Multidisciplinary approach for post-acute COVID-19 syndrome: time to break down the walls

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The importance of the COVID-19 pandemic requires us to break down the walls between medical specialties to optimise the management of patients with post-acute COVID-19 syndrome https://bit.ly/3gzqEik

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has provoked an ongoing global pandemic of coronavirus disease 2019 (COVID-19), which has affected 130 million people worldwide and caused nearly 3 million deaths in just over 1 year [1]. In 2020, COVID-19 represented the third highest cause of death in the USA after heart disease and cancer [2], and this outbreak has led to the largest drop in life expectancy since World War II [2]. Evidence-based medical treatment of COVID-19 (anticoagulants, corticosteroids, anti-inflammatory drugs, oxygenation therapy and ventilation) [3] seems to have improved patients' outcomes, and the vast majority will recover spontaneously or after acute phase management.

Several studies have reported the diversity of long-term complications of COVID-19 with a variety of symptoms and organ-related injuries, which has been referred to as "long COVID" or "post-acute COVID-19 syndrome" [4]. Even if the frequency of these complications is not high, the massive number of people who have been infected with SARS-CoV-2 suggests that this will represent a public health issue leading to a major consumption of healthcare resources. The issue of long COVID has been identified as a clear priority of the utmost importance for the World Health Organization [5].

The precise definition of these long-term complications remains to be defined, as well as the duration of chronic symptoms after initial presentation. The term "post-acute COVID-19 syndrome" was proposed to define symptoms and abnormalities persisting or present beyond 12 weeks of the onset of acute COVID-19 and not attributable to alternative diagnoses [4, 6]. This term appears more appropriate than the unclear and worrying wording "long COVID", which could falsely suggest the presence of a chronic SARS-CoV-2 infection. Nevertheless, the mechanisms leading to long-term complications of COVID-19 remain to be elucidated, although it is likely that they are diverse, encompassing a variety of local and systemic mechanisms. Besides potential sequelae of initial organ injuries, the questions of enhancing factors, such as persisting low grade inflammation, endothelial dysfunction or possible viral reservoirs, must be addressed [7, 8]. They may also include post-traumatic factors, especially in hospitalised patients, culminating in those treated in intensive care units. The impact of initial management and the SARS-CoV-2 variants on the type and incidence of long-term symptoms remains unresolved.

Many long-term complications of COVID-19 have been reported to date (table 1). Of these, dyspnoea may be a direct consequence of lung infection with SARS-CoV-2, due to pulmonary sequelae detected by chest imaging (ground glass opacities, fibrotic lesions, sequelae of acute pulmonary embolism) and functional testing (restrictive pattern, low diffusing capacity of lung for carbon monoxide, persistent hypoxaemia). In addition to these direct sequelae of infection, other causes of respiratory symptoms may be observed, such as dysfunctional breathing or muscle weakness. However, the exploration of patients with post-acute COVID-19 syndrome requires a multidisciplinary approach, as complications far exceed the problem of dyspnoea, and it appears that pulmonary and systemic complications can be intimately entangled. Among the many complications are general signs (asthenia, diffuse pain), psychiatric symptoms (post-traumatic stress syndrome, depression, anxiety, insomnia), neurological symptoms (cognitive impairment, dysautonomia), and specific organ lesions affecting cardiovascular, renal, endocrine, ear-nose-throat, gastrointestinal or dermatological systems (table 1) [9–16]. Most patients with post-acute COVID-19 syndrome experience multiple and overlapping symptoms, in addition to a significant impact on their quality of life [10, 12–15]. Of note, such complications have been described in other post-acute settings and may not be specific to COVID-19 [17, 18]. However, the emergence of these chronic symptoms requires a structured response to understand, treat and, most importantly, prevent it.

Given the diversity of symptoms, the management of these patients cannot be limited to a single specialised clinic and requires a multidisciplinary team approach. This is the experience we were able to carry out during the COMEBAC (*Consultation MultiExpertise de Bicêtre Après COVID-19*) uncontrolled cohort study, which included 478 adult patients discharged from Bicêtre Hospital (Université Paris-Saclay) [15]. This study strongly supports our vision that screening *via* telehealth consultation followed by a multidisciplinary assessment in outpatient clinics involving multiple specialists on the same day in a single location is likely the most effective way to manage the complexity of post-acute COVID-19 syndrome. This structured muldisciplinary team approach allows to offer a set of careful investigations necessary for each patient, with the aim of individualised medicine and the rationalisation of healthcare resources. To date, most studies have

TABLE 1 Symptoms related to post-acute COVID-19 syndrome

Organ systems	Post-acute COVID-19 symptoms
General assessment	Asthenia Muscle weakness Diffuse pain Myalgia, joint pain Weight loss Deterioration of quality of life
Respiratory	Dyspnoea Cough Radiologic sequelae Functional impairment Dysfunctional breathing Chronic oxygen dependence
Psychiatric and neurological	Post-traumatic stress Depression Anxiety Insomnia Headache Cognitive impairment (brain fog) Dysautonomia
Cardiovascular	Chest pain Palpitations Autonomic dysfunction Myocardial fibrosis Venous thromboembolic disease
Renal	Persistent impaired renal function
Ear-nose-throat	Persistent anosmia or parosmia Persistent ageusia
Endocrine	Thyroiditis Onset or worsening of diabetes
Dermatological	Hair loss Skin rash
Gastrointestinal	Diarrhoea

focused on patients formerly hospitalised for COVID-19, but it is important to underscore that post-acute COVID-19 syndrome also exists in outpatients.

Post-acute COVID-19 syndrome clearly represents a global threat to mankind. A better understanding of the mechanisms, predisposing factors, and evolution (after 6 months) of these symptoms will require broad international cooperation, in order to offer efficacious preventative and curative approaches. The European Respiratory Network for Data-sharing in COVID-19 (END-COVID), initiated by the European Respiratory Society to merge different national initiatives in Europe studying the long-term effects of COVID-19, represents a unique opportunity to answer unresolved issues [19].

If we are to learn from the positive aspects of this dramatic episode, we will keep in mind the solidarity and adaptability of healthcare teams and the need to break down the walls between medical specialties to optimise the management of patients with post-acute COVID-19 syndrome.

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