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## A breath of fresh air: The role of incentive spirometry in the treatment of COVID-19



Dear Editor:

With over 93 million cases of the coronavirus disease of 2019 (COVID-19) worldwide, clinicians continue to search for new treatment options to reduce its morbidity and mortality. While 80–90% of COVID-19 patients are asymptomatic or have only mild symptoms, some develop severe pulmonary complications, including Acute Respiratory Distress Syndrome (ARDS) [1]. Among those who develop ARDS, there is a high mortality rate. Factors causing some patients to progress from mild to severe symptoms have not been fully elucidated, but the change can occur quickly, with an average of 8 days between first symptom and ARDS onset [1]. This period presents a time where intervention may be able to prevent clinical worsening. Unlike in severe COVID-19 cases, providers have very few treatment options to offer patients with mild-to-moderate symptoms in order to prevent progression to severe disease. We propose that incentive spirometry (IS) be considered an intervention to treat patients with mild-to-moderate COVID-19 disease.

Incentive spirometry is a lung expansion technique used to promote sustained maximal inspiration, which is proposed to help patients by improving ventilation/perfusion mismatch and alveolar- $\text{PaO}_2$  gradient. These effects reduce intrapulmonary shunting and the risk of atelectasis [2]. Incentive spirometry is commonly used for pre- and post-operative patients, as well as patients with pneumonia, acute chest syndrome, COPD exacerbations, and ARDS [2].

Patients with COVID-19-related ARDS (CARDS) demonstrate a phenotype of ARDS with preserved lung compliance. Although initially thought to represent a novel phenotype, a re-analysis of the LUNG SAFE data by de Prost and colleagues suggested that ARDS with preserved lung compliance were prevalent pre-COVID-19 [3]. Since both ARDS phenotypes involve decreased  $\text{PaO}_2:\text{FiO}_2$  ratio as a result of intrapulmonary shunting, it is not surprising that placing patients in a prone position leads to improved oxygenation in both CARDS and non-COVID-ARDS [4]. The benefit of proning results from decreased ventilation/perfusion mismatch by recruiting more alveoli to open from previously compressed areas of the lung [4]. Incentive spirometry works similarly by decreasing ventilation/perfusion mismatch via splinting and preventing alveolar collapse [1].

Although some hospitals include IS in their discharge instructions for patients with COVID-19, it is not a universally-accepted recommendation. Early in the pandemic, concerns were raised that IS may lead to self-inflicted lung injury [5]. However, there are no data to our knowledge demonstrating lung injury resulting from IS, and IS has been successfully used in a variety of other pulmonary illnesses without leading to significant lung injury [2]. Another concern was that IS

could theoretically increase aerosolization of the virus, but it is unlikely to do so more than coughing, using inhalers, or even talking loudly, and the patient would already be isolated from uninfected individuals.

In conclusion, we believe IS should be considered as part of treatment protocols for patients with mild-to-moderate COVID-19 due to its theoretical benefits and limited risk. Further research is needed on the role of IS in the management of COVID-19 so that clinicians may better treat these patients as well as apply the findings to future pandemics.

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### Author contributions

JC conceived the presented ideas. HS performed a literature review and drafted the letter. JC, MG, and HS edited and revised the document before giving final approval for submission.

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Hannah Seyller

University of Illinois at Chicago, College of Medicine, Chicago, IL, USA

\*Corresponding author.

E-mail address: [hseyll3@uic.edu](mailto:hseyll3@uic.edu)

Michael Gottlieb

Department of Emergency Medicine, Rush University Medical Center, Chicago, IL, USA

Joseph Colla

Department of Emergency Medicine, University of Illinois at Chicago, Chicago, IL, USA

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