

This month's Editor's Choice is a prospective trial evaluating the impact of heliox on airway pressures and gas exchange in mechanically ventilated subjects with severe airflow obstruction. Leatherman and colleagues report a 10% reduction in peak airway pressure but no change in plateau pressure. Importantly, there was also no decrease in the total PEEP and the fall in  $P_{aCO_2}$  was minor. They conclude, that despite anecdotal reports, heliox has no impact on dynamic hyperinflation. In the accompanying editorial, Kleiman and Huffmyer describe the potential benefits of heliox, beyond the mechanically ventilated patient with severe disease. Heliox has benefits during aerosol therapy and perhaps is best suited for spontaneously breathing patients with less severe disease.

Povitz and coworkers report on home mechanical ventilation in Ontario, Canada over a 12-year period. In a province with a population of 13,000,000, the use of home mechanical ventilation increased by 0.3/100,000 persons from 2000 to 2012. Increases in the use of home mechanical ventilation were primarily for neuromuscular disease and thoracic restriction. The initiation of home ventilation was associated with a decrease in hospitalizations compared to the prior year. Sayas Catalan and Lujan comment on the importance of developing robust home ventilation registries in an effort to evaluate outcomes in this population.

To date, a 30-min a spontaneous breathing trial (SBT) remains the standard of care for determining patient readiness for ventilator liberation. Guopeng et al evaluated characteristics of subjects who passed an SBT at 30 min, but failed at 120 min. They found that  $P_{aCO_2}$ , rapid shallow breathing index,  $P_{aO_2}/F_{IO_2}$ , breathing frequency, and pH were independently associated with 120-min SBT failure. Two or more of these predicted SBT failure. Nanchal and Truwit point out that an aggregate score can be useful but does not identify the etiology of SBT failure; the latter being critical to avoiding future failure.

CPAP is a standard of care for treating neonatal respiratory distress. Bennett and coworkers describe a low-cost bubble CPAP device designed for low-resource settings. Comparing this system to a commercially available system demonstrated similar performance. A number of devices for low resource settings have been described to bring this technology to emerging nations.

High frequency oscillation (HFO) remains an important rescue therapy in pediatrics. Rowan and others performed a retrospective analysis of 85 pediatric allogenic hematopoietic cell transplant subjects with ARDS who received HFO. They found that early use of HFO was associated with improved survival compared to late implementation, and had similar outcomes to subjects treated only with conventional mechanical ventilation. Numbers were too small for definitive conclusions, but early HFO and conventional mechanical ventilation had higher survival compared to late HFO.

DeJulio and others evaluated the use of an open face mask design for oxygen therapy. The open mask design theoretically allows the use of lower flows without concern for  $CO_2$  rebreathing. Using a historical control they noted a decrease in the volume of oxygen used and no reported change in adverse events.

Using a portable ventilator during transport reduces variations in ventilator support compared to manual ventilation, yet manual ventilation is commonly used. Walton et al found that ventilator use was suboptimal during inter-facility transport of pediatric subjects. They developed a ventilator boot camp to educate respiratory therapists in the use of a portable ventilator. They found that the boot camp increased the knowledge and skills associated with mechanical ventilator use during transport. They also identify the need for re-education at defined intervals to maintain skills.

Walters and colleagues evaluated 4 methods of securing endotracheal tubes using twill tape. Endotracheal tubes were secured using 4 different knots and tested for slippage of the twill tape in both wet and dry conditions. The authors found that the double hitch was the only knot that prevented slipping in both wet and dry conditions. The authors suggest use of the double hitch knot may reduce accidental extubation.

Lacerda et al describe a multidetector computed tomography (MDCT) method for monitoring lung dysfunction in cystic fibrosis (CF) subjects. The MDCT results were paired with pulmonary function testing in subjects with CF and normal subjects. Subjects with CF had larger non-aerated regions and more poorly aerated regions compared to controls. These findings correlate well with pulmonary function studies. MDCT can be used to evaluate structural and functional changes in disease progression.

Sedation during mechanical ventilation represents a challenge for the ICU team. Excessive or too little sedation each have consequences. Meiser and co-workers describe the use of a system for providing inhaled anesthesia during mechanical ventilation. Compared to propofol and midazolam, isoflurane allowed continued spontaneous breathing and reduced the need for opioids. The system uses a technology to return isoflurane in a fashion similar to a heat and moisture exchanger returning heat and humidity.

Monitoring respiratory function during procedural sedation is a key to patient safety. Nichols and colleagues describe the use of a respiratory volume monitor (RVM) that measures minute volume using noninvasive impedance from a chest wall sensor. During total intravenous anesthesia, all subjects were monitored using the RVM. The control group blinded RVM data to the anesthesiologist while the intervention group had access to the data. Compared to baseline minute volume, the intervention group spent less time at a  $\dot{V}_E < 40\%$  and had fewer apneas. The authors suggest that the RVM may be a useful tool for identifying early signs of respiratory depression and maintaining adequate ventilation to minimize patient risk.

The helmet interface is a unique interface for noninvasive ventilation. Mayordomo Colunga et al compared the helmet to nasal prongs to deliver CPAP in pediatric subjects with bronchiolitis. In a crossover trial lasting 60 min, the devices performed similarly. There was no difference in need for invasive ventilation or in measured physiologic parameters. These data suggest that the helmet is equivalent to nasal prongs in this small group of pediatric subjects.