

This month we are pleased to publish the proceedings from the conference, Pediatric Respiratory Care. We offer a special thanks to Brian Walsh and Ariel Berlinski for co-chairing.

Walsh and Smallwood review pediatric oxygen therapy. Over the years, we have learned about the benefits and risks of oxygen. Today oxygen is cheap, widely available, and easy to administer. Oxygen therapy has saved many lives and improved others. However, the risks, costs, and benefits should be considered in the same way as other drugs, and titrated to a measured endpoint. Withholding oxygen can have a detrimental effect, yet continuing to provide oxygen when it is no longer indicated can prolong hospitalization and increase costs.

Inhaled medications are the mainstay of therapy for many pediatric pulmonary diseases. Berlinski covers pediatric aerosol therapy. Device and delivery technique selection is key to improving lung deposition of inhaled drugs. This subject is reviewed as it relates to several pediatric clinical situations: acute pediatric asthma, transnasal aerosol delivery, delivery through tracheostomies, and delivery during noninvasive ventilation (NIV) and invasive mechanical ventilation.

Kuch et al review indications for inhaled pulmonary vasodilators in the pediatric ICU. Inhaled nitric oxide (INO) is only FDA cleared for neonates >34 weeks gestation with hypoxic respiratory failure. Off-label use of INO is common in pediatrics despite a lack of evidence regarding survival benefit, thus questioning whether the therapy should be used. Increasing health-care costs have led to the use of less costly inhaled prostacyclin as an alternative to INO, presenting unique patient safety concerns. The authors evaluate current evidence and patient safety considerations regarding INO and inhaled prostacyclin analogs in the pediatric population.

Fedor reviews noninvasive respiratory support in infants and children. CPAP and NIV offer an alternative to intubation and mechanical ventilation in the treatment of acute and chronic respiratory disorders commonly encountered in pediatrics. There are many challenges associated with application, management, and safety of noninvasive respiratory support in pediatrics. This review identifies indications, contraindications, management strategies, and safety measures associated with the application of CPAP and NIV delivery in children.

The Pediatric Acute Lung Injury Consensus Conference (PALICC) has provided a pediatric-focused definition for ARDS. Cheifetz reviews the PALICC recommendations, which provide guidance on conventional ventilator management, gas exchange goals, high frequency ventilation, adjunct management approaches, and extracorporeal membrane oxygenation (ECMO) for pediatric ARDS (PARDS). Improvements in prognostication and stratification of disease severity may guide therapeutic interventions. Improved comparisons between patients and studies might promote future clinical investigations.

Lin reviews the use of ECMO in children. Although pediatric randomized control trials have not been completed, sufficient evidence supports use of ECMO for pediatric respiratory failure. The acceptance of clinical utility and benefit from ECMO for PARDS, and the trend towards increasing venovenous ECMO use, led to its inclusion in the PALICC as a strongly agreed upon recommendation for severe PARDS. Ultimately, decisions to proceed with ECMO and the concomitant risk of potential life-threatening complications must consider multiple factors that balance potential risks and likelihood of benefit, pre-morbid conditions and impact on potential post-ECMO quality of life, candidacy for lung transplantation, and patient and family goals of care.

Noninvasive monitoring of oxygenation and ventilation is an essential part of pediatric respiratory care. Smallwood and Walsh review carbon dioxide monitoring, gas exchange monitoring, transcutaneous monitoring, near-infrared spectroscopy

(NIRS), pulse oximetry, and electrical impedance tomography (EIT). Incorporation of these technologies into mechanical ventilators, and recently developed methods, may provide important clinical insights. Less mature technologies (EIT and NIRS) offer easy bedside application and potential for improved care of children with respiratory failure and other disorders.

Stokes and colleagues review common pulmonary complications seen in the pediatric oncology patient. They offer an approach to diagnosis, management, and therapy in this specialized population. This includes patients receiving chemotherapy, radiation, and hematopoietic stem cell transplantation. Although infections cause the most significant complications in this population, non-infectious complications also occur commonly. With improvements in survival of childhood cancer, there are now a growing number of adults who are childhood cancer survivors who may be encountered by respiratory therapists in adult hospitals.

Pediatric lung transplantation is a viable option for treatment of end stage lung disease in children. More than 100 pediatric lung transplants are reported to the Registry of the International Society of Heart and Lung Transplantation each year. As reviewed by Sweet, long-term outcomes are limited by availability of donor organs, debilitation as a result of chronic disease, impaired mucus clearance resulting from both surgical and pharmacologic interventions, increased risk for infection resulting from immunosuppression, and most importantly late complications such as chronic lung allograft dysfunction (CLAD). Ex vivo lung perfusion is a promising technology with the potential for increasing the lung donor pool. Extracorporeal support strategies, rehabilitation to effectively bridge patients to transplant, and increased understanding of CLAD are important advances.

Watters reviews pediatric tracheostomy. Tracheostomy is an uncommon procedure in the pediatric ICU, being performed in less than 3% of patients. There is no definite consensus about the length of time a child should remain intubated prior to tracheostomy. Percutaneous tracheostomy is performed infrequently in children. An ideal decannulation protocol is presented, as well as a review of recently published decannulation algorithms. The majority of the tracheostomy-related adverse events are potentially preventable. A multidisciplinary coordinated approach to tracheostomy care has shown promising results.

Panitch examines issues related to airway clearance and mucus mobilization, sleep problems, and use of assisted ventilation in children with neuromuscular diseases. Airway clearance therapies and assisted ventilation have improved survival of children with neuromuscular weakness. Questions regarding the best time to introduce some therapies, the therapeutic utility of certain interventions, and the cost-effectiveness of various treatments demand further investigation. Studies that assess the potential to improve quality of life, and reduce hospitalizations and frequency of lower respiratory tract infections, will help clinicians decide which techniques are best suited for use in children. As children with neuromuscular disease survive longer, coordinated programs for transitioning these patients to adult care must be developed to enhance their quality of life.

Rehder reviews adjunct therapies for refractory status asthmaticus in children. Following administration of inhaled beta-agonists and systemic corticosteroids, a number of adjunct therapies may be used for status asthmaticus. The data supporting the use of these adjuncts are often unclear, conflicting, or absent. This review summarizes the supporting evidence for a host of adjunct therapies, including ipratropium, intravenous beta-agonists, methylxanthines, intravenous and inhaled magnesium, heliox, ketamine, antibiotics, NIV, inhaled anesthetics, and ECMO. A suggested care map is proposed for escalating to these therapies in children with refractory status asthmaticus.