The Limb-O circuit (Vital Signs, Inc.) is a single-lumen circuit designed to have less tubing at the bedside, no need for additional humidification and less weight on the patient's airway. Equipped with a heat moisture exchanger (HME), the smooth common wall found inside the tubing, reduces turbulent flow resulting in a resistance that is comparable to a traditional ventilator circuit. The purpose of this study is to evaluate the expiratory resistance across the expiratory limb of the Limb-O circuit as compared to a heated-wire circuit when ventilating an electronic lung simulator. Additional studies are needed to determine whether or not this is clinically significant for patients. This study was performed without additional heat or humidification; results may vary when using heated, humidified circuits. Based on these findings, there is an increase in resistance across the expiratory limb of the Limb-O circuit compared to a heated-wire circuit when ventilating an electronic lung simulator. Further research is needed to determine the clinical significance of these findings.

**Methods:** A Dräger XL ventilator, with a CMV rate 12 BPM and tidal volume 500 mL, was used with a Limb-O circuit and with a heated-wire circuit. To measure the resistance across the circuit, pressure and flow transducers were connected at the patient wye and immediately before the exhalation valve. Each circuit was then connected to a Hans Rudolph Electronic Breathing Simulator (HR 1101). A compliance of 100, 80, 60, 40 and 20 mL/cm H2O and PEEP of 3, 6, 9, 12 and 15 cm H2O were used. The expiratory resistance was higher using the Limb-O circuit than the heated-wire circuit at each compliance and PEEP setting. At PEEP of 6 cm H2O and 12 mL/cm H2O, the expiratory resistance was 3.74 cm H2O/L and 2.40 cm H2O/L, respectively. This trend in expiratory resistance was similar at each PEEP setting.

**Discussion:** The results of this study suggest that the Limb-O circuit may have a higher resistance compared to a traditional heated-wire circuit. This could result in increased work of breathing and potentially affect patient comfort and respiratory mechanics. Future studies should evaluate the clinical implications of these findings on patient outcomes.