

Rainbow Respiratory Reader



2008 Summer Edition

May 2008 Neo-Peds Section News

Open Forum Deadline Extended Till June 15

If you've attended an AARC Congress, you know the Open Forum is one of the highlights of the event. Nowhere else will you find as many reports of original research performed by your colleagues in respiratory care. Hopefully, we'll have lots of presentations from section members this December – and now you have more time to submit your abstracts. The AARC has just extended the deadline from June 1 to June 15. [GO TO EASY STREET TO SUBMIT ONLINE](#)

Section Reaches Membership Milestone

The Neo-Peds Section has always been one of the biggest in the AARC — but we recently reached a major milestone that reinforces our strength within the organization. As of this Spring, the section had more than 2000 members. Section Chair Brian Walsh thanks everyone for their support — and encourages current members to keep recruiting their colleagues into the section. His goal for 2010 is to top the 3,500 member mark.



Four Factors Help Determine Outcomes for Extremely Premature Infants

Determining the course of care for extremely premature infants has been a challenge. Now researchers from the University of Texas Medical School have identified 4 factors that can help clinicians decide which infants are most likely to benefit from aggressive treatment. In a study conducted among 4,192 infants born between 22 and 25 weeks gestation and followed for up to 22 months, outcomes were better for girls, those with higher birth weights, those who were singleton births, and those whose mothers had received antenatal steroids. These factors were more effective in predicting survival and impairment at the follow up among infants in the study who underwent mechanical ventilation than gestational age alone. The study appeared in the April 17 edition of The New England Journal of Medicine. [READ ABSTRACT](#)

Admission Day Crowding May Lead to Longer Stays for Respiratory Patients

Children who come to the hospital with respiratory illnesses on especially busy days may be subjected to a delay in care that leads to longer hospitalization, report Children's Hospital of Pennsylvania researchers publishing in the April issue of Pediatrics. They looked at data on 116,235 children hospitalized in Pennsylvania and New York over about a 2 year period in the late 1990s. When the admission day occupancy rate climbed from 60% to 100%, children with respiratory problems ended up, on average, staying in the hospital 0.25 days longer. Children with non-respiratory disorders did not have a change in length of stay. The results, report the authors, suggest "medical professionals, during times of increased workload, first focus their attention on more acutely ill children with a complicated course and thus delay treatment of children who have less complicated courses but require time-consuming management and treatment." [READ ABSTRACT](#)

Policies on Pulse Oximeter Saturation Limits Reduce Nurse Variation

Researchers from Children's Hospital in Boston find a hospital policy on pulse oximetry saturation limits can reduce the impact of nurse opinion on targeted limits and reduce nurse target limit variation in the NICU. But only up to a point. While nurses were more likely to adhere to the limits when a policy was in place, only 28% of nurses in NICUs with policies accurately identified the upper and lower limits of their NICU's policy and also targeted these values in practice. The research was conducted among nurses in U.S. facilities with neonatal-perinatal fellowships in 2004. Surveys were returned by 2,805 nurses from 59 facilities. Among those facilities, 40 had a policy specifying a pulse oximeter saturation range for extremely premature infants. The study appears in this month's Pediatrics. [READ ABSTRACT](#)

Study to Assess CPAP/Surfactant Therapy Strategy

A new study getting underway at the Medical College of Georgia and two other academic sites is looking at a novel way of delivering surfactant to premature infants. In the trial, researchers will compare outcomes among 30 infants who will receive surfactant via an endotracheal tube that is quickly removed, then be supported with CPAP, with 30 similar infants who will receive surfactant while undergoing invasive mechanical

ventilation. The authors hope to find the CPAP method reduces the lung trauma often seen in infants undergoing invasive ventilation. The infants will be followed to 36 weeks gestational age. [READ PRESS RELEASE](#)

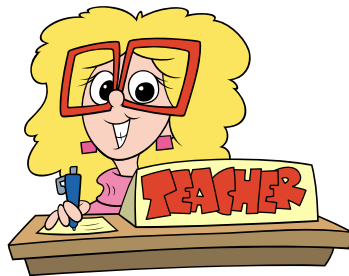
May 2008 Education Section News

Join Your Colleagues at the 2008 Summer Meetings

Your colleagues in respiratory care education will soon be gathering for the 2008 AARC Summer Forum and other meetings, scheduled for July 9-14 at the beautiful all-suites Pointe Hilton Tapatio Cliffs Resort in Phoenix, AZ, and we hope you will join them. So take a few minutes to review the [ONLINE PROGRAM](#) and then make plans today register for this premiere educational event of the summer.

Preparing Clinical Preceptors

Vermont nurses report on a new program aimed at improving preceptor development in their state in the March-April issue of the Journal for Nurses in Staff Development. Seven years in the making, the program relies on delineating the Protector and Evaluator components of the clinical preceptor role and specifying the development of critical thinking, documentation of evidence, and team leading responsibilities. "To meet the challenges inherent to the 21st century health care environment, preceptors require specific preparation for their teaching/mentoring role, as well as resource materials and policies that support this instructional work," write the authors. "The Vermont Nurse Internship Project approached this challenge in a collaborative manner and has 'raised the bar' for preceptor development with statewide, standardized, research- and theory-based preceptor instruction and support." [READ ABSTRACT](#)



The AARC has recently addressed the need for preceptor development in respiratory care as well, with a new Clinical Preceptor Training (CPT) Program that was spearheaded by the Education Section and will be offered for the first time at the AARC Summer Meetings in Phoenix. [GO HERE TO LEARN MORE ABOUT THE CPT PROGRAM](#)

Improving Bedside Education

Boston researchers who conducted detailed interviews with medical students and residents on their perceptions of bedside teaching find significant room for improvement. While the participants identified bedside teaching as a valuable learning tool, they believe it is underutilized and subject to barriers that compromise its use. The students offered the following suggestions to improve the practice:

- Orienting and including the patient.

- Addressing time constraints through flexibility, selectivity, and integration with work.
- Providing learners with reassurance, reinforcing their autonomy, and incorporating them into the teaching process.
- Faculty development.
- Advocating evidence-based physical diagnosis.

The study appeared in the March issue of Academic Medicine. [READ ABSTRACT](#)

Missed Message

Young people aren't getting the message about the great career opportunities in allied health, report researchers who questioned 720 young adults between the ages of 18 and 24 who were taking part in job fairs and other community events. The investigators asked the participants to compare 6 allied health professions, including respiratory therapy, to the "ideal career." None of the 6 measured up to the young people's overall idea of "ideal," which took into account factors such as "being respected," "working with high technology," "care for people," and "job security." In terms of job security, for example, only nursing was perceived as matching the ideal. The authors conclude, "Inaccurate perceptions of allied health occupations likely hamper the development of an adequate pipeline of new recruits to these professions, which has the potential to impact all health disciplines." The study was reported in the spring issue of the Journal of Allied Health. [READ PAPER](#)

Faculty Salaries Fail to Keep Up with Inflation

The latest salary survey from the American Association of University Professors suggests faculty salaries are lagging behind inflation and professors are paid less at public versus private institutions. While salaries rose by 3.8% over the past year, inflation came in at 4.1%, leading to a decline in faculty purchasing power for the third time in four years. Other interesting facts from the survey include:



- Head football coaches at Division I-A schools earn 10 times more than senior professors.
- The gap continues to widen between faculty salaries and administrator salaries.
- Over the past 30 years, the number of contingent faculty and nonfaculty professionals has tripled, while tenured and tenure-track faculty has grown by just 17%.

[READ REPORT](#)

Supervisor Update Kathy Deakins, RRT-NPS

Another summer is upon us and with it comes a wind of change as well. There are many exciting things happening in Peds Respiratory Care. Here are a few of them.

From a staffing perspective, we celebrate with our new graduates of the local RT programs: Congratulations to Kristin Burns CRT will be begin her ICU orientation very soon. Ebony Johnson recently graduated and will soon be orienting to the ICU's as well. We are very proud of your accomplishments.

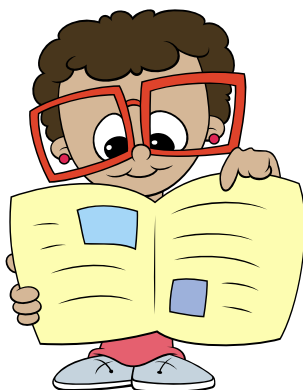
Hats off to Victoria Redpath and Melissa Cosgray who recently finished their department orientations!

A few new staff members have been added to our PRN pool: Rhonda, McGhee and Christina Egan, both seasoned RT's who have crossed over from adult therapy to learn the ropes in peds.

We've added some new technology to our array of noninvasive monitoring. To better serve our population, especially HFOV patients, we've added digital TcC02 monitoring. TcC02 provides accurate trending monitoring that will become the standard of care for these most critical patients.

Relationship based care, (RBC) a care model designed to transform the way we do patient care is about to evolve. Everyone will be expected to take on and "own" this new approach to care. The basic foundational principles to providing this care include:

- connecting with the patient and family beginning with the first interaction
- creating a healing environment, respecting the value that all disciplines bring to the bedside
- quality care delivery and interdepartmental relationships result in the caregiver satisfaction
- the marriage of personal and professional values that are displayed in interactions with families and the care that is delivered to them
- understanding the patient caregiver relationship, while placing value on it while providing an organized plan of care
- a relationship with the patient and family is required to produce quality care at the bedside
- all caregivers must possess their own confidence in practice and are respected for their involvement in providing and meeting the needs of the patient and family
- Caregivers must be inspired and share a "common vision", employ this recognized method of caring for the patient, receive education on personal and professional development and assess and celebrate the change
- And finally, create "transformational change" one patient at a time!



What is on the horizon for the future? In the upcoming months you will hear more about the new care model as it is implemented throughout Rainbow beginning in July. The Electronic Health Record process continues throughout the next year. The renovation of the treatment center at MacDonald House is coming in the fall. Plans for process and care delivery in the new NICU are in progress. The Rainbow Respiratory Conference will take place this September. Updates on the policy and procedure manual should be completed later this year. Disaster planning review is on the horizon and...much, much more!

Thanks for your continued efforts to make this a center of excellence.

You make a difference in all that you do!

Kathy

Education Update Nancy Johnson, RRT-NPS

Competency News

Competency testing for Pediatric RT staff will continue, although, the initial schedule has been modified to accommodate a more realistic time line.

- The month of May therapist's completed the Hospital based Mandatory Modules. May Madness, as it's affectionately penned, was accessible through the EDA and the Learning Management System. If you have not yet completed the mandated modules and have questions on how to complete them ask any of the coordinators.
- June – BLS recertification was completed by all staff thanks to the departments BLS instructors Mary Lou Drahnak and Kathy Deakins.
- July's Mandatory Competency's will include Oxygen Delivery Devices. High Flow NC's, Blended NC's, and the Neonatal Functional Oxygen chart will be included in this review.
- August we'll wrap up the summer by reviewing all the clinical studies that RT's are involved in, These will include the new PGE1 Protocol, iNO and the Support Trial.

Web Page News

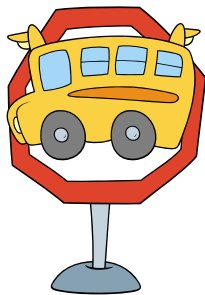
With the evolution of digital information the Pediatric Respiratory Care department is above the rest with the creation of it's Intra-departmental Web site. Kudo's were handed out from the Clinical Nurse Managers and Nurse Educators on the site for its content, layout and ease of use. This is just one example of how our Department stays on the cutting edge of technology in all areas.

Additions and changes recently made to the Peds Respiratory Intranet Site;

- Digital Policy and Procedure Manual, Sections 1 & 2 are completed with Section 3, Clinical procedures not far behind.
- New Page “Pediatric Respiratory Nursing” – This page has numerous informative links and will include a monthly contribution on a topic of interest.
- We’re going to begin to utilize the “Calendar of Events” page to list in-service dates and times.
- Additions and Updates have also been made to the Congenital Heart page, Competency Page, Study Page and the Equipment Index page.

As always, our site is a work in progress, if you see something that needs attention or have a suggestion please don’t hesitate to send them to me.

Student News Starting July 7th through August 12th please help me in welcoming Respiratory students from Clarion Community College. Clarion is a 2 year program in Seneca, PA. Students will complete two twelve hour clinical days with us on Monday’s and Tuesday’s.



Conference News We’re currently putting the finishing touches on this year’s agenda. We’re looking to get the flyers out by the first of July. I’ll be recruiting volunteers for labeling the brochures. Also, keep in mind any ideas you may have for the “Rainbow Booth”. The promotional gift this year will be a Tenth Anniversary coffee mug.

Preceptor’s Class We will soon have a meeting for all the Clinical Preceptors. The AARC just recently addressed the need for preceptor development so I thought this would be a prime time for us to sit down and discuss the educational goals of our orientation/preceptor program. The agenda will include; Objectives and Expectations of Orientation, Adult learning styles, Promotion of Critical Thinking Skills, Teaching Methods and more. Come prepared to share your suggestions and ideas.

President Bush Appoints AARC Member to National Commission

May 7, 2008

An AARC member has been appointed by President George W. Bush to the National Commission on Children and Disasters.

Michael R. Anderson, MD, Pediatric Critical Care Specialist at Rainbow Babies & Children’s Hospital in Cleveland, was appointed by the president to serve on the commission established last year.

The group will be comprised of 10 members and will complete a study to examine and assess the needs of children in preparation for, response to and recovery from all hazards, including major disasters and emergencies. The commission will prepare and submit a final report to the president and Congress with specific recommendations to address the needs of children during major disasters.

“It is imperative that we take a closer look and become more adequately prepared to handle the unique needs of children in future disasters, and I am honored and thrilled to be named by the President to this Commission,” said Anderson.

Dr. Anderson is an associate professor of pediatrics at the Case Western Reserve University School of Medicine, and he serves as the director of Continuing Medical Education and Fellowship Training at Rainbow Babies & Children’s Hospital, and as medical director of the pediatric intensive care unit for the



MetroHealth Medical Center. He has been on the faculty at Rainbow Babies & Children’s Hospital for 10 years, and for the past two years has committed his professional career to bringing the resources of children’s hospitals to the forefront of pediatric disaster medicine. What was once a local plan to create a Cleveland pediatric response team to assist children affected by Hurricane Katrina has now become a national model for developing a unique pediatric disaster response team.

In Cleveland, Dr. Anderson serves as the Pediatric Life Support (PALS) affiliate faculty for Rainbow, and serves on the board of directors for the Fresh Air Camp for ventilator dependent children.

Concepts to Ponder: The Minute Ventilation Test in Neonates

Kathy Deakins, RRT-NPS

Clinicians claim mechanical ventilation is an art, not a science. Most want to believe clinical assessment of readiness to wean from mechanical ventilation is the ultimate method of choice. Indeed, clinician-based assessments have been used to predict readiness for extubation for more than 20 years. We have relied on clinical assessment of respiratory rate, breath sounds, spontaneous tidal volume measurements, spontaneous

effort required to produce a minimum tidal volume, presumed condition of the respiratory muscles, and resolution of the disease process to determine whether weaning is being tolerated. Clearly defined criteria have been developed to assess our ability to maintain spontaneous ventilation in mechanically ventilated adults and children. These include rapid shallow breathing index (RSBI) or frequency/tidal volume ratio, pressure time product, negative inspiratory force (NIF), work of breathing, occlusion pressure (P.01), and minute ventilation (Ve). Do these apply to neonates? Assessing parameters that reflect the patient's ability to sustain spontaneous ventilation sometimes requires sophisticated measurements. Determination of an infant's minute ventilation is often difficult due to the minute tidal volumes and rapid respiratory rates. Fourth generation mechanical ventilation technology now makes this possible, as minute ventilation is measured and assessed by graphics and displayed digitally on the ventilator or pulmonary mechanics monitor.

The minute ventilation test (MVT) has been used to objectively assess and predict successful extubation of premature infants. 242 premature infants with RDS were entered into a randomized/controlled study following surfactant replacement therapy and 24 hours of subsequent mechanical ventilation. All patients were assigned to predetermined mechanical ventilator settings of: time-cycled assist controlled, flow-synchronized ventilation at 40% FIO₂, PIP <16 cm H₂O, MAP ≤10 cm H₂O. Gillespie et al evaluated the amount of time spent on mechanical ventilation from study entry until 24 hours following extubation. Infants were either extubated using a conventional method or assigned to participate in an MVT. The Ve was determined by multiplying the measured expired tidal volume and the respiratory rate during mechanical ventilation (MV_M) and during a spontaneous ventilation trial (MV_S) of CPAP +3 to +4 cm H₂O. Each trial (MV_S and MV_M) lasted for 10 minutes. Infants were extubated if the MV_S/MV_M ratio was 50%. Those whose ratio did not meet the criteria of 50% were retested after eight hours and extubated upon meeting the criteria. Infants assessed using the MVT were extubated on average after eight hours while those extubated using clinical evaluation were extubated on average after 36 hours. Extubation failures were identical in both groups.

The MVT appears to be a useful indicator of pulmonary mechanics that is consistent with adequate gas exchange in all populations including the premature infant. A change in either the respiratory rate or tidal volume will alter the minute ventilation and compromise the infant's ability to maintain spontaneous ventilation for a prolonged period of time. Other problems inherent in premature infants that may also affect extubation

duration include the presence of secretions, apnea of prematurity, and post-extubation stridor caused by edema.

So when making assessments in extubation readiness, include the Ve test when evaluating neonates!

Did you know that INO is not the only cause of Methemoglobinemia?

Denise Lauderbaugh, RRT



Methemoglobinemia is a rare and potentially fatal condition. Infants are particularly susceptible to the condition during their first 6 months of life because they have low amounts of a red blood cell enzyme that converts methemoglobin back to hemoglobin, called methemoglobin reductase. Causes of Methemoglobinemia include: genetic enzyme deficiencies, sepsis, metabolic acidosis (usually secondary to diarrhea), environmental exposure, and as a drug or chemical reaction.

There are two forms of inherited methemoglobinemia. The first form is passed on by both parents who usually do not have the condition themselves. It occurs when there is a problem with an enzyme called cytochrome b5 reductase which controls the amount of iron in your red blood cells, and helps the cells carry plenty of oxygen. This deficiency is endemic in the Yakutsk people of Siberia. The second form of inherited methemoglobinemia, called hemoglobin M disease, is caused by defects in the hemoglobin molecule. This can be passed down by only one parent with the defective gene.

Large amounts of nitric oxide are released into the blood of patients with sepsis or inflammatory disease as a protective response. Nitric oxide is converted to methemoglobin and nitrate. Methemoglobin levels can be significantly higher in patients with sepsis than in nonseptic patients. This can be a good predictor of illness.

Methemoglobinemia has been found in infants less than 6 months of age with diarrhea who develop a severe metabolic acidosis from dehydration. Low stomach acid production, large number of nitrite-reducing bacteria, and the relatively easy oxidation of fetal hemoglobin make them at high risk. In addition, the higher intestinal pH of infants may promote the growth of gram-negative organisms that convert dietary nitrates to nitrites. The most common environmental agent associated with this diagnosis is nitrate-contaminated water; however, foods that are high in nitrate or nitrite may also be involved. Well water is particularly at risk due to the number of fertilizers that are transported through the soil

into ground water, especially in farming areas. Baby foods containing fennel can also create high levels of Methemoglobinemia. Other commercial baby foods have been found to have >45ppm nitrate levels.

Chemical substances which react to create methemoglobinemia:

- Inorganic agents
 - Nitrates - Fertilizers, contaminated well water, preservatives, and industrial products.
 - Chlorates –matches, explosives, and fungicides
 - Copper sulfate - Fungicides
- Organic nitrites/nitrates
 - Amyl nitrite
 - Isobutyl nitrite
 - Sodium nitrite
 - Nitroglycerin
 - Nitroprusside
 - Nitric oxide
 - Nitrogen dioxide
 - TNT
- Others
 - Local anesthetics - Benzocaine, lidocaine, prilocaine, phenazopyridine (Pyridium), EMLA cream
 - Antimalarials - Primaquine, chloroquine
 - Antineoplastic agents - Cyclophosphamide, ifosfamide, flutamide
 - Analgesics/antipyretics - Acetaminophen, acetanilid, phenacetin, celecoxib
 - Herbicide - Paraquat
 - Antibiotics - Sulfonamides, nitrofurans, P-amino-salicylic acid, and dapsone (used to prevent and treat Pneumocystis carinii pneumonia and to treat leprosy and other skin diseases. This drug should be used with great caution in patients with known G6PD deficiency, methemoglobin reductase deficiency or Hemoglobin M)
 - Industrial/household agents - Aniline dyes, nitrobenzene, naphthalene (moth balls), aminophenol, nitroethane (nail polish remover) (1)



Go Ahead and Flip: Mechanical Ventilation in the Prone Position

Sharon Estok, RRT-NPS

Patients with acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) spend extended periods, despite turning, in the supine position. It is a common consideration though, that prone positioning may be the better option.



Indications: As stated, patients with ARDS or ALI resulting from situations such as: aspiration, pneumonia, sepsis, trauma, cardiac surgery, etc. would be candidates for proning. In addition, patients with congestive heart failure have also benefited with improved oxygenation.

Benefits: Increased arterial PaO₂ levels in proned patients with acute respiratory failure were first reported in two case series back in the 1970s. Later studies followed showing that 60-80% of ALI and ARDS patients had improved oxygenation with prone positioning resulting in lower FIO₂ requirements. Some of these patients were noted to have continued improved oxygenation for hours after returning to the supine position and better results with each subsequent proning.

Improved ventilation is thought to be achieved for multiple reasons. Factors involved include pleural pressure, compression of lung parenchyma, alveolar recruitment, and functional residual capacity (FRC).

In patients with ARDS, lung collapse is a common problem. An elevated alveolar distending pressure is needed to recruit these areas. The alveolar distending pressure is resultant of the transpulmonary pressure (P_{tp}) which is the difference of the airway (P_{aw}) and pleural pressure (P_{pl}). When the patient is in the supine position, there is a vertical pleural pressure gradient. As a result, the ventral transpulmonary pressure is greater than the dorsal transpulmonary pressure which results in greater expansion of the ventral alveoli. With ARDS, the pleural pressure gradient is bigger because of increased lung weight. This typically causes over inflation of the ventral areas while dorsal areas become atelectatic. Prone positioning reduces the pleural pressure gradient, which homogenizes transpulmonary pressure and may even encourage lung protective ventilation.

Lung collapse can also be the result of lung compression from the heart and/or diaphragm. In the supine position, the heart compresses the posterior lung parenchyma while the diaphragm compresses the posterior-caudal lung parenchyma. In addition, sedation tends to reduce diaphragmatic tone which accentuates this problem. Prone positioning reduces posterior lung compression thus contributing to improved ventilation.

In terms of recruitment, it is much easier to mechanically keep sick lungs open than opening them after they've collapsed. Prone ventilation helps to sustain alveolar recruitment.

Functional Residual capacity may be increased, therefore decreasing end-expiratory airspace closure. This is a significant benefit regarding gas exchange since the dorsal lung area is mostly affected and it is the dorsal lung area that receives the greatest amount of perfusion in any position.

Other benefits of prone positioning include enhanced secretion mobilization, and improved distribution of aerosols and inhaled nitric oxide.

Contraindications: Although there are no absolute contraindications to prone positioning, obvious ones such as serious burns or open wounds on the face and/or anterior body would rule out proning. In addition, spinal instability, pelvic fractures, or life-threatening cardiac arrhythmias and hypotension should also be included. Patients with tracheostomy tubes should be supported with padding so that tubes have do not have direct contact with the bed.

Special Considerations: Accidental extubation is never pleasant and could happen when repositioning the patient if you are not careful. It is suggested that before you reposition the patient, make sure you note the ETT position. It should be 2-4 cm above the carina. This will allow the greatest excursion of tip position without risk of extubation or right mainstem intubation. Since proning can increase secretion mobilization dramatically, you should have suction equipment prepared before repositioning. Also note that it is not uncommon to witness an abrupt fall in oxygen saturation while turning the patient. This is usually a transient issue and should not be interpreted as failure. Oxygen saturation should return to at least what it was when they were supine within a few minutes of turning. Chest wall compliance can be reduced when prone and when in the pressure-control mode can result in decreased tidal volumes and increased PaCO₂ values. This can easily be improved by adjusting the rate.

Although prone ventilation has been shown to improve oxygenation, there are no firm findings of reduced morbidity or mortality. Since not well studied, it is difficult to predict who will respond best to prone positioning. It has, however, been noted that patients having early diffuse injury including edematous lungs and dependent collapse should respond well. Those

with anterior prevalence of infiltrates or injury with considerable consolidation or fibrosis do not.

Medical Use of Helium

Christopher M.
Joyce RRT-NPS

The use of a helium-oxygen mixture as the driving gas to nebulize adrenergic beta2-agonist bronchodilators such as albuterol sulfate is not a

new concept. As a matter of fact helium-oxygen (heliox) alone as treatment for airflow obstructive disorders has been around since the mid 1930's. Barach used heliox in the management of asthma and upper airway obstruction as early as 1935(Bag et al, Journal of Asthma, Vol.39, No.7, p.663,2002). Knowledge of bronchodilator therapy has been around for even longer, so it is no surprise that the marrying of albuterol and heliox would be inevitable just like peanut butter and jelly.

The function of helium as the replacement for nitrogen bound to atmospheric oxygen is that heliox as a result is one-third as dense as air. "Airflow patterns in the pulmonary system are products of the physical conditions in the airway (eg, diameter, anatomic shape, branching, and smoothness of airway lining) and the composition of the inhaled gas. Lung periphery airflow is primarily laminar because of the large cross-sectional surface area that the gas flows through in the periphery. Conversely, airflow in the larger upper airways is turbulent with relatively high flow and relatively small cross-sectional surface area (Timothy R. Myers RRT-NPS, Respiratory Care, Vol.51, No.6, p.620)." Therefore if airway resistance is increased such as the case in asthma exacerbations, it would seem logical to use heliox to improve laminar airflow not only past upper airway obstructions but to smaller peripheral airways. Theoretically, aerosol delivery would have a better chance of deposition to the lung periphery with heliox as the driving gas resulting in greater bronchodilation.

Several studies have shown success with the use of heliox-driven aerosols for the treatment of moderate to severe asthma. Bag et al conducted a two day study 1-7 days apart consisting of 31 moderate to severe asthmatics ranging from 18-44yrs of age and the effect of heliox-driven aerosol therapy on pulmonary function tests. Each patient on separate days was exposed to heliox driven aerosols with an 80% helium to 20% oxygen mixture versus room air driven aerosols. The patients did not know which gas was given, they were not permitted to talk for several minutes after aerosols for chance of voice change secondary to heliox, they were non-smokers, and were excluded if they had an acute exacerbation in the past week or were pregnant. They also used a two way valved closed system and tight lip seal with nose clips to prevent entrainment of



external air. According to Bag et al, "In all patients, FEV1 improvement with heliox-driven bronchodilators (HDBD) was 49% better than air-driven bronchodilators (ADBBD). Of 31 patients, 21 showed more improvement in PFTs with HDBD. Nineteen of 21 had 10% or better Δ FEV1 after HDBD compared with ADBBD. Those with more favorable response with HDBD had more airflow obstruction shown by a lower baseline percent-predicted FEV1 on both days of testing compared with the non-responders. The FVC and FEFmax responses were significantly greater when heliox was used as the driving agent(p.663)."

In a 1993 study, using an inhaled radionuclide deposition study, Anderson et al were among the first to observe the benefit of heliox as a driving gas(Am Rev Respir Dis 1993;147[3]:524-528). They concluded that heliox was significantly more effective than air in depositing 3.6 μ m particles in alveolar regions, and that improvement was more pronounced in asthmatic subjects than in healthy subjects (Kim et al, Respir Care 2006; 51[6]:614).

Kim et al recently published the first prospective randomized single-blind pediatric study of heliox-driven albuterol nebulization with moderately-to-severely ill pediatric asthmatic patients They found that early exposure to continuous heliox-driven albuterol resulted in improved Pulmonary Index scores as well as ER discharge in the heliox group of 66% versus 33% in the oxygen-driven aerosol group (Kim et al, Respir Care 2006;51[6]:616).

Regardless of the few references presented here supporting the use of heliox-driven aerosols it should be noted that this article only scratches the surface of what has been debated. There are many factors that contribute to the efficacy or lack of efficacy when using heliox-driven aerosol therapy. There are debates about the optimal flow rates, concentrations of helium to oxygen, age disparities, research protocols and study controls, varying delivery systems, etc. The most important thing to remember is whatever protocol or therapy a clinician or center adopts, patients should be evaluated on an individual response basis with continuous collaborative team assessments.

Vitamin A for Fetal Lung Development

Denise
Lauderbaugh, RRT



Organ development occurs during specific windows of time of fetal growth. Vitamin A causes changes in cells that result in its specialization for specific functions, such as those of a nerve cell. Researchers have found that Vitamin A requirement for successful fetal development begins at 14-21 days of life. This is when the embryo forms the primitive heart, circulatory system, and hindbrain

(1).Vitamin A deficiency can affect the CNS, the lungs, retina, inner ear, spinal cord, craniofacial development, as well as the thymus, thyroid, and parathyroid glands. After formation of the organ system, Vitamin A continues to support their growth. This article will concentrate on Vitamin A's effect on the pulmonary system.

Vitamin A is required during mid-gestation for development of the fetal lung. The alveoli are lined with two types of cells, the Type 1 and Type 2 pneumocyte. The Type 1 pneumocyte is a very large thin cell stretched over a very large area. This cell can not replicate and is susceptible to a large number of toxic insults. The Type 1 pneumocyte is responsible for gas exchanges occurring in the alveoli. The Type 2 pneumocyte is usually found at the alveolar septal junctions, and is responsible for the production and secretion of surfactant. Vitamin A deficiency causes Type I & II pneumocytes to be replaced by stratified squamous keratinizing epithelium. This epithelium is found in thin skin cells like those of the lip which create a barrier. The end result is lungs which are incapable of effective gas exchange and surfactant excretion.

A study by Ting-Yu Li and Hua Wei (1) showed that Vitamin A deficient rats had lower weights, less alveoli, and that their alveolar septal wall was thinner. In addition, a study by **Richard C. Baybutt², Ling Hu and Agostino Molteni** revealed that the lungs of vitamin A-deficient rats had less collagen in the adventitia of small caliber arteries and arterioles and in the alveolar septa. Increased size of air spaces distal to the terminal bronchiole, with thinning and partial or total destruction of septal wall was also noted. Elastin was lower in the lung parenchyma, small arteries, and arterioles. Peribronchial collagen was not affected by the deficient diet. Scattered inflammation was observed in most. In addition, surfactant synthesis was lower in formed type II pneumocytes.

Real Vitamin A occurs only in animal fats found in foods such as liver, spring butter, and fish eggs.

Rainbow Babies and Children's Hospital—Neonatal Intensive Care Vitamin A Administration Protocol

For babies <1000g: Vitamin A injection 5000 units IM q MWF x 12 doses

For babies 1001-1250g: Vitamin A injection 5000 units IM q MWF x 12 doses (begin @ 3 days of life if patient remains on vent in >40% fio2.

Vitamin A may be discontinued early if patient is PO feeding at 150mg/kg/day of premature formula or 120mg/kg/day of preterm formula and 1ml/day of polyvisol.

1 Journal of Nutrition. 2001; 131: 705-708. Maija H. Zile.

2 Effects of Vitamin A on lung development in the rat from early age to adulthood. Ting-Yu Li and Hua Wei.

3 Vitamin A Deficiency Injures Lung and Liver Parenchyma and impairs function of Rat Type II pneumocytes (*Journal of Nutrition*. 2000; 130:1159-1165.)

© 2000 [The American Society for Nutritional Sciences](#)

Richard C. Baybutt², Ling Hu and Agostino Molteni

Different Perspectives, Different Initiatives: It's Generational: *The Changing Face of Health Care Workers*

Kathy Deakins RRTNPS

It's not all about you, its about the team... You have no idea what you are talking about... I need more recognition... I made the difference ... I told them the right way to do things, since my colleague didn't know... We did a darn good job with that patient... I need all of my requested days off... I'm willing to help you out! Do any of these phrases sound familiar in your workgroup? Do you get frustrated with the fact that some individuals take over and try to sway the whole group with their perspective? Do you ever have difficulty being around certain individuals that stand at your side and work with you day in and day out? Let's face it we are all different and there are many reasons why. Genetics and personalities aside, we are all faced with an ever-changing workforce. And one of the most important differences in how we act outwardly or interact with each other is simple... it's generational!

It's a well known fact that we could indeed have five different generations of people working together in the same room. Each person may interpret a situation in an individualistic way and could be attributed to their generation.

However, the approaches to confrontation, criticism, recognition, and confidence are vastly different. There are many things that need to be considered.

Any expert on this topic would define five well-known generations that exist in the workplace. The post war generation, those who are either at or close to retirement were born somewhere between 1928 and 1945. A small percentage of these folks are still working in some capacity and are fortunate enough to be in good health to do so. They look at their work as a requirement, are dedicated to still maintaining some semblance of a fixed but maybe scaled-down schedule, focus on the task or profession at hand, have begun passing the torch to others as they are beginning the phasing out of their

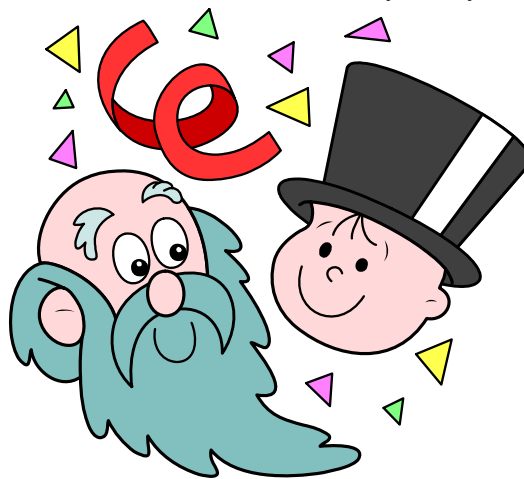
employment. Others in this group cannot fathom the fact that technology has far surpassed them and feel that their time in this business is limited. Others continue to support and inspire up and coming protégé's to carry on their work they've been doing for years. The workforce, as we knew it was based on the many individuals in this generation.

Baby Boomers I and II, all 250 million of them were born between the ages of 1946 and 1965. Many grew up thinking that the workplace of choice would provide adequate personal resources, the employee would eventually work to achieve higher status in a company and many would remain at their jobs as committed employees for lengthy periods of time. These individuals show up to work every day, rarely miss time away from the action, continue to be loyal to the workplace and its team members...but sometimes can't tolerate change. Although they deal with the everyday struggles of beating the same path over and over again, they still remain intact, sometimes in a battered form, but won't quit! Boomers question everything! However... Burnout was born out of this era as well!

Generation X, those born in 1966 to 1977 are a combination of a part boomer and the new vogue generation. They are either go-getters who work incessantly as workaholics, think they should move up in the company quickly, are sometimes not satisfied with their jobs...and move around between careers about every 5-10 years. This generation focuses on professional development, task development expertise and may support coalitions for a cause. Some are committed to their jobs and look at small efforts as large contributions. The "me" generation and some sense of entitlement was born sometime during this period. Many fulfill obligations if necessary, while others are comfortable with using their resources to get what they need. The lack of trust amongst coworkers began appearing during this time.

The Millennial Generation, those born in 1986-2000, are those who are just finishing their college education and entering the workplace or are still in the developing years. These folks have shown a sense of service recovery, have less focus on themselves and are showing a sense of commitment to the workplace. Many realize that it takes an entry level step to achieve their goals; while others expect to be hired and be compensated appropriately simply for finishing their education. A significant number in this group don't want shift work schedules and are willing to move jobs to get where they want to be quickly.

So five generations in the same place at the same time: where does this leave us? There are many unanswered questions for dealing with the problem of manning the workforce of the future. How can we work better



together? Are different approaches to situations appropriate? Can we ever get along as a group, not a clique? Will our interactions coincide without judgment? Where's the professional in all of us? Do we stand a chance?

What the workforce needs is preparation, for the future that is. Regardless of generational differences, we must continue to learn to accept that we are different by nature. We need to promote certain expectations of all caregivers. These include: accountability, priority, relationship and approach. A professional relationship starts with your ability to give a little, accept that you don't know everything, learn from your mistakes, be helpful to others who need it without requiring something in return and care about what happens!

Passing the torch: Does it have a slippery handle? When all is said and done, as time goes on and the generational mix continues, will your profession remain the same as it is today? What will it take to keep it alive? How can it be accomplished? Is it possible to move forward in a constructive manner? Each step in the life cycle of health care takes time and requires participation, motivation and professionalism from each individual. As we progress through the future it will be *respect* that determines whether we can accomplish anything in the future. *Respect* for generational differences, *respect* for other's opinions, *respect* for change, *respect* for patients, *respect* for the work we do, *respect* for the needs of others... and it all starts with *respect* for ourselves!

Farewell to Fellow Therapist and Friend

It is with some sadness that I complete this edition of the Respiratory Reader and send it to print. After proofing it for the final time I'm reminded not of what's in print, but that which is missing. This is the first edition of the Respiratory Reader that I've published that didn't include an article by John Dickson. John routinely wrote the "Medical History" corner for the Reader. John finished his tenure here at Rainbow Babies & Children's Hospital last month to pursue opportunities at Hillcrest Hospital. Like many, I have fond memories of John. He was well liked by all for his friendship, knowledge, commitment and sense of humor. Good Luck John, We'll miss you.

Below is the Thank you John sent - -

**"Think where man's glory most
begins and ends and say my glory
was I had such friends"
~W.B.Yeats**

*Dear Friends, brothers and sisters of
respiratory, fellow breath sculptors,
Thank you all so much for the incredible
party, the gifts and for sharing the last 20
years of my life with me! Through the
emotional roller coaster of miracles and
tragedies that we witness each day, its true
friendship that sustains me. I wish you all
well and I will miss you more than you know.
I want very much to stay "in the loop" so
please keep in touch! John*

