



## The next step: how sleep and physical activity can act together in the post-COVID-19 scenario

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Dear Editor,

Since early 2020, the vast majority of countries has faced a severe crisis as a consequence of the COVID-19 pandemic. At the present moment, the cases worldwide amount to 500 million, and the number of deaths have exceeded 6 million. As vaccination campaigns advance, it is forecast that the spread of the virus, hospital admissions, and deaths will decrease.

Although this pandemic control is welcomed with optimism, the post-pandemic era needs to be considered. Comorbidities, including obesity, diabetes, and arterial hypertension, are strong predictors of a worse outcome in COVID-19 cases [1]. Patients with pre-existing conditions experience a persistent convalescent period, and even in those with no comorbidities, especially older individuals, long-term hospitalization may result in muscle tissue loss that hinders locomotion [2]. Furthermore, patients can have a significant long-term impairment of pulmonary function [3].

The current situation presents two circumstances that deserve attention. Many COVID-19 survivors require continuing treatment and close follow-up due to the residual effects of the illness, and simultaneously, the global population now has higher awareness of the necessity of adequate health maintenance in the face of novel infections that bring serious consequences [2, 3]. Two main questions arise: first, how should health systems respond to meet the necessities of the ever-growing population who have been infected by SARS-CoV-2? Second, what preventive measures must be taken currently, not only to facilitate recovery in current COVID-19 cases, but also considering possible future pandemic crises?

There are various interventions that may be a focus to address these questions. One of these is improvement in sleep quality. In the aftermath of COVID-19, sleep has an important role to play. Overall respiratory function may be markedly impaired in many individuals convalescing from COVID-19 [3]. Exacerbation of sleep breathing disorders, such as obstructive sleep apnea (OSA) is a possibility that warrants attention. Furthermore, there is risk of the development of pulmonary fibrosis following COVID-19.

Regarding prevention, sleep partakes in the regulation and performance of the immune system [4]. Although the importance of pre-existing OSA in relation to COVID seriousness must be considered, further research on this topic and on the impact of other sleep disorders with respect to COVID-19 is required.

In light of the significant impact of COVID-19 on the respiratory system, attention to physical activity and treatment is another factor that deserves emphasis. Physical exercise is well supported in the literature as a key contributor to enhanced sleep as well as breathing capacity [5]. Once patients have recovered from SARS-CoV2 infection, physical rehabilitation may be necessary for a sizable portion of the patients experiencing residual effects. However, there is an ongoing debate about the most effective treatment protocol. Although it is agreed that respiratory rehabilitation, when needed, is a sound therapeutic measure, the timing of the rehabilitation is not established. There has been indication that rehabilitation must not be started in critically ill patients during the phase in which further degradation of respiratory function is still ongoing due to low levels of tolerance. In other instances, an intervention during the early phase of the disease has been recommended. Whichever procedure is found to be adequate, it is clear that physiotherapy will play an essential part in the improvement of sleep quality and in the physical recovery process in outpatients with COVID-19.

The post-pandemic situation presents a number of major challenges to healthcare professionals and changes to health

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care systems. Sleep, along with physical activity and rehabilitation, may be among the factors that dictate a new global healthcare approach that is being shaped by the pandemic. The triad of sleep, physical activity, and rehabilitation may comprise a network of components that influence each other. This multidimensional system may constitute an important approach for the follow-up of COVID19 survivors and for improved post-COVID outcomes. In the new health situation emerging before the medical community, sleep and physical therapy are two valuable cornerstones of treatment that must be emphasized.

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## Declarations

**Competing interest** The authors declare no competing interests.

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