

COVID-19 Cough



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Cough is one of the most common presenting symptoms of COVID-19, along with fever and loss of taste and smell.

Cough

is not only distressing to patients, but also
increases the risk of community transmission
by
respiratory droplets.

Dhand R, Li J. Coughs and sneezes: their role in transmission of respiratory viral infections, including SARS-CoV-2. Am J Respir Crit Care Med 2020; 202: 651–59.

Similar to the more common but less serious infections of the common cold or flu, **cough** is a key symptom of COVID-19 in the *acute phase* of the infection, and one that persists in the *post-infective phase*.

Acute COVID-19-associated cough

- Dry cough is one of the most common initial symptoms of COVID-19, reported in about 60–70% of symptomatic patients.
- The co-presence of cough, anosmia, and ageusia indicates that neuroinflammatory mechanisms might be operative in COVID-19 pathogenesis.
- As the cough reflex is mediated by the vagus nerve, interactions between the virus and the airway vagus nerve, with ensuing neuroinflammation, represent the likely primary events for the initiation of cough.

Cough can *persist for weeks or months* after SARS-CoV-2 infection, often accompanied by chronic fatigue, cognitive impairment, dyspnea, or pain—a collection of long-term effects referred to as the **post-COVID syndrome or long COVID**.

In a post-COVID cohort of 143 patients from a hospital in Italy, 125 (87·4%) reported struggling with symptoms—76 (53·1%) reported fatigue, 62 (43·4%) dyspnoea, and 23 (16·0%) cough—2 months after discharge.

Carfi A, Bernabei R, Landi F, Gemelli Against C-P-ACSG. Persistent symptoms in patients after Acute COVID-19. JAMA 2020; 324: 603–05.

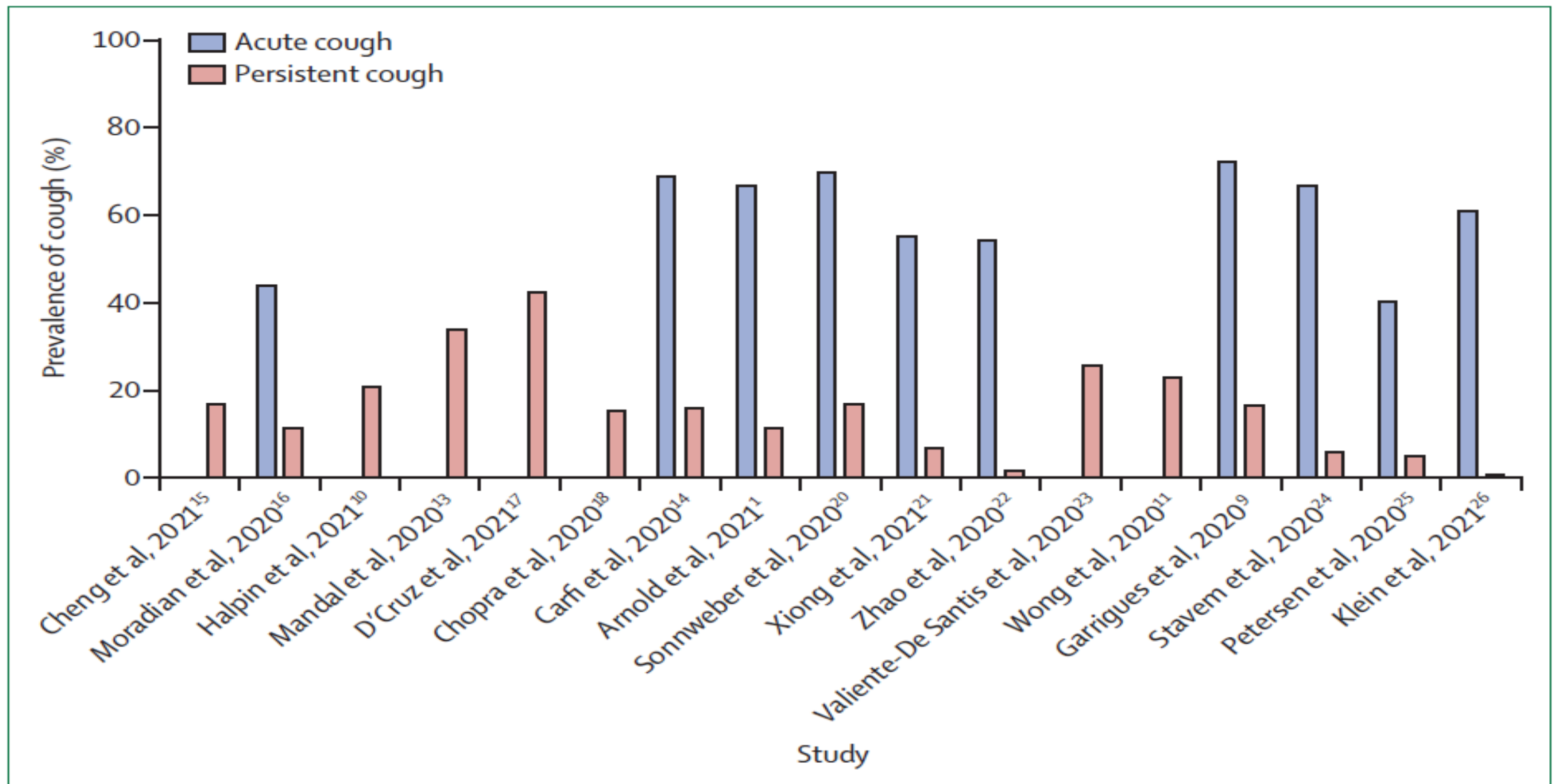
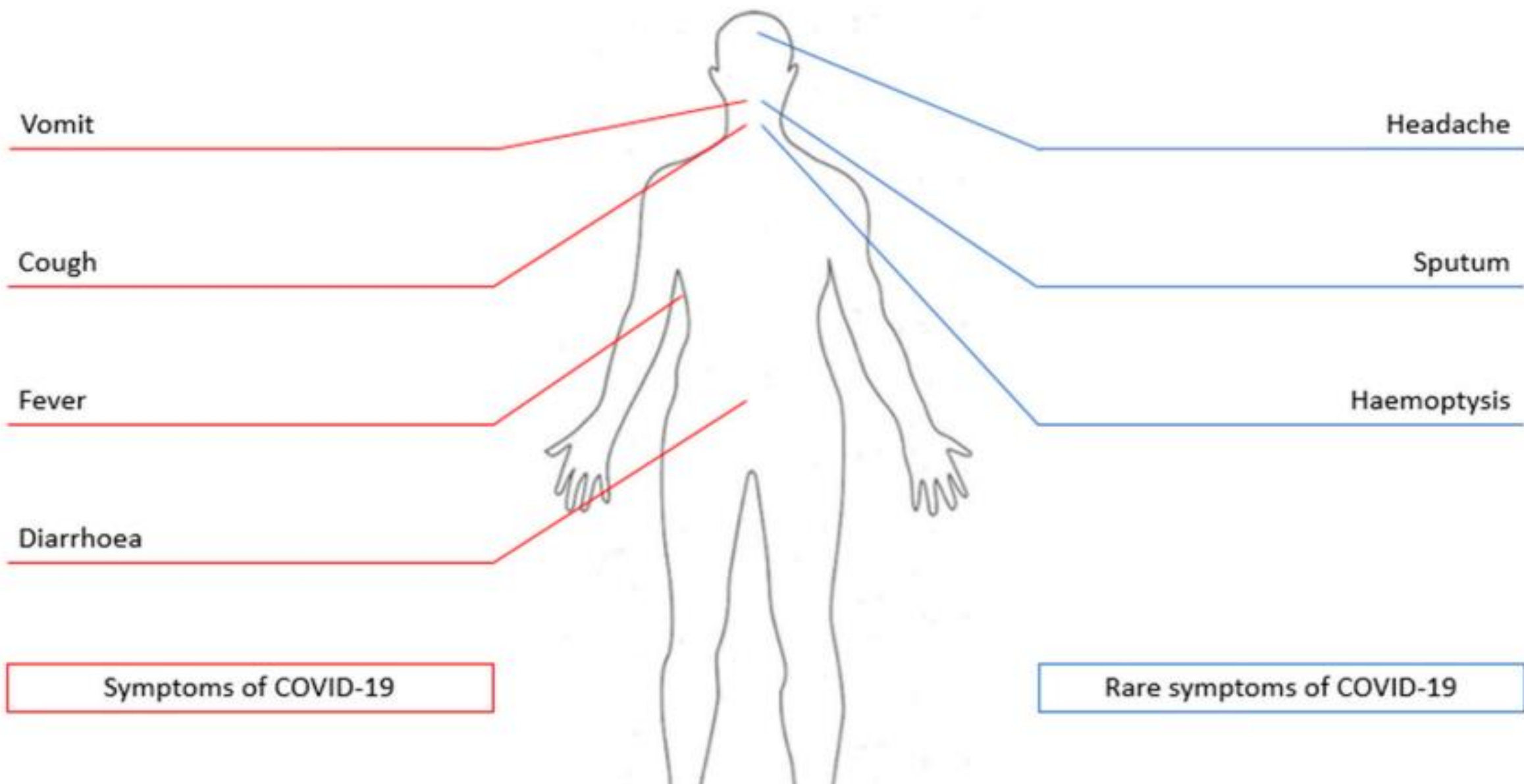


Figure 1: Follow-up studies reporting persistent cough in patients with post-COVID syndrome

Cough in the post-COVID syndrome

- An increasing number of reports describes an array of fluctuating or persistent symptoms experienced by patients for months after recovery from COVID-19.
- Symptoms include cough, fatigue, dyspnea, pain, and so-called brain fog (cognitive impairment, including and are associated with a deleterious effect on activities of daily living. This phenomenon has been termed the post-COVID syndrome or long COVID.



The cough reflex improves release of secretions and particles from airways as a result of irritating mechanisms, such as accumulated secretions, postnasal drip, and pathogens, in addition to inflammatory processes.

In some conditions, it can become excessive and potentially harmful to the airway mucosa.

Confronting COVID-19-associated cough and the post-COVID syndrome: role of viral neurotropism, neuroinflammation, and neuroimmune responses



Woo-Jung Song, Christopher K M Hui, James H Hull, Surinder S Birring, Lorcan McGarvey, Stuart B Mazzone, Kian Fan Chung

We hypothesise that the pathways of neurotropism, neuroinflammation, and neuroimmunomodulation through the vagal sensory nerves, which are implicated in SARS-CoV-2 infection, lead to a cough hypersensitivity state.

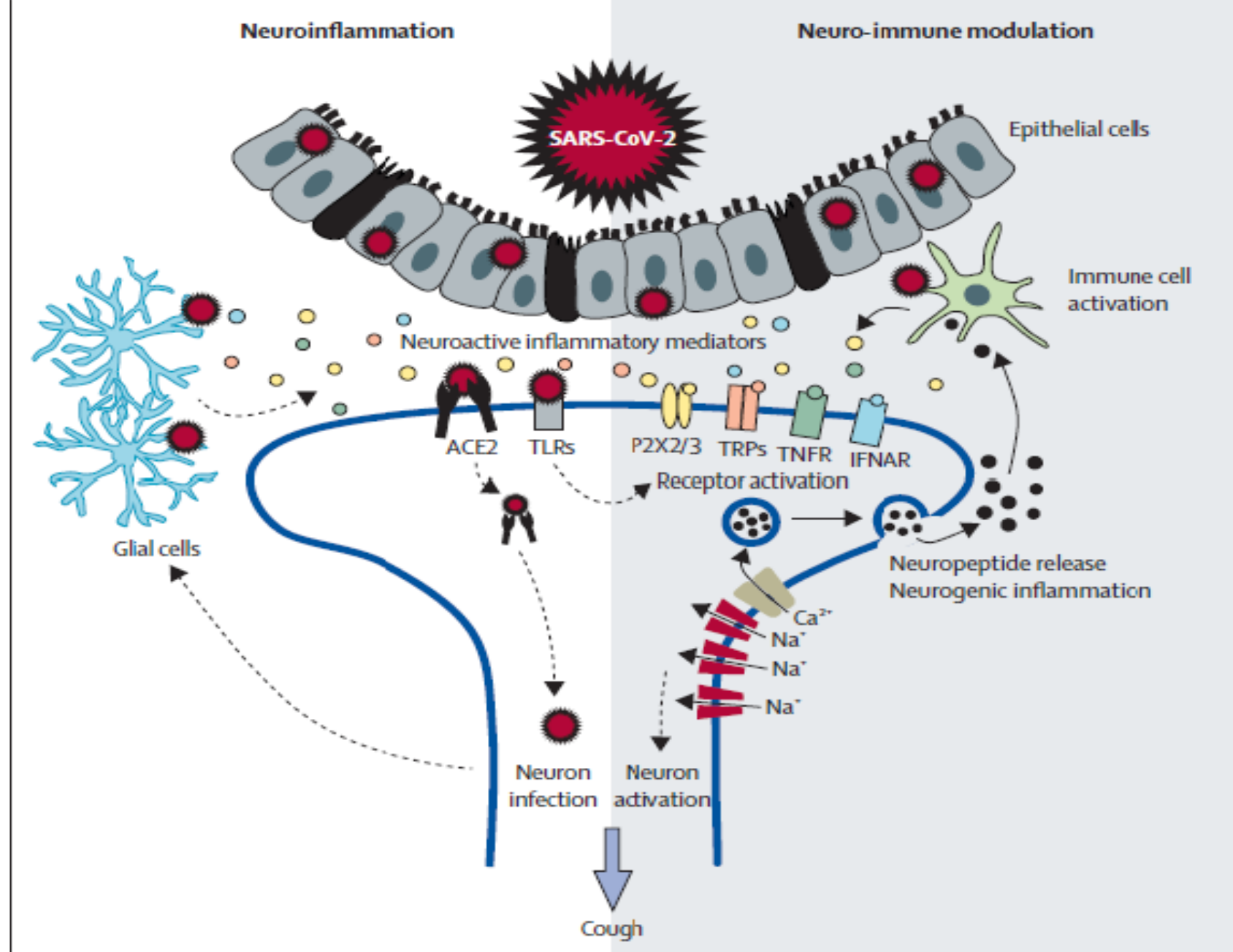


Figure 3: Proposed mechanisms of cough in SARS-CoV-2 infection

However, we currently have
little understanding of the mechanisms
underlying
COVID-19-associated cough.

ORIGINAL ARTICLE

Clinical Characteristics of Coronavirus Disease 2019 in China

W. Guan, Z. Ni, Yu Hu, W. Liang, C. Ou, J. He, L. Liu, H. Shan, C. Lei, D.S.C. Hui, B. Du, L. Li, G. Zeng, K.-Y. Yuen, R. Chen, C. Tang, T. Wang, P. Chen, J. Xiang, S. Li, Jin-lin Wang, Z. Liang, Y. Peng, L. Wei, Y. Liu, Ya-hua Hu, P. Peng, Jian-ming Wang, J. Liu, Z. Chen, G. Li, Z. Zheng, S. Qiu, J. Luo, C. Ye, S. Zhu, and N. Zhong, for the China Medical Treatment Expert Group for Covid-19*

We extracted data regarding 1099 patients with laboratory-confirmed Covid-19 from 552 hospitals in 30 provinces, autonomous regions, and municipalities in mainland China through January 29, 2020.

The symptoms of COVID-19 include fever (88%),
cough (68%), vomiting (5%) and diarrhea
(3.7%).

Wien Klin Wochenschr (2021) 133:377–382
<https://doi.org/10.1007/s00508-020-01760-4>

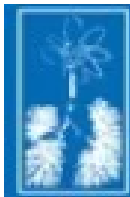


Wiener klinische Wochenschrift
The Central European Journal of Medicine

Clinical manifestations of COVID-19 in the general population: systematic review

A systematic review of the literature was conducted. A total of 8070 scientific productions were found in the databases. Among the studies, **184** met the initial inclusion criteria, with a total of **114,046 patients**.

- In percentage terms, 6 symptoms had a general prevalence greater than or equal to 25%, namely, fever (58.66%), **cough (54.52%), dyspnea (30.82%),** malaise (29.75%), fatigue (28.16%) and sputum/secretion (25.33%).



PEDIATRIC

PULMONOLOGY

REVIEW |  Free Access

Clinical manifestations of children with COVID-19: A systematic review

Tiago H. de Souza MD, PhD ✉, José A. Nadal MD, MSc, Roberto J. N. Nogueira MD, PhD, Ricardo M. Pereira MD, PhD, Marcelo B. Brandão MD, PhD

First published: 03 June 2020 | <https://doi.org/10.1002/ppul.24885> | Citations: 84

A total of 38 studies (1124 cases) were included.
The most prevalent symptom was fever (47.5%), followed by **cough (41.5%)**, nasal symptoms (11.2%), diarrhea (8.1%), and nausea/vomiting (7.1%).



Contents lists available at [ScienceDirect](#)

Computers in Biology and Medicine

journal homepage: www.elsevier.com/locate/combiomed



COVID-19 cough classification using machine learning and global smartphone recordings



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Both datasets indicate that COVID-19 positive coughs are 15%–20% shorter than non-COVID coughs.

Cough was the second most common manifestation (54.52%), and it is directly linked to the transmission of the virus through respiratory droplets.

The cough of a COVID-19 infected subject contaminates a large volume of surrounding air with coronavirus due to the entrainment of surrounding air in the jet-like flow created by the cough.

Reducing chances of COVID-19 infection by a cough cloud in a closed space

when a person coughs, what is the volume of air that gets contaminated due to the cough ejected out by the person?

- The answer to this question is not straightforward because the surrounding air gets entrained into the cough-cloud coming out from the person's mouth and, eventually, becomes its part; therefore, a much larger volume than initially ejected is affected by coughing.

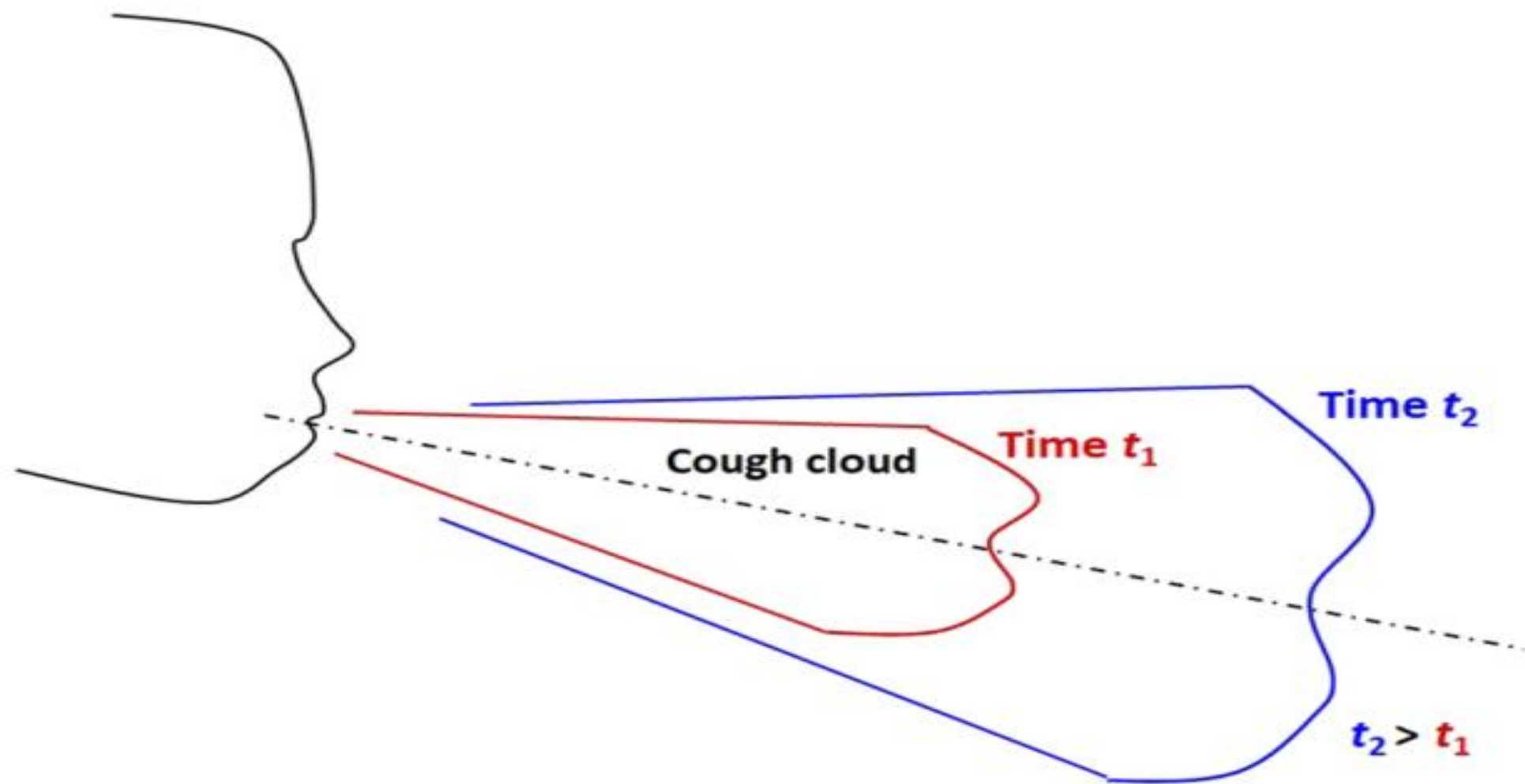


FIG. 1. Schematic of the cough cloud generated by a human subject. The volume of the cloud increases with time due to the entrainment of the surrounding air into it.

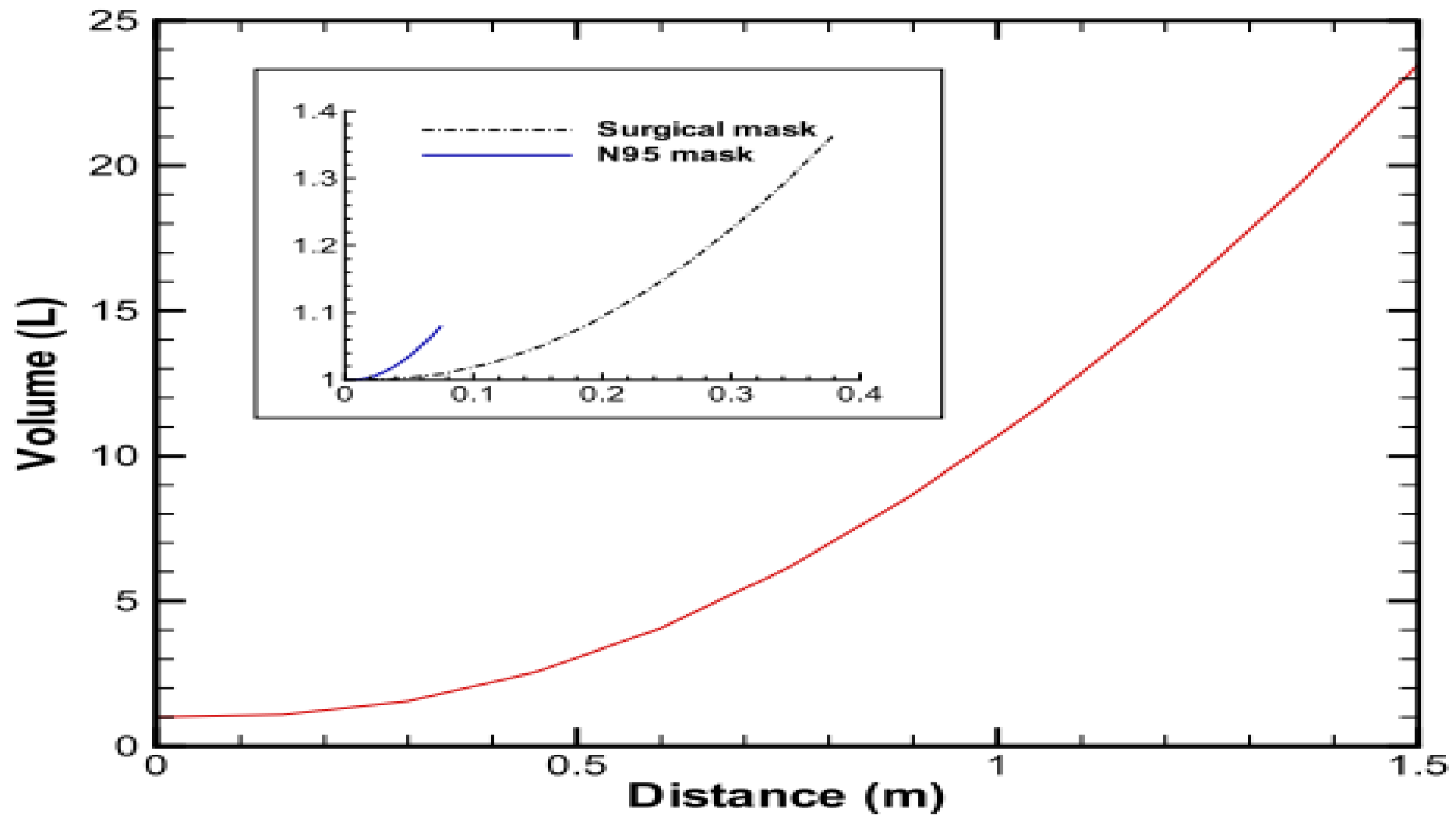


FIG. 4. Volume of the cloud as a function of distance from the origin. The data for without a face mask are shown in the main plot, while those with the face mask are shown in the inset.

- **Stigmatisation** of patients with cough can occur, leading to social isolation, particularly during the COVID-19 pandemic.
- Identifying ways to control COVID-19-associated cough could help to prevent community transmission and disease spread, as well as removing the stigma of this symptom.

Hulme K, Dogan S, Parker SM, Deary V. 'Chronic cough, cause unknown': A qualitative study of patient perspectives of chronic refractory cough. J Health Psychol 2019; 24: 707–16.

Perspectives



Digital medicine Is my cough COVID-19?

Imagine that even if you have no symptoms of COVID-19, the sound of your forced cough transmitted to your smartphone or smart speaker, processed by an algorithm, could provide a 98.5% accurate diagnosis.



COVID-19 Artificial Intelligence Diagnosis Using Only Cough Recordings

Jordi Laguarda , Ferran Hueto, and Brian Subirana

We hypothesized that COVID-19 subjects could be accurately discriminated only from a forced-cough cell phone recording using Artificial Intelligence.

We built a data collection pipeline of COVID-19 cough recordings through our website

Results:

- When validated with subjects diagnosed using an official test, the model achieves COVID-19 sensitivity of 98.5% with a specificity of 94.2%.

Conclusions:

- AI techniques can produce a free, noninvasive, real-time, any-time, instantly distributable, large scale COVID-19 asymptomatic screening tool to augment current approaches in containing the spread of COVID-19.

Management of COVID-19-associated cough

- The advice for treating the acute and chronic cough of COVID-19 is based on available treatments and guidelines.
- Although many drugs are on the market or in development for the relief of cough, there is no good evidence for their benefits in the treatment of cough associated with acute viral infection or pneumonia.
- the UK National Institute for Health and Care Excellence guidelines for managing acute symptoms of COVID-19, only taking honey or opioid-derived antitussives are recommended for cough

Oral corticosteroids are often prescribed for acute lower respiratory tract infection and have been used by many centers to treat patients with post-COVID interstitial lung changes.

Although neuromodulators such as **gabapentin or opioids** might be considered for acute and chronic COVID-19 cough, we discuss the possible mechanisms of COVID-19-associated cough and the promise of new anti-inflammatory or neuromodulators that might successfully target both the cough of COVID-19 and the post-COVID syndrome.



THANK YOU SO MUCH FOR YOUR ATTENTION