



ERS | *monograph*

COVID-19: An Update

Edited by James D. Chalmers,
Catia Cilloniz and Bin Cao

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James D. Chalmers, Catia Cilloniz
and Bin Cao

Editor in Chief
Peter M.A. Calverley

This book is one in a series of *ERS Monographs*. Each individual issue provides a comprehensive overview of one specific clinical area of respiratory health, communicating information about the most advanced techniques and systems required for its investigation. It provides factual and useful scientific detail, drawing on specific case studies and looking into the diagnosis and management of individual patients. Previously published titles in this series are listed at the back of this *Monograph*.

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Preface

Peter M.A. Calverley 

Newspaper journalists often claim they write the first draft of history. That distinction can also be applied to Aurelie Fabre, John R. Hurst and Sheila Ramjug who, in 2021, edited the first *Monograph* on the new and frightening viral illness COVID-19. To do so was a tour de force of academic writing in the midst of a major health crisis.



Like a metaphorical tsunami, the worst of the pandemic wave has passed and in 2023 the WHO declared an end to the global health emergency. COVID-19 upended everyone's life and left many with unexpected new and poorly understood problems in the form of post-COVID illnesses. On the positive side, the response of the healthcare profession across the world was remarkable and accompanied by a surge in scientific publication to communicate urgently needed knowledge about a previously unknown illness. In view of this wealth of data, we have taken the unusual step of commissioning a further *Monograph* to update our readers on how our knowledge has evolved and what challenges still face the respiratory community.

We are grateful to James D. Chalmers, Catia Cilloniz and Bin Cao who have brought together a truly international group of experts, as befits a global illness, to give us insight into all aspects of this disease – its cellular effects, epidemiological evolution, medical therapy and prevention, and the legacy it leaves in some who have been infected. Even the impact of COVID-19 on medical publication and clinical trial design are considered.

It is 500 years this year since the first of Shakespeare's plays was published. In *Macbeth*, the king laments his life as being a tale "full of sound and fury, signifying nothing." The voices of the patients affected by COVID-19, so eloquently presented in the first chapter of this *Monograph*, tell us why this must not be true of the lessons learned during the pandemic. By reading this *Monograph* you will be well equipped to ensure that is not the case.

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Guest Editors

James D. Chalmers



James D. Chalmers is Asthma and Lung UK Chair of Respiratory Research at the University of Dundee (Dundee, UK) and a Consultant Respiratory Physician at Ninewells Hospital (Dundee). His research and clinical interests lie in difficult respiratory infections, particularly bronchiectasis and pneumonia, and include COVID-19.

James is Chief Editor of the *European Respiratory Journal* and is Chair of the Science and Research Committee of the British Thoracic Society (BTS). He leads the Respiratory Research Group at the University of Dundee and has published >400 peer reviewed articles in the area of respiratory infections.

During the COVID-19 pandemic, James was Chair of the European Respiratory Society (ERS) Task Force for COVID-19, which produced the ERS living guidelines for the management of hospitalised patients with the virus. He was also a member of the NICE Long Covid Guideline committee and was chief investigator of a number of observational and intervention studies focused on novel therapeutics for COVID-19. He is part of the management board of PHOSP-COVID, the UK national observational study into the long-term effects of COVID-19.

Catia Cilloniz



Catia Cilloniz is Associate Professor at the School of Medicine of the University of Barcelona (Barcelona, Spain), Coordinator of the Pneumonia Research Group of Applied Research in Infectious Respiratory Diseases and Critically Ill Patients Group of IDIBAPS at the Hospital Clinic of Barcelona (Barcelona), and Coordinator of the Worldwide Pneumonia Awareness Campaign: Pneumolight.

Catia received the Extraordinary Doctoral Award from the University of Barcelona and the Mentor award from the Spanish Society of Pneumology. In 2019, she became a Fellow of the European Respiratory Society (ERS).

Catia has authored 210 scientific publications, 10 book chapters and one book. Her major achievements can be summarised as follows: she has studied the immunological profile of pneumonia

patients; she has described the microbiological features of pneumonia in different settings and the risk factors associated with antibiotic-resistant pathogens; she has demonstrated that HIV patients with *Legionella* pneumonia should be managed in the same way as people without HIV and that virologically suppressed HIV patients with pneumococcal pneumonia should be managed in the same way as the general population; and she has investigated pneumonia and sepsis in very old patients.

Bin Cao

Bin Cao is Director of the Department of Pulmonary and Critical Care Medicine, China-Japan Friendship Hospital (Beijing, China), and a professor at Peking Union Medical College, Capital Medical University, and Tsinghua University-Peking University Joint Center for Life Sciences (all Beijing). He is a member of the Chinese Academy of Medical Sciences, co-founder of CAP-China (<https://www.chinapneumonia.cn/>) and President-Elect of Chinese Thoracic Society (CTS). A physician-scientist, Bin is a leader in the field of respiratory medicine and a tireless researcher of evidence-based medicine for respiratory infections.



He pioneered “respiratory viral sepsis”, which extended the theory of sepsis and initiated the “seven-category ordinal scale” in clinical trials, which provided the feasibility to conduct randomised controlled clinical trials during the pandemic. His research has an outstanding influence in China and has provided a source for the treatment guidelines of respiratory diseases of the WHO and around the world.

Bin has published over 200 original peer reviewed articles and reviews in major journals, including *The Lancet* and the *New England Journal of Medicine*, among which 14 papers are listed as a Highly Cited Paper in the Essential Science Indicators (ESI), have an H-index of 68, and have >130 000 citations. He was also elected as “Highly Cited Chinese Researcher” by Elsevier for 5 consecutive years.

Introduction

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The second *ERS Monograph* dedicated to COVID-19 offers a reflective view of the pandemic. It provides a patient perspective of the pandemic, as well as considering the pathophysiology of the infection and the consequences on global health. <https://bit.ly/ERSM105intro>

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This is the second *ERS Monograph* dedicated to COVID-19 and we write at a very different time, and in a very different healthcare environment, than when Aurelie Fabre, John R. Hurst and Sheila Ramjug published their *Monograph* in December 2021. At that time, the WHO still considered COVID-19 to be a global pandemic. Vaccines had become available in late 2020/early 2021 in many parts of the world but were still being rolled out. New variants were emerging, contributing to ongoing waves of infection and still placing a significant burden of the disease on healthcare, including inpatient care. It would take another 18 months before the WHO declared, on the 5th May 2023, that COVID-19 was no longer a public health emergency of international concern.

COVID-19 has not gone away, but developing a *Monograph* on COVID-19 to be published in 2024 requires a different perspective. In 2021, we were still very much at the beginning of the story, with many basic questions unanswered and a full understanding of the impact of the pandemic still elusive. In 2024, we can be more reflective and consider how the pandemic began and developed, understanding how COVID-19 and the public health measures taken to control it have affected public health. We can also consider how lessons learned during the pandemic are now influencing clinical trials and translational science, as well as our thinking about the role of viruses and the pathophysiology of chronic diseases like COPD and asthma. Looking to the future, we must consider how COVID-19 may evolve in an era of high population immunity and its clinical significance as another endemic respiratory virus.

A few chapters merit special mention. We are particularly pleased to incorporate a patient perspective of the pandemic and its impact, developed in collaboration with the European Lung

Foundation (ELF), who provided such outstanding support to concerned respiratory patients during the pandemic [1].

We feature several chapters on COVID-19 in special populations, reflecting on the impact during the most difficult periods of the pandemic, and the long-term sequelae relating to airway diseases [2], ILD [3] and the immunocompromised [4], for example. We review the current state of the art in therapeutics for COVID-19, in the community [5], in hospital [6] and in the ICU [7]. The long-term sequelae of COVID-19 have rightly generated a lot of attention, as millions of patients are living with a complex syndrome arising following COVID-19 infection. Given its public health importance, we include chapters focussing on the pathophysiology [8] and the management [9] of long COVID.

We are very grateful to all of our authors, who have contributed their time and effort to making this such a high-quality *Monograph*. The COVID-19 pandemic was an unprecedented disruption to our way of life and to healthcare globally. It is right that we learn every lesson that we can. The end of the global emergency and the return to normal life for many across the globe represents a triumph of science and healthcare in developing effective therapies and vaccines. A further triumph will be learning the lessons of the COVID-19 pandemic to develop better ways to prevent and treat respiratory viral infections and to avert the next pandemic before it happens.

We hope all of our readers enjoy the *Monograph*.

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List of abbreviations

| | |
|-------------------|---|
| ACE | angiotensin-converting enzyme |
| ARDS | acute respiratory distress syndrome |
| BAL | bronchoalveolar lavage |
| CRP | C-reactive protein |
| CT | computed tomography |
| ECMO | extracorporeal membrane oxygenation |
| ICU | intensive care unit |
| IFN | interferon |
| IL | interleukin |
| ILD | interstitial lung disease |
| IMV | invasive mechanical ventilation |
| JAK | Janus kinase |
| MERS | Middle East respiratory syndrome |
| MERS-CoV | MERS coronavirus |
| NICE | National Institute for Health and Care Excellence |
| NIH | National Institutes of Health |
| NIMV | noninvasive mechanical ventilation |
| NIV | noninvasive ventilation |
| RCT | randomised controlled trial |
| RSV | respiratory syncytial virus |
| SARS-CoV-2 | severe acute respiratory syndrome coronavirus 2 |
| TNF | tumour necrosis factor |
| VAP | ventilator-associated pneumonia |
| VOC | variant of concern |
| WHO | World Health Organization |