

Monitoring Respiratory Mechanics During Multiplex Ventilation

To the Editor:

We read with extreme pleasure the recent research by Chatburn and colleagues¹ about multiplex ventilation published in the July issue of *RESPIRATORY CARE*. We applaud our colleagues on their meticulous methods and findings.

All clinicians fighting the COVID-19 pandemic are faced with the potential issue of mechanical ventilator shortages. Like others, we also designed and tested our own of multiplex ventilation system in 2 hospitals in preparation for a surge of patients and lack of ventilators. Our research was published in September 2020.² We agree with Chatburn et al¹ that the use of these systems is much more complex and inherently dangerous if done with little expertise, and it is not as simple as advertised in social media.

There are many pitfalls with this ventilation technique, especially regarding rebreathing and flow diversion from one patient circuit to the other; one-way valves have been used to mitigate this issue. Most important is the issue of individualized settings for tidal volume and PEEP.

We want to discuss another important problem illustrated in the article, namely patient monitoring. We believe this is one of the most vital issues to address because it allows clinicians to detect improvements or deterioration and adjust the settings accordingly. Chatburn et al¹ offer a solution of monitoring patients' tidal volumes and PEEP, where one patient exhales to atmosphere while the other exhales through the ventilator's exhalation valve. We would like to offer another solution that allowed us, in our experiment, to monitor those parameters as well as measure the respiratory mechanics and pressure-volume curves individually without flow interruption or circuit disconnection to the other patient.

Using a ventilator with an external flow sensor placed close to the circuit Y-piece, along with flow sensor tubing from each patient connected with a 3-way stopcock to the ventilator, it is possible to alternately assess each patient's respiratory mechanics by closing the sensor to one patient to monitor the other (Fig. 1). In our experiment we used a Hamilton ventilator (Hamilton Medical, Bonaduz, Switzerland) as an example of a ventilator with an external flow sensor.

We understand that the vast majority of mechanical ventilators have their flow

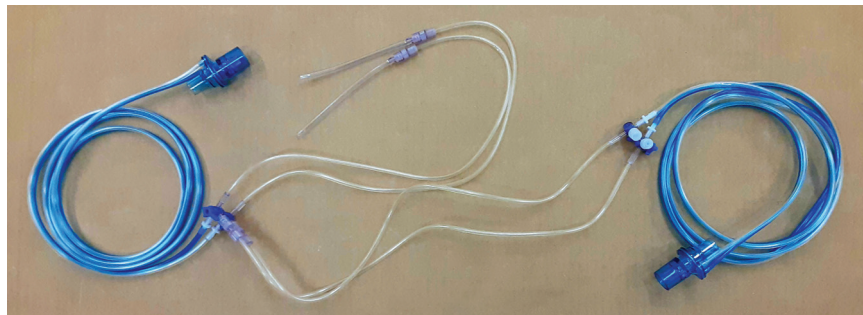


Fig. 1. Two flow sensors connected together with a 3-way stopcock, with ends connected to the ventilator side and each end to the patient side.

sensors inside the ventilator and that this solution might be impractical in some situations, but we wanted to share a quick, reasonable option.

Ehab G Daoud

John Burns School Of Medicine
(JABSOM)
University of Hawaii, Hawaii
Respiratory Care Program
Kapiolani Community College, Hawaii

Correspondence: Ehab G Daoud MD.
E-mail: ehab_daoud@hotmail.com

DOI: 10.4187/respcare.08373

REFERENCES

1. Chatburn RL, Branson RD, Hatipoğlu U. Multiplex ventilation: a simulation-based study of ventilating 2 patients with a single ventilator. *Respir Care* 2020;65(7):920-931.
2. Daoud EG, Cabbat R, Cabigan J, Kaneshiro G, Yamasaki K. Split-ventilation for more than one patient, can it be done? Yes. *J Mech Vent* 2020;1(1):1-7.

The authors respond:

We appreciate the comments by Dr Daoud with regard to the use of a proximal flow sensor to monitor individual tidal volumes during multiplex ventilation. We agree that monitoring of delivered volumes and pressures to the individual patient is key to safe use of multiplex ventilation.¹ However, we urge caution with regard to the modification of a flow sensor. Altering the length of the tubing from the flow sensor or changing the internal diameter of the tubing defeats the calibration and validation integral to the device. We would encourage Dr Daoud to test this system at the bench to determine the impact of these alterations on

the accuracy of flow and volume measurements before attempting this with patients.

Respiratory therapy has a long history of modifying equipment to meet the needs of patients. These modifications have often been made with emphasizing the principle of "can we do it?" We should be careful to assure that these changes are safe and anticipate potential consequences.

Robert L Chatburn

Department of Respiratory Care
Cleveland Clinic
Cleveland, Ohio

Richard D Branson

Department of Surgery
University of Cincinnati
Cincinnati, Ohio
Editor-in-Chief, Respiratory Care
Irving, Texas

Umur Hatipoğlu

Department of Critical Care Medicine
Cleveland Clinic
Cleveland, Ohio

Correspondence: Robert L Chatburn MHHS
RRT RRT-NPS FAARC, Department of
Respiratory Care Cleveland Clinic, 9500
Euclid Ave, Cleveland, OH 44195. E-mail:
chatbur@ccf.org

Mr Chatburn has disclosed relationships with IngMar Medical, Vyair Medical, and Hillrom. Mr Branson has disclosed relationships with Mallinckrodt, Pfizer, Ventec Life Systems, Vyair, and Zoll Medical. Dr Hatipoğlu has disclosed no conflicts of interest.

DOI: 10.4187/respcare.08582

REFERENCE

1. Chatburn RL, Branson RD, Hatipoğlu U. Multiplex ventilation: A simulation-based study of ventilating 2 patients with a single ventilator. *Respir Care* 2020;65(7):920-931.