# Long COVID and Rehabilitative Support

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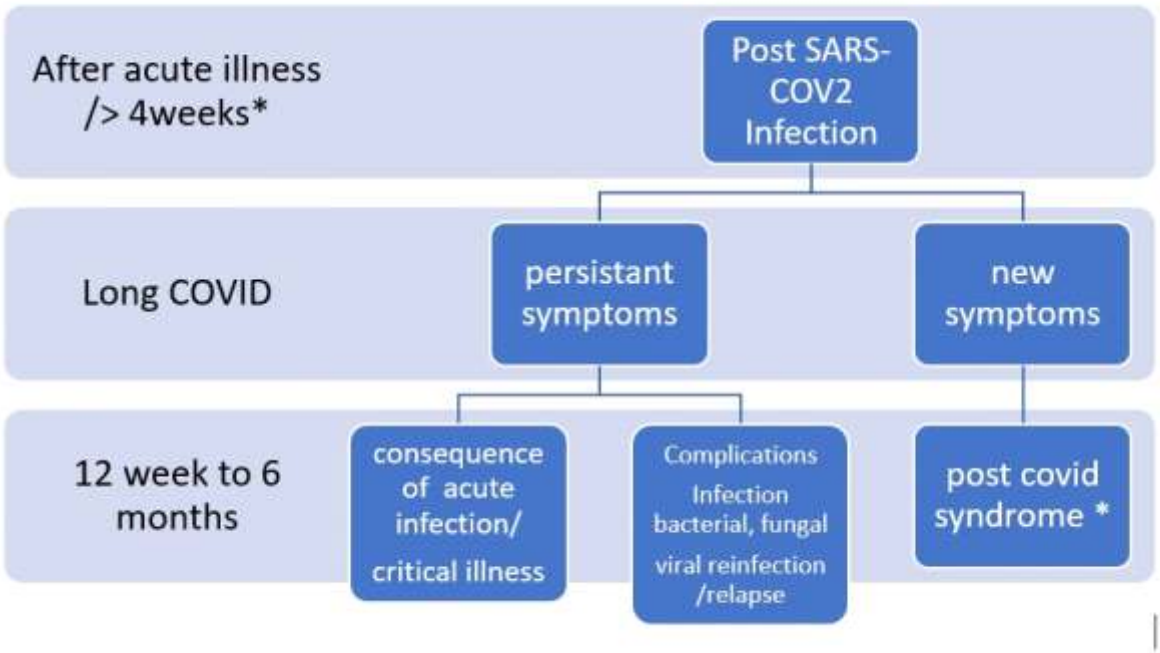
**Introduction**

Coronavirus disease 2019 (COVID-19) continues to be the most serious infectious disease threat in 2021. It is known to affect multiple organs and presents with wide range of symptoms from mild, moderate to severe manifestations.[1] More recently, evidence has emerged that some individuals continue to suffer COVID-19-related symptoms after the acute phase of infection has passed. There is currently no clear consensus definition for the disorder; terms such as "long COVID," "post-COVID syndrome," and "post-acute COVID-19 syndrome" have been used. The term "long haulers" is frequently prevalent among the general public.[2]

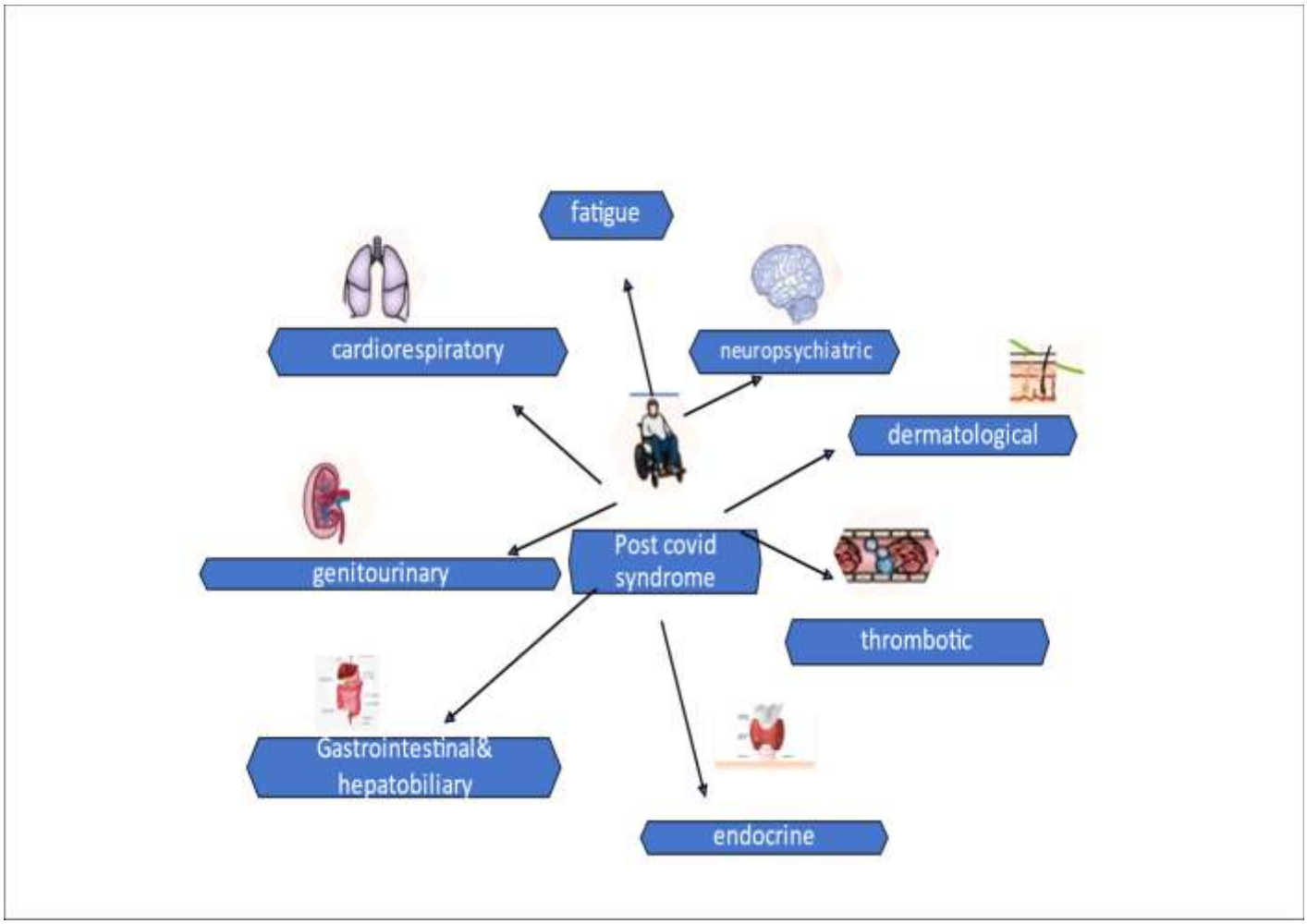
Acute COVID-19 usually lasts for 4 weeks after the onset of symptoms, after which no replication-competent SARS-CoV-2 has been found. Post covid syndrome is defined from onset beyond 4 weeks of acute onset up till as long as 6 months [3].

In this current review we are propose the approach to post covid illness as a clinical classification to identify persistence of old symptoms or onset of new symptoms in those who have recovered from the SARS-CoV-2 infection. (Fig 1)

Fig 1
Clinical classification of post covid illness



We outline the post-acute manifestations of SARS COV-2 as post covid syndrome. The common syndromes observed in post-acute COVID-19 are summarized as in fig 2




Management guidelines and recommendation for each post covid syndrome is mentioned as per available current literature and evidence

**1.Post Covid fatigue syndrome.**

The most prevalent long-term health condition faced by COVID-19 survivors. This could include post-intensive care syndrome and post-viral fatigue syndrome.[4] Reason for the strong relationship between corona virus infection and long-term fatigue is assumed to be a dysregulated immune response.[5]

**Management Guidelines-**

1.Blood tests inclusive of CBC, urea, creatinine, serum electrolytes, thyroid function tests, liver functions tests, ESR, vitamin B-12 should be considered for evaluating case of chronic fatigue syndrome (CFS).[6] (ISSCM recommends)

The cornerstone of management is a supportive experienced team that validates and empathizes with the patient's suffering. (ISSCM recommends)

a) Cognitive behavioral therapy (CBT) is proven along with making. lifestyle changes follow healthy diet, quality sleep, limiting alcohol intake, resting and relaxing (ISSCM recommends)

b) The rehabilitation process can be completed with the help of respiratory, mental health, and occupational health professionals. (ISSCM suggests)

3.Managing associated symptoms

a) Physical pain -If the pain is definitely muscular or neuropathic Use of GABA agonists and tricyclic antidepressants or serotonin and noradrenaline reuptake inhibitors (SNRI).[7] (ISSCM recommends)

b) Recurrent headache- Treating the underlying precipitating factors and recently topiramate is approved for use in CFS patients.[8] ( ISSCM recommends )

2.Post covid cardio-respiratory syndrome

Clinical presentation and basic pathophysiology

It usually presents with symptoms like cough, low grade fever, shortness of breath and chest pain and persistent oxygen requirement. If patient complains of sudden increase in breathlessness, then pulmonary embolism, tension pneumothorax, coronary artery disease and heart failure should be suspected as differential diagnosis in patient recovered from covid-19.[9]

Myocardial inflammation contributed towards ongoing cardiac symptoms.[10]

The most typically documented pulmonary physiologic deficit in post-acute COVID-19 is a decrease in diffusion capacity. Few patients also show restrictive pulmonary physiology at 3 and 6 months. [11]

**Management Guidelines-**

1.Home pulse oximetry supporting evidence lacking.[12] (Good clinical practice)

2. Serial ECG and echocardiogram for those with persistent cardiac symptoms.[13] (ISSCM recommends)

3.Patient on RAAS inhibitor medication should not be discontinued.[14] ( ISSCM suggests)

4.Low dose betablocker for patient with orthostasis and inappropriate sinus tachycardia.[15] (ISSCM recommends)

5.Restrict /caution with use of amiodarone in patient with post covid 19 pulmonary fibrosis as antiarrhythmic agent.[16] (ISSCM suggests)

6.At 12 weeks, all post covid patient should undergo clinical examination and chest X-ray, as well as PFTs, 6MWTs, sputum sample, and an echocardiography based on clinical judgement. Follow up HRCT chest at 6 and 12 months.[17] (ISSCM recommends)

7.In patients with post covid inflammatory lung disease corticosteroids may be beneficial.[18] (ISSCM suggests)

8.Lung transplantation surgical procedure for extreme cases COVID-19.[19,20] (ISSCM suggests)

9.Antifibrotic therapy in selected patients.[22] ( ISSCM suggests)

**3.Neuropsychiatric symptoms.**

Most frequently seen neuropsychiatric symptoms in post covid patient are Anxiety/depression (4.6%) Sleep disturbances (3.4%), PTSD, Cognitive disturbances (brain fog), Headaches (3.7%)., Loss of taste and smell may also persist (1.2%).[23,24]

Neurological deficit due to complications such as ischemic or hemorrhagic stroke(1.2%), hypoxic–anoxic damage, posterior reversible encephalopathy syndrome and acute disseminated myelitis(2.3%), critical illness neuropathy(0.6%) or myopathy due to neuromuscular blocking agents may need extensive rehabilitation.[24]

**Management Guidelines-**

1.Neuropsychiatric evaluation for cognitive impairment. To thoroughly assess cognitive impairment, advanced neuroimaging may be required; unresolved depression should be handled by a mental health professional.[25] (ISSCM recommends)

2.Standard screening tool for anxiety/depression Sleep disturbances PTSD, dysautonomia, fatigue.[3] (ISSCM recommends)

3.Patient with persistent symptoms to be referred to neurologist.[25] (ISSCM suggests).

4.Gastrointestinal and hepatobiliary

Predominant clinical features are abdominal discomfort, diarrhea, constipation, vomiting, Nausea, jaundice, deranged LFT.

Hepatic impairment may result from drugs used in the treatment of COVID-19 like remdesivir, favipiravir, lopinavir/ritonavir and tocilizumab.

Alteration of the gut microbiome, including enrichment of opportunistic infectious organisms. Postinfectious irritable bowel syndrome and dyspepsia may persists.[26]

**Management Guidelines-**

1. Correct personalized diet plan (Increased intake of anti-inflammatory foods (e.g., vegetables, fruit, and fish) combined with a decrease in pro-inflammatory foods (e.g., red meat, processed foods, and alcohol) may help to reduce baseline gut inflammation).[27] (ISSCM suggests)

2.Adjuvant treatment with prebiotic and probiotics may be considered.[26] ( ISSCM suggests)

**Post covid thromboembolic syndrome**

Presentation depends up on upon the vascular region thrombotic event may present with of sudden breathlessness in PE(pulmonary embolism), chest pain in CAD(coronary artery disease) and limb weakness and neurological deficit in stroke

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**Management Guidelines-**

1. Extended VTE prophylaxis is not necessary for all patients with COVID-19 who are being discharged from the hospital.[28] ( ISSCM suggests)

2.Risk stratify patients like elevated D dimer, known cancer or immobility

Prolong primary thromboprophylaxis up to 45 days in high-risk patients. (ISSCM recommends)

Newer oral anticoagulants and low-molecular-weight heparin are preferred anticoagulation agents over vitamin K antagonists due to the lack of need to frequently monitor therapeutic levels, as well as the lower risk of drug–drug interactions.[28] ( ISSCM recommends)

**6.post covid Genito- urinary symptoms.**

Presentation with proteinuria and hematuria.

Direct viral effect on kidney, endothelial dysfunction, complement activation sepsis and coagulopathy are the main contributors leading to CKD.

(COVAN)(covid associated nephropathy) is characterized by the collapsing variant of focal segmental glomerulosclerosis, with involution of the glomerular tuft in addition to acute tubular injury.[29]

**Management Guidelines-**

1.Early and close follow-up with a nephrologist improves survival.[30] ( ISSCM recommends)

7.Post covid dermatological syndrome Presentation with predominant complain of hair loss/ TE(Telogen Effluvium)E(27.9% cases ) apart from Vesicular, maculopapular, urticarial rash.[31]

**Management Guidelines-**

1.To address systemic diseases, stressful experiences, medicines, dietary inadequacies, and major surgery which are the precipitating event. (ISSCM recommends)

2.Referral to dermatologist. ( ISSCM suggests)

8.Post Covid Endocrine sequelae

DKA(Diabetic ketoacidosis), Subacute thyroiditis clinical thyrotoxicosis or covid may precipitate latent thyroid autoimmunity manifesting as new-onset Hashimoto's thyroiditis or Graves' disease.[32,33]

**Management Guidelines-**

1.Screen all patients blood glucose and HbA1c irrespective of previous history (ISSCM recommends)

2.High doses of insulin may be required in hyperglycemic crises.[34] (ISSCM recommends)

3.Newly diagnosed DM check postprandial C peptide in absence of traditional risk factors (ISSCM suggests)

4.Destructive thyroiditis with hyperthyroidism can be treated with corticosteroids after ruling out new onset graves' disease.[35] (ISSCM recommends)

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