This month's Editor's Choice is a secondary analysis of a delayed cord clamping protocol evaluating the relationship of pH and Pa_{CO_2} to adverse outcomes. Brown and colleagues evaluated the degree of permissive hypercapnia in 147 neonates. They found no adverse events linked to hypocapnia. However, hypercapnia was associated with death and severe intraventricular hemorrhage. The authors conclude that moderate hypercapnia increases the risk of neurologic injury while providing no pulmonary benefit. In an accompanying editorial, Wells questions the idea that permissive hypercapnia is a safe and effective means of minimizing bronchopulmonary dysplasia. Wells suggests that efforts to achieve a normal physiologic state (normocarbia) remains an essential aspect of care for preterm newborns, and that despite its popularity, permissive hypercapnia should be avoided.

Pulmonary contusion is widely accepted as the most common etiology of hypoxemia following thoracic trauma, having far greater effect than mechanical disruption of the chest wall. Trauma surgeons from the University of Missouri evaluated the impact of pulmonary contusion on duration of ventilation, incidence of pneumonia, and mortality. Comparing subjects with similar severity of injury, they found pulmonary contusion had no impact on outcomes. Robinson comments that changes in trauma care including damage control surgery, fluid restriction, and lung protective ventilation appear to mitigate the contribution of lung contusion to negative outcomes. This finding suggests that in the past, high tidal volumes and aggressive fluid resuscitation with crystalloids exacerbated lung injury and that morbidity from pulmonary contusion may have been iatrogenic in origin.

Cesareo et al evaluated the impact of mechanical-insufflation-exsufflation (MI-E) on breathing pattern in stable subjects with Duchenne muscular dystrophy (DMD). They evaluated 20 subjects with DMD, using optoelectronic plethysmography following 5 cycles of MI-E. In these stable subjects without active infection they reported a reduction in breathing frequency and rapid shallow breathing index. This may easily be explained by hyperventilation associated with MI-E. However, the authors did report changes in chest wall properties. Benditt opines that while these are short-term changes, the care of patients with DMD requires an approach that improves cough function as well as maintenance of the mechanical properties of the lung and chest wall. He notes that further work to separate the impact of MI-E on lung and chest wall mechanics using esophageal manometry could provide answers to questions raised in this trial.

The use of positive expiratory pressure (PEP) to alleviate air-trapping and improve exercise tolerance in COPD has been demonstrated in previous studies. Phimphasak and colleagues describe the design of a conical PEP device which can be placed directly on to a face mask for this purpose. They tested a conical PEP device, 1 cm in length with an orifice size of 6 or 7 mm in a group of normal volunteers. This design resulted in effective PEP during exercise in these subjects with no adverse effects. The utility of this device in COPD patients remains to be elucidated.

Vilozni et al describe the utility of measuring inspiratory capacity (IC) in subjects with cystic fibrosis (CF). In a group of nearly 100 CF subjects they compared the % predicted IC to FEV_1, lung volumes, and hospitalizations. They found that IC fell along with FEV_1 and that a fall of the % predicted IC below 40% was associated with increased hospitalizations and hospital days. The authors suggest that IC may reveal silent worsening of lung function which may explain dyspnea, leading to an increase in hospitalization days/year.

Guan and coworkers report on the relationship of mixed venous oxygen saturation ($S_{\bar{v}O_2}$) to regional cerebral oxygenation ($rScO_2$) in 65 subjects during coronary artery bypass grafting. $S_{\bar{v}O_2}$ was obtained from a pulmonary artery catheter while $rScO_2$ reflects oxygen saturation in a small region of the frontal lobes monitored by near-infrared spectroscopy. They compared values at 5 time points across the continuum of care. There was a positive correlation between $rScO_2$ and $S_{\bar{v}O_2}$ during off-pump coronary artery bypass grafting, and a positive correlation in the variation trend between $rScO_2$ and $S_{\bar{v}O_2}$. Whether $rScO_2$ can replace $S_{\bar{v}O_2}$ cannot be determined from this investigation.

The 6-min walk distance (6MWD) is often used to evaluate aerobic capacity and endurance in patients with cardiorespiratory disease. Holland et al evaluated the 6MWD, nadir oxygen saturation (S_{pO_2}), and heart rate in 70 adults with idiopathic pulmonary fibrosis. They evaluated parameters following an intervention period, and again 6 months later. They report that using the longest 6MWD significantly reduced the proportion of subjects classified as having a clinically significant response to rehabilitation compared to using the first 6MWD. They conclude that the 6MWD is a reproducible measure of exercise capacity in subjects with idiopathic pulmonary fibrosis, but that evaluating change in 6MWD following an intervention may require 2 tests.

Morita and others evaluated heart rate recovery following a 6-min walk test in subjects with COPD. In 145 subjects they demonstrated that delayed heart rate recovery at 1 min was associated with shorter 6MWD, a more sedentary life style, and worse dyspnea scores. The authors suggest that the simplicity of measuring heart rate recovery may be advantageous in evaluating outcomes in COPD patients.

Tracheostomy has become a more common procedure in ventilated patients, being accomplished early to facilitate ventilator discontinuation. Ovnat Tamir and coworkers performed a retrospective analysis of morbidity and mortality of tracheostomy in a group of primarily elderly subjects. They demonstrated that late (> 15 d) surgical tracheostomy was not associated with increased 30-d morbidity or mortality rates. Comorbid conditions and the subject's age had a greater impact on 30-d mortality rate than the timing of tracheostomy.

Plotnikow et al evaluated the impact of oxygen delivered by high-flow nasal cannula (HFNC) in 16 normal subjects. They used electrical impedance tomography to evaluate changes in lung volumes at different flows in the supine and semi-sitting position. They report that the semi-sitting position and the use of HFNC increased end expiratory lung volumes globally. These changes were accompanied by a significant decrease in the breathing frequency. Changes in breathing frequency are likely due to washout of deadspace and are not with changes in expiratory lung volumes.

Mask fit is important to the success of NIV by minimizing leak, enhancing comfort, and preventing skin breakdown. Shikama et al describe the use of 3D personalized mask fitting on these factors in normal subjects. Compared to an off the shelf mask, the 3D personalized fitting device resulted in a reduced presence of blanchable erythema, standardized redness intensity, discomfort level, and contact pressure. These findings were particularly evident on the forehead, bridge of the nose, and cheeks. Leaks were also reduced. The authors suggest that 3D solutions may aid in reducing NIV mask-related pressure injury and discomfort.

Vargas and colleagues describe the performance of CPAP devices in a bench study. They evaluated 8 devices in a lung model connected via a standard orofacial mask. They simulated eucapnic breathing and tachypnea at different oxygen flow inputs. The major outcome measures were maintenance of airway pressure and total flow. They demonstrated significant variations in device performance. Greater flow output was associated with maintenance of CPAP. The importance of these findings in patients remains to be determined.

Morita and others evaluated the optimum sit-to-stand (STS) test in subjects with COPD. The primary difference in protocols is the duration and number of repetitions. In 23 COPD subjects they found that the 1-min STS resulted in higher hemodynamic demands and correlated better with clinical outcomes. They noted that despite the greater hemodynamic demands of the 1-min STS, there was a good level of agreement among the 3 protocols. All 3 tests were able to discriminate subjects with low and preserved exercise capacity.

Resistance training has become a popular method of exercise in COPD subjects. This can be accomplished with elastic resistance or traditional weight training. Vanderlei and coworkers compared the impact of different resistance training methods on cardiac autonomic modulation of post-exercise recovery in COPD subjects. Heart rate variability was used to evaluate autonomic modulation. Post-exercise recovery time was similar for all resistance training methods. With the lack of differences, the authors suggest that the use of elastic bands should be used because of the lower costs and simplicity.

An invited review comes from the University of California at San Francisco group well known for their expertise in ARDS. Pais and others take a close look at the impact of inclusion/exclusion criteria in studies of ARDS on the reported mortality rates. They note that ARDS has a much higher mortality rate in observational studies compared to randomized controlled trials. A host of potential factors may explain these differences including disease heterogeneity, comorbidities, subject commitment to care, and adherence to lung protective protocols. Patient selection and enrollment timing may also impact mortality. This review highlights the impact of subject- and trial-related factors influencing mortality rates in ARDS observational studies and randomized controlled trials.