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Letter to the Editor

Using PaCO2 as a sensitive information for detection of respiratory deterioration in severe COVID-19 patients

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Dear Editor,

Dr Helmy and colleagues should be congratulated for their great work recently published in the *Anaesthesia Critical Care and Pain Medicine* journal [1]. This original study provided insight into the diaphragmatic excursion as an available, free, and reproducible tool to predict the need for further invasive ventilation rescue and mortality in patients with Coronavirus 2019 disease (COVID-19). They found an excellent positive predictive value for ventilatory support requiring if the right diaphragmatic excursion decreased below 24 mm. We could stand if this diaphragmatic excursion threshold value is reached, patient's respiratory distress is no longer compensated and invasive ventilation appears as necessary protection.

We think that Patient Self-Induced Lung Injury (P-SILI) and associated hypocapnia may play a role in severity assessment. Some patients might have an initial intensive respiratory effort followed by a decreased ability to provide adequate respiratory effort. Therefore, an initial hypocapnia (induced by a high respiratory drive) at or before the ICU admission could be a sensitive trigger to detect these patients at risk for invasive ventilation. An early paCO2 follow-up appears as an attractive way to detect this intensive respiratory effort. Face to severe hypoxaemia, patients develop a greater respiratory effort up to a P-SILI phenomenon, in both invasive or non-invasive ventilation in ARDS, leading to a respiratory deterioration [2]: An excessive transpulmonary pressure results in heterogeneous distribution of transpulmonary pressure variations with a cyclic opening/closing of non-dependent regions, Pendelluft phenomenon and volutrauma [3]. P-SILI should not provide a systematic rescue for invasive ventilation, especially in patients with severe COVID-19, but constitutes a warning sign with constant reassessment [4]. In this insight from Lung Safe Study, Madotto and al. underlined the association with early hypocapnia and ICU mortality, in particular among mild and moderate ARDS patients [5]. Although hypercapnic patients presented more severe ARDS, a higher mortality was observed in the hypocapnia patients group. If not recognised by clinical assessment or by a close paCO2 monitoring, an excessive respiratory effort detected during the diaphragmatic excursion should alert the physician.

For these reasons, hypocapnia induced by an excessive diaphragmatic course in patients with severe COVID-19 requiring oxygen therapy may represent an additional and earlier "red flag" for patients at risk for P-SILI. If these data were available in authors' records in the current study or in a former work by Helmy et al., it would be interesting to compare PaCO2 values (not presented by authors) with the diaphragmatic course [1–6].

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Conflict of interests

The authors have no competing interest to declare.

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