

This month's Editor's Choice is a retrospective study by Jimenez and others evaluating the impact of noninvasive ventilation (NIV) on transcutaneous carbon dioxide (P_{tCO_2}) in subjects treated for chronic hypercapnia. In a group of 337 subjects, probability of survival was improved when P_{tCO_2} was < 50 mm Hg after 90 days. The authors concluded that reducing $TcPCO_2$ from baseline in subjects with chronic hypercapnia using NIV was associated with improved survival and that NIV strategies should target the greatest possible reductions in $TcPCO_2$. Locke and Brown provide an accompanying editorial. They note that this retrospective trial cannot infer causality. It is possible that inability to reduce $TcPCO_2$ is an indicator of mortality risk versus its cause. They argue for prospective studies to make this determination.

Rogerson et al performed a retrospective analysis of data from 157 institutions via the Virtual Pediatric Systems database to predict the duration of mechanical ventilation. Data over a decade evaluated subjects requiring mechanical ventilation for > 24 h. They found observed-to-expected ratios (O/E) were close to one, however there were large O/E differences between institutions. They concluded that the model developed might be beneficial in benchmarking and quality improvement initiatives in individual facilities. Dalabih and Aljababri provide commentary. They suggest that the results can best be used to help identify facilities with low O/E ratios, investigate best practices, and track performance over time.

Wise and colleagues describe an educational initiative using training dolls to enhance caregiver education of children with tracheostomy. Caregivers received a training doll to practice tracheostomy placement skills or standard education. Two questionnaires were used to evaluate the utility of the training dolls, skills practiced, and caregiver confidence in related skills. Caregivers who received a training doll felt training was helpful for practicing skills and demonstrated improved confidence in skills (changing the tube, providing manual ventilation). Use of the training doll did not impact hospital length of stay or time to complete training. Nickel and colleagues concur with the findings but call for further research to focus on the impact of training on quality of home care, sustainability of skills over time, and impact on healthcare utilization.

Zander et al report the results of a bench study comparing proximal airway pressures to tracheal pressures during pressure control ventilation. During testing compliance was varied between 10 and 100 mL/cm H_2O and with variable I:E. They found differences between proximal and tracheal pressures of as much as 8 cm H_2O . They suggest a small pressure sensor at the tip of the endotracheal tube could be an alternative pressure monitoring site for ventilator control.

Furlong-Dillard and others retrospectively reviewed the incidence and severity of oxygen desaturations during intubation of children on noninvasive respiratory support. They evaluated oral intubations over 18 months, defining desaturation events based on the S_{pO_2} value. Subjects were stratified based on preintubation respiratory support including oxygen via nasal cannula at standard flows, high-flow nasal cannula (HFNC), HFNC at > 2 L/kg/min, and NIV. They reported severe desaturation events in 12% of subjects. Factors associated with desaturation events included $F_{IO_2} > 0.60$ and duration of support before intubation. NIV was also independently associated with severe desaturation.

Alanzi and Li conducted a bench study of five different HFNC devices on transnasal aerosol delivery. Each device was set at

flows from 10–60 L/min. Salbutamol was placed in the nebulizer and a filter was used to collect delivered aerosol which was measured using spectrophotometry. Different HFNC devices performed similarly with few differences, except the Vapotherm device which consistently delivered the lowest dose. They concluded that HFNC devices and increasing flows impacted aerosol delivery.

Smyth et al evaluated pulmonary function and incremental cardiopulmonary exercise testing (CPET) in subjects with idiopathic pulmonary fibrosis. CPET included measurements of lung volume, Borg score, and leg discomfort scores. Subjects with severe diffusion limitation ($D_{LCO} < 40\%$) demonstrated more severe restrictive disease, lower peak work rate, and earlier anaerobic threshold. They concluded that severely reduced D_{LCO} in interstitial lung disease was associated with greater cardiovascular impairment, greater dyspnea, and more leg discomfort. They suggest these subjects might represent patients who might benefit from pharmacologic intervention.

Nagumo and colleagues conducted an open-label, randomized controlled trial of the impact of airflow directed at the face with a fan in subjects with dyspnea associated with chronic respiratory disease. They measured dyspnea using a visual analog scale and physical activity level. There were no differences in measured variables between groups after three weeks of study at home.

Roldán et al performed a single center observational study of 166 subjects with COVID-19 and ARDS. They set out to determine the prognostic performance of the oxygenation stretch index (oxygenation and ΔP) on 60-d mortality. Prognostic factors were evaluated through receiver operating characteristic (ROC) analysis, Cox proportional-hazards regression model, and Kaplan–Meier survival curves. Oxygenation, ΔP , and composite variables were tested: oxygenation stretch index (OSI: P_{aO_2}/F_{IO_2} divided by ΔP) and $\Delta P \times 4 +$ breathing frequency ($\Delta P \times 4 + f$). At both day 1 and day 2 after inclusion, the OSI had the best area under the ROC curve. They suggested that the oxygenation stretch index might be useful in predicting outcomes in patients with COVID-19 and ARDS.

Bergez and coworkers performed a bench study of noise produced by neonatal ventilators inside and outside of incubators using a range of respiratory support modalities. They studied 9 neonatal ventilators in invasive ventilation, high frequency oscillation ventilation (HFOV), NIV, and CPAP. Sound measurements were performed inside and outside an incubator mimicking the clinical setting. Invasive ventilation was the quietest technique and HFOV the loudest. They concluded that modern ventilators produce clinically relevant noise, independent of the respiratory support modality, with acceptable noise levels being measured only outside the incubator.

Wollstein and others contribute a short report on the implementation of a tracheostomy airway safety placard placed at the bedside of tracheostomized children. Placards emphasized critical airway anomalies as well as an emergency management algorithm were placed at the head of the bed and remained with the patient during transport. A survey was conducted pre- and post-implementation. They received a response rate of 44%. Following placard use there were increases in the domains of confidence. Less experienced providers (≤ 5 years of experience) demonstrated improved confidence post-implementation.

Ferraz et al contribute a narrative review on physiologic markers of disease severity in ARDS. This review describes the

strengths and limitations of relevant parameters, with the goal of better understanding disease severity and future treatment targets. Zhang and others provide a systematic review of the risk of fracture in osteoporosis in COPD subjects using inhaled corticosteroids. Their analysis does not support a connection between steroid use and fracture. Roberts contributes the final Year in Review on ventilator liberation. Morris and coworkers review phrenic nerve stimulation for acute respiratory failure as part of the New Horizons symposium. Damiani and colleagues provide

the final New Horizons paper on the importance of mechanical power during mechanical ventilation. A special article on eccentric contractions of the diaphragm during mechanical ventilation by García et al delves into the relationship between asynchrony, patient breathing effort, and diaphragmatic dysfunction.

Our symposium, *Research in Respiratory Care*, continues with how to write the methods section of a research manuscript by Denise Willis and how to write an effective discussion by Dean Hess.