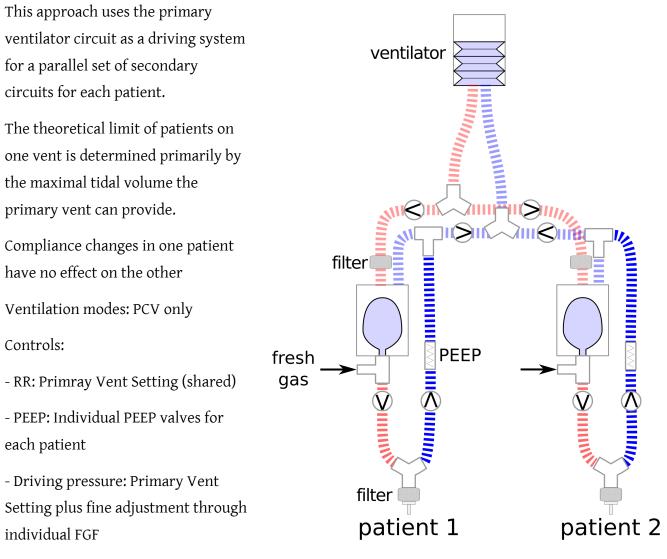
From the laboratories of Azad Mashari, Jay Han and Joseph Fisher

One suggested approach to the severe global shortage of ventilators during the current pandemic has been the splitting of ventilators in order to ventilate multiple patients with one device. The simplest version of this involves simply splitting the inspiratory and expiratory limbs of the circuit into a branch for each patient. Indeed a 3D-printable splitter device, the Prisma VEsper, was granted emergency approval by the FDA last week. This approach however poses significant risks and has a high likelihood of harming one or both patients. This motivated a joint statement by all the major critical care societies and the Anesthesia Patient Safety Foundation (<u>https://www.apsf.org/news-updates/joint-statement-on-multiple-patients-per-ventilator/</u>) warning about the hazards of such an approach.

Our team is investigating an alternative technique for ventilator splitting which addresses the hazards, at the cost of a significant increase in complexity. This approach includes separate fresh gas flows and pressure-isolated secondary circuits for each patient with the primary ventilator acting to drive a bellows assembly for each patient circuit. This technique is still limited to pressure control mode and the respiratory rates of the two patients must be matched, but FiO2, PEEP, and driving pressure/tidal volume can be individually adjusted and, most critically in terms of safely, compliance changes in one patient or obstruction in one of the patient circuits does not impact the ventilation to other patients. Bench validation of the model will be completed over the next week with further testing to follow.

## **Cerebrus Ventilation Splitting Strategy**

Based on Sommer DD, Fisher JA, Ramcharan V, Marshall S, Vidic DM. Improvised automatic lung ventilation for unanticipated emergencies. Crit Care Med. 1994;22: 705–709.



- FiO2: individual FGF control