

Dutheil, Frédéric et al.

## Article

# Financial burden and shortage of respiratory rehabilitation for SARS-CoV-2 survivors: The next step of the pandemic?

Journal of Risk and Financial Management

## Provided in Cooperation with:

MDPI – Multidisciplinary Digital Publishing Institute, Basel

*Suggested Citation:* Dutheil, Frédéric et al. (2022) : Financial burden and shortage of respiratory rehabilitation for SARS-CoV-2 survivors: The next step of the pandemic?, Journal of Risk and Financial Management, ISSN 1911-8074, MDPI, Basel, Vol. 15, Iss. 1, pp. 1-5, <https://doi.org/10.3390/jrfm15010020>

This Version is available at:

<https://hdl.handle.net/10419/258744>

## Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

## Terms of use:

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*







*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<https://creativecommons.org/licenses/by/4.0/>

Editorial

# Financial Burden and Shortage of Respiratory Rehabilitation for SARS-CoV-2 Survivors: The Next Step of the Pandemic?

Frédéric Dutheil <sup>1,2</sup>, Maelys Clinchamps <sup>2</sup> , Julien S. Baker <sup>3</sup> , Rashmi Supriya <sup>3,\*</sup> , Alistair Cole <sup>4</sup> ,  
Yang Gao <sup>3</sup>  and Valentin Navel <sup>5,6</sup> 

- <sup>1</sup> CNRS, LaPSCo, Physiological and Psychosocial Stress, University Clermont Auvergne, F-63000 Clermont-Ferrand, France; frederic.dutheil@uca.fr
  - <sup>2</sup> Preventive and Occupational Medicine, University Hospital of Clermont-Ferrand, F-63000 Clermont-Ferrand, France; maelysclinchamps@gmail.com
  - <sup>3</sup> Centre for Health and Exercise Science Research, Department of Sport, Physical Education and Health, Hong Kong Baptist University, Kowloon Tong, Hong Kong 999077, China; jsbaker@hkbu.edu.hk (J.S.B.); gaoyang@hkbu.edu.hk (Y.G.)
  - <sup>4</sup> Department of Government and International Studies, Hong Kong Baptist University, Kowloon Tong, Hong Kong 999077, China; alistaircole@hkbu.edu.hk
  - <sup>5</sup> CNRS, INSERM, GReD, Translational Approach to Epithelial Injury and Repair, University Clermont Auvergne, F-63000 Clermont-Ferrand, France; valentin.navel@hotmail.fr
  - <sup>6</sup> Ophthalmology, University Hospital of Clermont-Ferrand, CHU Clermont-Ferrand, F-63000 Clermont-Ferrand, France
- \* Correspondence: Rashmisupriya@hkbu.edu.hk



**Citation:** Dutheil, Frédéric, Maelys Clinchamps, Julien S. Baker, Rashmi Supriya, Alistair Cole, Yang Gao, and Valentin Navel. 2022. Financial Burden and Shortage of Respiratory Rehabilitation for SARS-CoV-2 Survivors: The Next Step of the Pandemic? *Journal of Risk and Financial Management* 15: 20. <https://doi.org/10.3390/jrfm15010020>

Received: 30 November 2021

Accepted: 29 December 2021

Published: 7 January 2022

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

We read with great enthusiasm the recent article by Daynes et al. highlighting the encouraging outcomes of COVID-19 rehabilitation (Daynes et al. 2021). Indeed, results for exercise capacity, health related quality of life, anxiety, and depression seemed to improve following 6 weeks of rehabilitation. In chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD), respiratory rehabilitation (RR) has demonstrated benefits both in terms of respiratory symptoms (Ward et al. 2020) and mental health (Gordon et al. 2019). RR centers are the cornerstone of patient management (Ward et al. 2020). In spite of the known benefits of RR, in reality, patients are not as likely to attend, and complete RR as required. Transportation, hospital capacities, and staffing issues are often overlooked as impediment factors in RR compliance. In fact, some studies have shown that the most common barrier to participation in RR is insufficient transportation to and from hospital-based programs (Wadell et al. 2013; Thorpe et al. 2012). In 2015, the official ATS/ERS Policy Statement on Enhancing Implementation noted that further barriers to RR were highlighted in the delivery of RR (Rochester et al. 2015). Health professionals, payers, patients, and caregivers lack awareness and knowledge of the benefits of RR; the optimal use of RR by suitable patient populations (Jones et al. 2014); and limited training opportunities for RR providers. The use of telerehabilitation is another potential method to overcome the limitations of traditional hospital-based RR (Salawu et al. 2020; Sivan et al. 2020). Using information and communication technologies to provide clinical rehabilitation services over the internet has been classified as telerehabilitation (Kairy et al. 2009). In 2021, it was reported that during the treatment of chronic COPD, the need for continuous treatment and care, and the high costs of medications and RR services led to a heavy financial burden for patients and their families. In contrast, the stress and concern caused by the inability to receive medication and to participate in RR worsened the condition. As a result, RR is often not continued by patients and their families (Sami et al. 2021). A Canadian Economic Analysis, published in 2010, showed that normal care plus RR is 27% more effective than usual care, with incremental cost-effectiveness ratios of Canadian dollar (CAD) 27,924 per additional quality-adjusted life-year gained. The authors also reported that, over a 10-year period, if COPD patients were only treated in moderate and severe

cases, then 1505 additional people would receive RR treatment in Canada at an added cost of CAD 1.8 million per year. In the case of a 25% increase in COPD patients needing RR, the cost would rise to CAD 33.9 million. The additional annual cost for all individuals with COPD (100% treatment) who require RR would be CAD 168 million (CADTH 2010).

The novel Coronavirus-19 (COVID-19) pandemic mainly affects the respiratory tract. Older adults with comorbid conditions are particularly vulnerable. Post-intensive care syndrome (PICS) is more likely to develop in patients weaned from mechanical ventilation. COVID-19 is an infectious disease responsible for several symptoms, such as fever, tiredness, dry cough, difficulty breathing, pneumonia, and respiratory failure (Velavan and Meyer 2020). Even if the most infected patients recover from the disease without specialist treatment, the remaining population, especially those with underlying comorbidities, tend to develop difficulty in breathing. This condition progresses from mild to severe, and eventually results in critical case diagnosis. Generally, critical cases who develop an acute respiratory distress syndrome (ARDS) are sent to intensive care units (ICU). Because of the severity of lung damage and because of the common phylogenetic association with coronaviruses, COVID-19 was renamed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Jiang et al. 2020). In the worst-case scenario, patients evolve towards respiratory failure due to lung deterioration, and if they survive, can cause long-term lung failure (Xu et al. 2020). The major sequelae caused by the virus increase the need for respiratory rehabilitation for SARS-Cov-2 survivors. Moreover, even patients from the general population who did not require an ICU stay may also need respiratory rehabilitation. This results from the fact that more than half of the patients with pneumonia presented with bilateral multifocal lung lesions, such as ground glass and linear opacities, adjacent pleura, or interlobular thickening (Xu et al. 2020). Although not evaluated, some suggestions of home respiratory rehabilitation programs for patients in quarantine have been proposed, with the use of connected and developed technologies for rehabilitation guidance (Zhao et al. 2020).

All aspects of health care delivery have been greatly affected by the COVID-19 pandemic. A number of changes have been implemented to rules, regulations, and reimbursement policies in order to protect health care workers and patients from the transmission of the disease (Centers for Medicare and Medicaid Services 2020). Numerous organizations have expanded their resources and advice for the implementation of telerehabilitation services as a reaction to this new landscape of medical practice, including the American Physical Therapy Association, Australian Physiotherapy Association, and Italian Physiotherapy Association. Physical therapy services were deemed essential by federal, state, and local authorities during the pandemic, as reported in the Report from the American Physical Therapy Association published in June 2020 (American Physiotherapy Association 2020). Yet, many physical therapists have actively curtailed their hours to “flatten the curve” of the pandemic by reducing patient contact time. In the midst of a pandemic, the American Physical Therapy Association recommends video conferencing to allow physical therapists to communicate directly with clients. Since patients with COPD are especially susceptible to severe COVID-19 complications, in-person RR should not take place during the pandemic except in exceptional cases (Lippi and Henry 2020; Zhao et al. 2020). It may be possible to conduct in-person RR only when COVID-19 has a low community spread. It is recommended to wear acceptable personal protective equipment (PPE) at all times for those physical trainers who will have to provide care in person during the pandemic. Numerous respondents commented that their PPE supplies were inadequate despite these recommendations.

Mobile health technologies have demonstrated some positive possibilities for respiratory disease rehabilitation (MacKinnon and Brittain 2020), and the technologies proposed might be useful as a support mechanism for survivors of SARS-CoV-2. Due to telerehabilitation’s high cost, it is important to make sure that it is implemented according to sound clinical policy decisions and high-quality evidence. Telerehabilitation holds great potential as a “therapeutic” tool for a large number of COPD patients during and after the COVID-19

pandemic, if these challenges can be overcome (Burkow et al. 2015). Telerehabilitation is underfunded in most jurisdictions. These programs need funding in order to develop a solid foundation of evidence for their use and to sustain the treatment in the community. In the past, most insurers around the world would reimburse PR for outpatient rehabilitation but not telerehabilitation prior to the COVID pandemic (Garvey et al. 2018; Bierman et al. 2018). The uptake of telerehabilitation in US health care systems has been constrained by variations and restrictions in state regulations and reimbursement policies of private and Medicare insurers, according to a 2018 report by Bierman et al. 2018. Telerehabilitation could be used in the community more often if funding was provided for the technology. However, these technological developments would not provide sufficient medical benefits for the most severe SARS-CoV-2 patients who have been subjected to mechanical ventilation in ICU. Even if recommendations exist for respiratory physiotherapy for patients hospitalized in ICU with invasive mechanical ventilation (Lazzeri et al. 2020), there is still no consensus or guidelines on the best rehabilitation procedures for survivors following treatment in ICU. As more patients recover from COVID-19 and are stable enough to enter post-acute rehabilitation care, nursing homes are declining to admit these patients because of their inability to provide efficient care in a safe environment. Due to decreased Medicare revenues and increased costs related to managing patients with COVID-19, some nursing homes are facing bankruptcy (Grabowski and Mor 2020). There is an urgent need for the rehabilitation of survivors in specialized centers; however, specialized rehabilitation establishments already lack reception capacities and have long waiting lists.

Moreover, rehabilitation medicine has a holistic dimension that is essential for SARS-CoV-2 survivors who may have problems with sarcopenia, usually as a consequence of hospitalization in ICU (Gropper et al. 2019). Sarcopenia development in SARS-CoV-2 survivors may be of multifactorial origin and could include neuromyopathy, muscular dysfunction linked to respiratory failure, neurological damage specific to the virus (neurotropism), cardiovascular disorders (endothelitis), undernutrition, or common frequent comorbidities recorded in the most vulnerable SARS-CoV-2 elderly patients (e.g., obesity, diabetes) (Cruz-Jentoft and Sayer 2019). Finally, the overall functional dimension of physical and rehabilitation medicine is useful for SARS-CoV-2 survivors. Despite global efforts to limit the spread of the SARS-CoV-2, we draw attention towards the need to plan for optimal respiratory and general rehabilitation of SARS-CoV-2 survivors. The next major problem related to infection rate of the pandemic might be a shortage of respiratory rehabilitation centers, which may also collaterally affect patients with other chronic respiratory diseases. In response to the COVID-19 pandemic, RR has undergone dramatic changes. Some of these changes are practical venue changes and increased use of telerehabilitation. In addition to revealing longstanding structural barriers to RR, the pandemic has highlighted the lack of funding, resources, and healthcare professionals, which have been exacerbated by COVID-19. This has been compromised further by the economic burden of the pandemic, shortages of healthcare staff and equipment, and diminished hospital and healthcare facilities.

**Author Contributions:** F.D., M.C., V.N., J.S.B. and R.S. wrote the paper. A.C. and Y.G. contributed to discussion and editing. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Acknowledgments:** This paper was prepared from the presentation on idea presented in the symposium “Transnational and Transdisciplinary Lessons of COVID-19 From the Perspective of Risk and Management”.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- American Physiotherapy Association. 2020. Impact of COVID-19 on the Physical Therapy Profession: A Report from the American Physical Therapy Association. Available online: <https://www.naranet.org/uploads/userfiles/files/documents/APTAReportImpactOfCOVID-19OnThePhysicalTherapyProfession.pdf> (accessed on 29 July 2021).
- Bierman, Randal Trey, Mei Wa Kwong, and Christine Calouro. 2018. State Occupational and Physical Therapy Telehealth Laws and Regulations: A 50-State Survey. *International Journal of Telerehabilitation* 10: 3–54. [CrossRef] [PubMed]
- Burkow, Tatjana M., Lars K. Vognild, Elin Johnsen, Marijke Jongsma Risberg, Astrid Bratvold, Elin Breivik, Trine Krogstad, and Audhild Hjalmsen. 2015. Comprehensive pulmonary rehabilitation in home-based online groups: A mixed method pilot study in COPD. *BMC Research Notes* 8: 766. [CrossRef]
- CADTH. 2010. Pulmonary rehabilitation for chronic obstructive pulmonary disease: Clinical, economic, and budget impact analysis. *CADTH Technology Overviews* 1: e0127. Available online: <http://www.ncbi.nlm.nih.gov/pubmed/22977417> (accessed on 29 July 2021).
- Centers for Medicare and Medicaid Services. 2020. COVID-19 Emergency Declaration Blanket Waivers for Health Care Providers. Available online: <https://www.cms.gov/files/document/summary-covid-19-emergency-declaration-waivers.pdf> (accessed on 2 August 2021).
- Cruz-Jentoft, Alfonso J., and Avan A. Sayer. 2019. Sarcopenia. *The Lancet* 393: 2636–46. [CrossRef]
- Daynes, Enya, Charlotte Gerlis, Emma Chaplin, Nikki Gardiner, and Sally J. Singh. 2021. Early experiences of rehabilitation for individuals post-COVID to improve fatigue, breathlessness exercise capacity and cognition—A cohort study. *Chronic Respiratory Disease* 18: 147997312110156. [CrossRef]
- Garvey, Chris, Jonathan P. Singer, Allan Murphy Bruun, Allison Soong, Julia Rigler, and Steven Hays. 2018. Moving Pulmonary Rehabilitation Into the Home. *Journal of Cardiopulmonary Rehabilitation and Prevention* 38: 8–16. [CrossRef] [PubMed]
- Gordon, Carla S., Jacob W. Waller, Rylee M. Cook, Steffan L. Cavallera, Wing T. Lim, and Christian R. Osadnik. 2019. Effect of Pulmonary Rehabilitation on Symptoms of Anxiety and Depression in COPD. *Chest* 156: 80–91. [CrossRef] [PubMed]
- Grabowski, David C., and Vincent Mor. 2020. Nursing Home Care in Crisis in the Wake of COVID-19. *JAMA* 324: 23. [CrossRef]
- Gropper, Sareen, Dennis Hunt, and Deborah W. Chapa. 2019. Sarcopenia and Psychosocial Variables in Patients in Intensive Care Units. *Critical Care Nursing Clinics of North America* 31: 489–99. [CrossRef]
- Jiang, Shibo, Zhengli Shi, Yuelong Shu, Jingdong Song, George F. Gao, Wenjie Tan, and Deyin Guo. 2020. A distinct name is needed for the new coronavirus. *The Lancet* 395: 949. [CrossRef]
- Jones, Sarah E., Stuart A. Green, Amy L. Clark, Mandy J. Dickson, Ann-Marie Nolan, Clare Moloney, Samantha S. C. Kon, Faisal Kamal, Joy Godden, Cathy Howe, and et al. 2014. Pulmonary rehabilitation following hospitalisation for acute exacerbation of COPD: Referrals, uptake and adherence. *Thorax* 69: 181–82. [CrossRef] [PubMed]
- Kairy, Dahlia, Pascale Lehoux, Claude Vincent, and Martha Visintin. 2009. A systematic review of clinical outcomes, clinical process, healthcare utilization and costs associated with telerehabilitation. *Disability and Rehabilitation* 31: 427–47. [CrossRef]
- Lazzeri, Marta, Andrea Lanza, Raffaella Bellini, Angela Bellofiore, Simone Cecchetto, Alessia Colombo, Francesco D'Abrosca, Cesare Del Monaco, Giuseppe Gaudiello, Mara Paneroni, and et al. 2020. Respiratory physiotherapy in patients with COVID-19 infection in acute setting: A Position Paper of the Italian Association of Respiratory Physiotherapists (ARIR). *Monaldi Archives for Chest Disease* 90. [CrossRef]
- Lippi, Giuseppe, and Brandon Michael Henry. 2020. Chronic obstructive pulmonary disease is associated with severe coronavirus disease 2019 (COVID-19). *Respiratory Medicine* 167: 105941. [CrossRef]
- MacKinnon, Grant E., and Evan L. Brittain. 2020. Mobile Health Technologies in Cardiopulmonary Disease. *Chest* 157: 654–64. [CrossRef] [PubMed]
- Rochester, Carolyn L., Ioannis Vogiatzis, Anne E. Holland, Suzanne C. Lareau, Darcy D. Marciniuk, Milo A. Puhan, Martijn A. Spruit, Sarah Masefield, Richard Casaburi, Enrico M. Clini, and et al. 2015. An Official American Thoracic Society/European Respiratory Society Policy Statement: Enhancing Implementation, Use, and Delivery of Pulmonary Rehabilitation. *American Journal of Respiratory and Critical Care Medicine* 192: 1373–86. [CrossRef]
- Salawu, Abayomi, Angela Green, Michael G. Crooks, Nina Brixey, Denise H. Ross, and Manoj Sivan. 2020. A Proposal for Multidisciplinary Tele-Rehabilitation in the Assessment and Rehabilitation of COVID-19 Survivors. *International Journal of Environmental Research and Public Health* 17: 4890. [CrossRef]
- Sami, Ramin, Kobra Salehi, Marzieh Hashemi, and Vajihe Atashi. 2021. Exploring the barriers to pulmonary rehabilitation for patients with chronic obstructive pulmonary disease: A qualitative study. *BMC Health Services Research* 21: 828. [CrossRef] [PubMed]
- Sivan, Manoj, Stephen Halpin, Lisa Hollingworth, Niki Snook, Katherine Hickman, and Ian J. Clifton. 2020. Development of an integrated rehabilitation pathway for individuals recovering from COVID-19 in the community. *Journal of Rehabilitation Medicine* 52. [CrossRef]
- Thorpe, Olivia, Kylie Johnston, and Saravana Kumar. 2012. Barriers and Enablers to Physical Activity Participation in Patients With COPD. *Journal of Cardiopulmonary Rehabilitation and Prevention* 32: 359–69. [CrossRef]
- Velavan, Thirumalaisamy P., and Christian G. Meyer. 2020. The COVID-19 epidemic. *Tropical Medicine & International Health* 25: 278–80. [CrossRef]
- Wadell, Karin, T. Janaudis Ferreira, Mats Arne, Karin Lisspers, Björn Stållberg, and Margareta Emtner. 2013. Hospital-based pulmonary rehabilitation in patients with COPD in Sweden—A national survey. *Respiratory Medicine* 107: 1195–200. [CrossRef]



- Ward, Thomas JC, Charles D. Plumptre, Thomas E. Dolmage, Amy V. Jones, Ruth Trethewey, Pip Divall, Sally J. Singh, Martin R. Lindley, Michael C. Steiner, and Rachael A. Evans. 2020. Change in O<sub>2</sub>peak in Response to Aerobic Exercise Training and the Relationship With Exercise Prescription in People With COPD: A Systematic Review and Meta-analysis. *Chest* 158: 131–44. [[CrossRef](#)] [[PubMed](#)]
- Xu, Xi, Chengcheng Yu, Jing Qu, Lieguang Zhang, Songfeng Jiang, Deyang Huang, Bihua Chen, Zhiping Zhang, Wanhua Guan, Zhoukun Ling, and et al. 2020. Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2. *European Journal of Nuclear Medicine and Molecular Imaging* 47: 1275–80. [[CrossRef](#)]
- Zhao, Hong-Mei, Yu-Xiao Xie, and Chen Wang. 2020. Recommendations for respiratory rehabilitation in adults with coronavirus disease 2019. *Chinese Medical Journal* 133: 1595–602. [[CrossRef](#)] [[PubMed](#)]
- Zhao, Qianwen, Meng Meng, Rahul Kumar, Yinlian Wu, Jiaofeng Huang, Ningfang Lian, Yunlei Deng, and Su Lin. 2020. The impact of COPD and smoking history on the severity of COVID-19: A systemic review and meta-analysis. *Journal of Medical Virology* 92: 1915–21. [[CrossRef](#)] [[PubMed](#)]