Post-Acute COVID-19: Evaluation and Management of Pulmonary Complications

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What Patients are at Highest Risk of COVID-19 Pneumonia Complications?

All patients managed on intensive care unit or high-dependency unit.

All patients with protracted dependency on high inspired fractions of oxygen, continued positive pressure ventilation and bi-level non-invasive ventilation

Patients discharged with a new oxygen prescription.

Any other patient the discharging team has significant concerns about.

George PM, et al. Thorax 2020;0:1–8. doi:10.1136/thoraxjnl-2020-215314

What are the Aims of COVID-19 Pneumonia Follow-up

Identify complications of COVID-19 pneumonia and refer to care as needed.

Identify early the most serious and potentially life-limiting complications of COVID-19

- Organizing Pneumonia
- Pulmonary fibrosis
- Pulmonary thromboembolism
- Pulmonary Hypertension
- Bacterial/fungal Infectious complications (Pneumonia)

Identify and address acute patients' needs as early as possible

- Breathlessness
- Oxygen requirements, rehabilitation
- Palliative care/symptom management
- Psychosocial needs are identified and addressed at the earliest possible stage.

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Specific Aims of COVID-19 Pneumonia Follow-up

- Reassurance of those who have made full recovery
- Coordinate/optimize the use of radiology, referrals, rehabilitation
- Diagnose and treat pre-existing respiratory disease
- Reminder of undertaking ‘post-COVID- 19 holistic assessment’

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What Evidence do We Have to Address this Problem?

Persistent Post–COVID-19 Interstitial Lung Disease
An Observational Study of Corticosteroid Treatment

Rationale:

- The natural history of recovery from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) remains unknown.
- Fibrosis with persistent physiological deficit is a previously described feature of patients recovering from similar coronaviruses
- Treatment represents an early opportunity to modify the disease course, potentially preventing irreversible impairment.

Objectives:

- Determine the incidence of and describe the progression of persistent inflammatory interstitial lung disease (ILD) following SARS-CoV-2 when treated with prednisolone.

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Persistent Post–COVID-19 Interstitial Lung Disease
An Observational Study of Corticosteroid Treatment

Methods:

- Eight hundred thirty-seven patients were assessed by telephone 4 weeks after discharge.
- Those with ongoing symptoms had outpatient assessment at 6 weeks.
- Patients underwent a thorough clinical assessment that could include, if necessary, HRCT, PFT;s Echocardiogram, 6-minute walk.

Results:

- At 4 weeks after discharge, 39% patients reported ongoing symptoms (325/837) and were assessed.
- Interstitial lung disease, predominantly organizing pneumonia, with significant functional deficit was observed in 35/837 survivors (4.8%)
- Thirty of these patients received steroid treatment, resulting in a mean relative increase in transfer factor following treatment of 31.6% with significant symptomatic and or radiological improvement.

Conclusions:

- Following SARS-CoV-2 pneumonitis, a cohort of patients are left with both radiological inflammatory lung disease and persistent physiological and functional deficit.
- Early treatment with corticosteroids was well tolerated and associated with rapid and significant improvement.

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Persistent Post–COVID-19 Interstitial Lung Disease
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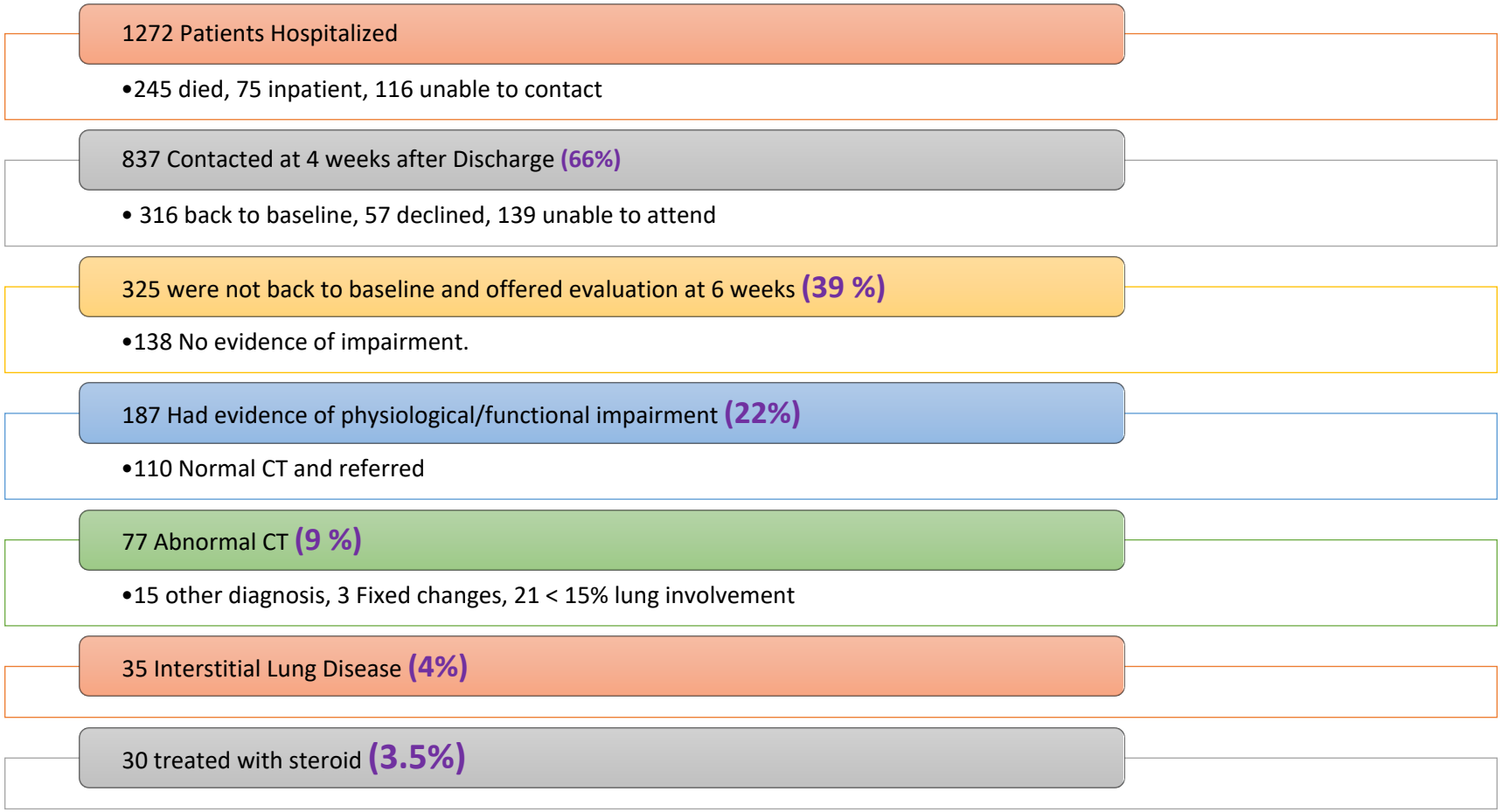

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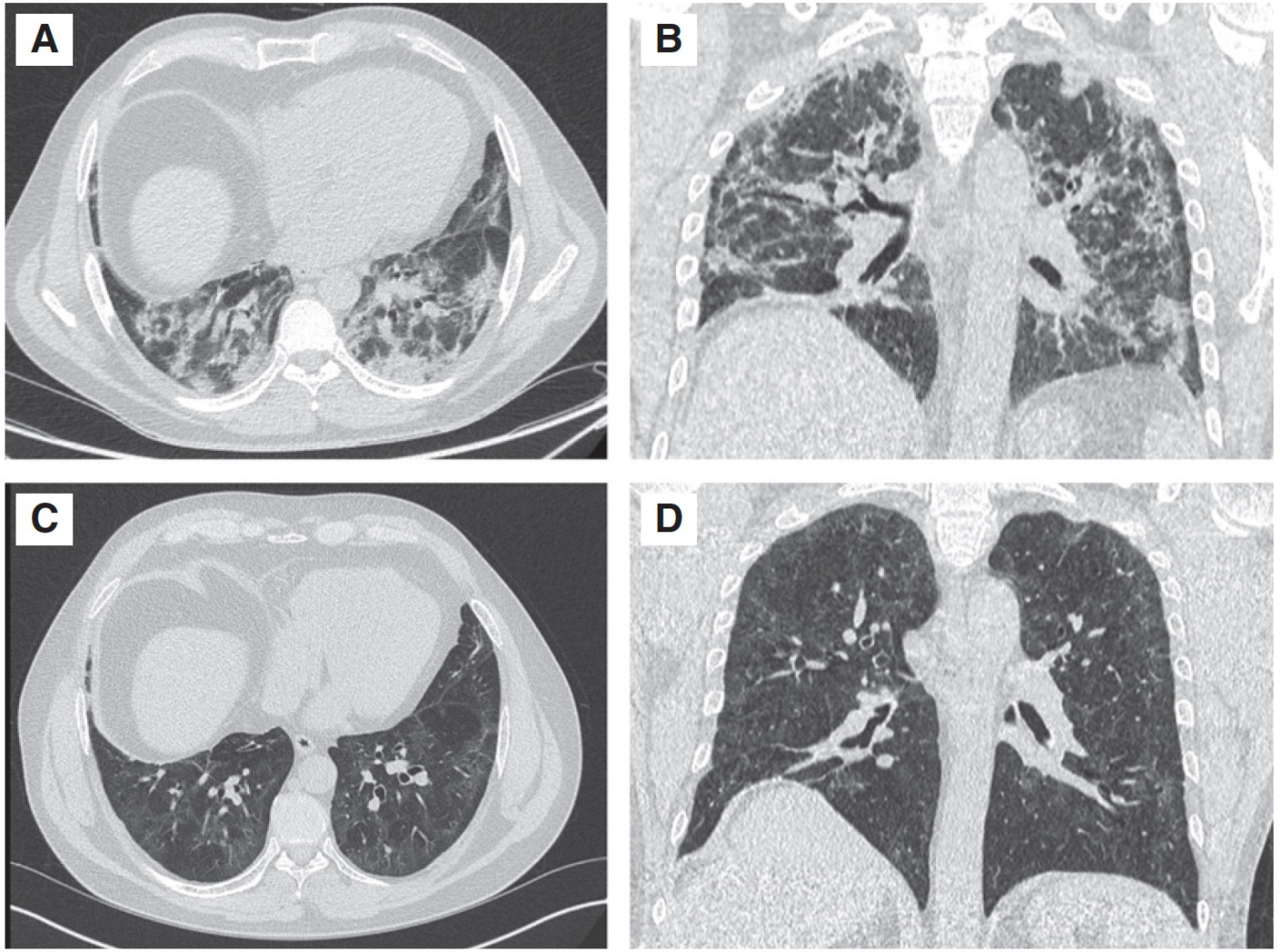
Persistent Post–COVID-19 Interstitial Lung Disease: An Observational Study of Corticosteroid Treatment

- Axial image and coronal reconstruction from computed tomographic (CT) imaging of the thorax acquired immediately before discharge in a previously fit and well 57-year-oldman
- (A and B) shows a radiological pattern of organizing pneumonia disease with predominant peribronchial and perilobular dense consolidation mild traction bronchiectasis of the airways.
  - **At this stage, the patient could only walk 30 yards.**
- (C and D) shows follow-upCT imaging of the thorax acquired after 3weeks of oral prednisolone shows
  - Resolution of consolidation with residual ground glass and fine subpleural reticulation.
  - The airways still have a slightly non tapering appearance.
  - **The patient was now able to run for 30 minutes a day.**



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Respiratory follow-up of patients with COVID-19 pneumonia

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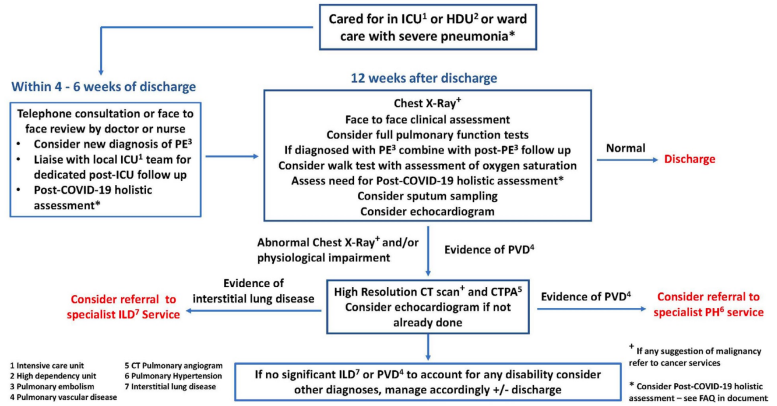

Figure 3 Respiratory follow-up algorithm for patients with COVID-19 pneumonia cared for in the ICU, HDU or those cared for on the ward with severe disease.

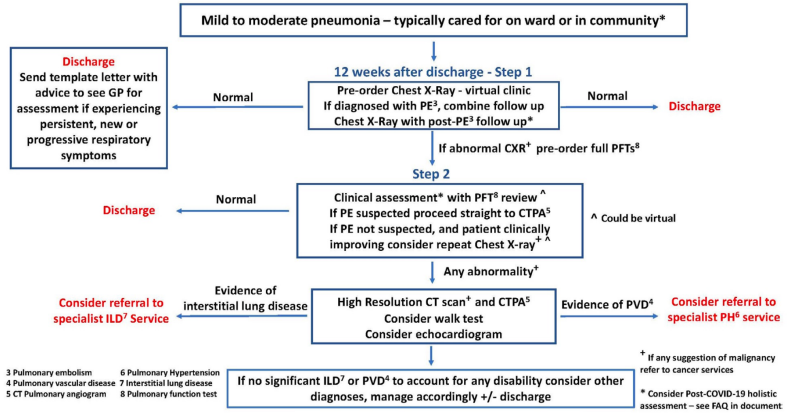

Figure 4 Respiratory follow-up algorithm for patients with mild to moderate COVID-19 pneumonia–typically cared for on the ward or in the community. GP, general practitioner.

Follow-up of Patients with Mild COVID-19 Pneumonia

Mild COVID-19 Pneumonia is Defined as :

- Radiologically confirmed pneumonia in a patient with acute COVID-19
- Patient treated as an outpatient **or**
- Patient treated as inpatient but **not requiring high flow oxygen or noninvasive ventilation**

Chest X ray (CXR) at week 12 and Virtual Visit

- CXR is normal and patient without cardiopulmonary symptoms: → Discharge patient
- CXR is abnormal or the patient has cardiopulmonary symptoms. → PFTs. EKG, D-dimer, and Clinical eval
  - Normal: → Discharge patient
  - Abnormal: → Consider CT angiogram/HRCT, Echocardiogram, 6 min walk and pulmonary consultation

If new symptoms appear, they worst or are not improving before week 12 after discharge

- Instruct the patient to call for a face-to-face appointment

Follow-up of Patients with Severe COVID-19 Pneumonia

Severe COVID-19 Pneumonia is Defined as :

- Radiologically confirmed pneumonia in a patient with acute COVID-19
- Patient treated in the ICU
- Patient treated in general ward but required high flow oxygen or noninvasive ventilation
- Patient discharged on oxygen therapy

Virtual visit at week 4

- If cardiopulmonary symptoms resolved schedule for CXR at week 12.
- If cardiopulmonary symptoms did not resolve or new symptoms appeared schedule for face-to-face visit ASAP
  - Detailed history and physical exam
  - PFTs, EKG, troponin, D-dimer, CXR
  - IF CXR or PFTs abnormal consider Consider CT angiogram/HRCT, Echocardiogram, 6 min walk and pulmonary consultation

If new symptoms appear, they worst or are not improving before week 4 after discharge

- Instruct the patient to call for a face-to-face appointment

CXR: Chest X ray, PFTs: Pulmonary function tests

What are you looking for in the Chest CT?

- Organizing Pneumonia
- Pulmonary fibrosis
- Pulmonary thromboembolism
- Bacterial/fungal Infectious complications (Pneumonia)

Post-COVID-19 Holistic Assessment

- Assessment and management of breathlessness
- Symptom or palliative care management where required
- Assessment and management of oxygen requirements
- Consideration of rehabilitation needs and onward referral where required
- Psychosocial assessment and onward referral where required
- Assessment and management of anxiety

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Thorax: first published as 10.1136/thoraxjnl-2020-215314 on 24 August 2020.

Post-COVID-19 holistic assessment

Assessment and management of fatigue

Assessment and management of dysfunctional breathing

Assessment and management of post viral cough

Consideration of a new diagnosis of venous thromboembolic disease.

Consideration of specific post-intensive care unit complications

- Sarcopenia
- Cognitive impairment
- Post-traumatic stress disorder.