

This month's Editor's Choice is retrospective review of ventilator alarms in the pediatric intensive care unit (PICU). High- and medium-priority alarms from two ventilators used in different ICUs were evaluated over 6 months. Langga et al identified 11 distinct ventilator alarms, with high-priority alarms more common with one ventilator and medium-priority alarms more common with the other. On average, 22.5 alarms occurred per ventilator day. Scott provides commentary on the importance of alarm settings, concerns about alarm fatigue, and the need for research aimed at alarm management that maximizes patient safety.

Urner and coworkers performed a secondary analysis of subjects undergoing diaphragmatic ultrasound and applied machine learning techniques to clinical data to stratify subject risk of diaphragmatic atrophy. Data from 191 subjects representing 761 study days failed to yield a variable predictive of diaphragmatic atrophy. However, a single measurement of diaphragmatic thickening fraction within 48 h of initiating ventilation was a good predictor of risk. Hilty and Sascha opine that big data and machine learning are only as good as the value of data entered. They remind us to 'mind the gap' between physiology and big data.

Dianti and others compared the measurement of deadspace to tidal volume ratio (V_D/V_T) to estimated V_D/V_T in subjects with ARDS. They also evaluated the measures in predicting driving pressure (ΔP) changes during extracorporeal carbon dioxide removal (ECCO₂R). The agreement between measured and estimated V_D/V_T was low, with more than half the error secondary to differences in CO₂ production. Predicted reductions of ΔP with ECCO₂R were similar, but only measured V_D/V_T predicted mortality. The authors conclude these cannot be used interchangeably in clinical practice. Kallet opines that the role of V_D/V_T in assessing the severity of ARDS and as a prognostic factor is evidence-based, but that researchers should be careful in these determinations when V_D/V_T is estimated.

Varipapa et al performed a retrospective cohort study of high-flow nasal cannula (HFNC) used to treat hypoxemic respiratory failure in an effort to identify variables associated with HFNC success and failure. In a group of 74 subjects (32 requiring intubation and 42 remaining on HFNC), they identified net fluid balance in the first 24 h as an important predictor of success. These differences in fluid balance were nearly 2.5 L/day. They also note that the respiratory rate-oxygenation index effectively predicted success.

McPeck and others conducted a bench study of continuous aerosol therapy during mechanical ventilation comparing a vibrating mesh nebulizer (VMN) with a breath-enhanced jet nebulizer (BEJN). The VMN was positioned on the dry side of the humidifier and the BEJN on the wet side. They measured inhaled mass using radiolabeled saline at 6 flows. VMNs failed to completely nebulize the saline in 20% of studies and deposited 15% of the dose in the humidifier. They concluded that BEJNs were more reliable than VMNs at a 10-12 mL/h infusion rate.

Krasinkiewicz and colleagues performed a single-center, retrospective chart review of mechanically ventilated pediatric subjects over 12 months to evaluate extubation readiness practices and barriers to extubation in individuals who passed a readiness screen. Of 427 subjects, 69% underwent a readiness screen prior to extubation. The most common reasons for delaying extubation were planned procedure (29%), neurological status (23%), and absence of leak around endotracheal tube (18%). They concluded that variations in extubation readiness practices could lead to significant delays in ventilator liberation.

Peterson et al evaluated a respiratory therapist (RT)-driven HFNC protocol in the PICU. HFNC was initiated and weaned according to a validated scoring tool. Adherence with the protocol was > 80% after 4 months, and HFNC duration decreased by half a day while PICU and hospital length of stay (LOS) fell by 0.5 d and 1 d, respectively. They suggest that an RT-driven HFNC protocol is safe and effective.

Duggal et al evaluated implementation of a protocol for ARDS management using a pre-post study design. Post protocol changes

included a reduction in plateau pressure and with a decrease in occurrence of a $V_T > 10$ mL/kg by more than half. They found that the protocol resulted in improved survival.

Pinède and colleagues evaluated expiratory valve resistance in ICU ventilators in a bench model. They measured flow and pressure immediately prior to the exhalation valve to determine resistance. While some differences in resistance were identified, the clinical impact of these small changes remains unclear.

Fusina and coworkers compared the association of corrected minute ventilation (\dot{V}_E), V_D/V_T , and ventilatory ratio on mortality in ARDS. Corrected \dot{V}_E is referenced to a normal P_{aCO_2} of 40 mm Hg and has the advantage of simple determination compared to other variables. They retrospectively studied 187 subjects with ARDS from COVID-19 and found that corrected \dot{V}_E was independently associated with hospital mortality.

Hayat Syed and others retrospectively reviewed data on total power during mechanical ventilation and evaluated the impact of obesity and severity of hypoxemia on risk of ventilator-induced lung injury (VILI). The components of power were calculated for each group of subjects stratified by BMI and hypoxemia. They concluded that understanding the contribution of both lung and chest wall mechanics is essential for managing VILI risk.

Kucher et al evaluated implementation of an asthma protocol in the PICU using a before and after study design. The primary endpoint was a reduction in time on continuous albuterol. Following implementation of the protocol, adherence rate was only 41% and there were no changes in continuous albuterol duration or LOS. In a subgroup of subjects in adherence with the protocol, albuterol use, PICU LOS, and hospital LOS were reduced.

Matlock et al implemented a quality improvement protocol for weaning noninvasive respiratory support in neonates. The primary outcome was time to wean support. In a sample of 89 subjects, protocol implementation demonstrated expedited weaning of respiratory support, and reductions in LOS and in growth velocity. They concluded that, in this population of 30-34 week gestation neonates, weaning could be facilitated but might negatively impact growth velocity.

Arnold and others evaluated inhaled medication use in smokers with normal spirometry. In a retrospective analysis, they categorized GOLD-0 subjects based on inhaled medication use from no medications up to dual bronchodilators with an inhaled corticosteroid. Use of inhaled medications was associated with increased frequency and severity of respiratory exacerbations and findings of obstructive spirometry at follow-up. These findings may predict which patients are likely to progress to obstructive lung disease.

Derasse et al compared chest expansion and lung function in healthy subjects and those with pulmonary disease and the impact of age and BMI. Chest expansion was measured using a tape measure at two points on the thorax. The relationship of chest expansion to pulmonary function testing was poor suggesting this measure provides little utility.

Chabert and coworkers performed a retrospective multicenter analysis of subjects with neuromuscular disease (NMD) admitted to the ICU for acute respiratory failure. Most of the 242 subjects had non-hereditary NMD and 112 were intubated at admission. Of the 119 who received noninvasive ventilation, 65% avoided intubation and ICU mortality was 14%. Noninvasive ventilation success and survival were reduced in NMD with bulbar involvement.

Gutiérrez-Arias and others provide a systematic review of electrical stimulation of respiratory muscles in mechanically ventilated subjects. Including 12 randomized controlled trials the authors suggest the current evidence is insufficient to recommend use. Taito et al provide a narrative review of telerehabilitation in subjects with respiratory disease. The authors highlight the impact of COVID-19 on the acceptance and success of telerehabilitation.