



**HAL**  
open science

## Ventilating multiple patients on a single ventilator: Statement from the French Society of Anaesthesia and Intensive Care (SFAR)

Emmanuel Futier, Samir Jaber, Olivier Joannes-Boyau

### ► To cite this version:

Emmanuel Futier, Samir Jaber, Olivier Joannes-Boyau. Ventilating multiple patients on a single ventilator: Statement from the French Society of Anaesthesia and Intensive Care (SFAR). *Anaesthesia Critical Care & Pain Medicine*, 2020, 10.1016/j.accpm.2020.04.014 . hal-02612664

**HAL Id: hal-02612664**

**<https://hal.science/hal-02612664>**

Submitted on 4 Jul 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Ventilating multiple patients on a single ventilator: Statement from the French Society of Anaesthesia and Intensive Care (SFAR)

In the hypothesis where the number of patients requiring invasive mechanical ventilation would exceed the present capacities and availability of ventilators in French health care facilities, the possibility of employing a single ventilator to ventilate several patients has recently been suggested. The French Society of Anaesthesia and Intensive Care [“Société française d’anesthésie et de réanimation” (SFAR)] was requested to support the elaboration of recommendations regarding how such a therapeutic option could be used in the Coronavirus disease 2019 (COVID-19) epidemic context.

The SFAR does not recommend this therapeutic strategy in the actual context and strongly advises clinicians that placing multiple patients on the same ventilator should not be attempted, since data to guarantee the safe use of such procedure are largely lacking [1,2]. Similar recommendations were made by the Society of Critical Care Medicine (SCCM), the American Association for Respiratory Care (AARC), the American Society of Anesthesiologists (ASA), the Anesthesia Patient Safety Foundation (ASPF), the American Association of Critical-Care Nurses (AACN) and the American College of Chest Physicians (CHEST).

The logic underlying the use of a single ventilator to treat several patients may, at first glance, respond to our most precious and fundamental desire of saving lives of patients with acute respiratory failure in a context of resource shortage.

There are certain situations in which ventilating two or more patients using a single ventilator could at least theoretically work well. This is most likely to be the case for patients with similar characteristics of the respiratory system (compliance and resistance) when mechanical ventilation is instituted and, most importantly, whose respiratory mechanics will remain unchanged until ventilators allowing individualised settings will become available.

Unfortunately, these conditions will presumably rarely be met in patients with acute respiratory distress syndrome (ARDS), especially in the context of COVID-19 pneumonia where different patterns of presentation may be found [3]. International guidelines have recommended the use of lung-protective mechanical ventilation to limit ventilator-induced lung injury [4]. This remains obviously true in COVID-19 patients for which personalised mechanical ventilation tailored to lung morphology may be of particular interest [5].

The pathophysiology of ARDS is complex and may involve modifications in lung mechanics (compliance) in relation with the evolution of the underlying causing pathology and the resuscitation strategy (e.g. fluid loading), which may require frequent adaptations of ventilator settings, including but not limited to tidal volume, positive end-expiratory pressure, use of recruitment

manoeuvres, as well as prone positioning. Ventilating a patient with ARDS may be challenging, attempting to ventilate several patients on a single ventilator could expose all patients to an increased risk of complications or even increased mortality. Finally, placing several patients on a single ventilator implies considering the following:

- providing accurate individualised monitoring of respiratory mechanics (including plateau pressure, tidal volume and the inspired fraction of oxygen), which is of critical importance in ARDS patients, would be not possible;
- providing individualised alarm monitoring and management (at least peak airway pressure, minimal and maximal tidal volume, minute ventilation), required for pressure-controlled or volume-controlled ventilation modes, would be not possible, as it could have possible dramatic consequences in case of pneumothorax;
- in the case of a complication justifying interruption of ventilation in one patient, ventilation to all other patients would need to be stopped (possible aerosolisation of the virus in the context of COVID-19 patients);
- even if all patients have similar respiratory mechanics at initiation of ventilation, any deterioration in one patient (increased lung elastance) would lead to significant inhomogeneity of tidal ventilation distribution – resulting in possible harm (volutrauma) to less seriously ill patients;
- spontaneous ventilation of a single patient would disrupt the respiratory cycle of all patients by imposing its frequency;
- finally, there is also a theoretical risk of transmission of viral load as well as exchange of gas volume between patients due to the “Pendelluft” effect.

It is not difficult to understand that using a single ventilator to support several patients may be an appealing option in a resource shortage context. Nevertheless, if this extreme salvage solution was to be chosen, whether as a transitional or sustainable option, clinicians should be fully aware of the potential aforementioned risks and, most importantly, after having exhausted all other available resources (ICU ventilators, anaesthesia machines, transport ventilators, home-care ventilators). If the ventilator can be lifesaving for a single individual, ventilating multiple patients on a single ventilator can precipitate treatment failure for all of them.

### Funding

Support for this study was provided solely via institutional sources.

### Disclosure of interest

EF reports receiving consulting fees from Dräger Medical, GE Healthcare, Edwards Lifesciences, and Orion Pharma and lecture fees from Fresenius Kabi, Baxter, and Fisher & Paykel Healthcare. SJ reports receiving personal

fees from Drager, Fisher & Paykel, Medtronic, Fresenius-Xenios, and Baxter. OJB reports receiving consulting fees from Baxter and BBraun.

## References

- [1] Branson RD, Rubinson L. One ventilator, multiple patients – what the data really supports. *Resuscitation* 2008;79(1):171–2.
- [2] Branson RD, Blakeman TC, Robinson BR, Johannigman JA. Use of a single ventilator to support 4 patients: laboratory evaluation of a limited concept. *Respir Care* 2012;57(3):399–403.
- [3] Gattinoni L, Chiumello D, Caironi P, et al. COVID-19 pneumonia: different respiratory treatments for different phenotypes? *Intensive Care Med* 2020. <http://dx.doi.org/10.1007/s00134-020-06033-2>.
- [4] Fan E, Del Sorbo L, Goligher EC, et al. An Official American Thoracic Society/ European Society of Intensive Care Medicine/Society of Critical Care Medicine clinical practice guideline: mechanical ventilation in adult patients with acute respiratory distress syndrome. *Am J Respir Crit Care Med* 2017;195(9): 1253–63.
- [5] Constantin JM, Jabaudon M, Lefrant JY, et al. Personalised mechanical ventilation tailored to lung morphology versus low positive end-expiratory pressure for patients with acute respiratory distress syndrome in France (the LIVE study): a multicentre, single-blind, randomised controlled trial. *Lancet Respir Med* 2019;7(10):870–80.

Emmanuel Futier<sup>a,\*</sup>, Samir Jaber<sup>b</sup>, Olivier Joannes-Boyau<sup>c</sup>  
<sup>a</sup>*Département Anesthésie et Réanimation, Centre Hospitalier Universitaire (CHU) Clermont-Ferrand, Hôpital Estaing, and Université Clermont-Auvergne, CNRS, INSERM U-1103, 63000 Clermont-Ferrand, France*

<sup>b</sup>*Département Anesthésie et Réanimation B (DAR B), Centre Hospitalier Universitaire (CHU) de Montpellier, Hôpital Saint-Éloi, and INSERM U-1046, 34295 Montpellier, France*

<sup>c</sup>*Service Anesthésie et Réanimation SUD, Centre Hospitalier Universitaire (CHU) de Bordeaux, Centre médico-chirurgical de Magellan, 33000 Bordeaux, France*

\*Corresponding author at: Département de médecine périopératoire, Anesthésie réanimation, 1, place Lucie-Aubrac, 63003 Clermont-Ferrand cedex 1, France  
*E-mail address: [efutier@chu-clermontferrand.fr](mailto:efutier@chu-clermontferrand.fr) (E. Futier).*