Update Alert 2: Ventilation Techniques and Risk for Transmission of Coronavirus Disease, Including COVID-19

We have updated the protocol of our living systematic review (PROSPERO registration: CRD42020178187). This most recent search update, which was done on 11 July 2020, identified 2756 citations. Of these, we included 3 observational cohort studies of patients with coronavirus disease 2019 (COVID-19) in the updated quantitative synthesis (1–3). One of the new studies compared bilevel positive airway pressure (BiPAP) with continuous positive airway pressure (CPAP) (1), 1 compared high-flow oxygen by nasal cannula (HFNC) with invasive mechanical ventilation (IMV) (2), and the last compared noninvasive ventilation (NIV) with IMV (3) (**Supplement Table 1**).

The first study compared BiPAP with CPAP in frail patients with COVID-19 who were deemed unsuitable for IMV by the treating team (1). We judged this study to be high risk of bias, with a Newcastle-Ottawa Scale score of 5. In the initial systematic review and the first update, we did not find any studies examining the comparative efficacy of CPAP or BiPAP in patients with COVID-19 (4, 5). This new study found a mortality rate of 40% in patients receiving BiPAP and 52% in those receiving CPAP; however, the sample size was low (*n* = 28; 5 received BiPAP and 23 received CPAP), contributing to imprecision and limiting conclusions.

The second study compared HFNC with IMV in patients with COVID-19 in the intensive care unit (2). We judged this study to be high risk of bias, with a Newcastle-Ottawa Scale score of 3. We previously included 2 studies that gave imprecise estimates of the comparative efficacy of HFNC or IMV on mortality in COVID-19 (6, 7). Mortality rate in the new study was 14% in patients receiving HFNC and 100% in those receiving IMV, although the sample size was low (*n* = 13; 7 receiving HFNC and 6 receiving IMV), limiting our ability to generate conclusions (**Supplement Table 2**).

The final study compared NIV with IMV in critically ill patients with COVID-19. This study was judged to be low risk of bias, with a Newcastle-Ottawa Scale score of 8 (3). The results suggested a lower mortality rate in those receiving NIV (odds ratio, 0.34 [95% CI, 0.16 to 0.71]). We compared this study with another found as part of our initial search (7). This demonstrated an inconsistent effect on mortality (hazard ratio, 0.75 [95% CI, 0.16 to 3.45]).This other study suggested a higher mortality in those treated with NIV (hazard ratio, 1.61 [95% CI, 0.84 to 3.09]) (very low certainty of evidence due to the nonrandomized study designs, imprecision, and inconsistency). In the prior searches, we identified 4 other cohort studies examining this effect (8–11). Including the new data, the results are imprecise and inconsistent when examining the effect of NIV versus IMV (**Supplement Figure** and **Supplement Table 2**).

In summary, the results suggest no change in the findings of the original systematic review. Noninvasive ventilation may have similar effects to IMV on mortality, but the evidence is uncertain (**Supplement Table 2**).

Rebecca Thomas, MPH, MBChB

Liverpool School of Tropical Medicine, Liverpool, United Kingdom

0000-0003-2607-000X

Tamara Lotfi, MD, MPH

McMaster University, Hamilton, Ontario, Canada

0000-0001-6101-3946

Gian Paolo Morgano, MSc

McMaster University, Hamilton, Ontario, Canada

0000-0001-7577-7963

Andrea Darzi, MD, MPH

McMaster University, Hamilton, Ontario, Canada

0000-0002-2498-1697

Marge Reinap, MA

London School of Hygiene and Tropical Medicine, London United Kingdom

COVID-19 Systematic Urgent Review Group Effort (SURGE) Study Authors

\* SURGE Study Authors include Bram Rochwerg, MD, MSc; Elie A. Akl, MD, MPH, PhD; Giovanna E.U. Muti-Schünemann, Cand. Med; Joanne Khabsa, MPH; Karla Solo, MSc; Anna Bąk, PharmD; Finn Schünemann, MD; Antonio Bognanni, MD; Leila Harrison, MPH; Rosa Stalteri, BSHc; Anisa Hajizadeh, MPH; Ewa Borowiack, MSc; Assem M. Khamis, MD; Guang Chen, MD, PhD; Hong Zhao, PhD; Chen Chen, MM; Layal Hneiny, MPH, MLIS; Holger J. Schünemann, MD, PhD, MSc

**Disclaimer:** The systematic review was commissioned and in part paid for by the World Health Organization. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the decisions, policy, or views of the World Health Organization.

**Financial Support:** By the World Health Organization.

**Disclosures:** Authors have disclosed no conflicts of interest. Forms can be viewed at www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=L20-1211.

**Corresponding Authors:** Holger J. Schünemann, MD, PhD, MSc, Michael G. DeGroote Cochrane Canada and McMaster GRADE Centres, McMaster University, HSC-2C, 1280 Main Street West, Hamilton, ON L8N 3Z5, Canada (e-mail, schuneh@mcmaster.ca), and Elie. A Akl, MD, MPH, PhD, Clinical Research Institute and AUB GRADE Center, American University of Beirut, PO Box 11-0236/CRI (E15), Riad-El-Solh Beirut, 1107 2020 Beirut, Lebanon (e-mail, ea32@aub.edu.lb).

**References**

1. **Burns GP, Lane ND, Tedd HM, et al.** Improved survival following ward-based non-invasive pressure support for severe hypoxia in a cohort of frail patients with COVID-19: retrospective analysis from a UK teaching hospital. BMJ Open Respir Res. 2020;7. [PMID: 32624494] doi:10.1136/bmjresp-2020-000621

2. **Lalla U, Allwood BW, Louw EH, et al.** The utility of high-flow nasal cannula oxygen therapy in the management of respiratory failure secondary to COVID-19 pneumonia [Letter]. S Afr Med J. 2020;110:12941. [PMID: 32880537]

3. **Wang T, Tang C, Chen R, et al.** Clinical features of coronavirus disease 2019 patients with mechanical ventilation: a nationwide study in China. Crit Care Med. 2020;48:e809-e812. [PMID: 32618693] doi:10.1097/CCM.0000000000004473

4. **Schünemann HJ, Khabsa J, Solo K, et al.** Ventilation techniques and risk for transmission of coronavirus disease, including COVID-19: a living systematic review of multiple streams of evidence. Ann Intern Med. 2020;173:204-216. [PMID: 32442035] doi:10.7326/M20-2306

5. **Rochwerg B, Solo K, Darzi A, et al.** Update alert: ventilation techniques and risk for transmission of coronavirus disease, including COVID-19 [Letter]. Ann Intern Med. 2020;173:W122. [PMID: 32735446] doi:10.7326/L20-0944

6. **Hong Y, Li J, Zhao G, et al.** Clinical diagnosis and prognosis analysis of severe patients with novel coronavirus pneumonia. Ningxia Med J. 2020;42:337-339.

7. **Wang K, Zhang Z, Yu M, et al.** 15-day mortality and associated risk factors for hospitalized patients with COVID-19 in Wuhan, China: an ambispective observational cohort study [Letter]. Intensive Care Med. 2020;46:1472-1474. [PMID: 32328724] doi:10.1007/s00134-020-06047-w

8. **Duca A, Memaj I, Zanardi F, et al.** Severity of respiratory failure and outcome of patients needing a ventilatory support in the emergency department during Italian novel coronavirus SARS-CoV2 outbreak: preliminary data on the role of helmet CPAP and non-invasive positive pressure ventilation. EClinicalMedicine. 2020;24:100419. [PMID: 32766538] doi:10.1016/j.eclinm.2020.100419

9. **Wu C, Chen X, Cai Y, et al.** Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. JAMA Intern Med. 2020;180:934-943. [PMID: 32167524] doi:10.1001/jamainternmed.2020.0994

10. **Zheng Y, Sun LJ, Xu M, et al.** Clinical characteristics of 34 COVID-19 patients admitted to intensive care unit in Hangzhou, China. J Zhejiang Univ Sci B. 2020;21:378-387. [PMID: 32425003] doi:10.1631/jzus.B2000174

11. **Shang J, Du R, Lu Q, et al.** The treatment and outcomes of patients with Covid-19 in Hubei, China: a multicentered, retrospective, observational study. SSRN. Preprint posted online 3 March 2020. doi:10.2139/ssrn.3546060

Supplement. Supplementary Material