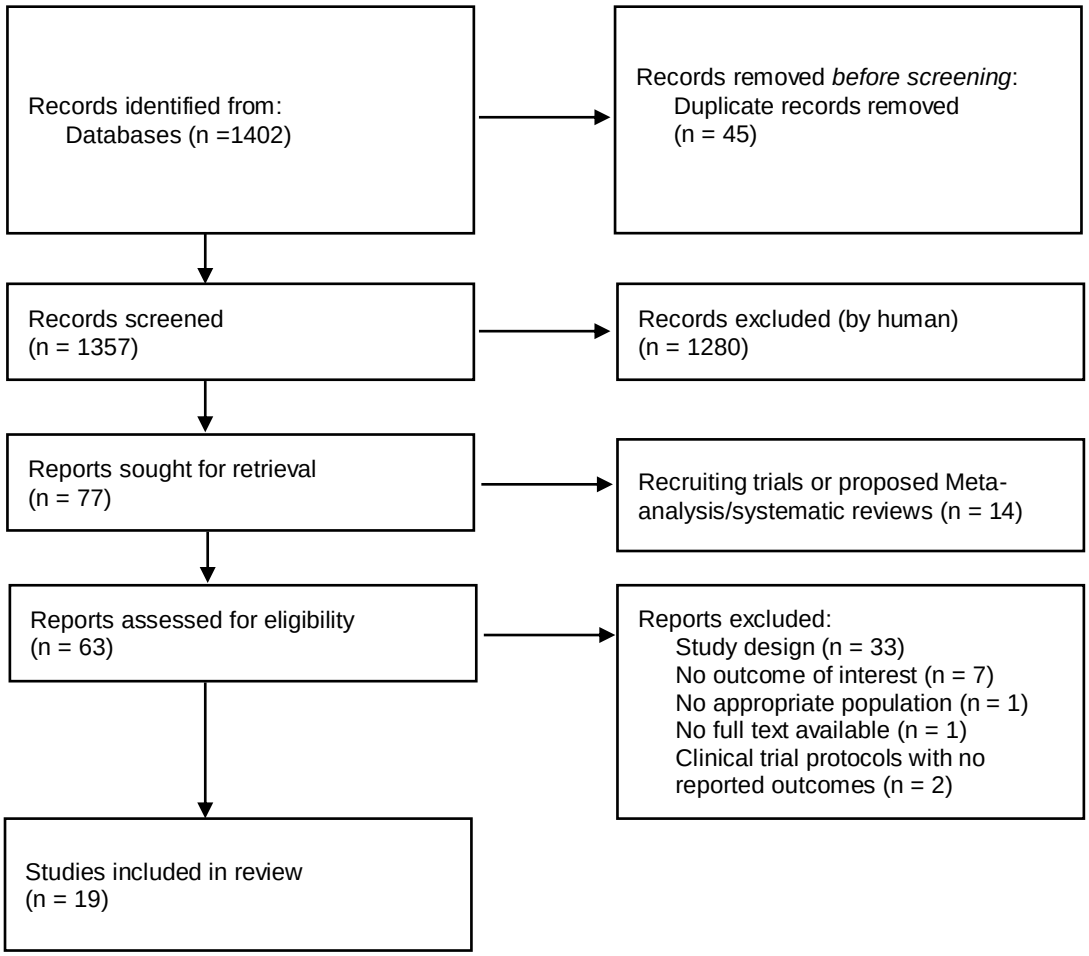
PRISMA diagram for question 4



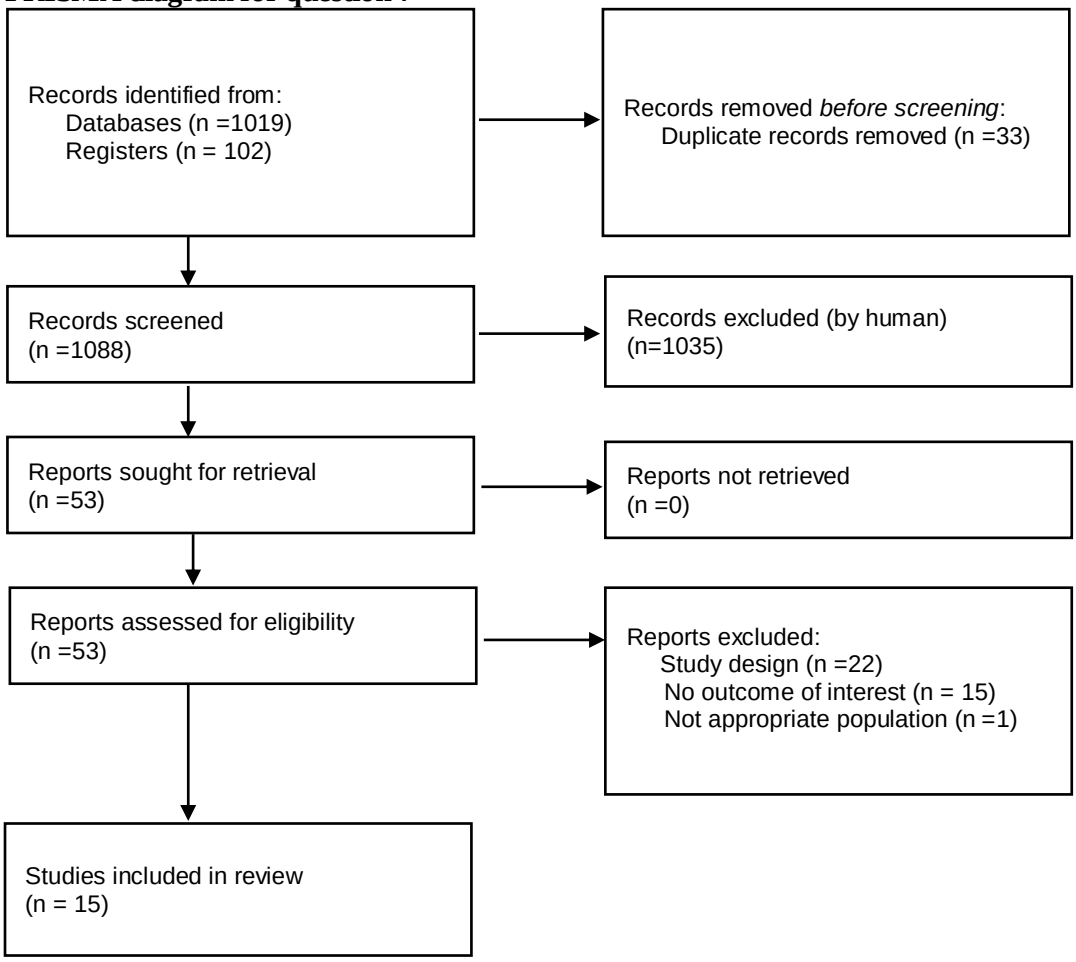
PRISMA diagram for question 5



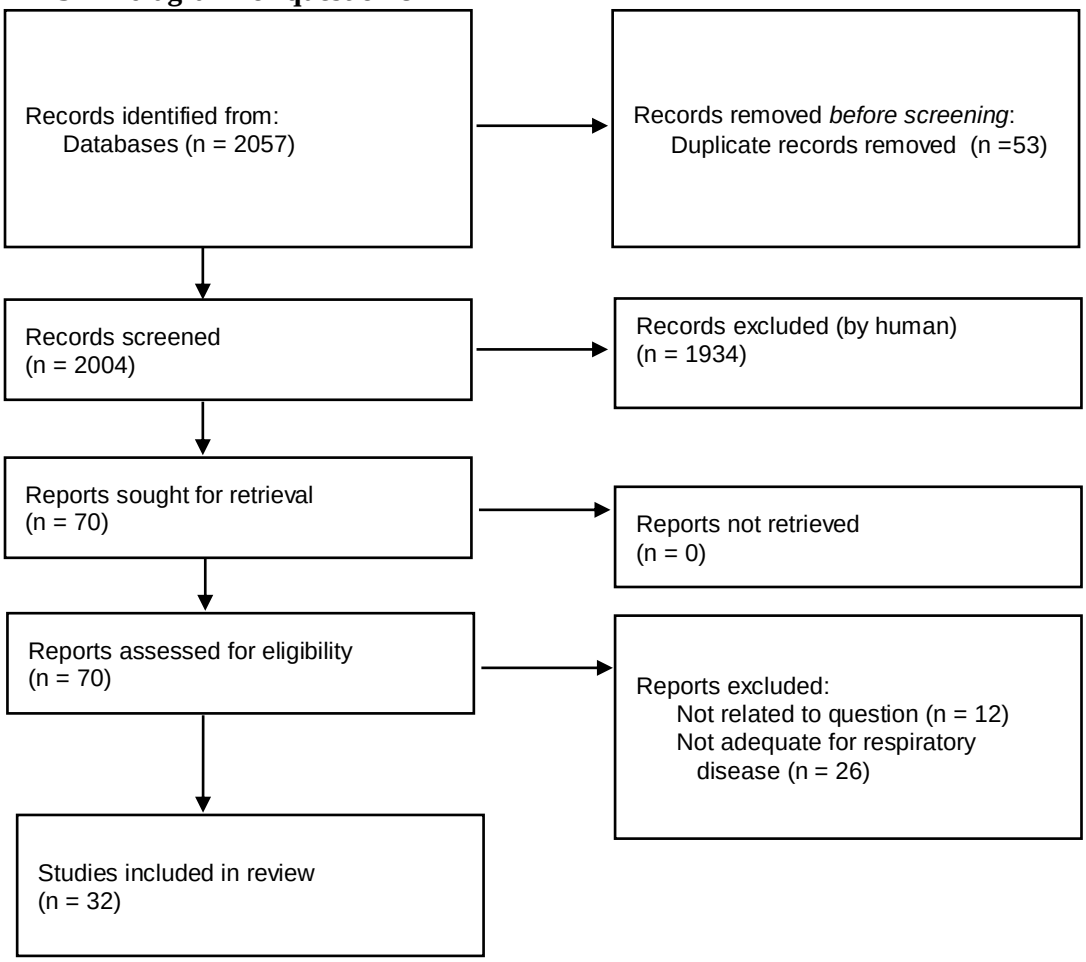
PRISMA diagram for question 6



PRISMA diagram for question 7



PRISMA diagram for question 8



Supplementary Table 2.
Table of instruments measuring symptoms burden and quality of life in COVID-19 survivors (clinical question 6).

Instrument	Intended use	Properties	Reference
Barthel's Index	Performance measure of ADLs:measures functional independence in the domains of personal care and mobility.	Ordinal scale 10 items Self report	Mahoney FI, Barthel D. Functional evaluation: the Barthel Index. Maryland State Med Journal 1965; 14:56-61.
BORG	Rating of perceived exertion (RPE) to monitor and guide exercise intensity.	Ratio Scale Original 6-20 scale Revised 0-10 scale Self report	Borg G. Borg's Perceived Exertion and Pan Scales. Champaign, IL: Human Kinetics, 1998.
CFS	Chalder Fatigue Scale: measure the severity of tiredness in illnesses known to have an element of fatigue.	Multi-dimensional 11 or 14 items Self Report	T Chalder, G Berelowitz, T Pawlikowska, et al.Development of a fatigue scale. J Psychosom Res, 17 (1993), pp. 147-153.
DASS	Depression, Anxiety and Stress Scale: a measure of emotional states.	Dimensional Scale 42 items 21 items Short Form Self Report	Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety Stress Scales. (2nd. Ed.) Sydney: Psychology Foundation.
EPQ	Eysenck Personality Questionnaire: a measure of two central dimensions of personality, extraversion and neuroticism.	Ordinal scale EPQ-R 100-items EPQ-RS 48-items Self Report	Eysenck and Eysenck, 1975 Manual of the E.P.Q.Hodder & Stoughton.
EQ-5D	Euroqol quality of life questionnaire: five questions on mobility, self-care, pain, usual activities, and psychological status and VAS assessing QOL.	Ordinal Scale 5 domains Each with 3 items Short Form Self Report	EuroQoL Group (1990) EuroQoL: a new facility for the measurement of heath-related quality of life. Health Policy 16:199–208.
FIC	Functional Impairment Checklist: measure of intensity developed in Hong Kong for Post-SARS clinics to measure health status and to serve as a clinical checklist for referral rehabilitation.	8 items Ordinal Scale Self Report	Siu Pui Lam et al. The validity and reliability of the functional impairment checklist (FIC) in the evaluation of functional consequences of severe acute respiratory distress syndrome (SARS) Quality of Life Research (2006) 15: 217–231 2006.

FIM	Functional Independence Measure: a measure of dysfunction in activities that commonly occur in subjects with any progressive, reversible or stable neurologic, musculoskeletal, or other disorder ie patients with functional mobility impairments.	18-item 7-level Ordinal Scale Clinician Reported	Linacre JM, Heinemann JW, Wright BD, Granger CV, Hamilton BB. The structure and stability of the functional independence measure. Arch Phys Med Rehabil. 1994. 75: 127-132.
FSS	Fatigue Severity Scale: measures the severity of fatigue and its effect on a person's activities and lifestyle in patients with a variety of disorders.	9-item Ordinal scale Self report	Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The Fatigue Severity Scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. Arch Neurol. 1989;46(10):1121-3.
GAD-7	Generalised Anxiety Disorder: screening tool for anxiety / severity.	7-items Summative scale Clinician report	Spitzer RL, Kroenke K, Williams JB, et al; A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006 May 22;166(10):1092-7. GAD-7
Instrument	**Intended use**	**Properties**	**Reference**
GHQ-12	General Health Questionnaire 12: measures anxiety and depression, social dysfunction, and loss of confidence.	unidimensional 12-items Self Report	Hardy GE, Shapiro DA, Haynes CE, & Rick JE. Validation of the General Health Questionnaire-12: Using a sample of employees from England's health care services. Psychological Assessment, 1999 11(2), 159–165.
HADS	Hospital Anxiety and Depression Scale: measure of anxiety and depression – overall measure of psychological distress.	7-items anxiety 7-items depression Ordinal scale Self report	Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiat Scand 1983;67: 361–70.
MMRC	Modified MRC breathlessness scale: for patients with respiratory diseases, to assess degree of baseline functional disability due to dyspnea.	5-item	Mahler DA, Wells CK: Evaluation of clinical methods for rating dyspnea. Chest. 1988, 93: 580-586. 10.1378/chest.93.3.580.

PCFS	Post-COVID-19 Functional Status (PCFS) Scale: an additional outcome measure to evaluate the ultimate consequences of COVID-19 on functional status.	Ordinal Scale 5 items Clinician Reported	Klok FA, Boon GJAM, Barco S, Endres M, Geelhoed JJM, et al. PCFS: a tool to measure functional status over time after COVID-19. Eur Respir J. 2020;56(1):2001 494.
PHQ-9	Patient Health Questionnaire 9: screening tool for depression / severity.	9-items Summative scale clinician report	Kroenke K, Spitzer R L, Williams J B (2001). The PHQ-9: validity of a brief depression severity measure. Journal of General Internal Medicine, 16(9): 606-613.
PSQI	Pittsburgh Slep Quality Index	19 items Self Report	Buysse, D.J.; Reynolds, C.F.; Monk, T.H.; Berman, S.; Kupfer, D. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiat. Res. 1989, 28, 193–213.
PSS-10	Perceived Stress Scale: measures the perception of stress; the degree to which situations are appraised as stressful by the individual.	10-items Ordinal scale Self Report	Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behaviour, 24, 386-396.
PSSS	Perceived Social Support Scale: measure perceptions of support from 3 sources: Family, Friends, and a Significant Other.	12-items Ordinal scale Multidimensional Self Report	Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA. Psychometric characteristics of the Multidimensional Scale of Perceived Social Support. Journal of Personality Assessment, 1990 55: 610-17.
PC-PTSD	Primary Care PTSD: Screening tool to assess whether the respondent has had any exposure to traumatic events.	5-item Binary Self Report	Prins, A., Bovin, M. J., Kimerling, R., Kaloupek, D. G., Marx, B. P., Pless Kaiser, A., & Schnurr, P. P. (2015). The Primary Care PTSD Screen for DSM-5 (PC-PTSD-5).
SAS	Self-rating Anxiety Scale: an instrument to discriminate anxiety from mood disorders.	20 items Ordinal scale Self Report	Zung WWK. A rating instrument for anxiety disorders. Psychosomatics, 1971, 12, 371–379.
SCID (quick)	Structured Clinical Interview for DSM Disorders: semi-structured interview guide for making diagnoses according DSM /	Modular Manual required Clinician delivered	First MB & Williams JBW Quick Structured Clinical Interview for DSM-5® Disorders (QuickSCID-5) American Psychiatric Association 2021.

	DSM-5.		
Instrument	**Intended use**	**Properties**	**Reference**
SCL-90	Symptom Checklist 90: a measure of symptomatic distress.	90 items Ordinal Scale multidimensional Self Report	Derogatis LR. SCL-90-R: Administration, Scoring of Procedures Manual-II for the Revised Version and Other Instruments of the Psychopathology Rating Scale Series: Clinical Psychometric Research Incorporated. 1992.
SCSQ	Simplified Coping Style Questionnaire;: a measure of problem-focused coping and emotion-focused coping.	20-items Ordinal scale Self report	Jie, Y. Reliablility and validity of the Chinese version of coping style scale. Chin. J. Clin. Psychol. 1998, 2, 114–115.
SDS	Self-rating Depression Scale: an instrument to assess the severity of a depressive disorder in patients with other parameters and where treatment of the depressive disorder changes.	20 items Ordinal scale Self Report	Zung WWK. A self-rating depression Scale Arch Gen Psychiatry. 1965;12(1):63-70.
SES	Self-Esteem Scale: measures global self-worth by measuring both positive and negative feelings about the self.	10-item Ordinal Scale Unidimensional Self Report	Rosenberg, M. (1965). Society and the adolescent self-image. Princeton, NJ: Princeton University Press.
SF-36	Short-Form 36: Quality of life measure at the individual level in clinical practice and research, and at the population level for health policy evaluations, and general population surveys.	36-items 8 domains Multi-dimensional Self-Report	Ware Jr. JE, & Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36). Conceptual Framework and Item Selection. Medical Care, 1992 30, 473-483.
SGRQ	St George's Respiratory Questionnaire: Disease-specific HRQOL instrument designed to measure impact on overall health, daily life, and perceived well-being in patients with obstructive airways	50-items Part I Symptoms: several scales; Part II: Activity and Impacts;dichotomous (true/false); Final question (4-point Likert scale)	Jones PW, Quirk FH, Baveystock CM. The St. George's Respiratory Questionnaire. Resp Med 1991;85 (suppl B):2531.

	disease.		

ADLs: Activities of Daily Living, VAS: Visual Analog Scale, QOL: quality-of-life, PTSD: Post-Traumatic Stress Disorder, DSM: Diagnostic and Statistical Manual of Mental Disorders