Volume 8 Number 5 October-November 2013

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* Mireles-Cabodevila, E., Hatipoğlu, U., & Chatburn, R. L. (2013). A rational framework for selecting modes of ventilation. Respiratory Care, 58(2), 348-366.

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The Journal of Pulmonary Technique

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Editorial

Here we go

We have already discussed an onerous funding provision of the Affordable Care Act in previous issues, the medical device tax, but haven't touched on other aspects of Obamacare. Now that October's here and the act kicks in, let's see how else it might affect the respiratory care community.

According to The Lancet, due to Obamacare's antidiscrimination provisions, insurance companies can no longer discriminate against adults who had asthma as kids, and this applies to cystic fibrosis patients as well. The act provides from a transition from payments for individual procedures and aims to reward favorable patient outcomes through incentives for so-called "accountable care" organizations. Bundled payments will replace a number of fee-for-service reimbursements. Also, capitated payments are being offered for treating specific diseases.

The Lancet quoted Suhail Raoof of New York Methodist Hospital in Brooklyn as saying, "Pay-for-performance will likely cause US physicians to change practice and to improve coordination of care. For example, asthma care is very well suited to bundled care… [but] There is concern physicians will be held accountable for outcomes beyond their control. Patient adherence and compliance pose challenges. This may result in cherry-picking patients."

On the plus side, patients covered by Medicare will see reduce bills for prescription medications. Few generic drugs exist for respiratory diseases and brand-name drugs can create large out-of-pocket expenses for patients with chronic obstructive pulmonary disorder and asthma.

Some are far less sanguine about the act. According to a respiratory therapist, writing on the blog respiratorytherapycave.blogspot.com, holding caregivers accountable for readmissions is a terrible approach. "The new COPD criteria for reimbursement says that if a COPD patient is readmitted to the hospital (ER and observation visits don't count) for any reason the government will not reimburse for that patient. Plus if the hospital has a poor showing overall – a high rate of COPD re admissions – CMS will punish that hospital by 1% this year, 2% in 2014, and 3% in 2015." The therapist says respiratory caregivers are not in a position to halt many readmissions; as a result of this provision, hospital costs will rise considerably. The government saves money, but hospitals suffer. "The new criteria are impossible to meet."

The RT goes on to point out the obvious: that COPD patients typically have comorbidities that necessitate readmission. Plus, if a COPD patients is noncompliant, doesn't take their medicine, won't wear BiPAP, that's out of the caregiver's hands. He argues that people aren't readmitted because of poor quality of care but because they're very sick.

Of course, it's impossible to foretell how Obamacare will play out in real time. I think there's a certain amount of irrational panic any time systemic change occurs. Even at worst, from an RT and hospital point of view, it won't be the end of the world. At best, if proponents of the ACA are correct, a new pool of patients will actually be created, increasing the need for respiratory therapists. The latter is a long-shot, I think. We'll just have to wait and see.

Les Plesko, Managing Editor

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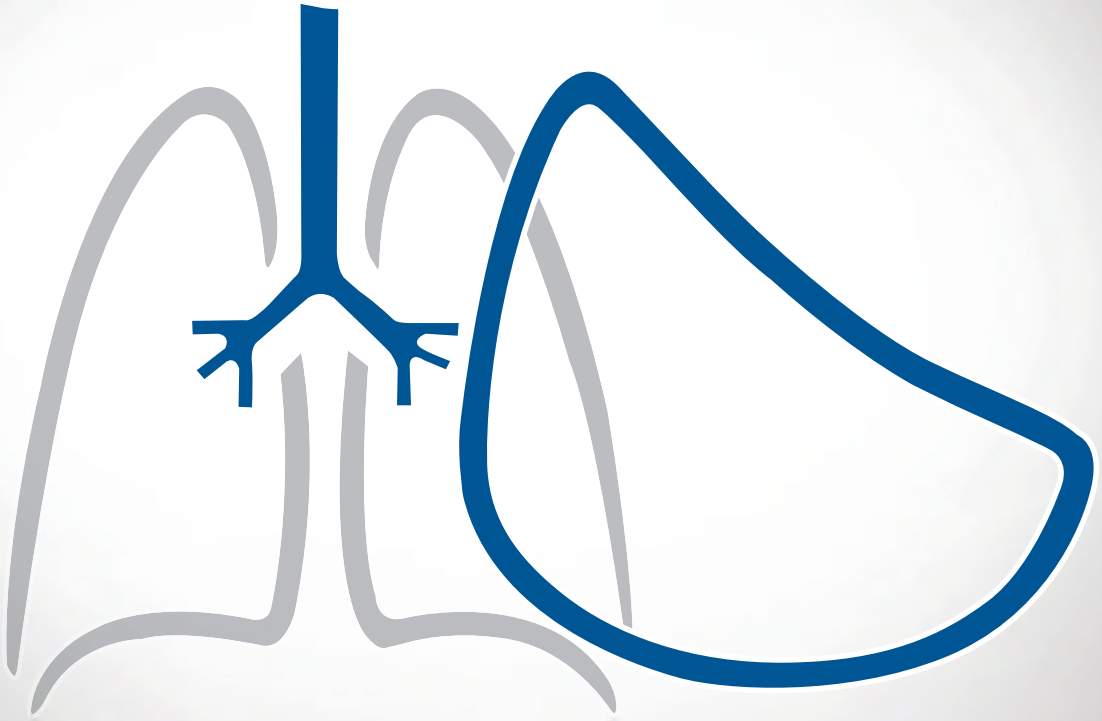

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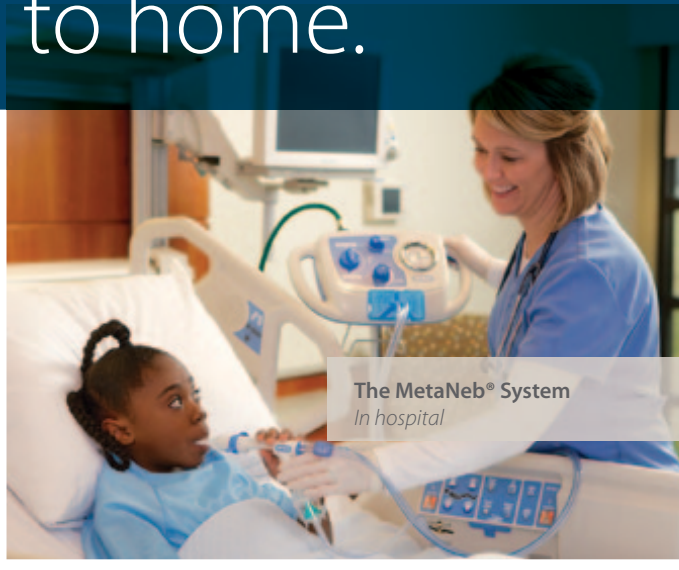

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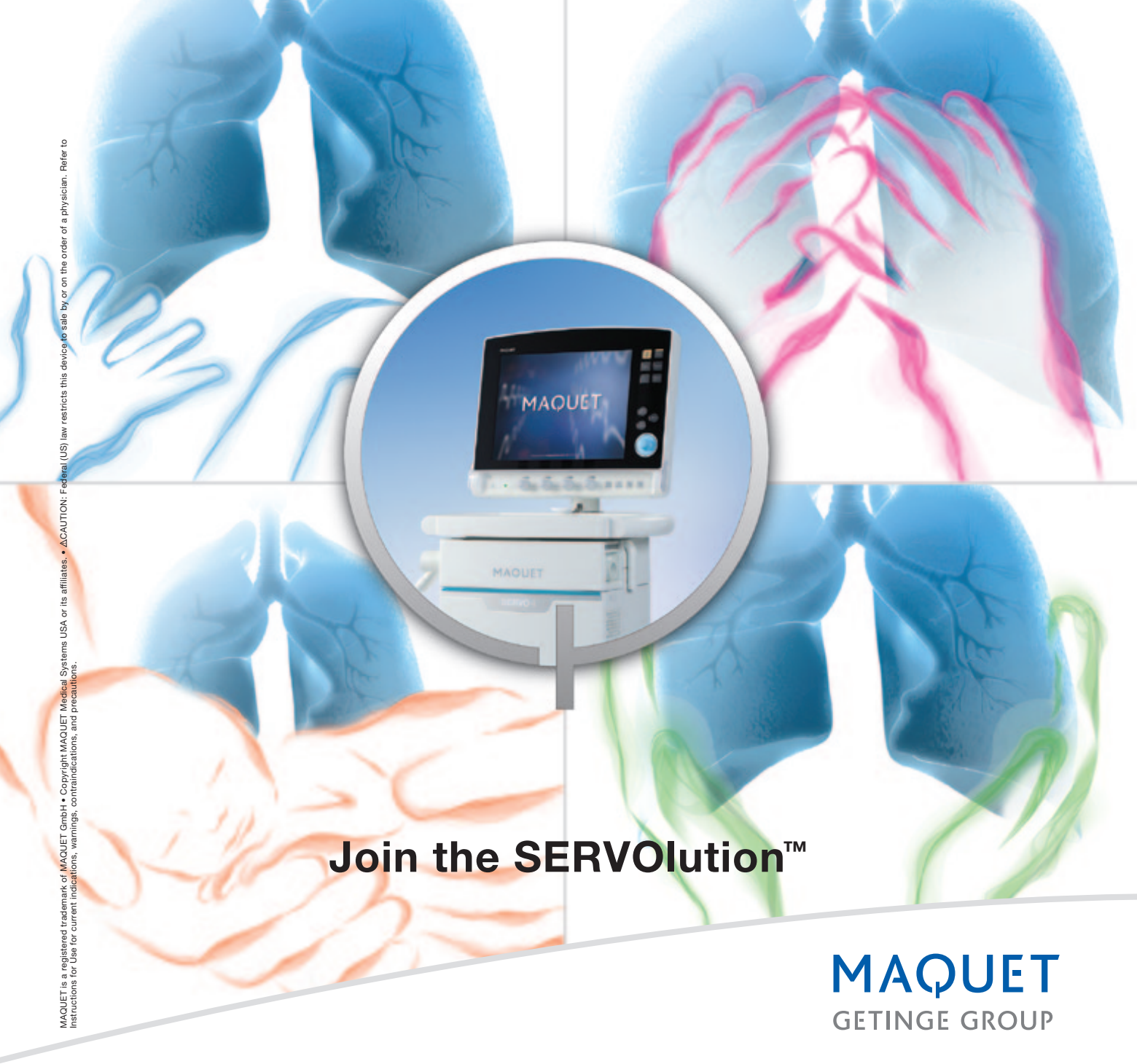

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News

■ October-November 2013

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CAN'T BE TRUSTED

Jordan Robertson reports for Bloomberg News that electronic health records have created problems, and cited a case from his personal experience where a medication dropped out of an elderly patient's record, and its absence caused her death. Robertson writes that the FDA has found that dangerous doses of drugs have been given because of confusing drop-down menus; patients have undergone unnecessary surgeries because of incorrect info, and computer-network delays in sending medical images have resulted in serious injury or death. According to a study by the Pennsylvania Patient Safety Authority, the number of medical error reports doubled between 2010 and 2011, to 1,142, with 3,099 over an eight-year period. About 69% of US physicians are using electronic health records, and this will increase as penalties for not using them start in 2015. The market generated $24.2 billion last year. On the plus side, Robertson notes, more than 17 million medication mistakes are now avoided in the US each year because of prescription-ordering systems. On the downside, by way of anecdotal example, nurses at a California hospital complained that an EMR system was causing medications to be ordered for the wrong patients. In one month, 129 complaints were filed by nurses at California county detention facilities, where the problems were most acute. Software companies don't have to report malfunctions to the FDA, even if they result in serious injuries or death. According to the Office of the National Coordination for Health Information Technology, part of the HHS, there's no evidence of safety problems associated with electronic records. The most dangerous time for patients is when the software is initially installed. In the first five months when a system was installed at Children's Hospital of Pittsburgh, mortality rates increased to 6.6%, up from 2.8% for the previous year. Delays were said to be a contributing factor, a major issue being the number of clicks required to submit prescriptions, and restrictions imposed by the software about when doctors could order medications for new patients.

WHILE WE'RE ON THE SUBJECT

Dr Douglas Farrago writes on his website, Authentic Medicine: "Ready for the new controversy in healthcare? Before electronic medical records took over there was a criticism of doctors that they didn't put enough information or documentation in the patient's chart for each visit. This was really for billing and coding purposes and in no way reflected reality or the work doctors did with a patient. Doctors were punished for this by not being able to bill as much for each visit. With the advent of the EMR or EHR there came an advantage to the new technology. It made it easier to code each visit and get an optimal reimbursement. Of course, no advantage can ever go to the physicians so that will have to stop as well. In a new American Medical News article, they list how the Centers for Medicare & Medicaid Services are now scrutinizing the accuracy of physician documentation for those who use the features of electronic health record systems to support their billing. 'Auditors and lawmakers have suggested that recent increases in the rates at which doctors bill costlier, higher-level services could be attributable to the enhanced billing capabilities provided by EHRs.' We are damned if we do and damned if we don't! The whole thing is a stupid cat-and-mouse game anyway. Coding and billing and auditing are creations of the insurance companies who want to screw docs out of payment. Any benefits given to the physicians will soon be removed by the all powerful insurers. And the worst part is that none of it means anything to patient care. That is why a 'monthly membership' model without billing a third-party would remove all this. Without the risk of auditing the only thing that would be placed in the chart is the basic SOAP note and those things pertinent to the patient's care."

UNBELIEVABLE

Bloomberg News writer Charles R. Babcock reports via the website Crooks and Liars: The FBI said that pulmonologists at Sacred Heart Hospital in Chicago kept patients too sedated to breathe on their own, then ordered unneeded tracheotomies for them, enabling the for-profit hospital to reap revenue of as much as $160,000 per case. A physician and two Sacred Heart administrators surreptitiously taped conversations with other hospital staff members, according to the complaint. The FBI affidavit includes a quote attributed to the owner of the hospital, Edward Novak, saying tracheotomies were the hospital's "biggest money maker." The hospital's pulmonologist is quoted as saying during [a] conversation that Novak asked him 'to provide two more tracheotomy cases for the hospital soon,' before inspectors returned." One surgeon performed tracheotomies on 28 Medicare patients, and five patients died in two weeks, which was three times the statewide rate. Novak, the hospital's CFO and five doctors have been charged with Medicare fraud for allegedly giving or receiving kickbacks for referrals.

HACK ATTACK

Dina Fine Merin, writing in Scientific American, said medical device makers need to protect their products from cyber attacks, especially since many medical devices are connected to the internet. The Department of Homeland Security said hard coded passwords that allow techs to gain access to multiple machines leaves these products vulnerable to unauthorized hackers. DHS singled out 300 devices, including drug infusion pumps, ventilators and external defibrillators, and the agency said it knew of hundreds of devices that have been affected by vulnerabilities or "incidents." Devices that run on Windows XP

may also be affected by typical viruses common to home and office users. Merin noted that the Department of Veterans Affairs have reported 327 incidents, and though these didn't harm any patients, they created problems for patients and cost hospitals money. For instance, Merin wrote, "One such incident occurred in 2010 when the Conficker computer worm infected an entire sleep lab at a VA hospital… All the patients had to be rescheduled… and the manufacturer had to reformat all the devices – at a cost to the hospital of about $40,000." Conficker can also expose patient data and passwords. Malware can slow down devices or disable them. The FDA has issued guidelines that urge device makers to address potential problems before they occur. However, Merin pointed out that installing patches to fix software security creates potential problems as well, and companies who have secured their equipment are loathe to admit it, lest hackers take these claims as a challenge.

UNFAIR

A commentary published in CHEST addressed access to patient care as outlined in the Affordable Care Act. The article appeared in print in the September 2013 issue. The authors, Erik A. Kumetz, MA, and John D. Goodson, MD, argue that the current coding and billing system does not support outpatient office-based medical services but rather focuses on those services that are procedure based. The current system offers limited coding options for outpatient cognitive visits. Patients with one or more chronic conditions may require additional time during an outpatient visit so that physicians can analyze data, provide diagnosis, and develop a treatment plan. However, the current system does not allow physicians to bill for that additional cognitive analysis. "This practice discriminates against all cognitively dependent specialties, including pulmonary care, primary care, infectious disease, and rheumatology," said Goodson. The authors recommended the creation of comprehensive, office-based service code families that would reflect increasing levels of multiple issue management and provide for both face-to-face patient/doctor consultation as well as for support not provided in person. To access the full commentary, visit http://bit.ly/16ioGq7.

A SLIGHT DISCREPANCY

The Huffington Post reports: When a patient arrives at Bayonne Hospital Center in New Jersey requiring treatment for the respiratory ailment known as COPD, or chronic obstructive pulmonary disease, she faces an official price tag of $99,690. Less than 30 miles away in the Bronx, NY, the Lincoln Medical and Mental Health Center charges only $7,044 for the same treatment, according to a massive federal database of national health care costs made public recently… Even within the same metropolitan area, hospitals charge prices that differ by staggering degrees for the same procedures. People without health insurance pay vastly higher costs for care when less expensive options are often available nearby. Virtually everyone who seeks health care winds up paying inflated prices in one form or another as these stark disparities in price sow inefficiencies throughout the market… These price differences impose a uniquely punishing burden on the estimated 49 million Americans who have no health insurance, experts say. They are the only ones who see on their bill the dollar amounts listed on these official price lists. Yet these same prices effectively shape what nearly everyone pays for health care, because they determine how much private health insurance companies must surrender in reimbursement for services. That in turn influences the size of the premiums that insurance companies charge their customers. Within the nation's largest metropolitan area, the New York City area, a joint replacement runs anywhere between $15,000 and $155,000. At two hospitals in the Los Angeles area, the cost of the same treatment for pneumonia varies by $100,000… How is it possible that two hospitals in close proximity would set prices as differently as Bayonne Hospital Center in New Jersey and the Lincoln Medical and Mental Health Center in New York? It's partly a relic of how hospitals used to operate and partly reflects their strategies to maximize revenues in ways that don't have a direct connection to the cost of the care they provide any individual patient. The charges are the prices hospitals establish themselves for the services they provide. Although Medicare and Medicaid don't base their payment rates on these figures, private health insurance companies typically do, which means they usually pay more for the same health care than the government does. That translates into higher premiums for people with insurance. And uninsured people are expected to pay the full list price or a discount from that number, which tends to mean they pay more than anyone else… When a

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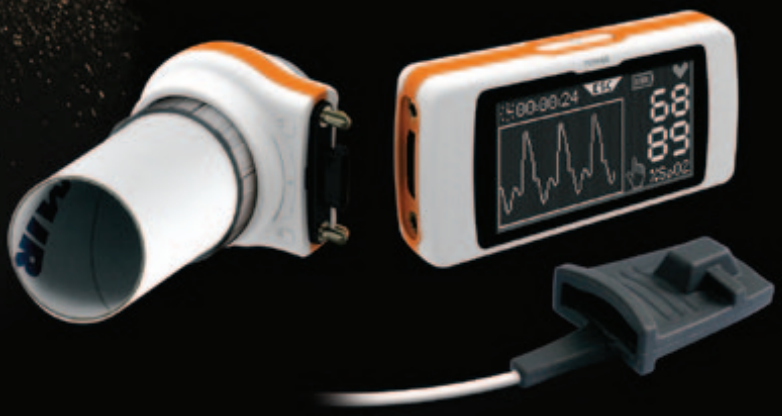

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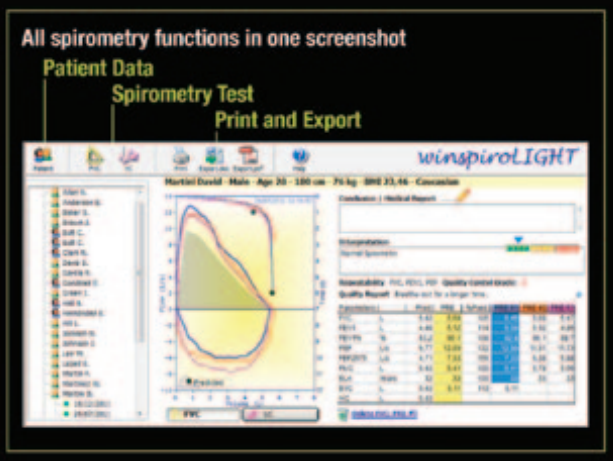

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hospital doesn't get paid as much as it wants from one source, it tries to make up the difference in other ways, such as billing so-called self-pay patients – almost always the uninsured – for the full list price of a service. Hospitals also inflate charges to raise money for things that aren't related to treatments… [A final example:] Birmingham's Brookwood Medical Center [charges] a $156,958 price for simple pneumonia and inflammation of the lung. That's almost 12 times what the same treatment costs at Russell Hospital about an hour away in Alexander City, AL, and about four times the local average. Edited from a report on the Huffington Post, written by Jeffrey Young and Chris Kirkham, with contributions by Jay Boice, Aaron Bycoffe and Andrei Scheinkman. You can read the entire article by googling: Hospital Prices No Longer Secret, at the Huffington Post.

COIL

A small, easily implantable device called the Lung Volume Reduction Coil (LVRC) may play a key role in the treatment of two types of emphysema, according to a study conducted in Europe. Results of the study indicate the beneficial effects of the device persist more than a year after initial treatment. The study was presented at the ATS 2013 International Conference. The coil works by gathering and compressing diseased lung tissue, allowing healthy tissue to function more efficiently. The device is implanted in a simple procedure which does not require a surgical incision. Patients typically are implanted with multiple devices in each affected lung, with each lung being treated in a separate procedure. The study's researchers gathered and analyzed data from three nearly identical multicenter European studies that analyzed the safety and efficacy of LVRC treatment in 109 patients with severe emphysema who had received two separate coil treatments. In total, 2,081 devices were implanted in 218 procedures. In addition, computed tomography (CT) scans were used to determine whether these patients had homogeneous or heterogeneous disease. Follow-up data were gathered from each patient at six months and 12 months following the procedure on the second lung. To evaluate the effectiveness of the LVRC device, the studies used a validated quality of life survey designed for patients with obstructive airways disease and three other standard measures: FEV1, RV, and 6WMD. The study authors found that, at both six months and 12 months following the procedure, values for all four measurements were significantly improved. A post-hoc analysis of 53 patients identified as having either homogeneous or heterogeneous disease showed the improvements from LVRC treatment were similar between the groups, an important finding since other minimally-invasive treatment methods have not shown sustained efficacy in the many patients who have diffuse patterns of emphysema.

SDB AND ALZHEIMER'S

Could Alzheimer's lead to sleep disordered breathing? At first researchers at NYU didn't find a direction of causality; then they looked at BMI and found that lean patients with SDB had several markers of AD risk. Among obese patients, glucose hypometabolism was also found in the medial temporal lobe. The study, presented at the ATS conference, enrolled 68 cognitively normal elderly patients who underwent two nights of home monitoring for SDB and were tested for at least one diagnostic indicator of AD. Biomarkers for AD risk were found only among lean study participants with SDB.

STRESSED OUT!

Health care employees are the most stressed of all professions, according to a report by ComPsych Corporation, which analyzes employee assistance programs. Workers in the retail industry are the most depressed, more men call for relationship counseling (22%) then women (18%), men are five times as likely to call about drug and alcohol problems, and most of them are in their 20s, and the highest percentage is from those in the construction industry.

BE THERE

The California Thoracic Society (CTS) will hold its fall symposium, Idiopathic Pulmonary Fibrosis and the Complications of Scleroderma on October 5 at the Cedars-Sinai Medical Center in Los Angeles. The program will feature Drs Paul Noble, Talmadge King, Joseph Lynch, Donald Taskin, Rajan Saggar and Daniel Furst, and there will also be a job fair. The CTS also announced that its Annual Carmel Conference will be held January 24 to 26 at the Quail Lodge in Carmel Valley. Contact calthoracic.org.

ETHICAL DILEMMAS

Mary Elizabeth Williams wrote on the website Salon about the story of Sarah Murnaghan, and the complicated issues surrounding her lung transplant. Here's

Williams' take (edited): "The 10-year-old girl, who has cystic fibrosis, received a lung transplant at Philadelphia's Children's Hospital after her family won a lengthy battle for her to get on the adult Organ Procurement and Transplantation Network's list. Her transplant was already controversial, raising ethical issues about who gets priority on organ donation lists, when the news of her family's legal victory broke last month. But [her] story took yet another turn when girl's health spiraled out of control after the surgery and she underwent a second lung transplant from a new adult donor. The girl was reportedly able to take a few breaths on her own, but needed another operation. Murnaghan was facing an all but certain imminent death before her transplant came through and faced very long odds of surviving. [A bioethicist at NYU wrote:] 'Given her medical situation, should she have been on the adult list in the first place?' But then again, it's worth asking why children her age were ever cut off from being candidates for potentially viable organs in the first place. The ethical issues her family and doctors face are common. Treatment is an investment – an expensive one – and stark financial reality and limited medical resources are often at odds with the emotional instinct to save lives. Clinical trials recruit subjects selectively, looking for candidates who are both sick enough to qualify for the drugs and well enough to tolerate them… Families battle ferociously over patient 'Do Not Resuscitate' directives. A recent DNR court case concluded, 'Determining what medical treatment should be provided to incompetent or dying patients presents a matter of substantial public importance.' But what's infinitely tricky to assess is exactly when someone becomes 'incompetent or dying.' The Murnaghan's story [reveals] agonizing, uneasy questions over who gets to be treated, who get a chance to be saved. And no guarantees, for anybody." [Subsequent to this, the child has had other operations, was still on a ventilator, and her cystic fibrosis was worsening.]

IT KEEPS SPREADING

Mari Cheng of the Associated Press reported via Huffington Post about the new respiratory virus that originated in the Middle East and keeps spreading. The MERS virus, which we reported on in an earlier issue, and which is more deadly than SARS, has now been identified in more than 60 cases, and has caused 38 deaths, mostly in Saudi Arabia. No one yet knows the source of the virus, but MERS (Middle East Respiratory Syndrome) spreads easily between people and within hospitals. It has infected some people who weren't physically close in the hospital to the infected person. Some cases have been also been reported in other Arab countries as well as Britain, France, Germany, Italy and Tunisia, among people who had a connection to the Middle East. Some patients infected a number of others and were labeled "superspreaders." Symptoms are a fever, a cough that lasts a few days, then fatal pneumonia. The fatality rate is at 65%. While SARS had an 8% death rate and came from bats to civet cats to humans, it's suspected that MERS comes from camels or goats, or perhaps bats that contaminated dates, which are popular in Saudi Arabia. While the number of cases is at this point small, scientists worry that it could evolve quickly and grow more dangerous. The latest news reports have indicated that the source of the virus might be camels.

BMC NEWS

BioMed Central's new online magazine, Biome, brings together a selection of new insights and perspectives from across the entire spectrum of biology and medicine. Biome highlights significant research, reviews and commentaries from BMC journals, place a spotlight on research communities, and provide a forum for discussion of the latest developments in open access publishing: research synopses and author Q&As, comment and analysis from the scientific community, spotlight on researchers from across biology and medicine, and guest blogs, podcasts and videos… BMC also introduced "portable peer review." A consortium of publishers, including BioMed Central, is working to minimize the difficulties of peer review by offering authors of papers rejected from eLife the option of taking the referees' reports with them to BMC-Series journals, Biology Open, PLOS and EMBO. Authors will have the choice of taking this option or not, and referees will have to agree for their names to be released, but the initiative has potential to save authors' and referees' time and resources.

NEW OPEN ACCESS JOURNAL

Respiratory Research is an open access journal aiming at publishing high-quality science in all areas of respiratory disease. Topics of specific interest include asthma, chronic obstructive pulmonary disease, cystic fibrosis, genetics, infectious diseases, interstitial lung diseases, lung development, lung tumors, occupational and environmental factors, pulmonary circulation, pulmonary pharmacology and therapeutics, respiratory immunology, respiratory physiology, and sleep-related respiratory problems. The journal accepts submission relating to both clinical and basic research in the respiratory field. The journal also welcomes state-of-the-art reviews on any topic related to the scope of the journal. Go to BioMed Central to see more.

UNNEEDED FOR THE UNINSURED

More than 40% of uninsured patients being treated for COPD

at a federally funded clinic did not have the disease, researchers found after evaluating the patients with spirometry. Dr Ghattas and Magdi H. Awad, PharmD, assistant professor of pharmacy at Northeast Ohio Medical University conducted their descriptive, retrospective study at Axess Pointe, a health center in Akron, OH. Federally Qualified Health Centers receive federal grants to support care for communities that have large numbers of uninsured and Medicaid patients. Between February 2011 to June 2012, researchers evaluated 80 patients who had been given either a diagnosis of COPD or had been prescribed an anticholinergic inhaler. Among those who received the diagnosis were three patients under the age of 35 and five patients who had never smoked, members of demographic groups unlikely to have COPD. Despite the Global Obstructive Lung Disease (GOLD) recommendation that no COPD diagnosis be made without spirometry, only 17.5% percent had been given the test. As part of this study, all 80 patients underwent spirometry. Results showed that 42.5% of patients had no obstruction at all, so did not have COPD. Another 23% had reversible obstruction, more characteristic of asthma. Only 35% of the patients had non-reversible obstruction, a defining characteristic of COPD.

PERILS OF YOUR PEERS

BioMed Central's new online journal Biome recently published an editorial about peer review by Gregory Petsko: "Increasing frustration with a peer review process that sometimes seems to reflect all the civility of being thrown to the lions in the Coliseum has led to a flood of commentaries with suggestions for reform. These range from a restrained comment from Raff et al in Science, in which they point out that getting experimental work published can take as long as or longer than doing the work in the first place, and that the extra experiments demanded by referees frequently only strengthen the conclusions marginally, to an invective against the tyranny of reviewer experiments (sic) about which Hidde Ploegh makes similar points in Nature. Current in many labs is a spoof carol with the first line 'Wreck their scrawls with caustic volleys,' sung to the tune of of 'Deck the Halls'. Suggestions for reform include Virginia Walbot's comment on how to train postdocs not to be pit-bull reviewers and, among many others, the publication policy of eLife, whose stated raison d'etre is to change the peer-review process, as well as the policy operated by BMC Biology, whereby authors may opt out of re-review after revision of their papers. It could reasonably be argued that none of this would ever have become necessary had the scientific community not lost sight of the fact that the responsibility of a reviewer is to review the paper as written, not to redesign the science the way he or she believes it should have been done. As Bob Horvitz has neatly put it: '…what is in the paper is fundamentally the responsibility of the authors, not of the reviewers.' Furthermore, journal editors should be willing to disregard unreasonable requests from reviewers, and not act as though the role of the journal was to set the direction of science and micromanage its conduct. Editors need to be more responsible, and journal policies could use improvement, but arguably the problem with peer review can only be fixed by an attitude adjustment on the part of reviewers: a recognition that follow-up and confirming experiments belong in future papers, combined with a humility that eschews showing off in favor of actually doing one's job. As Walt Kelly's philosophical possum Pogo so eloquently put it, 'We have met the enemy, and he is us.'"

IFC AND OSA

A study from researchers at the Cleveland Clinic shows that OSA patients who also have poor functional capacity have a greater risk of mortality, according to a study presented at the ATS 2013 International Conference. The study evaluated impaired functional capacity and its impact within the context of the OSA population. The researchers also wanted to determine if IFC remained a predictor of increased mortality even among OSA patients without coronary artery disease (CAD), another factor shown to be linked with increased mortality. Researchers reviewed the records of 1,533 OSA patients who had undergone both polysomnography and exercise stress tests utilizing echocardiograms. They found that OSA patients with IFC were five times more likely to die than those without IFC. It was also found that being female, smoking, increased BMI, comorbidities, and abnormal exercise echocardiograms were also predictive of IFC. Patients with IFC still were 2.7 times more likely to die than OSA patients without IFC. Among those with normal Duke Treadmill Scores, patients with IFC had a mortality risk that was 4.3 times that of those with normal functional capacity.

OSA = FAT MEN

A study from Japan indicates that OSA is independently associated with visceral (abdominal) fat accumulation only in men, perhaps explaining gender differences in the impact of OSA on cardiovascular disease and mortality. The study results were presented at the ATS 2013 International Conference in Philadelphia. The study enrolled 271 male and 100 female patients who were evaluated for OSA between October 2008 and December 2010. BMI and waist circumference were similar in men and women. Compared with women, men had greater visceral fat accumulation, more severe OSA, and more severe dyslipidemia. Statistical analyses of the relationships between OSA and fat accumulation revealed that in men, age, BMI, and two indicators of OSA, minimum oxygen saturation during sleep and alveolar-arterial oxygen difference, were independently associated with visceral fat accumulation, while in women, only BMI was associated with visceral fat accumulation. Measurements of subcutaneous fat were related to BMI in both men and women, but were not related to OSA parameters.

SAD AND BREATHLESS

Patients suffering from COPD typically suffer from depression more frequently than those without it, resulting in higher levels of disability and illness and increasing the overall healthcare burden for the COPD population. A study from researchers in Argentina indicates female COPD patients and patients who experience significant shortness of breath may have the greatest risk for developing depression. The study was presented at the ATS 2013 International Conference. The researchers evaluated 113 COPD patients who were treated at the Hospital Cetrangolo in Buenos Aires from January 2009 to March 2011 and who had not had exacerbations of their disease within the previous 30-day period. Patients were evaluated for pulmonary function and for the degree of shortness of breath they experienced, as well as other physical characteristics including weight and body mass index. The researchers used previous diagnoses of depression and the Beck Depression Inventory (BDI) to determine the presence and level of depression and the Saint George's Respiratory Questionnaire (SGRQ) to evaluate quality of life measures for each patient, and they also looked at specific lifestyle factors and habits like smoking and family history of depression. Patients were considered to be physically active if they engaged in physical activity for at least 150 minutes each week. The researchers discovered that while the severity of COPD and smoking had no bearing on whether or not a patient had depression or their level of depression, female patients and those experiencing significant shortness of breath were at a significantly greater risk for the condition. The presence of depression and its intensity had a direct bearing on a patient's quality of life. The researchers also identified physical activity as a protective factor against depression.

IMPROVE AND INVENT

The COPD Foundation (COPDF) partnered with Edison Nation Medical, an online resource for individuals who have an idea for improving healthcare but lack the knowledge or resources to make that idea a reality, to find and develop innovations that will improve the lives of those impacted by COPD. The search focused on finding various new ideas, from improvements to current respiratory therapy products on the market to new solutions that would make it easier for patients to take advantage of treatments. Edison conducted the search through a confidential and secure online portal. Healthcare professionals, patients and caregivers submitted their ideas for review by a team of product development and medical experts. Edison Nation Medical will design and build the winning products and split royalties with the inventors, and donate 50% of its share to the COPDF. Contact copdfoundation.org to find out more.

DECLINE

An updated analysis from the CDC reports a decrease in deaths among male patients who have COPD and a decline in hospitalizations for patients with COPD. The report also reveals that rates of physician-based office and emergency department visits remained the same, but pointed to this as encouraging because there was no increase in visits. The current report analyzed data from 1999 to 2011 and used a number of sources. The report noted that the American Indian population had higher COPD prevalence, hospitalizations and death rates than other specific racial or ethnic groups.

EASIER

The COPD Foundation (COPDF) announced the release of "Breathing Easier In Tennessee: How Employers Can Mitigate the Health and Economic Costs of Chronic Obstructive Pulmonary Disease (http://www.copdfoundation.org/Learn-More/For-Employers/COPD-Foundation-White-Papers.aspx)," discussing strategies for employers in Tennessee to improve the productivity and quality of life for employees living with chronic obstructive pulmonary disease (COPD). The rate of prevalence of COPD in Tennessee is 8.7%, the third highest in the nation, according to the Centers for Disease Control and Prevention. The paper outlines essential steps that employers can take to reverse this health crisis, including: Accessing tools to better understand and measure the full impact of COPD on the workforce, such as the COPD Employer Toolkit, which enables employers to estimate COPD costs and potential savings that could result from better management; establishing a benefit plan with employee incentives for following COPD preventive care and medication compliance; ensuring health plan coverage for COPD-related care, such as pulmonary rehabilitation services and maintenance programs; and encouraging employees to take the five-question COPD Risk Screener. Contact copdfoundation.org.

PRODUCTS

MEDAL WINNER

Fisher & Paykel Healthcare was recognized recently for Optiflow Junior, its new nasal cannula designed specifically for infant and pediatric patients, with a silver award at the prestigious Medical Design Excellence Awards. The award was presented in Philadelphia and is further recognition of the company's customer-led design processes. The Medical Design Excellence Awards (MDEA) are the medical technology industry's premier global awards and are judged by a multidisciplinary panel of independent jurors comprised of a balance of clinicians, engineers, and designers. Optiflow Junior was first released to market in March 2012 following years of engineering and development which included significant in-hospital customer research. Optiflow Junior is a revolutionary system for providing simple and effective delivery of oxygen therapy to infants in respiratory distress, and combines an anatomically contoured nasal cannula with optimally humidified flow. It is a high performance product that responds to requirements from parents, nurses and doctors - flow delivered through soft anatomical prongs, ease of use with a patented Wigglepad system which enables easy re-application, adjustment and maintenance,

and longer circuits and a clothing clip that enables improved mother child bonding and feeding. The result is a cannula that is loved by clinicians, parents and babies. Contact fphcare.com.

RIDE ON

Philips Respironics supported Mark Junge, a 70-year-old adventurer, cyclist, and COPD awareness advocate, as he embarked on a 500-mile bicycle tour through Canada to raise awareness for COPD and encourage oxygen-dependent people to stay as active as possible. The ride began in Vancouver, British Columbia on July 9, 2013 and concluded three weeks later in Prince George. The British Columbia ride was the fourth segment of a six-stage North American bike trip from Tijuana, Mexico to Homer, Alaska. Upon its completion, the retired historian had bicycled not only across the heartland of America, but also along two oceans flanking the US and Canada, all while relying on portable oxygen. During the ride, the Respironics SimplyGo portable oxygen concentrator (POC) was strapped to the back of Junge's bike to help him breathe more easily on his journey. Junge, who was diagnosed with COPD in 2003, was able to use SimplyGo at a pulse dose while riding, and set it to a continuous flow of oxygen while biking uphill and while sleeping. Junge's wife Ardath coordinated the journey and ride alongside him in a support vehicle.

A MAJOR LEAP

Respiralogics' new **baby** line represents a major leap forward in the delivery and maintenance of nCPAP and non-invasive ventilation for infants in the NICU and PICU by providing comfortable, secure and skin-friendly fixation. Clinicians' experiences and critical eye were integral in the design and development of the **baby** products, which were developed after listening to many a clinician's frustration with current products. The new Respiralogics line includes: Baby Nose Bumper and Circuit Bumpers for the baby who Just Wants To Have A Pretty Nose after therapy is complete. The skin-friendly Baby Nose Bumper "mustache" is made of RespiraGel, Respiralogics' new hydrocolloid- based adhesive. Baby Nose Bumper gently holds the nasal interface to the mustache-area, providing a secure grip and gentle cushion for the nares. Circuit Bumpers provide a cushion for the breathing circuit by gently attaching the inspiratory and expiratory limbs to the Baby Cap. Baby Nose Bumper and Circuit Bumpers allow ideal fixation and comfort of the patient interface. Baby Cap is for the baby who Just Wants A Soft, Comfortable Cap. Baby Cap holds the nasal prongs and circuit in place, providing optimal fixation for infant nCPAP and NIV. The inspiratory and expiratory limbs are secured to the Baby Cap with Circuit Bumpers. Baby Chin Strap is for the babies who Just Can't Keep Their Mouth Closed. Baby Chin Strap is a single patient use device intended to help keep small patients' mouths closed during delivery of nasal CPAP and NIV. Baby Chin Strap provides support with a soft, skin-friendly strap placed under the chin and secured to the Baby Cap with hook and loop tabs. Baby Chin Strap is a comfortable solution for mouth leaks. It adjusts to provide the support needed to easily close the mouth. [RespiraGel, Baby Cap, Baby Nose Bumper and Baby Circuit Bumpers and Baby Chin Strip are trademarks of Respiralogics.] Contact respiralogics.com.

INSTALLED IN ALL

University Children's Hospital Basel in Basel, Switzerland, and Masimo announced that the hospital has become the first multi-department pediatric facility in Central Europe to install on all general ward beds Masimo Patient SafetyNet, a remote monitoring and clinician notification system shown to keep patients safer, enabling a 65% reduction in rapid response team activations and 48% reduction in ICU transfers. The installation at the University Children's Hospital Basel – Universitats-Kinderspital Beider Basel (UKBB) – took place after an extensive evaluation process resulting in the organization's standardization to Masimo SET pulse oximetry. UKBB joins a growing list of prominent health systems around the world using Patient SafetyNet, which combines the performance of Masimo SET pulse oximetry, the enabler of reliable monitoring in the general ward, with ventilation monitoring and wireless clinician notification. Patient SafetyNet can help ensure patients' safety by noninvasively and continuously measuring and tracking their underlying physiological conditions and changes that signal declining health status in real time. When changes occur in the measured values, which may indicate deterioration in the patient's condition, the system automatically sends wireless alerts directly to clinicians. Patient SafetyNet has been clinically shown to reduce preventable and costly rescue events, transfers to intensive care units, and deaths related to opioid-induced respiratory depression. Contact masimo.com.

APPROVAL

The Bunnell Life Pulse High-Frequency Ventilator (HFV) circuit has been under a Class 1 Recall since December 12, 2013. With the approval of a new circuit for the Life Pulse HFV, Bunnell can now recall and replace circuits in the field that were included in the Class 1 Recall. Letters were sent to all affected hospitals announcing the circuit recall, identifying the affected Lot numbers, and explaining the return and replacement procedure. The new Life Pulse circuits have a heater wire with insulation that has a much higher melting temperature than the original heater wire. As a result, the failure mode that initiated the recall is eliminated. Bunnell Incorporated has been in business since 1980 and has manufactured the Life Pulse HFV since 1988. Contact bunl.com.

GROUNDBREAKING

Nihon Kohden announced the introduction of the PSG-1100 Polysomnography System. This groundbreaking technology brings together ease of connectivity, unsurpassed recording power, exclusive Nihon Kohden sensor technology and the highest quality electronics in the sleep industry. The PSG-1100 system brings technology that helps the clinician diagnose patients with complex sleep disorders and co-morbidities. The development of the PSG-1100 focused on including additional dedicated channels for PSG montages such as EOG, Chin and ECG, allowing the clinician to record complete EEG montages integrated with the PSG montages. Also included are 3 channels

of dedicated ECG and a dedicated reference to allow for accurate holter level ECG analysis. Nihon Kohden continues its legacy of cutting edge sensor development with the introduction of the TG-970 2nd generation main stream EtCO2 sensor. This new technology makes even smaller the most accurate EtCO2 monitoring available for polysomnography. With 42 AC, 10 DC channels with 16 bipolar inputs, built in EtCO2 and SpO2 and IP connectivity, this high quality system demonstrates unrivaled value in the industry. Contact nkusa.com.

LISTEN UP

GN Otometrics was the official partner to test the hearing of top athletes at the most recent Deaflympics. Deaflympics was the first international competition for any group of people with disability. It was created to address the need of hearing impaired athletes for special communication and social interaction the sports field. Formerly known as the International Silent Games, it was launched on 1924 in France. The most recent Summer Deaflympics was held in the city of Sofia in Bulgaria, where, 4000 athletes from over 90 countries competed in 16 different sports. The ability to test the athletes and ensure their eligibility for the competition was a vital part in securing fair play. Hearing assessment testing took place before and throughout the competition. In order to determine the top athletes' hearing loss and eligibility to compete, Otometrics had set up three test centers that were equipped with advanced testing equipment and sent three audiologists from the Institute of Sound and Vibration Research in Southampton in the UK. Two audiologists performed the required assessment and spot tests, while the third audiologist tested athletes from developing countries. Contact gnotometrics.com.

INFUSIASTIC

Belmont Instrument Corporation announced that The Belmont Rapid Infuser, a blood and vital fluid warmer, FDA cleared in 1999, has now been used in over 350,000 procedures worldwide. This includes civilian hospitals and military field hospitals in Iraq and Afghanistan. The Belmont Rapid Infuser warms blood and blood products to the correct physiological temperature, automatically removes air, and infuses high fluid volumes into patients during surgical procedures and trauma events. Featuring patented electromagnetic heating induction with automatic target temperature settings based on the selected infusion rate, it automatically monitors both the infusion process and its operation for optimum patient safety. Belmont Rapid Infuser is completely manufactured in-house, which has helped assure safe, high-volume operation. This includes low-cost single-use tubing sets that are color-coded, insert with a tactile feel, and fully align when the instrument door is closed. These single-use sets weigh less than a pound, and minimize medical waste. The Belmont Rapid Infuser is priced from $20,700. (list) and the single-use tubing sets are $115 each. Contact belmontinstrument.com.

IN HOME MONITORING

AMC Health announced the addition of five new technologies to its remote monitoring platform. A new wireless video console enables remote visits between clinicians and patients in their homes. In addition to high-definition audio and video, the console transmits blood pressure, pulse, blood glucose readings, oxygen saturation, weight and temperature. A wireless medication management system helps patients with complex dosing regimens take their medications on time, and notifies a family member or clinician if they don't. An adherence monitor for inhaled medications provides the same support for people with asthma and COPD. A wireless personal emergency response system enables users to contact a monitoring station or a family member for immediate assistance, even if they are not in their own homes. AMC Health also offers a multi-user kiosk provides wireless telemonitoring of weight, blood pressure, oxygen saturation and blood glucose levels. The kiosk can be installed at any location, such as a group residence. AMC Health's telehealth platform collects, analyzes and integrates information from different sources. It also contains decision support tools so clinicians can identify patients at risk of developing a medical problem so they can intervene. Contact amchealth.com.

MOST WIRED

PeriGen congratulates its nine provider clients named among the "Most Wired Hospitals and Health Systems." Published in the 15th annual "Most Wired" survey in July's Hospitals & Health Networks magazine, the survey's list recognizes US medical facilities that have made significant inroads advancing clinical information technologies to improve patient care and operational efficiencies. The clients are Atlantic Health Systems, NJ; Banner Health, AZ; Baystate Health, MA; Continuum Health Partners, NY; Maimonides Medical Center, NY; MedStar Health, MD; St Joseph's Hospital Health Center, NY; and Winthrop-University Hospital, NY. In the most-improved category was Mary Greeley Medical Center, IA. Contact perigen.com.

INTEGRATED

PeriGen announced the first integration of its PeriCALM perinatal system with Taylor Regional Hospital's electronic health record (EHR) from Computer Programs and Systems, Inc. The interface, which went live in June, allows clinicians at the Hawkinsville, GA-based 55-bed rural community hospital to access consolidated, up-to-date inpatient and perinatal data, improving quality, timeliness and safety of patient care across the facility. Contact perigen.com.

PULMONARY HYPERTENSION

Bayer HealthCare presented data on its investigational pulmonary hypertension compound riociguat at the ATS Conference. Multiple new data sets from Bayers' riociguat clinical development program in pulmonary hypertension and chronic thromboembolic pulmonary hypertension were presented. Riociguat, discovered and developed at the Bayer research laboratories, is an investigational oral soluble guanylate cyclase (sGC) stimulator that is being studied in CTEPH and PAH, as well as other forms of pulmonary hypertension. Bayer submitted a new drug application for riociguat in two

indications: the treatment of PAH (WHO Group 1) to improve exercise capacity, improve WHO functional class and delay clinical worsening; and the treatment of persistent/recurrent CTEPH (WHO Group 4) after surgical treatment or inoperable CTEPH to improve exercise capacity and WHO functional class. Riociguat will offer a new treatment option for patients with PAH and will also provide the first approved non-surgical treatment option for CTEPH patients who are inoperable or who have recurrent or persistent disease. It is an investigational, oral medication for the treatment of adult patients with PAH or inoperable or persistent/recurrent CTEPH. If approved by the FDA later this year, it would create a new class of therapy available in the US. PH is associated with endothelial dysfunction, impaired synthesis of nitric oxide and insufficient stimulation of soluble guanylate cyclase (sGC). Riociguat stimulates sGC independent of NO and increases the sensitivity of sGC to NO. Contact bayer.com.

TRANSITIONED

Boehringer Ingelheim Pharmaceuticals, Inc updated healthcare professionals and patients about the transition to COMBIVENT RESPIMAT (ipratropium bromide and albuterol) Inhalation Spray for the maintenance treatment of COPD. Distribution of COMBIVENT (ipratropium bromide and albuterol sulfate) Inhalation Aerosol (COMBIVENT MDI) ceased, and COMBIVENT RESPIMAT is the only COMBIVENT product available. COMBIVENT RESPIMAT is a propellant-free inhaler that uses a slow-moving mist to deliver the same active ingredients of COMBIVENT MDI. Patients transitioning to COMBIVENT RESPIMAT from COMBIVENT MDI need a new prescription prior to the transition. The new inhaler was developed in response to the Montreal Protocol, an international treaty enacted to protect the ozone layer by phasing out the production and use of substances believed to be responsible for ozone depletion, including some inhalers that use chlorofluorocarbon (CFCs) propellants. The recommended dose for COMBIVENT RESPIMAT is one inhalation four times a day as compared to COMBVIENT MDI, which is administered as two inhalations four times a day. The total number of inhalations for COMBIVENT RESPIMAT should not exceed six in 24 hours. The inhaler offers a dose indicator to inform patients of the approximate amount of remaining medication in the inhaler, and the device locks when all of the medication has been used. When used as directed, each COMBIVENT RESPIMAT delivers 30 days' worth of treatment compared to 25 days' worth of treatment in each COMBIVENT MDI. COMBIVENT RESPIMAT patients may require two less inhalers over the course of a year. Contact combivent.com.

CLEARED

Breathe Technologies, Inc announced that the FDA has granted the company 510(k) clearance to market its Sleep System (Continuous Positive Airway Pressure, or CPAP & Interface) in the US for treatment of OSA. The Breathe Sleep System utilizes miniaturized technologies coupled with user-centric design to provide a new therapeutic solution for patients with OSA. Breathe's Sleep System is easy to set up and provides effective CPAP therapy with a comfortable, discrete interface and tubing. Additional advanced features include a redesigned humidification system, an interactive patient touch-screen interface, and a smart pressure ramp function. Breathe Technologies' product portfolio will be further enhanced with the addition of the Breathe Sleep System. Breathe Technologies' award-winning Non-Invasive OPEN Ventilation (NIOV) System is a one pound, wearable hospital to home miniaturized ventilation device that facilitates early ambulation in hospital settings and enables patient independence in the home for better quality of life. NIOV is currently in use by clinicians and patients across the country, including public and private hospitals, VA healthcare facilities, pulmonary rehab centers, and with patients at home. Contact www.breathetechnologies.com.

LAUNCHED

Covidien has launched the Microstream MicroPod module. This is an important product for its OEM partners that will help hospitals improve patient safety by expanding access to capnography technology. With the MicroPod module adding a new level of flexibility to Covidien's line of OEM modules, OEM partners can now incorporate market-leading Microstream capnography in a wider variety of medical devices. Additionally, the MicroPod module's external module configuration will help hospitals better manage their capital costs with a "plug-and-play" solution that can be shared between multiple devices. The MicroPod module contains Smart Capnography algorithms, including: Integrated Pulmonary Index

(IPI) combining four real-time respiratory measurements – capnography, respiratory rate, pulse rate and pulse oximetry – to provide clinicians with an integrated snapshot of a patient's respiratory status, and Smart Alarm Respiratory Analysis alarm management technology that reduces insignificant respiratory alarms. In addition, the MicroPod module can be used with Covidien's FilterLine breath sampling lines which can effectively collect exhaled carbon dioxide from a patient's mouth and nose while delivering supplemental oxygen. FilterLine sampling lines are further designed to handle moisture and humidity effectively, decreasing potential for obstructions that make it difficult to obtain accurate readings, a common problem with other capnography systems. Contact covidien.com.

INTERFACE

Covidien released a new interface making the INVOS cerebral oximetry system compatible with the Nuvon System. The technology allows hospitals to integrate patient data with Electronic Medical Record systems. Covidien products compatible with the Nuvon interface include: • INVOS Cerebral/Somatic oximeter; • Nellcor N-600x pulse oximeter; • Oridion Capnostream 20 patient monitor; • BIS Vista brain monitoring system; and • Puritan Bennett 840 ventilator. Contact covidien.com.

MOTION CLAIMS CLEARANCE

Covidien announced that its Nellcor pulse oximetry portfolio, which is used to measure arterial oxygen saturation, has received FDA 510(k) clearance for motion claims. This makes Covidien the first company to receive FDA clearance for a motion-tolerant bedside pulse oximeter portfolio that is also compliant with ISO 80601-2-61 (International Organization for Standardization standards for pulse oximetry). Devices covered by the action include: • Nellcor Bedside SpO2 Patient Monitoring System; • Nellcor Bedside Respiratory Patient Monitoring System; and • Nellcor N-600x Pulse Oximetry Monitoring System. Nellcor devices rely on cardiac-based signals to provide a more accurate reading that is closely tied to the patient's physiology. This drives consistent performance during various challenging conditions, such as patient motion, noise and low perfusion, which can impede the assessment of patient respiratory status. Covidien offers pulse oximetry training through its Professional Affairs and Clinical Education Online Platform to support the safe and effective use of motion-tolerant pulse oximeters. Contact covidien.com.

WANNA BE SEDATED

Covidien announced a new campaign to help medical professionals better manage sedation for ventilated patients in the ICU. The campaign features an online sedation management resource site, www.covidien.com/ICUSedation, that houses education and training for clinicians. Sedation management in the ICU is an important issue because as many as 71% of patients in the ICU show signs of agitation at least once during their stay. In response, clinicians will often increase sedation levels because they believe it's the compassionate thing to do, but they are actually prolonging the patient's time on a ventilator and their recovery. The goal of this campaign is to give clinicians access to the tools they need, including clinical education, research, and advanced technology, to help manage sedation in patients more effectively. Contact covidien.com.

UNVEILED

Dräger unveiled its comprehensive portfolio of architectural products and workplace designs at the National Teaching Institute (NTI) in Boston. These ergonomic workplace solutions integrate components into an intelligent design that streamlines workflow for medical staff and creates a healing environment for patients. Innovative features include a new lighting concept, an additional support arm for lifting patients, and a noise volume indicator. Dräger's new circadian rhythm lighting option simulates the natural progression of daylight over a twelve-hour period. Another option allows staff to change the mood in the room by adjusting lighting in the primary colors of red, green and blue (RGB light). At night, navigation lights on the top of the ceiling supply the unit's arms and the bottom of the media column enable the nursing staff to move around safely without disturbing sleeping patients. Lights in self-closing drawers make it easy to quickly locate supplies and help to minimize mistakes and disturbance of the patient. Dräger now offers the option of adding an additional support arm to the ceiling supply unit to accommodate a Guldmann patient lifter. Designed for a total maximum weight of 771.6 lbs (350 kg), the patient lifter can be adjusted electrically for back-friendly lifting and transferring of patients from bed to bed. The Dräger Noise Display volume indicator gives an optical warning signal if staff or visitors exceed set limits for the room's sound level. Contact draeger.com.

CONSISTENCY

Dräger demonstrated its new AutoBreath technology at the 2013 AWHONN Conference. AutoBreath automates the neonatal resuscitation process, allowing clinicians to set and deliver consistent BPM, PIP, FIO2, PEEP, and LPM – which can contribute to a decrease or elimination of potential hazards such as air trapping, hemodynamic insult, and inadequate ventilation. Dräger offers AutoBreath as an advanced respiratory support option of the Resuscitaire Radiant Warmer. AutoBreath allows for matching ventilation rates with the recommended clinical protocols and guidelines for neonatal resuscitation because it eliminates inconsistencies in care caused by fatigue and different levels of clinician experience. Using AutoBreath technology reduces the risk of insufficient inflation and overinflation of the infant's lung during resuscitation. When using the AutoBreath feature, clinicians can use two hands to provide a better seal, which may reduce air leakage from the face mask. Contact draeger.com.

GOING SOLO

The new SOLO single prong cannula (affectionately nicknamed "Unicorn" by users) is Vapotherm's latest product. The SOLO cannula provides a whole new way to assure an open system while delivering High Flow Therapy to neonatal and infant patients. With its single prong design, SOLO eliminates concerns about over occlusion of tiny nares, simplifies NG tube placement, and may facilitate the delivery of High Flow Therapy in patients with anatomical defects. SOLO works with the Vapotherm Precision Flow to provide the same gentle and effective ventilatory support of a dual prong cannula, and only Vapotherm can deliver High Flow Therapy through a single prong. The SOLO cannula delivers up to 8 lpm, and standardizing on the SOLO simplifies fitting the right cannula for the patient. In general, Vapotherm High Flow Therapy offers an approach to avoid the skin breakdown from tight fitting masks and nasal prongs and the costly adverse events associated with intubation, while simplifying access to care for, feed, and hold the patient. Dr Jorge Rojas, an early adopter of the SOLO cannula tells us, "The single prong cannula has worked very well for us particularly to support neonates under 1000 grams. With the single prong

cannula we do not worry about occluding too much of the nares." Contact vtherm.com, (866) 827-6843.

HIGHER DOSE

Grifols, a global healthcare company based in Barcelona, presented results from a study demonstrating that a higher dose of PROLASTIN-C (Alpha 1-Proteinase Inhibitor [Human]) increased levels of the alpha1 protein in patients with alpha 1 antitrypsin (AAT) deficiency to levels that are considered within the normal range for healthy individuals. AAT deficiency is a life-threatening, genetic condition in which low levels of the alpha 1-proteinase inhibitor (A1PI) protein can lead to emphysema. Results of the PROLASTIN-C SPARK study, a multidose pharmacokinetic clinical trial, were presented at the annual meeting of the ATS. Data showed that weekly infusions of PROLASTIN-C at 120 mg/kg increased serum concentrations of the A1PI protein to proportionately higher levels than weekly infusions of 60 mg/kg, the currently approved dose of PROLASTIN-C. Furthermore, the 120 mg/kg dose raised serum concentrations of A1PI to the range of 20-53 µM, considered to be normal for healthy individuals. Both doses were safe and well tolerated in subjects with AAT deficiency. Contact grifols.com.

AGREEMENTS

Kimberly-Clark announced it was awarded three group purchasing agreements with the Premier healthcare alliance for its KimVent Oral Care products and the Pediatric Microcuff Endotracheal Tube. It was awarded two agreements for its KimVent Oral Care products, including one contract within Premier's Accelerated Supply Chain Endeavor (ASCEND) program. The contracts provide specially negotiated pricing and terms for Premier's nearly 100,000 hospitals and other care sites. Earlier this year, the company was awarded a contract through Premier's Technology Breakthroughs Program for its Pediatric Microcuff Endotracheal Tube. The agreement allows Premier's more than 300 ASCEND member hospitals to take advantage of additional pricing opportunities. ASCEND is designed to help healthcare providers achieve and sustain rapid improvements in supply chain performance and Kimberly-Clark is the only supplier providing oral care products for those facilities. Designed for nurses by nurses, KimVent 24 Hour Oral Care Kits offer a complete portfolio of oral care solutions to help maintain protocol compliance and specifically address the risk factors associated with ventilator-associated events such as ventilator-associated pneumonia which can be caused by oral aspiration of pathogenic bacteria and contaminated secretions. The second KimVent Oral Care products award allows all Premier members to take advantage of specially negotiated pricing and terms for the KimVent Oral Care solutions. Contact kimberly-clark.com.

ENHANCED CARE

Hill-Rom Holdings, Inc has commercially released the MetaNeb 4.0 System, the company's latest advancement in airway clearance technology for enhanced patient care in the hospital. Delivering therapy through airway oscillation (Continuous High Frequency Oscillation) and continuous pressure (Continuous Positive Expiratory Pressure), the MetaNeb 4.0 System helps enhance normal mucus clearance from the lungs, delivers lung expansion therapy, and assists in the treatment and prevention of pulmonary atelectasis, a complete or partial collapse of the lung. The system also has the ability to provide supplemental oxygen when used with compressed oxygen. The next-generation MetaNeb 4.0 System improves therapy performance, enhances ease of use when used with mechanical ventilation, and enhances therapy delivery. Patients who may benefit from the MetaNeb 4.0 System include those with one or more of the following disease states: bronchiolitis, cystic fibrosis, asthma, chronic bronchitis, neuromuscular disorders, emphysema, COPD, patients needing post-operative airway management, and patients needing emergency room airway management. Contact hill-rom.com.

GIFT OF LIFE

The LIFE Corporation manufactures superior quality, patented emergency oxygen and CPR administration equipment that is lightweight, portable and easy to use for all kinds of emergency first aid situations. The products from LIFE are the only models currently on the market that offer both the 6 and 12 LPM flow rates with just two simple settings, "norm" and "high." The LIFE StartSystem is packed inside a durable, water-resistant case that weighs only 8 pounds, and has the capability to hold both an AED defibrillator along with equipment for administering emergency oxygen. Containing a 15+ minute supply of 113 liters of safe, stable oxygen that does not expire and can be given in all temperatures, the oxygen cylinder additionally features a constant reading supply gauge to check oxygen levels, even when the unit is not turned on, and a durable, knurled knob valve for easier operation. The StartSystem easily fits into a standard-sized AED wall cabinet, and spare oxygen cylinders are optional, or the empty cylinder can also be refilled at a certified gas distributor. The defibrillator is sold separately. Available in two different models, the LIFE SoftPac system is the preferred choice for frequent carrying as it weighs only 6 pounds. Model LFC-LIFE-2-612 features the FDA minimum setting of 6 liters per minute for general emergencies, and the American Heart Association's 100% inspired oxygen at 12 liters per minute for extreme emergencies. The LFC-LIFE-2-025 model is recommended for trained EMTs, and features a variable flow rate with twelve independent flow settings for a wide range of emergencies. Both models contain a 40 minute supply of oxygen when they are set at 6 LPM, and the constant reading gauge allows monitoring of the amount of oxygen remaining in the unit. The LIFE CPR Masks can also be purchased separately in cases of 20, with a large airway opening that relieves back pressure, and a seal created by contoured soft medical-grade PVC. The one-way valve helps to prevent transfer of contagious diseases, while the hydrophobic 3M Filtrete filter located above the valve assists in preventing cross-contamination. These universal-fit masks are clear to enhance visual observation of the mask's interior, as well as the patient's status and color. Contact lifecorporation.com.

KEEPING PATIENTS SAFER

University Children's Hospital Basel in Basel, Switzerland and Masimo announced that the hospital has become the first multi-department pediatric facility in Central Europe to install on all general ward beds Masimo Patient SafetyNet, a remote monitoring and clinician notification system shown to keep patients safer, enabling a 65% reduction in rapid response team activations and 48% reduction in ICU transfers. The installation took place after an extensive evaluation process resulting in the organization's standardization to Masimo SET pulse oximetry. Patient SafetyNet, combines the performance of Masimo SET pulse oximetry with ventilation monitoring and wireless clinician notification. Patient SafetyNet can help ensure patients' safety by noninvasively and continuously measuring and tracking their underlying physiological conditions and changes that signal declining health status in real time. When changes occur in

the measured values, which may indicate deterioration in the patient's condition, the system automatically sends wireless alerts directly to clinicians, prompting a response to the patient's bedside. It has been clinically shown to reduce preventable and costly rescue events, transfers to intensive care units, and deaths related to opioid-induced respiratory depression. Contact masimo.com.

LESS PAIN/EXPANDED USE

Ochsner Medical Center in Baton Rouge expanded its use of capnography to monitor patients using pain medication through patient controlled analgesia (PCA) to strengthen patient safety measures. Capnography evaluates how effectively patients are breathing by measuring exhaled carbon dioxide, alerting medical caregivers when life-threatening respiratory depression occurs. PCA poses unique risks because the opioid medications have the potential to suppress the patient's breathing. Ochsner — Baton Rouge chose capnography equipment from Covidien… Terre Haute Regional Hospital recently expanded its use of capnography for respiratory monitoring outside the operating room, joining a growing group of healthcare leaders in embracing state-of-the-art patient safety technology. Terre Haute Regional Hospital also chose capnography equipment from Covidien. Contact covidien.com.

ROTARY FUNCTION

Olympus announced the commercial availability of its 510(k) cleared BF-190 bronchoscopes. The new BF-190 bronchoscopes offer unparalleled maneuverability and flexibility through the combination of their unique Rotary Function and wider tip angulation, which will potentially allow physicians to access areas of the lung that may not be easily reached with current generation bronchoscopes. The Rotary Function is estimated to reduce hand torque by up to 82%, which may translate to a significant reduction in hand fatigue and injury. The BF-190 bronchoscopes are powered by Olympus' new EVIS EXERA III Universal Platform, the only HDTV Imaging system that helps facilitate more accurate bronchoscopic diagnosis and treatment, simplify setup and reprocessing, and improve versatility. The HDTV image, along with other enhanced features from the EVIS EXERA III processor and light source, will provide a clear and detailed endoscopic image that allows for more precise observation. The EVIS EXERA III system works seamlessly with a wide range of endoscopes across specialties to provide easier data management and cost efficiencies. Contact olympusamerica.com.

FDA OK

Oricare, Inc announced that the V8800 ICU Ventilator has received 510(k) clearance from the FDA. The V8800 is an ICU ventilator that will complement Oricare's broad range of products for the Operating Room and Intensive Care Unit. The V8800, Critical Care Ventilator is designed for use with infants, children and adults. It has comprehensive functionality, a user-friendly design, and is full of high-quality, reliable treatment options for the clinician. With a 15" TFT LCD touch screen and a simple intuitive interface, the user can easily and quickly select ventilation settings. The V8800 display can be rotated 180 degrees, allowing for different angles of observation and action. The V8800 provides a wide range of advanced ventilation modes that enable effective care across different patient acuity types. Integrated Spirometry offers additional clinical information which enhances careful decision-making. Modes of ventilation include Volume Controlled, Pressure Controlled, Pressure Regulation Volume Controlled, Synchronized Intermittent Mandatory Ventilation, Spontaneous Ventilation, Bi Level Ventilation and Noninvasive Ventilation. Contact oricaremed.com.

SLEEP-STARTER

Philips Respironics introduced its REMstar SE sleep therapy system. REMstar SE is an entry-level continuous positive airway pressure (CPAP) device that includes many of the features of its System One family. The REMstar SE meets CMS reimbursement requirements and provides a robust set of features in one affordable unit. With the REMstar SE offers features including Flex pressure relief, enhanced humidification with Heated Tube option, and compliance tools such as the EncoreAnywhere compliance management system. The REMstar SE is oximetry-module-capable and offers on-board memory. The REMstar SE is a cost-effective solution for individuals seeking a reliable backup unit when needed. Patients can use the secondary device to remain compliant without sacrificing comfortable therapy. Contact respironics.com.

TOUGH

Panasonic announced upgrades to the Panasonic Toughbook H2 handheld tablet PC. The certified device includes a faster processor, expanded storage and other improvements, while retaining critical features to enhance usability and durability, including the ability to survive a 6-foot drop. With these upgrades, the Toughbook H2 delivers greater performance for clinicians and other mobile professionals. Key improvements are: an upgraded processor, expanded storage, improved battery life, and enhanced connectivity. The 3.5 lb Toughbook H2 handheld tablet PC runs the Microsoft Windows 7 Professional (32-bit or 64-bit) operating system and includes optional integrated technology such as barcode, fingerprint, insertable or contactless SmartCard/RFID readers. Its 10.1-inch XGA LED transflective touchscreen with Panasonic CircuLumin technology allows for full circle viewability from the brightest sunlight to pitch darkness. For healthcare environments, the Toughbook H2 has a fully-sealed design, with no fan vents or exposed ports, for easy disinfection, reducing the risk of potentially pathogenic microorganisms being spread from patient to patient. The device is a secure and intuitive platform for barcode medication administration (BCMA), vitals capture and electronic medical records (EMR) capture and review. Contact panasonic.com/toughbook/h2.

CONSENT

Drive Medical announces that it has unilaterally consented to the International Trade Commission case relating to the sale and importation of certain of its CPAP masks. Under the consent order, which was approved by the International Trade Commission on July 19, 2013, Drive Medical has agreed to stop importing and selling the Freedom 210 and Freedom 220 CPAP masks. Drive respects the intellectual property rights of all third parties and is conducting an investigation as to the patent claims asserted by ResMed as part of a separate lawsuit pending in California. Drive is continuing to offer a wide variety of CPAP masks to its customer base. Contact drivemedical.com.

REPLACEMENT

AvalonAire, a CPAP division of Pepper Medical Inc, now has a cost effective alternative to the PB Nasal pillows in stock and on sale: Part # AA-02 S Replacement nasal pillows, blue, small; Part # AA-02 M Replacement nasal pillows, clear, medium; Part # AA-02 L Replacement nasal pillows, green, large. • Low

cost replacement for Puritan Bennett, ADAM, and Breeze Interfaces; • Nasal Pillows made of premium grade silicone provide comfortable seal, reducing leaks and aiding compliance, available in three sizes (small, medium, large). Sizes color coded for easy reference. • Velcro fasteners secure tubing into place atop soft headgear. • Swivel Adapter provides greater range of motion without disrupting airflow. Each kit comes with Nasal Shell, Elbow Adapter, Swivel Adapter, Flex Tube Assembly, Headgear, and one pair of Nasal Pillows. Nasal Pillows made of premium grade silicone provide comfortable seal, reducing leaks and aiding compliance. Available in three sizes (small, medium, large). Sizes color coded for easy reference. • Velcro fasteners secure tubing into place atop soft headgear. • Swivel Adapter provides greater range of motion without disrupting airflow. Contact avalonaire.com.

MINIMAL CONTACT

Philips Respironics announced the commercial release of a first of its kind minimal contact nasal mask – Wisp. Designed to fit more than 98% of sleep apnea patients, Wisp brings distinctive styling and patented technology for a better overall mask experience that may improve patient compliance. A departure from traditional masks, Wisp combines the performance and comfort of a nasal mask with the aesthetic of a pillows mask to deliver best in class performance in four areas: comfort, ease of use, visual appeal, and the ability to fit a wide range of patients. Compact and lightweight, Wisp offers a minimal contact experience, a superior seal and an open field of vision. Patients can read and even wear their glasses. A variety of new features and customization options add to the mask's universal appeal: • Minimal headgear – no forehead pad – and minimal parts; • Quick release tabs and headgear clips make it quick and easy to adjust; • Contemporary frame options: reversible fabric – soft suedette and silky sateen – or clear silicone; • Patented auto seal groove and unique tip of the nose cushion technology; • Three interchangeable cushion sizes fit on the same frame, in same package. For homecare providers, more patients can be served from one package. Every Wisp mask also includes Philips Respironics' Fit for Life comprehensive resupply solution to help patients achieve compliance with their sleep therapies, while helping homecare providers efficiently manage their business. Contact philips.us/wisp.

SELF MANAGEMENT

Philips Respironics announced the launch of the SleepMapper self-management system, a mobile and web-based solution for patients diagnosed with OSA, that combines feedback, education and troubleshooting. It is also the first self-management system for OSA patients that incorporates motivation enhancement therapy techniques to aid in adherence to sleep therapy. With the SleepMapper, a patient who uses Philips Respironics System One PAP devices can view therapy feedback, set goals and access information, resources and tutorials about sleep apnea and System One sleep therapy devices and masks. SleepMapper can be downloaded to a smartphone or tablet, or accessed from a computer. It is available on Google Play, iTunes and www.sleepmapper.com. For more information about SleepMapper, the patient website is sleepmapper.com. The sleep professional and provider website is philips.us/sleepmapper.

COMPLETE GUIDELINES

Kennard Chandler offers a comprehensive basic primer, "Airway Pressure Release Ventilation – Building a Better (Safer) Mechanical Breath." Covered are: the goals of ventilation, compliance/resistance/time-constants/inspiratory time, APRV, HRF, alveolar recruitment/stability, ARDS, unassisted spontaneous breathing, CPAP and the P High and Low setting, the T High and Low setting, patient positioning, turbulent flow within the breathing circuit, weaning the patient during and from APRV therapy, indications and contraindications for and benefits and risks of APRV, setting up APRV, monitoring, and a case study. The guidelines, fully illustrated, were written by Chandler with the suggestions of the RT staff at Manatee Memorial, with editorial review provided by Ed Golden, Directory of Pulmonary Services at the hospital. ICON supplied and/or suggested many of the graphic ideas. If you would like a copy of the guidelines, contact magicmanchandler@gmail.com.

INTEGRITY

Radiometer addressed the topic of sample integrity at recent convention and discussed how to get accurate test results and fewer preanalytical errors: a sample not contaminated by room air, a clot-free, homogeneous sample, and a sample with minimal bias on patient results. Radiometer offers the Blood Gas Preanalytics app because preanalytical errors are said to be the reason for up to 75% of all errors in laboratory medicine. The app includes a handbook, interactive troubleshooting and skilltest. For more visit avoidpreanalyticalerrors.com or radiometer.com.

FDA OKAY

Siemens Healthcare Diagnostics has obtained FDA clearance to offer pleural fluid pH testing on its RAPIDPoint 500 Blood Gas System, providing US laboratories and point-of-care coordinators with an important new diagnostic tool for critical care situations. The pH measurement of pleural fluids can be a clinically useful tool in the management of patients with parapneumonic effusions, which may be a symptom of underlying illness. The addition of pleural fluid pH testing on the company's RAPIDPoint 500 system complements the analyzer's comprehensive critical care menu, which includes tests for blood gases, electrolytes, glucose, lactate and full CO-oximetry, including neonatal total bilirubin and total hemoglobin. The RAPIDPoint 500 system leverages Siemens technology to deliver laboratory-quality results in approximately 60 seconds from a single, whole blood sample. Further, the analyzer's measurement cartridges last up to 28 days and contain a full complement of tests, reducing downtime. Contact siemens.com.

TRIAL RESULTS

Sunovion Pharmaceuticals Inc announced results of a one-year, non-inferiority clinical trial that evaluated BROVANA (arformoterol tartrate) Inhalation Solution versus placebo for the risk of serious respiratory events (respiratory death or COPD-related hospitalizations due to exacerbations) in patients with moderate to severe chronic obstructive pulmonary disease (COPD). The study results showed that of 420 patients treated with BROVANA, 40 experienced at least one serious respiratory event as compared to 63 patients who experienced at least one serious respiratory event of the 421 receiving placebo. Among those patients who experienced an event, the mean time to first event was longer for BROVANA patients (171.7 days) as compared to patients receiving placebo (155 days). BROVANA is a twice-daily nebulized long-acting beta-2 agonist (LABA) approved by the FDA for the long-term maintenance treatment of bronchoconstriction in patients with COPD, including chronic bronchitis and emphysema. Contact sunovion.com.

ABSTRACTS PRESENTED

Vertex Pharmaceuticals Incorporated presented six abstracts

from its cystic fibrosis (CF) program at the 36th European Cystic Fibrosis Society (ECFS) Conference in Lisbon, Portugal. Presentations include data from Cohorts 2 and 3 of a Phase 2 study of lumacaftor (VX-809) combined with ivacaftor in people with the most common mutation in the cystic fibrosis transmembrane conductance regulator (CFTR) gene, F508del, as well as data from a Phase 2 study of VX-661 combined with ivacaftor in people with two copies of the F508del mutation. Additionally, poster presentations featured data on the use of KALYDECO (ivacaftor) in people with CF ages 6 and older who have the G551D mutation. You can view the abstracts at http://www.ecfs.eu/lisbon2013. Contact vrtx.ca.

HAPPY ANNIVERSARY
Vitalograph, celebrates its 50th anniversary, having come a long way since 1963 when it was founded by Dietmar Garbe, father of the current managing director, Bernard Garbe. From humble beginnings, the small company that began life in the family home has grown into a global provider of pioneering cardio-respiratory solutions and a leading specialist contract research organization in the field of respiratory clinical trials, with offices in England, Ireland, Germany, the United States and China, as well as over 80 dealers around the world. Vitalograph collaborates with medical professionals and researchers within leading teaching hospitals and universities to develop medical solutions based on new technologies in cardio-respiratory care. Many Vitalograph products have won awards for innovation and design. Contact vitalograph.co.uk.

AARC PREVIEW

AG Industries
Booth 650

What products will you be presenting?
Adult CPAP Masks, Pediatric CPAP Masks, Boomerang Gel Pad, CPAP Cleaning Products.

Are there any new products you wish to emphasize?
Pediatric Mask Kits.

Discuss educational/training materials you'll be offering.
YouTube Product Videos featuring instructions & information for patient use, care, and cleaning CPAP masks and accessories.

Why should AARC participants visit your display?
AG Industries seeks to inform attendees about our diverse product line, educate respiratory therapists about our line of mask interfaces and provide informational material on all cleaning products, masks, CPAP replenishment supplies.

Breathe Technologies
Booth 766

What product will you be presenting?
Breathe Technologies will showcase its award-winning NIOV System. The NIOV System is a palm-size, ultra light, volume assist system that provides pressure and volume via a proprietary nasal pillows interface to supplement patients' own breathing and relieve symptoms associated with respiratory insufficiency.

Discuss educational and training materials you will be offering.
We will share our most current clinical research with the participants to demonstrate the clinical effectiveness and performance of the NIOV System.

Why should AARC participants visit your display?
To learn about the latest technology to treat symptoms of people living with respiratory insufficiency and how this therapy can improve patients' quality of life. They can also learn about the details of the applications and incorporating the NIOV System into their patient treatment protocols.

BSCI
Booth 616

What products will you be presenting?
Bronchial Thermoplasty (BT) delivered by the Alair System.

Are there any new products you wish to emphasize?
The Alair Bronchial Thermoplasty System (BT) is the first and only FDA-approved device for treating severe asthma in adult patients who continue to experience symptoms despite the use of inhaled corticosteroids and long-acting beta-agonists.

Discuss educational/training materials you'll be offering.
An early Sunday evening CEC Educational Event discussing the disease of asthma, options for treatment, as well as the procedure of Bronchial Thermoplasty.

What speakers or papers will you be featuring?
The CEC Educational Event will be conducted by a respiratory therapist and will feature a BT patient.

Why should AARC participants visit your display?
Bronchial Thermoplasty (BT) is the only non-drug treatment for asthma with data from 3 randomized controlled trials out to 5 years. It has been proven to improve quality of life by reducing ER visits, hospitalizations, severe exacerbations, and days lost from work or school due to asthma. Asthma is a prevalent disease across the country affecting millions of Americans. All healthcare professionals should be able to speak with a basic understanding of this procedure and how it can benefit patients' lives. Please visit us at our booth for a procedural overview on a simulated lung model and look for an invitation to our CEC event.

CAIRE
Booth 307

What products will you be presenting?
CAIRE manufactures liquid oxygen systems and oxygen concentrators for the home healthcare industry. Liquid systems include a variety of reservoirs, ranging from 10-60 L, and portable units, ranging from 4-8 lbs and estimated operation up to 34 hours at 2 LPM. The SeQual Eclipse 3 portable oxygen concentrator (POC) offers a range of both pulse and continuous flow settings and includes a variety of clinical features such as adjustable rise time and adjustable pulse sensitivity. The AirSep FreeStyle and Focus POCs are the lightest on the market, while the VisionAire 5L stationary concentrator provides the reliability your patients need at home.

Are there any new products you wish to emphasize?
Yes, our new Eclipse 5 POC. The NEW SeQual Eclipse 5: The most robust and reliable POC on the market. The new generation of SeQual Eclipse raises the bar for POC performance. The Eclipse 5 features the same benefits that you love about the Eclipse 3, but with next generation internal components that enhance the reliability of the POC. The Eclipse 5 goes where you go, with improved DC power operation that allows for full functionality of the Eclipse 5 when running from DC outlets. All continuous flow settings, up to 3 LPM, as well as all pulse flow settings, including the largest super setting of 192 mL, are available while operation on DC power. The Eclipse 5 battery will also charge while the unit is connected to DC power, which eliminates any anxiety of failed batteries on long road trips.

Why should AARC participants visit your display?
With the addition of the SeQual and AirSep oxygen concentrator lines, CAIRE has become the largest manufacturer for oxygen therapy systems on the market and remains the one source for every provider's oxygen needs.

Hamilton Medical, Inc

Booth 443

What products will you be presenting?
Hamilton Medical, Inc is celebrating 30 years in providing the most advanced ventilator portfolio available. Hamilton Medical has the most current ventilator technology on the market today and we have a ventilator model that meets the requirements of all market segments. Our 30 years in ventilation will be celebrated by featuring our full product line, featuring the HAMILTON G5, HAMILTON C3, HAMILTON C2, HAMILTON C1 and HAMILTON T1 with a brief introduction to the next addition to our product line, the HAMILTON MR1 (Pending FDA 510(k)).

Are there any new products you wish to emphasize?
The Hamilton G5 will be showcased, demonstrating its latest software, designed to provide more functionality in daily use. We will introduce a new mode to address the higher standard for neonatal ventilation, additional options in waveforms and loops and a new transpulmonary waveform to highlight transpulmonary pressure.

Discuss educational/training materials you'll be offering.
Hamilton Medical will be focusing on the tools to make ventilation safer and more cost effective. We will have our licensed clinicians and international product managers in our booth to provide hands-on demonstrations the G5, as well as all of our unique features, including: ASV, Adaptive Support Ventilation (closed loop control); INTELLiCUFF, our automated cuff pressure controller; PV TOOL Pro, our Protective Ventilation Tool; INTELLiTRIG, our technology that automatically responds to leaks and adapts sensitivity thresholds in NIV; INTELLiSYNC, to assist in patient synchrony during spontaneous breaths; Dynamic Lung and Wean Window, a true graphical representation of your patient's lung condition. Hamilton Medical will also feature a demonstration of Hamilton Medical College, our on-line e-learning tool, offering courses on mechanical ventilation and the Hamilton Medical ventilators. View how you can train your staff effectively, meet your training requirements and have your staff earn CRCEs without ever leaving the hospital, and all at no charge.

Why should AARC participants visit your diplay?
Our 20 x 20 Island booth will house each of our products and product experts, so if you practice adult care, neonatal care, long-term care or are involved in transport care, either on the ground or in the air, Hamilton Medical is available to provide you a solution to address the needs of your daily practice.

Hill-Rom

Booth 443

What products will you be presenting?
Hill-Rom is a leading worldwide manufacturer and provider of medical technologies and services for the health care industry. We're a company that draws on a heritage of more than 80 years of innovation and excellence to provide solutions that enhance outcomes for our patients and their caregivers. Hill-Rom's The Vest Airway Clearance System, available for home and acute care, has been prescribed for over 123,000 patients, with a variety of conditions, to aid in the mobilization of retained secretions. The MetaNeb System, available for acute care, is indicated for lung expansion therapy, the mobilization of secretions, and the treatment and prevention of pulmonary atelectasis.

Are there any new products you wish to emphasize?
Hill-Rom is proud to announce the release of the new MetaNeb System 4.0.

What speakers or papers will you be featuring?
Stop by the Hill-Rom booth to hear about the latest research in airway clearance.

Why should AARC participants visit your display?
Visit the Hill-Rom booth to meet with the product experts for The Vest Airway Clearance System and The MetaNeb System. See the latest features available with our products. Learn how our products can help patients with retained secretions and those that are prone to atelectasis by shortening the length of stay in the hospital and keep them out of the hospital.

Hollister

Booth 249

What products will you be presenting?
AnchorFast Oral Endotracheal Tube Fastener and AnchorFast Guard Oral Endotracheal Tube Fastener.

Are there any new products you wish to emphasize?
AnchorFast Guard Oral Endotracheal Tube Fastener.

Discuss educational/training materials you'll be offering.
e-Learning materials for the AnchorFast Oral Endotracheal Tube Fastener product portfolio.

Why should AARC participants visit your display?
Hollister will feature the NEW AnchorFast Guard Endotracheal Tube Fastener. Visit the Hollister booth to learn more.

Inova Labs

Booth 917

What products will you be presenting?
LifeChoice Activox Portable Oxygen Concentrator.

Why should AARC participants visit your display?
Learn why Inova Labs is at the forefront of the new age of oxygen therapy. Hear how the LifeChoice Activox POC has changed lives and see what Inova Labs is introducing next!

Masimo

Booth 611

What products will you be presenting?
EMMA Capnograph - masimo.com/capnography/emma-capnograph.htm; Pronto-7 spot-check hemoglobin - masimo.com/pronto-7/index.htm; Radical-7 Pulse CO-Oximeter - masimo.com/Rainbow/Radical7.htm; Masimo Patient Safety Net – for post-op general floor patient monitoring masimo.com/generalFloor/index.htm; Rad-57 - masimo.com/rad-57/index.htm; iSpO2 – pulse ox for Apple iOS devices - ispo2.com/; Root – new patient monitoring and connectivity hub; CE Mark for outside US only at this time - masimo.co.uk/root/; ISA – sidestream analyzer - masimo.com/pdf/phasein/IRMA-ISA-brochure-web.pdf; RAM – rainbow acoustic monitoring with acoustic respiration rate masimo.com/rra/index.htm.

Are there any new products you wish to emphasize?
EMMA Capnograph, Root, RAM, ISA, Patient SafetyNet.

Discuss educational/training materials you'll be offering.
Breakfast Symposium on "Improving Patient Safety & Quality of Care While Improving Your Bottom Line: Advances in Non-Invasive Monitoring." Speakers: Garry Kauffman MPA, FACHE, FAARC, Director, Wake Forest, PA; Jon Carlson, Catholic Health Mercy Hospital of Buffalo, NY.

What speakers or papers will you be featuring?
The Accuracy, Precision and Reliability of Measuring Ventilatory Rate and Detecting Ventilatory Pause by rainbow Acoustic Monitoring and Capnometry. Ramsay M.A.E., Usman M., Lagow E., Mendoza M., Untalan E., De Vol, E. Anesth Analg July 2013.

Why should AARC participants visit your display?
Innovative, noninvasive monitoring technologies that enable clinicians to improve patient outcomes and reduce cost of care.

Mercury Medical

Booths 448/450

What products will you be presenting?
Coupled with Flow-Safe II, Mercury Medical will be showing the brand new, Flow-Safe II EZ CPAP & Nebulizer system with unparalleled advantages. Flow-Safe II EZ represents a major leap in product innovation. Taking emergency care to a whole new level, Flow-Safe II EZ is the ONLY ONE disposable CPAP system on the market that delivers consistent CPAP pressure while providing an integrated nebulizer using only one oxygen source. Additionally, it has an on/off switch that controls the nebulizer only, not the CPAP pressure. CPAP pressure is still controlled by the flow meter. Compared with other systems that require two sources, Flow-Safe II EZ consumes less oxygen. Three mask sizes are available: large adult, small adult and child. Also being displayed is the Neo-Tee with in-line adjustable PIP controller. It's the industry's first and ONLY ONE disposable Infant T-Piece Resuscitator with Built-In Pressure Relief and Color-Coded Manometer on the Tee. Mercury is the ONLY ONE company with three types of resuscitation systems: CPR, Hyperinflation and a T-Piece. Mercury will also be announcing a new Hyperinflation bag, NuFlO2. NuFlO2 incorporates an Adjustable Pressure Limiter (APL) and color coded manometer for quickly identifying airway pressure. A variety of configurations will be available with and without expansion tubing – which will be applicable for transport and MRI. Economical, high-quality disposable CPR bags in a variety of configurations will be exhibited along with the colorimetric CO2 line, including Neo-StatCO2<Kg, the ONLY ONE CO2 detector specifically designed for tiny babies with an expanded patient weight range of 0.25kg to 6kgs. The air-Qsp (Self-Pressurizing) complements the family of Masked Laryngeal Airways. The air-Qsp design is the ONLY ONE Masked Laryngeal Airway that prevents potential for overinflation. When delivering PPV, the increased airway pressure increases the pressure within the cuff creating a good seal, (consistently over 20 cm H2O). Increase in cuff seal pressure occurs at the exact time you need it ... during the upstroke of ventilation. Key advantages: • Simpler: No inflation line or pilot balloon - eliminates the extra step of inflation and guesswork of adding air to the mask cuff. • Eliminates mask cuff over inflation. • The removable color coded connector allows intubation through it using standard ET tubes. Mercury Medical will also be showing a new gauge design (0-60 cm H2O) for the ONLY ONE disposable NIFometer on the market.

Are there any new products that you wish to emphasize?
Mercury's new products mentioned previously (Flow-Safe II EZ, Neo-Tee with in-line controller, NuFlO2 hyperinflation, Neo-StatCO2<Kg air-Q sp and NIFometer) all improve patient outcomes at an economical cost.

Discuss what educational/training materials you'll be offering.
Full product training will be provided at the booth by Mercury Medical Product Specialists. We will provide product information brochures, DVDs, wall charts/posters with specifications and offer free samples. The samples will be provided by fully trained sales representatives who will provide comprehensive product in-servicing at the attendees facilities.

Why should AARC participants visit your display?
Mercury is a leading manufacturer of respiratory products and is highlighting several key industry first disposable products that save money for the hospital and health facility and improve patient outcomes at the same time. Mercury is the ONLY ONE company that has introduced the product types mentioned previously: Flow-Safe II EZ, Neo-Tee with in-line controller, NuFlO2, Neo-StatCO2<Kg, air-Q sp and NIFometer. Due to the changing NRP guidelines, it will be important for clinicians like RT Directors and NICU nurses to visit our display as they are actively looking for neonatal resuscitation devices that meet these NRP guideline requirements. For instance, the Neo-Tee offers more consistent inspiratory and expiratory pressure than other devices. It is affordable for use at every NICU, L&D and ED bedside. One of the latest requirements is that every NICU stock "size one" laryngeal mask for rescue airways. air-Q is the

infant rescue airway solution for meeting this requirement. Furthermore, NRP recommends using a colormetric CO2 on the supraglottic airway connector to ensure proper placement with rapid color change. Mercury provides the ONLY ONE disposable CO2 detector solution for premature infants below 1 kg with the Neo-StatCO. Clinicians should visit our display to get a first-hand view of our products and advantages.

MGC Diagnostics

Booth 829

What products will you be presenting?
MGC Diagnostics will feature recent product developments and technology advancements, including BreezeSuite WebReview for test interpretation anywhere, anytime; Platinum Elite Plethysmograph and Ultima Series with Real Time Diffusion (RTD) MultiGas Technology, delivering clinically significant graphic data and immediate results; together with our latest version of BreezeSuite software incorporating the latest HIPAA – HITECH Security Safeguards protecting your patients' Identifiable Health Information. We will also be featuring our CCM Express Indirect Calorimeter, CPX Express Cardiopulmonary Exercise system, and our CPFS/D USB full function spirometer. The ResMonPro FOT (Forced Oscillation Technique) will be presented for determining the degree of obstruction, expiratory flow limitation, heterogeneity, and bronchial reversibility with no forced maneuvers.

Are there any new products you wish to emphasize?
WorkFLOW powered by LabRetriever to completely manage the work flow from scheduling, to test ready e-mail alerts, to web interpretation and storage of all pulmonary and sleep tests in one location for easy Internet access. Billing modules connected directly to procedures make billing accurate and easy to perform.

Discuss educational/training materials you'll be offering.
Managing the MGC Diagnostics exhibit will be our best in class clinical, sales and support staff available to answer not only your product questions, but provide expert consultation for you clinical application and cardiorespiratory business needs.

Why should AARC participants visit your display?
MGC Diagnostics delivers diagnostic solutions for detection, classification and management of cardiorespiratory patients worldwide. This singular focus guides our strategy and defines our commitment to customers, employees and shareholders. These attributes make us uniquely qualified to solve today's challenges and uncover solutions for tomorrow's opportunities.

Monaghan Medical Corporation

Booth 819

What products will you be presenting?
Monaghan Medical Corporation manufactures the AeroChamber brand of Anti-Static Valved Holding Chamber (aVHC) and the AeroEclipse II Breath Actuated Nebulizer (BAN), aerosol delivery devices used by respiratory therapists in hospitals worldwide. The AeroChamber brand of aVHC is the most recommended chamber by major pharmaceutical companies. Monaghan provides solutions for effective airway clearance with the Aerobika Oscillating Positive Expiratory Pressure (OPEP) Therapy System; a device that can be used in conjunction with aerosol treatments.

Are there any new products you wish to emphasize?
We just released the Aerobika Oscillating Positive Expiratory Pressure (OPEP) device, an innovative design that allows for effective airway clearance treatments with a device that's easy to clean and use in conjunction with aerosol treatments. A recent cross-over study (Robarts Research Institute, ATS 2013), which utilized Hyperpolarized Helium Magnetic Resonance Imaging, indicated after four weeks use of Aerobika Oscillating PEP Therapy patients showed noticeable improvement including: reduced dyspnea, increased gas distribution to previously unventilated areas, and reduced hyperinflation. Aerobika OPEP is safe for use in COPD.

Discuss educational/training materials you'll be offering.
Our goal is to provide products and programs to help respiratory therapists and patients understand how effective management can help keep symptoms under control. A well-trained respiratory therapist is better equipped than anyone to provide education and training on aerosol delivery products. We suggest using the educational tools Monaghan offers to assist in that efforts, such as patient oriented product instructions, video aids, and demonstration devices. We also have programs such as our Doc Monaghan education series to help kids understand their asthma, what can trigger symptoms and how their medications work to keep them healthy.

What speakers or papers will you be featuring?
Monaghan is a proud Corporate Partner with the AARC and sponsor of the Open Forum at this year's AARC Congress. We salute all our colleagues presenting their scientific studies and posters in Anaheim. Over 300 peer-reviewed articles supporting the company's respiratory management products have been published in medical journals throughout the world. We will discuss three recent studies on treatment of patients with cystic fibrosis and COPD at our booth.

Why should AARC participants visit your display?
Attendees should stop by our booth to learn more about the research, design and development that goes into all our products. Today's market demands that companies provide more evidence-based, total "cost-of-care" value, rather than simply a low price. We are pleased to see providers focusing more on total cost and long-term outcomes for their patients. Particularly in light of the new healthcare reimbursement laws, which significantly impact respiratory care services, most stakeholders are focusing on products, programs and services that ensure patients are treated effectively, and remain healthy, in order to reduce readmissions. The entire Monaghan product line is designed with the patient in mind, backed by compelling clinical evidence while keeping an eye on economic value to providers.

NJR Medical

Booth 923

What products will you be presenting?
The No-Bite V suction catheter introducer. Every RT is familiar with nasopharyngeal or nasotracheal suctioning and the many problems associated with inserting a suction catheter up a patient's nose. To name a few: bleeding, pain and trauma, coiling of suction catheter, MRSA colonization in nares, and the list goes

on… So basically with the No-Bite V, you can avoid all these problems by avoiding the nose altogether! It makes suctioning easy for not only the caregiver but also the patient.

Are there any new products you wish to emphasize?
The No-Bite V is a newer product. It has been out on the market for about 1.5 years and we have been very, very busy! It is now becoming popular worldwide. The RT community has been very excited about adding the No-Bite V to their toolbox.

Discuss educational/training materials you'll be offering.
At our booth we will be offering No-Bite V in-servicing on mannequin heads; everybody is welcome to practice the techniques in a return demonstration. Also, we always offer a free online No-Bite V training with an opportunity to earn 0.5 CERP credits on our website www.NJRMedical.com. Once you finish the online course, you can print out your certificate.

What speakers or papers will you be featuring?
We will have the inventor of the No-Bite V at our booth and assisting the in-servicing. Also we will have case studies documenting the success of the No-Bite V in both the ICU environment as well as the hospice and palliative care setting.

Why should AARC participants visit your display?
The No-Bite V suction catheter introducer makes RT's lives easier and that is why every RT needs to learn about this product at our booth. It's not only easier for the RT, but also the patient.

Nova Biomedical

Booth 417

What products will you be presenting?
Nova will be showing its Stat Profile blood gas/critical care analyzers that offer the broadest test menu of any blood gas/critical care analyzer, at low cost. With up to 20 tests on board, fast, economical critical care results, and the industry's best overall user satisfaction, Nova's products are the best value in critical care testing. Our Stat Profile pHOx Ultra is the only blood gas/critical care analyzer to provide a comprehensive stat menu including blood gases, essential chemistry and hematology, co-oximetry tests, and metabolites including lactate, BUN and creatinine. No other blood gas/critical care analyzer can match the clinical value of pHOx Ultra to effectively manage high acuity, critically ill patients.

Discuss educational/training materials you'll be offering.
Immediately following analyzer installation, training of operators is provided by Nova training and applications staff. Correlation studies are included as part of the training process. We maintain a highly skilled and experienced technical support "hotline" staff to answer calls 24/7/365, as well as one-day on-site service by a trained Nova representative. Our Peak Performance Plus program includes • Onsite Validation Assistance by a Nova Clinical Application Specialist including Linearity, Precision, Correlation, and Data Processing. • Onsite Linearity Testing Assistance every 6 months by a Nova Clinical Applications Specialist. • Onsite Assistance every 6 months by a Nova Clinical Applications Specialist to perform patient cross checks to the Clinical Laboratory Reference Analyzer. • Proactive Weekly Onsite Visits by the Nova Field Support Specialist for the first 90 days after implementation. These onsite visits include: ongoing operator training for all levels of users; ongoing review of QC program and QC range establishment. • Routine PMs performed on all systems by the Nova Field Support Specialist every 6 months. Nova administers a periodic Customer Satisfaction Survey to allow customers to grade our performance and offer suggestions thereby helping us improve in ways that are meaningful to them.

Why should AARC participants visit Nova's booth?
As the acuity of patients seen in the hospital increases, more and more quick turnaround time, critical care tests are needed beyond basic blood gases to address critical patients such as burn, shock, and others with severe trauma. Stat Profile analyzers play an important role in providing expanded whole blood tests that are uniquely suited for these patient groups to give respiratory professionals additional critical care tools. AARC participants should visit the Nova booth to see the latest in Stat Profile blood gas/critical care analyzers that can provide up to 20 tests for use in these patient areas, including pH, PCO2, PO2, Na, K, Cl, iCa, iMg, Glu, Lac, BUN, Creat, Hb, Hct, SO2%, and Co-ox. In many institutions, RTs are leading the way to improving patient care by providing more tests from a single sample using fewer resources and generating faster results. Historically, respiratory therapists have overseen blood gas testing as it directly relates to their patient care. Now that Stat Profile point of care analyzers can provide full critical care testing results, respiratory therapists, with their unique knowledge of these devices, become even more valuable to the critical care team. Stat Profile analyzers enhance this value as the only whole blood analyzers to provide a comprehensive panel of tests including ionized magnesium and BUN/creatinine. Increased use of point-of-care testing also demands that devices be more automated. Nova analyzers feature fully automated operation and analysis of selected test menus with just a touch of a button. They perform an automated two-point calibration at pre-set intervals to assure that the instrument is ready for analysis at all times. Automated, on-board, true liquid quality control eliminates the steps involved in manually performing QC, thereby dramatically reducing labor costs. Snap-in sensors and reagent cartridges make maintenance easy.

Passy-Muir, Inc

Booth 548

What new products will you be presenting?
Passy-Muir Inc will highlight the Passy-Muir Cleaning Tablets and other accessory supplies such as the patient education handout and new on-line education. The Cleaning Tablets for Passy-Muir Valves are made from a detergent that is biodegradable and leaves no residue on the valves as do some commercially available soaps. The Passy-Muir Cleaning tablets are sold in a convenient one month supply of 30 tablets. Free samples will be provided.

What new products will you be featuring that are of current importance?
The Pocket T.O.M. is a more portable pocket-sized version of our popular Tracheostomy T.O.M. Tracheostomy Teaching and Observation Model. The Pocket T.O.M. displays the same cutaway view of the upper aero-digestive tract and anatomy with tracheostomy, and can be easily taken to the bedside for patient education. It is great for spontaneous staff teaching as well. The Pocket T.O.M. includes model, cuffed tracheostomy tube, syringe, 3 Passy-Muir Valves, and simulated nasogastric tubing. It can be easily cleaned between patients.

Discuss educational/training materials you'll be promoting at the convention.
At AARC, the Ventilator Instructional Tracheostomy Observation (VITO) mannequin will be featured to demonstrate the ventilator application of the Passy-Muir Valve. This simulated ventilator demonstration will aid clinicians in understanding the important aspects of ventilator application. Early rehabilitation with the Passy-Muir Valve can result in a faster weaning process and shorter length of stay. At Passy-Muir, Inc education and clinical support for professionals and patients has always been of utmost importance. Our newest FREE web-based continuing education opportunities will be featured, along with the, pocket-sized quick reference guide.

What speakers or papers will your company be featuring?
Contemporary evidence-based materials will be provided at the booth including: • an abstract from the Shock Trauma Center of the University of Maryland Medical Center entitled Using High Flow Nasal Cannula in Conjunction with the Passy-Muir Valve to Wean Patients from Mechanical Ventilation; • an article co-authored by Dean Hess, entitled Tracheostomy Tube Change Before Day 7 Is Associated With Earlier Oral Intake.

Why should AARC participants visit your display?
The Passy-Muir Tracheostomy and Ventilator Swallowing and Speaking Valve is the only closed position valve that restores more normal physiology, thus offering numerous clinical benefits beyond communication. A visit to the Passy-Muir, Inc booth will provide the respiratory professional with contemporary evidence based research and education to improve care and reduce costs associated with tracheostomized and mechanically ventilated patients. Respiratory care professionals are key players in helping to safely and effectively progress these patients to more cost effective levels of care. Clinicians will learn how early use of the Passy-Muir Valve can accelerate this process, thus reducing costs and improving quality of life. Our expert Clinical Specialists will answer questions and help provide the knowledge needed to advance outcomes of the tracheostomized patient.

Philips Hospital Respiratory Care
Booth 401

What products will you be presenting?
Philips Hospital Respiratory Care offers a complete line of ventilators and ventilator accessories, but our biggest contribution to innovation comes from our V60 noninvasive ventilator. The V60 gives the clinician the ability to take NIV further with advanced ventilation modes, auto-adaptation to the patient's changing breathing patterns, advanced monitoring and extended battery backup. Our Trilogy 202 ventilator is the hospital version in the Trilogy ventilation series and the common user interface facilitates hospital to home transitions.

Are there any new products you wish to emphasize?
We have some additions to our PerforMax mask line with new pediatric versions. The XS and XXS masks were designed to fit small faces. Trilogy 202 software release 13.0 brought a host of new features and benefits this year. Trilogy now has waveforms, mouthpiece ventilation and a new version of AVAPS-AE that auto-regulates the patient's baseline pressure.

Discuss the educational/training materials you will be offering.
We will have a new Education Catalog that lists all of our CEU programs. Clinicians can get information on courses offered in-hospital by our team of Clinical Specialists or on-line through our Philips Learning Center. We will also offer information on mask fitting workshops to instruct nurses and respiratory therapists how to properly choose and apply a mask interface. Clinicians can also pick up free computer-based training modules for all of our ventilators and monitors.

What speakers or papers will you be featuring?
We will have an updated listing each day in our booth of lectures and poster presentations featuring our products and solutions.

Why should AARC participants visit your display?
AARC visitors know us as the leader in noninvasive ventilation. We always enjoy visiting with our valued customers and friends and hearing how they are using our products to make a difference in patients' lives. We hope they will enjoy seeing how we continue to take NIV further with our new ventilators, patient masks and educational offerings.

Siemens Healthcare Diagnostics
Booth 839

What products will you be presenting?
Siemens will be exhibiting at the 2013 AARC Congress with products and solutions for critical care, including the RAPIDPoint Blood Gas Analyzer, the RAPIDLab 1200 Blood Gas Analyzer, the Stratus CS POC Cardiac Analyzer, and the RAPIDComm Data Management Solution.

Are there any new products you wish to emphasize?
In June 2013, Siemens Healthcare Diagnostics obtained FDA clearance to offer pleural fluid pH testing on its RAPIDPoint 500 Blood Gas System, providing US laboratories and point-of-care coordinators with an important new diagnostic tool for critical care situations. The pH measurement of pleural fluids can be a clinically useful tool in the management of patients with parapneumonic effusions, which may be a symptom of underlying illness. The addition of pleural fluid pH testing on the company's RAPIDPoint 500 system complements the analyzer's comprehensive critical care menu, which includes tests for blood gases, electrolytes, glucose, lactate and full CO-oximetry, including neonatal total bilirubin and total hemoglobin.

Discuss educational/training materials you'll be offering.
A major component of the Siemens POC Ecosystem is Clinical Education and Operator Competency. Siemens will be offering QR Codes to download the ABG App for their smart phone as well as e-book and hard copy versions of the "Rapid Analysis: Blood Gases and More" clinical reference handbook.

Why should AARC participants visit your display?
Current Siemens customers can visit our booth to learn more about the new features and improvements in the latest software releases for the RAPIDPoint and RAPIDLab product lines. Current and new customers are welcome to drop by to view product demonstrations and learn more about pleural fluid testing and the innovative point-of-care solutions RAPIDComm 5.0 will be offering, including Smart Phone/Tablet

Data Management and enhanced Operator Management with integrated competency training and tracking.

Sleepnet

Booth 838

What products will you be presenting?
Sleepnet is proud to display an expanded line of CPAP and hospital use masks. We will introduce three new masks – a custom fit nasal mask, our first replaceable cushion nasal mask and the Veraseal 2 Full Face Hospital Mask. We will also display our iQ Blue, Mojo, and MiniMe 2 masks, showcasing our enhanced AIR°gel and Custom Fit Technology.

Are there any new products you wish to emphasize?
Our team has talked extensively with patients and healthcare professionals about their preferences to aid our quest to create the interfaces of the future. We are thrilled to show off the results of this effort: a new custom fit nasal mask, our first replaceable cushion nasal mask, and the Veraseal 2 Full Face Hospital Mask.

Why should AARC participants visit your display?
Come by our booth to see and feel our new AIR°gel. Sleepnet's AIR°gel is now softer than ever – creating a luxurious cushion that reduces pressure while maintaining an effective seal. You have to feel it to believe it! Also, stop by to experience Sleepnet's unique Custom Fit Technology – many of our masks feature moldable shells you can shape to precisely fit your face for a truly custom fit.

Vapotherm

Booths 639/641 and 738/740

What products do you plan to exhibit?
Vapotherm's Precision Flow High Flow Therapy System with its family of comfortable patient interfaces, featuring the new SOLO Single Prong Cannula.

Tell us about your latest products and future plans.
The new SOLO single prong cannula (affectionately nicknamed "Unicorn" by users) is Vapotherm's latest product. The SOLO cannula provides a whole new way to assure an open system while delivering High Flow Therapy to neonatal and infant patients. With its single prong design, SOLO eliminates concerns about over occlusion of tiny nares, simplifies NG tube placement, and may facilitate the delivery of High Flow Therapy in patients with anatomical defects. SOLO works with the Vapotherm Precision Flow to provide the same gentle and effective ventilatory support of a dual prong cannula, and only Vapotherm can deliver High Flow Therapy through a single prong. The SOLO cannula delivers up to 8 lpm, and standardizing on the SOLO simplifies fitting the right cannula for the patient. In general, Vapotherm High Flow Therapy offers an approach to avoid the skin breakdown from tight fitting masks and nasal prongs and the costly adverse events associated with intubation, while simplifying access to care for, feed, and hold the patient. Dr Jorge Rojas, an early adopter of the SOLO cannula tells us "The single prong cannula has worked very well for us particularly to support neonates under 1000 grams. With the single prong cannula we do not worry about occluding too much of the nares."

Discuss educational or training materials that will be available.
Vapotherm provides extensive training and support on high flow therapy and the Precision Flow in particular. At the booth there will be presentations on mechanisms and clinical use of high flow therapy, a clinical reference list and the new NICU pocket guide which provides tips on clinical use of high flow therapy in the NICU.

Tell us about any speakers or in-booth promotions.
We will have samples of the new SOLO cannula for attendees to see the new technology.

Why should our readers stop by your display?
An opportunity to experience Vapotherm High Flow Therapy first hand will also be available for those who stop by the booth! We will have samples of the SOLO cannula, and presentations that describe the mechanisms of action and clinical experience with high flow therapy.

VORTRAN

Booth 213

What products will you be presenting?
We will be presenting the VAR VORTRAN Automatic Resuscitator, PercussiveNEB, IPPB, and E-Surge Kit, APM Airway Pressure Monitor.

Discuss educational/training materials you'll be offering.
Training CD's will be available at the booth.

What speakers or papers will you be featuring?
We have a new abstract on the VAR and APM used safely in a 3 Tesla MRI.

Why should AARC participants visit your display?
We have the world's only fully disposable ventilator perfect for transporting patients, using during an MRI treatment and which can be stored for years in case of a mass casualty event, which won't eat into your capital budget! We also have a great option for your patients suffering with cystic fibrosis called the VORTRAN PercussiveNEB, this device is handheld and disposable, and is great for young patients. We also are showing the VORTRAN APM, the Airway Pressure Monitor was developed to be used in conjunction with our VAR to give you monitoring and alarms.

INTERVIEW

In this new feature, Respiratory Therapy interviews clinicians and healthcare providers about the actual application of specific products and therapies. Our premiere interview is with Robert Steedley, President of Barnes Healthcare, headquartered in Valdosta, GA, discussing his company's services and its use of CAIRE products (Chart Biomedical).

Laszlo Sandor: Tell us about Barnes Healthcare and its role in respiratory care.
Robert Steedley: Barnes Healthcare has been in business for 104 years, providing personal care to customers with pharmacy and home medical equipment needs. Our motto of "We Take Care Of People" is reflected in the way we provide the service, the level of expertise and care, and validated by our customers routine praise of staff and care. We do not see ourselves as a respiratory company, nor pharmacy, nor HME company, but rather as the choice for post acute complex patient solutions.

LS: How long have you been using CAIRE products?
RS: Ten years or greater.

LS: Which CAIRE product are you currently using most?
RS: The Eclipse 3, and we transition some customers to the Freestyle 3.

LS: What do you like most about that product?
RS: Functionality and dependability of the products, along with the personal touch support of the team at CAIRE.

LS: What has been the patient feedback you have received about that product?
RS: Our customers love the product. It's user friendly and dependable. Confidence is a must for any product providing oxygen to these customers. Our customers know the quality and support is there so they can keep living life to the fullest.

LS: How has CAIRE best supported you through competitive bidding?
RS: Counsel of best practices and innovative financing solutions has been especially helpful. The CAIRE team made a commitment to our success and has been at our side step for step.

LS: Would you recommend CAIRE and its products to other providers?
RS: Absolutely. Along with their current products, they remain on the leading edge of newer technology, including new features and lighter weight options.

LS: In your opinion, what makes CAIRE unique?
RS: CAIRE has provided Barnes Healthcare the opportunity take care of and manage all home oxygen patients across the spectrum of care, from the simplest to the most complex. That is, CAIRE offers lightweight, wearable AirSep POCs to the clinically robust SeQual Eclipse to liquid oxygen systems and stationary concentrators.

Laszlo Sandor is assistant editor of Respiratory Therapy. Input on questions was provided by Taylor Erwin, Global BioMed Trade Show Coordinator for Chart Industries. If you would like to participate in this feature, as a company or healthcare provider, please contact Les Plesko or Steve Goldstein at s.gold4@verizon.net.

VISIT WWW.RESPIRATORYTHERAPY.CA

Respiratory Therapy, The Journal of Pulmonary Technique, can now be accessed on line. The site features everything you'll find in our journal, and more.

Visitors to Respiratory Therapy's official website can see informative videos of new products, read the current issue of the journal on line, select and review all our previous issues in the Respiratory Therapy archives, and catch up on the latest in respiratory therapy by viewing the day's updated news. The site also features information about article submission guidelines, subscriptions, advertising, and opportunities for editorial participation.

The website, like the journal, offers clinical studies, product reviews, news, facility reports, commentaries, and special sections about the current trends in respiratory care.

Respiratory Therapy's website, www.respiratorytherapy.ca, is published on line by Respiratory Therapy, The Journal of Pulmonary Technique, Goldstein & Associates, Inc., 10940 Wilshire Boulevard, Suite 600, Los Angeles, California 90024. For inquiries please contact us at s.gold4@verizon.net or see the website.

STO2 Monitoring: A True Reflection of Tissue Oxygenation?

Kenneth Miller, MEd, RRT-ACCS, RRT-NPS, AE-C

Tissue hypoperfusion is a common pathophysiologic process leading to multiple-organ dysfunction and death. Optimizing and preserving tissue oxygenation is one of the clinical end-points that the clinician strives for in the critically ill patient.[1] An important goal of hemodynamic monitoring is the early detection of inadequate tissue perfusion and oxygenation. Historically, there have been many different types of monitoring devices that have been utilized in an attempt to monitor this critical end-point. Oxygenation saturation via pulse oximetry, venous-saturation via vena-cava or jugular insertion, arterial blood gases analysis to mention a few. However none of these past tools have truly reflected tissue oxygenation, but made an assumption of it, by indirect measurements or calculations. Tissue oxygenation (StO2) is a monitoring device that directly measures oxygen in the tissue beds, the true goal of oxygenation end-point.

Throughout the years, ICU technology has allowed physicians to obtain reliable physiological parameters to guide goal-oriented ICU resuscitation. A number of studies have validated the use of tissue hemoglobin oxygen saturation (StO2) as a reliable index of tissue perfusion. StO2 monitoring offers a continuous assessment of the adequacy of ongoing shock resuscitation and aids in early identification of high-risk patients in septic and hemorrhagic shock.

Near-infrared Spectroscopy (NIRS) has emerged as a new monitoring tool that is a reliable, noninvasive means of continuously measuring tissue perfusion. In this review we summarize our experience with the value of StO2 monitoring in a number of settings including a) ICU shock resuscitation, b) predicting outcomes in the emergency department, c) ICU sepsis resuscitation.

ICU traumatic shock resuscitation

In the 1980s, William Shoemaker wrote a series of papers addressing the use of physiological monitoring to predict outcome and assist in clinical decision-making.[2,3] He identified two key variables, oxygen delivery (DO2) and oxygen consumption (VO2), as predictors of survival and popularized "supranormal oxygen delivery" as a resuscitation strategy. He proposed that unrecognized flow-dependent oxygen consumption contributed to the development of multiple organ failure (MOF) and believed that this deficit could be corrected by maximizing DO2. Although it is now recognized that resuscitation to achieve supranormal indices is not beneficial in all patients, the use of physiological parameters to guide resuscitation and predict outcomes is central to all ICU resuscitation.

The introduction of new technology into intensive care units, including continuous venous oximetry and continuous cardiac output monitoring with PA catheters permitted widespread use of oxygen transport variables to guide resuscitation. In an effort to further refine the logic for traumatic shock resuscitation, surgical intensivists employed computerized clinical decision support to prospectively collect data on responders and non-responders and optimize resuscitation strategies. Computerized protocols also provided the opportunity to test the utility of various monitors in shock resuscitation, such as the tissue hemoglobin oxygen saturation (StO2) monitor. Prospective studies utilizing protocol-driven shock resuscitation demonstrated that changes in skeletal muscle StO2 showed a strong correlation with changes in DO2, blood base deficit (BD, and lactate).

In studies, hemodynamic and NIR spectroscopic measurements were used to identify early predictors of irreversible shock. Measurements of hind-limb StO2 in each group diverged within 30 minutes of shock, such that by the end of the 90 minute period, the StO2 value for un-resuscitatable remained low despite resuscitation. Animals destined to survive shock and resuscitation did not exhibit an irreversible decline in StO2. These findings demonstrate that skeletal StO2 is a reliable, noninvasive means for early differentiation between resuscitatable and non-resuscitatable animals. Similarly, studies utilizing noninvasive StO2 to guide fluid resuscitation after traumatic shock showed StO2 as a reliable assessment tool to determine the adequacy of shock resuscitation in response to colloids.[4]

Taken together, these clinical and research data suggest that StO2 (derived from a noninvasive monitor) could provide information about the effectiveness of resuscitation equivalent to that of a invasive PA catheter or serial blood draws to measure base deficit or lactate levels.

Predicting outcomes in MOF

Post injury Multiple Organ Failure is well recognized as a significant cause of mortality following traumatic injury. In an effort to identify critically ill patients at risk, a number of studies focused on identifying early predictors of postinjury MOF.[5]

The author is Clinical Educator, Department Dean of Wellness, Respiratory Care Services, Lehigh Valley Health Nework (LVHN).

Through a series of studies, investigators determined base deficit as the earliest independent predictor of postinjury MOF , an observation that was validated by a number of clinical studies.[6]

Cohn et al decided to perform a study using StO2 monitoring in the emergency room to determine if it could predict MOF. The group performed a prospective observational study involving seven US trauma centers evaluating the efficacy of thenar StO2 as an early predictor of MOF in major torso trauma patients compared to the accepted standard (base deficit). StO2 monitors were placed upon arrival and MOF and death were the primary outcomes. They determined that 1) StO2 was equal to base deficit analysis for predicting MOF development and 2) StO2 outperformed both base deficit and systolic blood pressure as an early predictor of death. Subset analysis comparing StO2 levels to lactate levels also validated StO2 as an early predictor of death when compared to conventional parameters.[7]

From these observations, we conclude that StO2 obtained within the first hour after ED admission is an equally reliable predictor of adverse outcomes as the more conventionally used parameters of lactate and base deficit in a continuous, noninvasive fashion.

ICU sepsis resuscitation and the role of the StO2 monitor

In recent years, it has been recognized that severe sepsis and septic shock are the leading cause of ICU mortality. Recent efforts have been directed at updating the surviving sepsis campaign guidelines and improving early delivery.[8] To assist with consistent implementation of these interventions, surgical intensivists have developed a computerized clinical decision support application. To facilitate early identification of sepsis and facilitate implantation of this support application, a three step screening process was developed to collect physiologic parameters that characterize the systemic inflammatory response syndrome (SIRS) and to compile a SIRS score. If the SIRS score exceeds 4, efforts are focused on ascertaining presence of an infection. For patients that are identified as having sepsis, the computerized clinical decision support application is utilized to implement our sepsis protocol and provide a tool for ongoing assessment.

What is StO2 monitoring?

StO2 is the quantification of the ratio of oxygenated hemoglobin to total hemoglobin in the microcirculation of a volume of illuminated tissue and is an absolute number. The measurement of StO2 is taken with a noninvasive, fiber optic light that illuminates tissues below a sensor placed on the skin (Figure 1). StO2 correlates well with other accepted means of measuring oxygen saturation and the results of these studies demonstrate that StO2 is a valid measure of hemoglobin oxygen saturation. StO2 is a measurement of hemoglobin saturation of the microcirculation. During hypoperfusion, shock, blood flow to the peripheral muscles and core organs (liver, gut and kidneys) is reduced in order to preserve brain and heart oxygenation.

The thenar muscle group is a peripheral muscle, thus StO2 is measure via the thenar muscle which allows early changes in perfusion status during shock and resuscitation management. The utilization of the thenar muscle allows for early application and a non-invasive way of monitoring. The thenar site is not affected by gender, age, edema, and adipose tissue. StO2 does not require a pulsatile flow or is confounded by hypothermia.

StO2 can be measured on a continuous basis for trending and down loading clinical information. A new hand-held device is now available for spot checking (Fig 1).

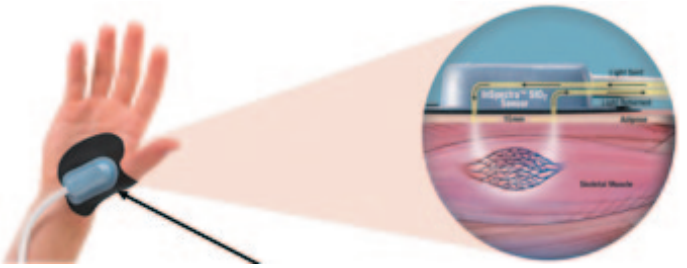


Figure 1. How is StO2 measured?

How StO2 Differs from Other Measures of Oxygenation

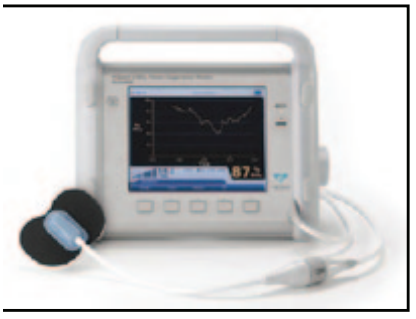
Previously, there were two basic kinds of oxygenation measurements, hemoglobin oxygen saturation in the blood and partial pressure of oxygen. Hemoglobin oxygen saturation in the blood (SO2, SaO2, SpO2), expressed as a percent, is the oxygen present on the hemoglobin in circulating blood divided by the total possible oxygen that could be carried by the hemoglobin. Transcutaneous pO2 measures the partial pressure of oxygen in the skin only.

StO2 measurements differ from the SpO2 measurements provided by pulse oximetry. StO2 is a measure of oxygen saturation in the microcirculation where oxygen is exchanged with tissue and is therefore a local measure. Pulse oximetry, which also uses near infrared light, measures the systemic oxygen saturation of arterial blood.

Measurements of StO2 will therefore change with changes in the local conditions of supply and consumption in the tissue, and SpO2 will not. Because no oxygen is exchanged between the thick walls of arteries and the tissue, SpO2 is fairly constant regardless of whether the measurement site is the earlobe, finger, or big toe. In addition, SpO2 requires a pulsatile flow, while StO2 readings do not.

StO2can be used to measure oxygenation at various depths of tissue: skin, subcutaneous tissue, and muscle. Transcutaneous pO2 measures the partial pressure of oxygen in the skin only.

The StO2 Tissue Oxygenation Monitor is a noninvasive monitoring system that measures an approximated value of



Can be measure continuously or spot checked
Can trend information up to 72 hrs. Fig 2

Wave strength (THI)

Figure 2.

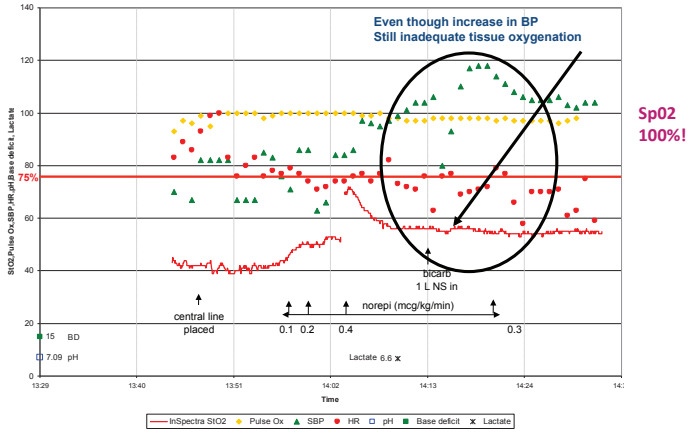


Figure 3. Cardiogenic shock

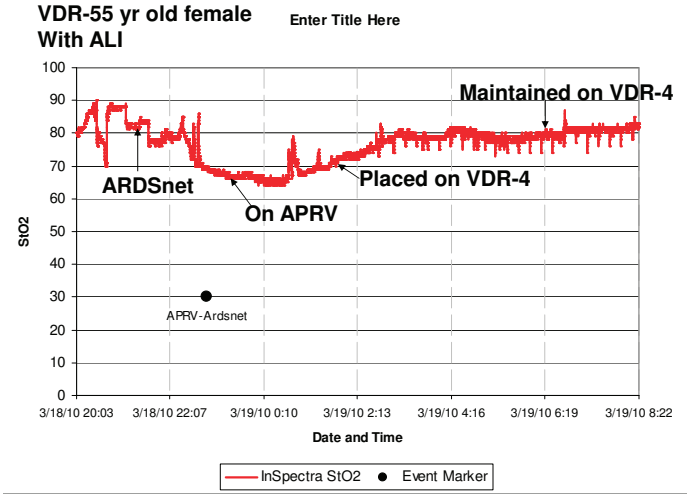


Figure 4. VDR-55 yr old female With ALI

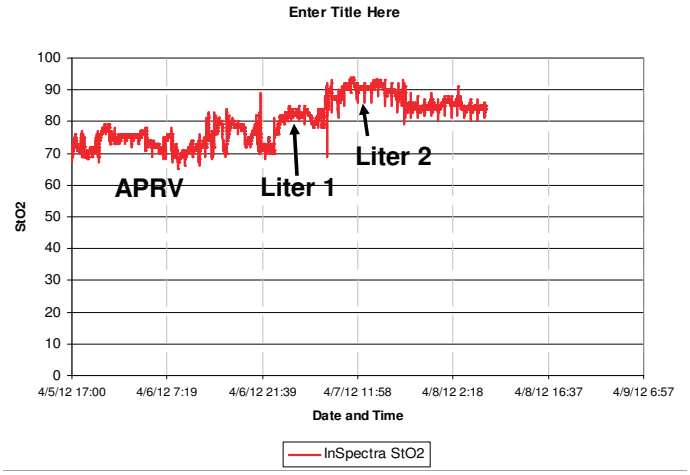


Figure 5. Volume Resuscitation After Implementation of APRV

percent hemoglobin oxygen saturation in tissue. The StO2 Tissue Oxygenation Monitor is indicated for use in monitoring patients during circulatory or perfusion examinations of skeletal muscle, or when there is a suspicion of compromised circulation.

Venous oxygenation devices or catheters measure oxygenation saturation in the superior or inferior vena cava or saturation in the pulmonary artery, not at the mirco-circulation.

StO2 monitoring can detect early signs of low core oxygenation.[9] (Fig 2) In animal studies, thenar muscle StO2 tracked liver and stomach StO2 during controlled shock and resuscitation states. In a multicenter trial of 383 severely injured trauma patients at risk of hemorrhagic shock the relationship of StO2 and hypoperfusion was validated.[10]

Normal StO2 values range from 75% to 93%. A value below 75% is indicative of hypoperfused tissue and values of above 93% indicate inadequate oxygen unloading at the tissue bed.

Historically, StO2 has been employed in trauma centers, emergency suites and medical evacuation services. StO2 is a very sensitive indicator of a reduced perfusion in the hemorrhagic patient. In various studies, it has been demonstrated that over 127 patients awaiting medical floor admissions, 20% had a StO2<75%, of 41 ICU patients deemed resuscitated, 29% had had a StO2<75% and in a National Dutch Study of 12 ICUs of 151 patients, 27% had a StO2<75% and 10% had St02 level >91%.[11-14]

Sagraves and associates looked at helicopter patients who had hemorrhagic trauma. In those patients who had StO2<60% had an increase mortality and increased organ dysfunction.[15] In patients presenting in an emergency room, those patients who had a admission StO2<75% had a longer hospital duration by five days than patients whose StO2 levels were>75% (2.8 vs 7.5 days).[16]

The role of StO2 for the respiratory therapist

StO2 can help the manage patient in the ICU by providing valuable information on tissue oxygenation. This can be a valuable tool when increasing the mean airway pressure during mechanical ventilation. It can be utilize when doing best PEEP studies and when performing pressure/volume diagnostics to determine the lower and upper inflection points. The StO2 will drop if the mean airway pressure causes a reduction in blood flow to the tissue bed, unlike SpO2 and PaO2. It is also valuable when transitioning patients from on ventilatory strategy to another, for example placing a patient from volume targeted ventilation to Airway pressure Release Ventilation or when utilizing high Frequency Percussive Ventilation (Fig 3). Another role for StO2 is during the weaning process. If during the weaning process excessive oxygen consumption occurs secondary to high work of breathing there will be a drop in StO2 before a reduction in PaO2 or an evaluation of carbon dioxide levels. (Fig 4). Also STO2 can be useful in determine the oxygen cost of excessive ventilator asynchronization. If the patient has a high work of breathing on the ventilator it will cause the StO2 to drop, if the appropriate ventilator settings are instituted or the proper sedation or neuromuscular blockade is administered, StO2 will increase. (Fig 4).

In conclusion, Sto2 monitoring provides a non-invasive method to determine tissue oxygenation, the gold standard to insure tissue integrity. It provides valuable information to the clinical during resuscitation and when adjusting mechanical ventilation. This new technology can help the bedside respiratory therapists optimize gas exchange, improve patient-interfacing, and provide patient safe ventilator management.

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Continued on page 52…

Inadvertent Intracranial Insertion of Nasotracheal Suction Catheters Compared to Nasogastric Tubes in Transsphenoidal Surgery & Basal Skull Fracture Patients

N.J. Pastron, M.B. Early, CRNA

Abstract

Inadvertent intracranial insertions of (NG) nasogastric tubes have been documented in over 40 case reports, but case reports of inadvertent intracranial insertions of (NT) nasotracheal suction catheters have not been found. Since NG tubes and NT suction catheters are similar, nasally introduced tubes, it is likely that even with a lack of case reports, both devices are at equal risk of intracranial insertion. Speculative possibilities are discussed to why the incidence of these case reports differs so greatly. Raising awareness to the subject, susceptible patient populations, preventative protocols and alternate routes to nasal suctioning are discussed.

Background Information

Transsphenoidal surgery is a type of surgery in which surgical instruments are inserted into part of the brain by going through the nose and drilling out the sphenoid bone (a butterfly-shaped bone at the base of the skull).[1] Transsphenoidal surgery is used to remove tumors of the pituitary gland and is usually patched up with a piece of fat from the abdomen.[1,2] With a suggested average of about 5500 patients undergoing transsphenoidal operations every year in the US, you may be in contact with transsphenoidal surgery patients.[3]

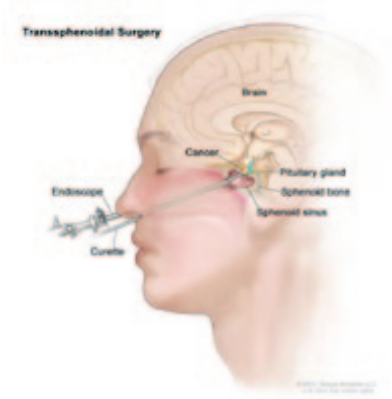

Figure 1. Illustration of transsphenoidal pituitary surgery with instruments inserted intracranially

Basilar skull fracture (or basal skull fracture) is a fracture of the base of the skull, typically involving the temporal bone, occipital bone, sphenoid bone, and/or ethmoid bone.[4,5] Basal skull fractures are often not detectable with skull x-rays or even CT scans.[6] They are frequently diagnosed by clinical findings, making clinical assessment skills critical.[6]

Signs and symptoms[6]

- Battle's sign — is ecchymosis behind the ear
- Raccoon eyes — is periorbital ecchymosis ie "black eyes"
- Cerebrospinal fluid rhinorrhea
- Cranial nerve palsy
- Bleeding from the nose and ears
- Hemotympanum
- Conductive or perceptive deafness, nystagmus, vomitus
- In 1 to 10% of patients, optic nerve entrapment occurs:[7] the optic nerve is pressed by the broken skull bones, causing irregularities in vision.
- Serious cases usually result in death

Auto accidents are a frequent cause of basilar skull fractures. Other causes include assaults and violence, motorcycle accidents, bicycle accidents, slip and fall accidents, or any other direct blow to the head. Basilar skull fractures are famously associated with the auto racing accident contributing to the death of Nascar driver Dale Earnhardt Sr.[8] Occurring in 4% of severe head injury patients, you may be in contact with basal skull fracture patients.[4,5]

Raising Awareness & Understanding

In the transsphenoidal surgery or basal skull fracture patient, there is little protection of the pathway that leads up through the nose and into the brain. The basal skull, which is normally protecting that pathway, has been either drilled out or fractured. Since there are risks of CSF leaks in these patients immediately post-op or post trauma, there are restrictions against blowing their nose, sneezing or even coughing.[2] With the high risk for perforation, any type of nasally introduced tube should be absolutely contraindicated.

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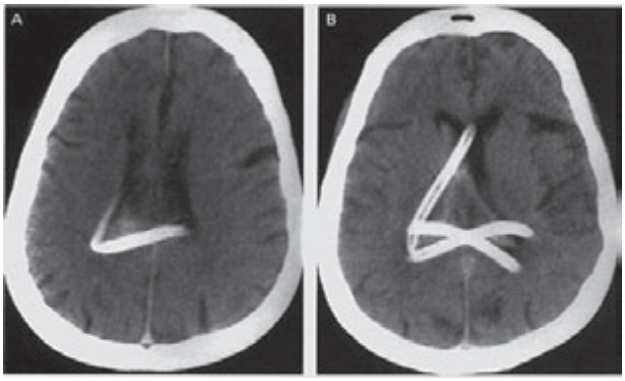

Figure 2. Computerized tomography scan showing the intracranial placement of the nasogastric tube.

The CT Scans in Figure 2 are examples of a non-trauma patient, where a congenital anomaly and inadvertent intracranial placement of NG tube occurred.[9] The patient had the tube surgically removed but subsequently died; the necropsy report concluded the causes of death were bronchopneumonia and meningitis.[9]

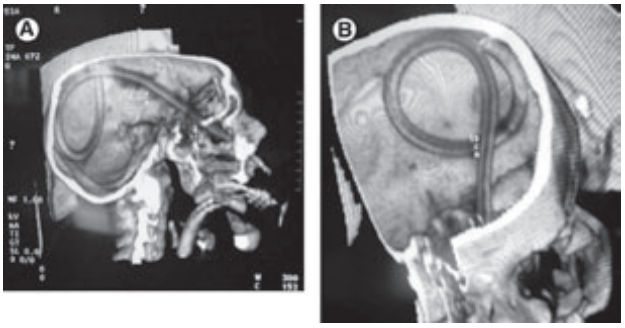

Figure 3. (A, B) Computed tomography (superficial 3-dimensional reconstruction) showing the intracranial course trajectory of nasogastric tube. *Genu et al. Inadvertent Intracranial Placement of an NG Tube. J Oral Maxillofac Surg 2004.*

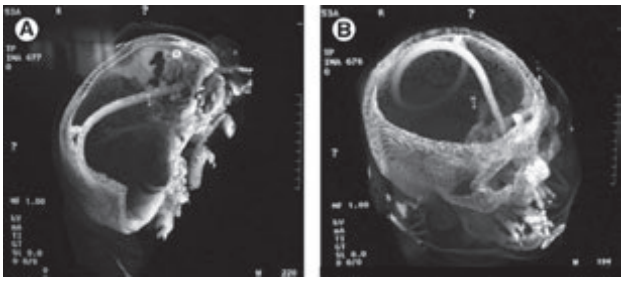

Figure 4. (A, B) Computed tomography (superficial 3-dimensional reconstruction) showing the intracranial course trajectory of nasogastric tube. *Genu et al. Inadvertent Intracranial Placement of an NG Tube. J Oral Maxillofac Surg 2004.*

The CT Scans in Figures 3 & 4 are examples of where a 53-year-old man was injured riding his motorcycle. He suffered several basal skull fractures and an inadvertent intracranial placement of NG tube occurred.[10] Upon admission the patient could only react to painful stimulus and move his left arm and leg.[10] The patient was discharged 80 days later with the same neurological complications he was admitted with.[10]

Discussion

According to Paul et al[11] in 2003, inadvertent intracranial placements of NG tubes were documented in over 40 reported cases.[12,13] Five case reports of inadvertent intracranial placement during nasotracheal intubation with nasotracheal tubes also exist.[12,14-17] Intracranial placement of a Foley catheter, inserted to tamponade severe epistaxis, has been reported four times.[18-21] Additionally 5 cases were reported of intracranial placement of nasopharyngeal airways.[22-26]

No case reports were found documenting inadvertent intracranial placement of NT suction catheters. The most appropriate case report found was not intracranial, but cervical esophageal perforation due to the use of (NP) nasopharyngeal and NT suction catheters in premature infants.[27] After several blind attempts to NP and NT suction, bleeding was noted from the nose and mouth of the premature infants.[27] With the physician's suspicions raised and the known delicate nature of premature infants, the physician performed NP and NT suctioning under flexible endoscopy.[27] Only then did the physician locate the bleeding and visualize lacerations leading to the cervical esophageal perforation.[27]

Speculated Possibilities

The stationary nature of the NG tube and customary X-ray to confirm its placement may be the reason case reports are found occasionally documenting NG tubes inadvertently inserted intracranially.

The quick, in and out nature of using NT suction catheters and no X-ray to confirm its placement, may be the reason case reports do not exist documenting NT suction catheters inadvertently inserted intracranially.

Conclusion

Although case reports do not exist documenting inadvertent intracranial placement of NT suction catheters, over 40 case reports exist of NG tubes inadvertently placed intracranially. Since the NG tube and NT suction catheter are similar devices, it is likely that both are at equal risk of insertion intracranially. X-rays and CT scans documenting NT suction catheters inserted into the brain also do not exist, but it is not common practice to leave NT suction catheters in place and confirm placement with an X-ray. The lack of evidence should not suggest that inadvertent intracranial placement of NT suction catheters does not exist, only that the evidence does not exist.

Protocols Towards Prevention

1. Review education of NP & NT suctioning contraindications for both the RT and RN staff.

2. Initiating appropriate signage above the at risk patient's head of bed, for example, "Nothing To Be Placed Up Nose." Ensure signage follows the patient throughout his or her hospital stay.

3. Reinforce the importance of checking the past medical history of patients before NP & NT suctioning.

Alternate Routes to Suctioning

Immediately post-op transsphenoidal surgery or immediately post trauma basal skull fracture patients may be absolutely contraindicated for any type of suctioning, due to risk of increasing (ICP) intracranial pressure, causing a CSF leak.[2] If suctioning is needed and appropriate, consider alternate routes to suctioning, other than NP and NT routes.

1. *Oropharyngeal Suctioning* is the suctioning of the oral and back of the tongue area, where secretions begin to pool. This

can be performed with various types of suction swabs or Yankauer tip suction devices.

2. *Oral Laryngopharyngeal Suctioning* is the suctioning of the vocal cord area with a suction catheter. The vocal cord area is where secretions can pool and cause aspiration. This area is roughly 3 inches further than the oropharyngeal area in an adult, so a suction swab or Yankauer will not reach in this situation.[28]
   a. *Awake Patient* — Since the patient is awake, minimizing the gag reflex and stimulating a strong cough is key. They may not always be cooperative, so it is important to not let your patient damage or bite off a piece of the suction catheter. The No-Bite V can be used to assist laryngopharyngeal suctioning in a quick manner, causing minimal suctioning stress to your patient.[29]
   b. *Lethargic Patient* — Since the patient is lethargic, they may have a diminished gag reflex. Oral airways may be feasible in this situation, but if oral cavity pressure ulcers or gag reflex is an issue, The No-Bite V has proven to be a more comfortable way to suction.[29]
3. *Oral Tracheal Suctioning* is the suctioning of the trachea via the oral route on a non-intubated patient. These are usually patients who are too lethargic to cough up secretions on their own, possibly a rapid response type situation where an intubation is trying to be avoided. Oral tracheal suctioning can be done via The No-Bite V and has proven to prevent some cases of intubation.[30]

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Liberation from Mechanical Ventilation: some new strategies

Justin Tse, BS, RRT-NPS

Mechanical ventilation has been in use for many years. Vesalius first demonstrated it by blowing into a reed inserted into the trachea of an animal and watching the chest rise. We, as a profession, have seen many changes over the years. Mechanical ventilation and sedation have always gone hand in hand. The balancing act that must be maintained has always been an issue. The impact of delirium during mechanical ventilation can be seen both medically and financially. ICU delirium and weakness can have a significant influence on a patient's ability to overcome critical illness[1,2] but can also have a significant effect on long-term physical and cognitive outcomes.[3-6] The estimated cost for caring for delirious patients receiving mechanical ventilation is from $6.5 to 20.4 billion annually.[7,8] With a growing population and healthcare costs rising, we need to find ways to minimize length of stay.

An abstract presented at this year's Society of Critical Care Medicine in San Juan, Puerto Rico, demonstrated an increase in days without mechanical ventilation and less delirium. "The Awakening and Breathing Coordination, Delirium Monitoring and Management, and Early Mobility (ABCDE) bundle, first developed at Vanderbilt University, incorporates interdisciplinary and multi-component approaches to critical care."[9]

There have been numerous studies looking at outcomes for "sedation vacations" as well as increasing mobility for mechanically ventilated patients but this is the first time the two practices have been studied together.

The study contained 186 patients which were divided into two groups: those treated with traditional care and those on the ABCDE bundle. "Although baseline characteristics, including age, severity of illness, and sedative drug use were similar in two groups, patients in ABCDE group spent more days breathing without ventilator assistance. In addition, rates of delirium and mortality in intensive care units were lower in ABCDE group than in traditional-care group."[9]

One barrier identified in this study was communication. "To address this problem, researchers recommend that at least once a day all members of the interdisciplinary team get together to talk about a plan for that 24-hour period."[9] Another factor in implementing the bundle is awareness that delirium can have long-lasting effects, said Dr Balas. "We were surprised that a lot of providers were not aware of the long-term consequences of critical care. I think we are so focused on saving lives that we may not take time to think about what happens when the patient leaves the hospital and what their life is like in the long term."[10]

Critical care medicine has come a long way over the last several decades. New innovations and ways of thinking have evolved from what we have learned. It is time we embrace what is new and embark on a journey into helping improve patient outcomes.

Justin Tse is Senior Clinical Specialist, Hamilton Medical, Inc. This article is from the company's newsletter, Intelligent Ventilation.

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Surfaxin and RDS

Les Plesko

The journal Expert Reviews — Clinical Pharmacology recently published a paper, Lucinactant for the Prevention of Respiratory Distress Syndrome in Premature Infants.* The authors discussed lucinactant, the peptide containing synthetic surfactant developed and marketed as SURFAXIN by Discovery Labs.

Lucinactant is the first non-animal derived, synthetic surfactant, containing sinapultide, a peptide that mimics SP-B. The authors noted that a long term follow up study evaluating outcomes of infants treated with lucinactant, as well as the comparator products, through one year corrected age, "demonstrates that lucinactant is as effective as animal-derived surfactants in preventing RDS in premature neonates, and in vitro studies suggest it is more resistant to oxidative and protein-induced inactivation." The authors added, "Its synthetic origin confers lower infection and inflammation risks as well as other potential benefits, which may make lucinactant an advantageous alternative to its animal-derived counterparts."

Background

The authors noted that the use of surfactant replacement therapy was introduced in 1980s and formalized in 1990. Since then, half the decrease in infant mortality in the US is attributable to its use.

Surfactant comprises phospholipids and proteins produced by type II alveolar pneumocytes which begin to be detectable at 22 weeks' gestation. The phospholipids acting with the proteins give surfactant the ability to lower surface tension. The most important protein for lowering alveolar surface tension is SP-B, in that it enables the even distribution of lipids across the alveolar surface. As such, the lipid monolayer allows for resisting alveolar collapse at end expiration.

The first FDA-approved surfactant was colfosceril palmitate (Exosurf), a protein-free synthetic surfactant that reduced neonatal mortality from RDS. Research suggested, however, that animal-derived surfactants might be even more effective. This turned out to be the case, and four protein-containing surfactants were approved by the FDA (Infasurf, Survanta, Curosurf and Surfaxin). These surfactants combine lipids and proteins and as such are more like human surfactant.

The use of animal-derived surfactants demonstrated faster response than the no-protein surfactant and animal-derived surfactants became the standard treatment.

Les Plesko is editor of this journal.

According to the authors of the article, "Animal-derived surfactants have both practical and theoretical disadvantages. The most worrisome potential problems include the transmission of infectious agents and the delivery of potentially immunogenic substances, which could worsen inflammation in the neonatal lung and sensitize an impressionable immune system. In addition, animal-derived surfactants have been shown to be susceptible to inactivation by plasma proteins, reactive oxygen species and meconium… Potential quality control issues and batch-to-batch variation have been associated with the animal-derived surfactants. Furthermore, both neonatologists and parents are concerned about cultural and religious conflicts created by the use of bovine, porcine or human proteins."

Definition and Administration

Here are the highlights of authors Jordan and Donn's definition and description of lucinactant (the description is abridged): Lucinactant is a synthetic surfactant containing a mixture of phospholipids and fatty acids, to which sinapultide, a bioengineered 21 amino acid peptide designed to mimic the carboxyl-terminus of SP-B, has been added. Its lipid content is primarily dipalmitoyl phosphatidyl choline but also contains lesser amounts of palmitoyloleoyl phosphatidyl glycerol and palmitic acid. The peptide content is comprised entirely of sinapultide.

The authors explained: Lucinactant functions primarily at the air-liquid interface of the alveolar membrane, mimicking endogenous surfactant by forming a phospholipid monolayer that lowers the surface tension at the low lung volumes typical of end expiration. Sinapultide assists with the distribution and stabilization of the phospholipid monolayer in a dynamic fashion throughout the respiratory cycle in a manner similar to SP-B. Lucinactant is administered directly to the trachea beneath the vocal cords and is delivered to the distal alveoli by gravity, bulk diffusion and positive pressure ventilation.

The recommended dosing for lucinactant is 5.8 mL/kg of birthweight. [According to the manufacturer, before use, the vial should be warmed for 15 minutes in a preheated dry block heater set at 44° C. After warming, the vial should be vigorously shaken until the SURFAXIN is a uniform and free-flowing suspension. The temperature of the product will be approximately 37° C or less after the product is drawn into a syringe for administration.] Each dose should be divided into four equal aliquots, each delivered intratracheally, while maintaining positive airway pressure of 4-5 cm H2O. The infant should be positioned with

its head elevated to 30° and placed in the right lateral decubitus position for the delivery of the first aliquot. Once the infant has been checked for stability, it should be repositioned in the left lateral decubitus position for delivery of the second aliquot, and this procedure should repeated for the third and fourth aliquots that complete the dose; four doses may be administered at 6 hour intervals as needed.

Clinical Trials

Lucinactant's safety has been evaluated in two phase III trials involving 1,500 preemies. Common side effects were transient hypoxia and pallor related to endotracheal tube reflux and obstruction, and interrupted doses during administration. These side effects, the authors noted, were the same as for animal-derived surfactants. Adverse outcomes were the same as with beractant and poractant alfa, and the trials found no contraindications for the use of lucinactant. In vivo trials with animals didn't identify any systemic toxicity, and in vitro, lucinactant didn't induce reversion mutations or induce chromosomal aberrations. The authors referenced in vitro studies in human cell lines demonstrating that lucinactant is absorbed by fetal type II alveolar pneumocytes without affecting endogenous surfactant protein synthesis.

Various studies have demonstrated the efficacy of lucinactant. The SELECT trial compared lucinactant and beractant to colfosceril, and the STAR trial compared it to poractant alfa.

The authors explained that SELECT was a multicenter double-blinded randomized trial that involved 1,294 infants at less than 32 weeks gestation who weighed between 600 and 1,250 g at birth and who required endotracheal intubation. Results showed that lucinactant decreased the incidence of RDS at 24 hours, RDS-related mortality at 24 hours, and death at 14 days. Comparing lucinanctant to beractant, according to the authors, "The SELECT study showed a statistically significant decrease in RDS-related mortality at 2 weeks for infants treated with lucinactant (4.7%) compared with beractant (10.5%)."

The STAR study compared lucinactant to poractant alfa and included 252 infants at 24-28 weeks' gestation, weighing 600-1250 g at birth. The authors noted, "Because of the ethical dilemma involved in undertaking a placebo-controlled study in the face of substantial evidence of the benefit of protein-containing surfactants, the STAR study was designed as a noninferiority trial based on the hypothesis that infants treated with lucinactant would do no worse than those treated with poractant alfa in its placebo-controlled trial." In this study, "lucinactant was shown to be noninferior to poractant alfa, and similar complication rates were observed for both treatments. The hypothesis that lucinactant is superior to poractant alfa could not be tested by this study design." The authors added that no differences were found in the primary outcomes, including mortality and chronic lung disease, but that "a statistically significant decrease in risk of necrotizing enterocolitis was noted in infants treated with lucinactant despite the fact that neither study was powered to detect this difference. Together, the SELECT and STAR studies suggest that lucinactant is as effective as animal-derived surfactant preparations for the primary prevention of RDS."

The future

The authors pointed out that at the present time, lucinactant is only available as an intratracheal suspension and is indicated for the prevention of respiratory distress sydrome (RDS). Though lyophilized lucinactant is under development, it has yet to be approved for use. They noted that "aerosolization of surfactant has been an attractive but an elusive proposition. Attempts to aerosolize or nebulize animal-derived surfactants have been unsuccessful. The energy required to create the aerosol denatures the proteins. In perhaps the most exciting area of new research in RDS, lucinactant was recently shown to remain functional in an aerosolized form. The ability to reaggregate at the alveolar membrane and regain surface tension-lowering function after aerosolization appears to be a uniquely beneficial property of lucinactant, not shared by its animal-derived counterparts… If this formulation and mode of delivery are borne out in larger clinical trials, the benefits of delivering surfactant without the potential complications of intratracheal instillation would likely be substantial."

The authors concluded, "The future of SRT will probably see the development of novel uses for the peptide-enhanced synthetic surfactants. Lucinactant, which appears to resist inactivation by serum proteins and reactive oxygen species better than other surfactants, may be better suited than animal-derived surfactants to treat meconium aspiration syndrome, cystic fibrosis and acute RDS in older pediatric patients and adults. Another intriguing possibility is the use of surfactants as a vehicle to deliver other medications directly to the lung with avoidance of systemic side effects."

**Lucinactant for the prevention of respiratory distress syndrome in premature infants. Expert Rev Clin Pharmacol 6(2), 115-21 (2013), Brian K. Jordan and Steven M. Donn. The authors are with the Department of Pediatrics and Communicable Diseases, Division of Neonatal-Perinatal Medicine, CS Mott Children's Hospital, University of Michigan Health System, Ann Arbor, MI.*

Long-Term Ventilation With Variable PSV

Prof Dr med habil Marcelo Gama de Abreu, DEWA

Case: A 73-year old male patient, while working in his garden, fell about 12 feet from a ladder. He was found by his wife who called an ambulance. When the paramedics arrived, he was observed to have an oxygen saturation SpO2 of 65%. The patient was then intubated and ventilated.

Diagnosis and initial treatment

Due to a suspected right-sided tension pneumothorax, thoracic suction was applied and the patient brought to the emergency department of the University Hospital Dresden, where a radiological examination was performed. The examination revealed a right-side hemopneumothorax, bilateral rib fractures, a sternal fracture, and fractures of thoracic vertebra T4 and T11. After surgical treatment and internal stabilization of the 11th thoracic vertebra, the patient was moved to the surgical intensive care unit where volume-controlled ventilation was applied.

He was placed under the care of an intensivist. As a result of the pleural effusions, atelectasis, and tracheobronchitis, the patient started showing signs of respiratory insufficiency with pronounced hypoxemia (PaO2/FiO2= 173).

As expected, proper oxygenation and ventilation would be difficult to maintain because of the multiple fractures, unstable thorax, and resultant paradoxical breathing.

Method

The spontaneous breathing of the patient was first supported with conventional pressure support ventilation (PSV) and a constant support pressure of 10 cmH2O, flow trigger = 3.0 l/min, PEEP = 12 cmH2O and FiO2 = 0.4. This made it possible to achieve an average tidal volume of 514 ml and a respiratory frequency of 21/min, which in turn resulted in a minute volume of 10.8 l/min, a PaO2/FiO2 of 250 and a PaCO2 of 53.1 mmHg. Given the reduced variability in tidal volume, which was about 10% and thus significantly lower than the variability of the tidal volume in spontaneously breathing patients (approximately 26%),[1] as well as the difficulty of finding the right support pressure for the patient, which at the same time provided some relief and allowed an adequate gas exchange, the ventilation mode was switched to variable pressure support.

Mechanical ventilation was supported with a Dräger Evita Infinity V500 SW 2.n ventilator [in other countries the product name is Infinity Acute Care System Workstation Critical Care].

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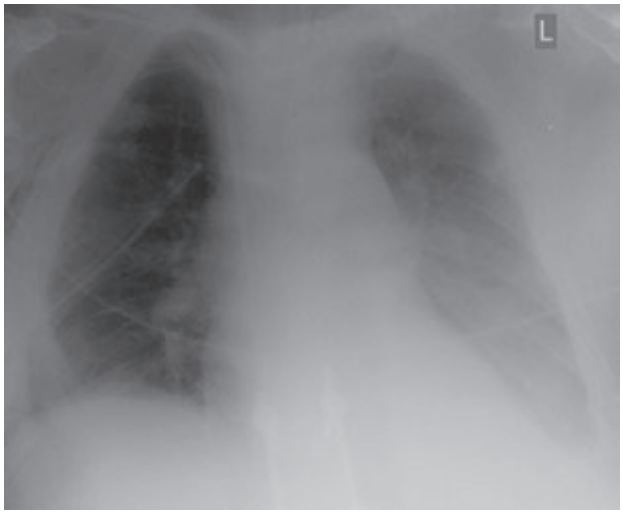
The ventilator is equipped with the new Variable Pressure Support option. Variable pressure support provides the ability to apply distributed pressure support within defined limits stochastically, ie, randomly, as described by Gama de Abreu and coworkers.[2] In case of variable pressure support, the desired degree of pressure support variability is set in addition to the usual pressure support parameters (eg, ramp, cycle off criterion, trigger and pressure support). This results in a breathing pattern where the level of pressure support varies from breath to breath.

The support pressure variability was initially set to 90% (range adjustable from 0-100%). With a value, for example, of 100%, the pressure support would amount to a minimum of 0 cmH2O and a maximum of twice the pressure support value, with the extreme values occurring only very rarely. The specified pressure support variability of 90% resulted in a coefficient of variation of 30% in the support pressure. The reason for this is that, with a normal distribution, these two variables (variability of the support pressure and coefficient of variation) have a ratio of about 3:1. Since all the other ventilator settings remained unchanged, this setting resulted in a tidal volume of approximately 530 ml (average).

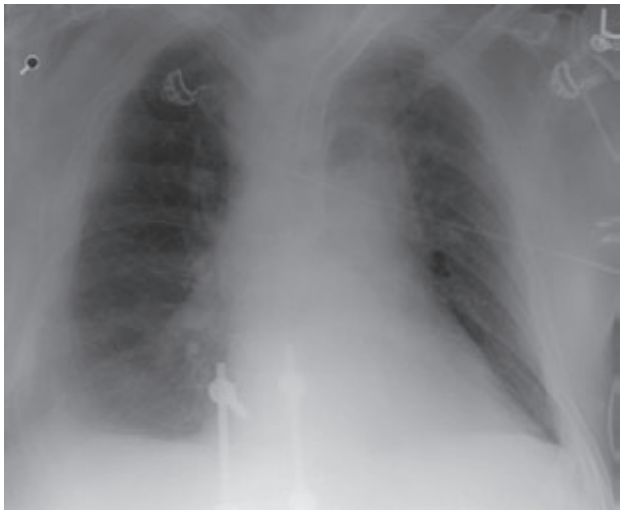
Result

Compliance was improved by approximately 20% during the initial first hour, while the gas exchange parameters with a PaO2/FiO2 of 248 and a PaCO2 of 50 mmHg remained almost constant. Over a period of approximately seven hours, the pressure support variability was reduced to 60% and maintained at that level.

Window for activating Variable Pressure Support in the Evita Infinity V500 ventilator. In addition to setting the support pressure (ΔPsupp), as with conventional pressure support ventilation, the variability of the pressure support (Pressure Var.) can be set in a range from 0-100%. Pressure Var. (in percentage) refers to the range in which ΔPsupp can vary. Since ΔPsupp values are subject to normal distribution, the coefficient of variation is approx. 17% (50%/3) at a Pressure Var = 50%.



The chest x-ray revealed a left-side pleural effusion with adjacent partial atelectasis, right basal partial atelectasis, a right thorax suction drainage with the tip projecting toward the right midfield and right thoracic subcutaneous emphysema.



Six weeks after the previous admittance and assisted spontaneous breathing with pressure support ventilation, the lung conditions improved and the patient was transferred to a rehabilitation clinic.

Over a period of ten days, the patient was treated successfully with a variable pressure support of 8 cmH20 and variability in the range of 40-60% while continuing to suffer from persistent thoracic instability. The patient was tracheotomized before his transfer to a rehabilitation hospital. Conventional pressure support ventilation was used then only intermittently to reduce the work of breathing, since the severely fatigued respiratory muscles would recover over a lengthy period of time.

Summary

The critical finding of this case is that while using variable pressure support, different, randomly generated pressure support values could be applied during a long-term weaning period. This was made possible in spite of the variability of the patient's spontaneous breathing being affected by the unstable thorax. The use of variable pressure support avoided having to make frequent changes to the ventilator settings to ensure the patient felt comfortable, the gas exchange was adequate, and compliance of the respiratory system improved as well.

Key conclusions

- Variable pressure support leads to increased variability of the tidal volume which is similar to spontaneous respiration variability.
- Using variable pressure support required fewer ventilator adjustments and thus relieves staff from constant need to adjust parameters.
- With variable pressure support, it was possible to cover a wide range of ventilation pressures by optimizing the gas exchange and increasing patient comfort levels.

Expectations for the future use of variable pressure support

- Variable pressure support makes it possible to reduce pressure support compared to traditional pressure support ventilation, thus allowing for faster weaning.
- Since different pressure support values are generated, the always changing needs of the patient could be better met in terms of respiratory support.
- Variable pressure support could help to reduce the number of necessary assisted ventilation adjustments. – Variable pressure support could replace traditional pressure support ventilation.

Brief description of the general research situation

According to experimental studies, variable pressure support leads to better oxygenation, lower airway pressures, and fewer ventilator-associated lung injuries compared to traditional pressure support ventilation.[2,3,4]

Additionally, the breathing effort with variable pressure support is lower than with traditional pressure support ventilation and proportional assist ventilation (proportional pressure support).[5]

Early clinical experiences suggest that variable pressure support can cover a wide range of pressure support to meet the needs of the patient.

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Keeping Patients Active — a one-year follow-up

Bob McCoy, RRT, FAARC

In the Oct/Nov 2012 issue of Respiratory Therapy, we presented a case report about Mr Dana Jones, an Alpha-1 patient, who was struggling to maintain his Activities of Daily Living (ADLs). The report highlighted the impact of Alpha-1 on Mr Jones' life and how a new medical device has helped him regain his independence and ability to participate in activities he enjoys. Mr Jones was introduced to the Non Invasive Open Ventilation (NIOV) System (Breathe Technologies, Inc) while participating in a clinical research study at the Rehabilitation Clinical Trials Center, Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center in Torrance, CA. The NIOV System is a palm-size, volume assist system that provides pressure and volume via a proprietary nasal pillows interface. Clinical study data has demonstrated the clinical benefits of the NIOV System, including improvements in exercise endurance, oxygen saturation (SpO2) levels and a reduction in dyspnea.[1]

Alpha-1 Antitrypsin (AAT) deficiency is a genetic disorder affecting approximately 3.4 million individuals worldwide.[2] This inherited disorder results in COPD, liver disease, and several other conditions. The deficiency of the protein, alpha-1 antitrypsin, can lead to emphysema and presents with respiratory symptoms including shortness of breath, decreased exercise tolerance, and frequent lower respiratory tract infections. Therefore, the general management of AAT deficiency as recommended by the ATS/ERS is similar to that of COPD.[3] Several of the interventions recommended by ATS/ERS include supplemental oxygen, pulmonary rehabilitation, and consideration for lung transplant.

Since the publication of the case study in 2012, Mr Jones has incorporated the NIOV System into his daily activities and has seen a marked improvement in his ability to complete activities of daily living (ADLs). He attributes the positive changes in his lifestyle to the benefits of using the NIOV system to reduce his work of breathing and alleviate the symptoms of dyspnea. The NIOV System allows Mr Jones to tolerate increased activity necessary and to accomplish his daily routines. Mr Jones has been an outspoken advocate of the benefits of maintaining activity even with diminished lung capacity and is working to increase awareness of new technologies in the Alpha-1, COPD, and medical communities.

He and his medical team had specific goals in mind for the use of NIOV System. The first goal was to reduce his dyspnea and to increase his exercise endurance allowing him to complete ADLs as well as return to his work and hobbies. By participating in a 4 hours per week pulmonary rehabilitation program, Mr Jones has seen a significant reduction in his dyspnea and a dramatic increase in his exercise endurance. Prior to the intervention with the NIOV System, he was using a pulsed dose oxygen system at a setting of 4. His ability to exercise with that system was limited to 20 minutes of treadmill time at a speed of 1.5 miles per hour. His Borg score was reported at 6-7 during exercise. Using the NIOV System, he is now able to exercise for approximately 30 minutes while on a treadmill reaching speeds of up to 2.2 miles per hour with a reported Borg score of 3-4. Also, using the NIOV System has made it possible for him to initiate and adhere to a resistance training regimen – lifting weights of up to 25 lbs with multiple repetitions – which is important factor in maintaining skeletal muscle function in AAT deficient patients.

The second goal in using the NIOV System was to prepare Mr Jones for lung transplant by participating in a pulmonary rehabilitation program. Maintaining pre-transplant health status is an important predictor of morbidity and mortality in lung transplant patients.[4] Augmented ventilation provided by the NIOV System has allowed Mr Jones to actively participate in his pulmonary rehabilitation program and he has reported no exacerbations or hospital admissions over the past 12 months. He has now been added to the national lung transplant list and is looking forward to a successful surgery and recovery.

Exacerbations are a common occurrence for anyone with a chronic lung condition. Mr Jones has been on oxygen therapy for 3 years with the first two years receiving low flow traditional oxygen therapy. He has indicated that in the first two years he needed to be hospitalized twice to treat an episode of respiratory insufficiency. After the initiation of the NIOV System, he reports that there have been at least two occasions where he was able to use his NIOV System to cope with severe dyspnea that in the past would have resulted in 911 calls and emergency room admissions.

The progress in Mr Jones' pulmonary rehabilitation program has been a major factor in regaining his independence. The NIOV System provides the respiratory support he needs, going beyond basic oxygen therapy to allow for showering, shaving, lifting objects, walking up stairs, and bending down or rising from a seated position. These basic activities are now all possible for him whereas before using the NIOV System all seemed daunting and out of reach.

People living with respiratory insufficiencies face many challenges in their daily lives. Oxygen therapy can address perfusion issues and pharmacologic options can dilate airways, reduce swelling, and address bacterial infections. Ventilation has not been practical in the past due to technology limitations. The NIOV System provides an option for ambulatory patients that

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Benefits of the Neo-Tee versus the Self Inflating Resuscitation Bag in the Delivery Room and NICU

Kennard Chandler

The self inflating resuscitation bag is unable to provide the neonate continuous positive airway pressure (CPAP). In addition, the self inflating resuscitation bag is unable to maintain end expiratory alveolar volume, which may lead to alveolar collapse and loss of alveolar recruitment. This may be overcome if a PEEP valve is incorporated into the self inflating resuscitation bag. However the self inflating resuscitation bag is often used without this PEEP valve.

The Neo-Tee (Mercury Medical) is able to provide the neonate with CPAP. As simple as this sounds, Neo-Tee's ability to provide CPAP is the tremendous benefit of the Neo-Tee over the self inflating resuscitation bag.

The only strategy that has proven to promote alveolar stability and enhance alveolar recruitment in the delivery room and the NICU is CPAP in one form or another. CPAP also prevents the loss of end expiratory alveolar volume thus maintaining alveolar stability and alveolar recruitment.

During a positive pressure breath the variation of lung volume depends on the compliance of the alveolar structures and the amount of pressure used to produce that change. The normal lung at birth does not present pure elastic behavior across the vital capacity range. Even in the normal lung at birth there are regional and postural variations in how fast or slow lung units will fill or empty along the vital capacity range.

When the lung is subjected to a pressure change, time is needed until a volume change will occur. The time necessary to inflate an alveolar structure to 63% of its volume is called a "time constant." This concept is extremely important when trying to understand the challenges of the neonate's pulmonary mechanics during the transition to breathing air. Time constants refer to the speed at which the alveoli will fill or empty. In the normal or near normal lung the alveolar time constants will vary based on the resistance and compliance of the lung structures. Some alveoli will fill or empty faster while others are slower to fill or empty. During transition many factors may unfavorably alter the regional time constants immediately after birth. Understanding these challenges and regional differences in time constants is essential in the delivery room and the NICU.

The successful transition from fetal circulation to pulmonary circulation depends on the neonate's ability to achieve a stable functional residual capacity (FRC) immediately following birth. The challenge in these neonates is to achieve and maintain an adequate FRC allowing alveolar stability and optimizing alveolar recruitment. Achieving alveolar stability means that the spontaneous breath must be able to open or recruit as much of the available alveoli as possible. Maintaining alveolar stability also means that there is adequate end expiratory alveolar volume to prevent alveolar collapse and loss of alveolar recruitment.

As stated earlier, the only strategy that has proven to promote alveolar stability and enhance alveolar recruitment in the delivery room and the NICU is CPAP in one form or another. CPAP also prevents the loss of end expiratory alveolar volume, thus maintaining alveolar stability and alveolar recruitment. The Neo-Tee provides CPAP and will assist the transition process from fetal to pulmonary circulation by providing a dynamic FRC immediately following birth. The self inflating resuscitation bag does not provide a dynamic FRC.

Maintaining end-expiratory alveolar stability and alveolar volume is the function of the amount of the positive-end expiratory pressure (PEEP) or continuous positive airway pressure (CPAP) that is applied. Adding PEEP to a self inflating resuscitation bag requires the addition of a special PEEP valve to the self inflating resuscitation bag. Without this PEEP valve the end expiratory airway pressure will be allowed to return to zero after each positive pressure breath. This may cause a decrease in the FRC and loss of alveolar stability resulting in alveolar collapse and a loss of alveolar recruitment. Maintaining alveolar stability using a self inflating resuscitation bag without a PEEP valve may be impractical or impossible.

CPAP is able to achieve and maintain alveolar stability because the airway pressure never falls below the lower inflection point, preventing alveolar collapse. Keeping these alveoli inflated (dynamic FRC) and continuously participating in gas exchange is the unique secret of CPAP.

Therefore the benefit of the Neo-Tee is the ability to provide CPAP, providing a dynamic FRC and alveolar stability and optimizing alveolar recruitment which will enhance the transition from fetal to pulmonary circulation in the newborn.

This review was written by Chandler, who is solely responsible for its content. This review would not have been possible without the suggestions and the unwavering support of Ed Golden RRT, Director of Pulmonary Services, Manatee Memorial Hospital. Chandler is a staff Respiratory Therapist who is currently employed at Manatee Memorial hospital. He has been involved in respiratory care for the past 44 years.

Is a More Accurate Pulse Oximetry Possible?

Richard J. Melker, PhD, MD

Although widely embraced as a vital tool to monitor oxygenation for patients receiving anesthesia, pulse oximetry — as conventionally employed outside the operating room — is by no means an absolute guarantee of safety. As the Anesthesia Patient Safety Foundation states, "Clinically significant drug-induced respiratory depression in the postoperative period remains a serious patient safety risk associated with significant morbidity and mortality."

How can healthcare facilities reduce that risk? The answer may lie in the results from a new study that compared conventional pulse oximetry sensors — which are usually placed on the digits of post-operative patients — with a "next generation" pulse oximetry sensor that is placed on the patient's nasal ala.

The data collected in this new study was presented at the Society for Technology in Anesthesia meeting in January 2013.

The alar sensor site, unlike the digits, is far less prone to measurement failures in patients with cardiorespiratory comorbidities, who are hypotensive, receiving vasoactive drugs or are hypothermic or anxious. It also detects drops in saturation more quickly than sensors placed on the digits.

Additionally, the alar sensor's design and placement makes it less prone to interference from ambient light, a common problem with digit sensors. The alar sensors are compatible with a variety of pulse oximeters.

Research has shown that conventional pulse oximetry sensors can yield less than optimum results. For example:

- A University of Calgary study found that finger probe placement is not always able to provide a pulse signal sufficient to achieve an accurate measure of arterial oxygen saturation (SpO2) on some emergency room patients.
- University of Arizona research states that motion artifact — a shivering patient, for example — is "a common cause of oximetry failure and loss of accuracy."
- A UC San Diego study states, "A high incidence of pulse oximetry failure was observed with the use of a digital pulse oximetry probe during prehospital RSI." In addition, a latent period appears to exist in the majority of patients undergoing desaturation.

These and other studies illustrate the many disadvantages of conventional finger-based pulse oximetry. High false alarm rates, slow response times to changes in oxygen saturation and a poor signal-to-noise ratio are among the most frequently cited.

Yet, these shortcomings might be reduced, or perhaps even eliminated, with nasal alar pulse oximetry, according to this research which was conducted recently at the HYPO2XIA LAB, University of California, San Francisco (UCSF).

The study tested 12 healthy, non-anemic, non-smoking subjects (six men, six women) between the ages of 21 and 49. During the experiments, both traditional pulse oximeter sensors and next-generation alar sensors were placed on the subjects. The alar sensors were placed on both alar regions, and a radial arterial catheter was placed to enable sampling for CO-oximetry determination of oxyhemoglobin saturation.

Baseline data was established by taking blood samples from subjects breathing room air through a tightly sealed facemask. Hypoxemia was then induced to different levels of oxyhemoglobin saturation (between 70% and 100%) by having the subjects breathe mixtures of nitrogen, room air and carbon dioxide. After a plateau was reached, two arterial blood samples were taken for a total of 25 samples and the study was repeated. This enabled well over 200 data points to be collected for each sensor.

The results were encouraging. As we summarized in our abstract to the STA, the research showed the next-generation nasal alar sensor to be highly accurate in measuring oxyhemoglobin levels throughout the range tested. As the abstract conclusion stated, "Nasal ala pulse oximetry is feasible and demonstrates accurate SpO2 (±2%) values over a range of 70-100%."

Although further tests of nasal alar pulse oximetry involving different patient populations are merited, it's clear that this next generation of pulse oximetry sensors represent a major step forward in both the accuracy of pulse oximetry and in patient safety.

Richard J. Melker is Professor of Anesthesiology, Biomedical Engineering and Pediatrics at the University of Florida College of Medicine and co-founder of Xhale.

Biphasic Cuirass Ventilation for the Chronic Lung Disease Patient

Gary W. Mefford, RRT

For patients with chronic obstructive lung disease and other types of chronic forms of respiratory insufficiency biphasic cuirass ventilation (BCV) offers interventions with a greater potential of maximal health achievement and maintenance than any individual or combination of other devices. For patients with diagnoses in these categories including COPD, asthma, bronchitis, bronchiectasis, cystic fibrosis, and chronic pulmonary disease processes that may result from similar or combined pathologies of this type, the goals of the non-pharmacologic portion of treatment strategies are relatively the same.

1. Maximize gas exchange and comfort
2. Minimize ventilation to perfusion mismatching
3. Maintain clear airways with minimal drain on systemic reserves
4. Provide support as needed non-invasively if possible that will replenish reserves allowing as normal as possible activities of daily living (ADL)
5. Utilize a simple to apply means of airway clearance and support with which a patient will be readily compliant
6. Provide maintenance of highest level of health, minimizing symptoms such as dyspnea, fatigue, etc while keeping the patient well in their home environment and avoiding exacerbation, keeping them from requiring the higher cost levels of care that also pose high risk of infections.
7. Minimize need for emergency care services and the potential advancement to intensive care while avoiding as much as possible the most extreme accrual of costs of care, and if required minimize duration of requirement

Multiple interventions are currently utilized to achieve these goals for patients of this type, but none offers a better means to achieve the result for the patient in a single easily applied and tolerated clinical technique, as does BCV.

The BCV interventions that provide the means of keeping these patients well, although relatively simple to apply, are well grounded physiologically.

A chronic patient at home will usually be placed on a multi-pronged treatment regimen utilizing the full spectrum of what BCV provides. Noninvasive support of ventilation will be provided, along with a powerful means of secretion clearance and cough assistance. This triad of interventions provides a powerful, well-proven means of achieving the goals stated above. The means of this for each goal using BCV and compared to alternatives are:

Gary W. Mefford RRT is VP Clinical Operations for Hayek Medical Devices. This article was provided by Hayek Medical.

For goal

1. Maximize gas exchange and comfort: For patients with chronic respiratory insufficiency normal respiratory activity combined with ADLs can result in increasing pulmonary muscle fatigue with no period in which the muscles of respiration are not taxed with a cost-of-breathing requirement that is above the range of effort that will allow rest of those muscles. Increased debility is the result. An easily tolerated means of unloading those muscles applied intermittently ie during sleep and for rest breaks during the day in severe cases will allow for increased strength and reserves, less fatigue, better exchange of O2 and CO2 – all resulting in a higher level of wellness. Similar gas exchange benefits can be obtained noninvasively using standard noninvasive positive pressure (NPPV) or biphasic positive airway pressure (BiPAP) techniques, except that a facial or invasive interface of some kind is required to deliver the support. These interfaces are known to be fraught with facial breakdown and compliance issues. In addition, no form of NPPV offers the additional benefits of secretion clearance, and cardiovascular support that BCV allows. This approach of support, ventilation/perfusion improvement and assistance with meeting airway clearance needs leaves patients better able to remain more free of breathing discomfort and able to tolerate their ADLs.

2. Minimize ventilation to perfusion (V/Q) mismatching: Deficits of this nature for these patients are the result of alveolar shunt and high levels of dead space ventilation. Alveolar shunt is typically the result of airways blocked or filled with retained secretions. Through both the prescribed routine of secretion clearance therapy, which includes high frequency chest wall oscillation, cough assist, and the intermittent noninvasive support of ventilation, all via the cuirass interface, removal of retained pulmonary secretions is accomplished. In addition to secretions cleared during periods of support and secretion clearance therapy, the increase in pulmonary muscle reserves provides increased ability to keep airways clear when BCV is not being used. Aside from the work of breathing (WOB) benefits of clear airways, improved gas exchange is also the result and along with that goes less symptoms of dyspnea and better preservation of tenuous reserves.

High levels of dead space ventilation are often the result of increased alveolar capillary perfusion pressure resultant

hypercarbia, hypoxemia, and acidosis that often accompany chronic forms of pulmonary compromise. Alveolar capillary compression from air trapping in obstructive disease processes results in additional potential for dead space ventilation. These factors result in decreased alveolar capillary blood flow and thus worsening V/Q mismatching.

BCV by means of supporting with a mean negative pressure transmitted from the cuirass to intrathoracic structures often results in clinical improvements by decreasing alveolar capillary pressure, increased pulmonary vascular perfusion, better V/Q matching, improved dead space to tidal volume (VD/VT) ratios and improved symptoms for these patients. The improvements in V/Q matching last beyond the period of use; thus intermittent support will provide an effect that lasts beyond the period of support providing these benefits to symptoms and ADLs even between uses of BCV.

No other non-drug intervention offers similar potential of improving alveolar capillary perfusion. There are other secretion clearance tools but none that offer the other benefits that BCV does.

3. Maintain clear airways with minimal drain on systemic reserves: There are multiple significant clinical advantages of use of BCV for secretion clearance over all of the current high frequency chest wall compression (HFCWC) or "vest" type devices.

a. Oscillatory waveform: All of the "vest" type devices on the market utilize a high frequency of chest wall compression to create what some of them even term high frequency chest wall oscillation; however, true oscillation involves both negative and positive pressures applied to the chest wall. "Vest" type devices are not able to provide anything other than a positive pressure deflection. The RTX by virtue of the rigid cuirass, flexible seal and the high frequency oscillation of the gas flow waveform generated by the power unit and applied to the chest wall through the cuirass provides true high frequency chest wall oscillation. This unique oscillatory wave applied to the lung through the cuirass and chest wall provide a powerful secretion thinning effect as well as a significant increase in the transport of the patient's retained secretions up to the large bronchi and trachea for expectoration. The disadvantage of chest wall compression reported by patients that have used both versus true oscillation is that over the duration of a therapy session the high frequency compressions causes many patients discomfort and dyspnea, presumably due to compression of lung volumes during the therapy. The oscillatory wave provided by BCV is frequently found much more tolerable by patients, and discomfort and dyspnea are rare, presumably due to the maintenance and protection of full lung volumes even with prolonged treatment.

b. Cough assistance: At the completion of each cycle of high frequency chest wall oscillation the RTX provides cough assistance. This is accomplished by the power unit advancing to a cycle in which a strong negative pressure is applied to the chest wall creating a very full lung inflation, which is followed by a strong positive pressure against the chest wall, facilitating a strong expiratory gas flow. The crucial elements of a good cough effort of a deep breath followed by a strong forced expiratory effort are enhanced by this cycle. The patient can perform huff cough, and forced cough maneuvers timed with the delivered positive pressure deflections through the cuirass and thereby produce intensely increased expiratory cough flows allowing expectoration of secretions that were loosened and advanced up the bronchial tree by the previous cycle of oscillation. Frequently patients that retain secretions and fail to expectorate refractory to all other secretion clearance therapies will be productive using this combined oscillation and cough assist method while expending far less effort than with standard methods of expectoration. They are able to accomplish this without needing a mask interface as with an in-exuflation type of device. Maximizing chest wall mobility is also another benefit of this cycle, which encourages a maximal inspiration that fully expands the rib cage, airways and alveoli safely. No "vest" type device can provide this type of assistance. BCV with its applied high frequency oscillatory wave for thinning and advancing secretions to the large airways combined with its cough assist function facilitating expectoration, provides unparalleled potential as a tool for airway clearance, which is considered a hallmark of good pulmonary care of all secretion retentive and muco-proliferative disease processes. Additionally the ability of the RTX to provide noninvasive ventilatory support when indicated provides a means of better maintenance of health for the patient needing assistance with secretion clearance and respiratory function than any of the various "vest" type devices are able to provide.

4. Provide support as needed non-invasively if possible that will replenish reserves allowing as normal as possible activities of daily living (ADL): Intermittent unloading of pulmonary muscles with noninvasive support allows increased reserves during unsupported periods. BCV offers multiple benefits while providing the noninvasive unloading needed to maximize ADLs and pulmonary reserves. BCV is very effective in most patients for assumption of all work of breathing (WOB) while the patient rests. BCV accomplishes this with an extra-thoracic, non-facial, non-tracheostomy interface that is well tolerated by most patients. Unlike any other form of noninvasive support, BCV is capable of providing cardiovascular support, secretion clearance assistance, and ease of use with a minimal to nil side effect profile in one package. If pulmonary secretions are a symptom of the disease process, a face mask interface with positive pressure inhibits expectoration that may occur at any given time.

5. Utilize a simple to apply means of non-invasive ventilation (NIV) and secretion clearance with which a patient will be readily compliant: BCV utilizes a lightweight, semi-rigid yet flexible cuirass shell with a soft compliant yet durable foam seal as its interface with the patient. Cardiopulmonary support is delivered via negative and positive pressure across the thorax with these extra-thoracic pressure exchanges creating inspiration and exhalation the same way the pulmonary pump does naturally. The cuirass is light, and flexible to be easily applied and tolerated. Noninvasive positive pressure ventilation (NPPV) support requires a nasal or full facial interface to deliver the positive pressure to the lungs. Difficulties with these interfaces and positive pressure applied to the airways result in compliance issues with patients. Poor mask seal or open mouth results in loss of benefit of the treatment. NPPV does not offer any of the cardiovascular or secretion clearance benefits available when BCV is used.

6. Provide maintenance of highest level of health, minimizing symptoms such as dyspnea, fatigue, etc while keeping the patient well in their home environment and avoiding exacerbation, keeping them from requiring the higher cost levels of care that also pose high risk of infections: By virtue of its potency of action as noninvasive cardiopulmonary support, secretion clearance and cough assist tools that can be utilized by patients with pulmonary compromise and their caregivers easily at home, BCV offers a powerful well-proven means of health maintenance for patients with diagnoses that include symptoms of respiratory insufficiency, retained secretions and increased pulmonary vascular resistance with V/Q mismatching. Keeping patients well at home, keeping them out of acute care, particularly intensive care, makes for the most cost effective care in the long term. BCV offers a very cost effective means for achieving that goal.

7. Minimize need for emergency care services and the potential advancement tointensive care and the most extreme accrual of costs of care, and if required minimize duration of requirement: Acute care hospital and emergency services access frequently occurs as a result of destabilization. A solid routine for chronic lung disease patients that provides for keeping strength and reserves associated with the cardiopulmonary systems at a maximum while assisting with minimizing effort required to keep airways clear is most advantageous. BCV does this and more for these patients. In the event of an exacerbation event that results in the requirement of accessing acute care services, use of BCV results in more expeditious resolution that other treatment routines, thus facilitating lower costs associated with emergent and inpatient stays.

No other single device or multiple devices designed to provide assistance to patients with cardio- pulmonary compromise can begin to compare in clinical effectiveness with the benefits provided by the interventions available with the Hayek RTX and BCV.

To see more data about BCV, including 142 citations supportive of BCV, visit https://app.box.com/s/f9pp2g9iqdjptkvijzdu. Those accessing the data should sort the files by name to arrange them in the correct order. To see Gary Mefford's LinkedIn Profile, visit http://www.linkedin.com/pub/gary-mefford-rrt/23/330/446.

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Comprehensive Outpatient Pulmonary Rehabilitation as an Adjunctive Treatment for Pulmonary Hypertension: Evaluating Effects of Six Minute Walk Distance, Dyspnea and Quality of Life

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Background: While the understanding of pulmonary hypertension (PH) is increasing and treatments with new medications are prevalent on the PH landscape, treatments centering on a comprehensive approach to disease management such as pulmonary rehab are often lacking. While there is voluminous data in regards to patients with chronic obstructive lung disease, patients with other pulmonary diseases are often overlooked as potential candidates. Early literature on the topic was staunchly opposed to any type of exercise program for patients with PH. It is only recently that patients with PH been considered as potentially viable PH candidates. **Methods:** This study utilized a retrospective chart review from patients attending a comprehensive pulmonary rehabilitation program to evaluate pre- and post-program data collected via the 6 MWT and the SF-36. Results: Using Wilcoxon signed rank analysis, the population of patients in this investigation demonstrated statistically significant improvements in 6MWD (p=0.018), Borg Scale score (p=0.017) and SF-36 Quality of Life (p=0.028). **Conclusions:** Based on findings, despite a relatively low sample size, it has been proven that that for these patients undergoing pulmonary rehabilitation with PH was a potentially viable method of treatment resulting in increases in activity tolerance, reduced dyspnea, and improved quality of life. Further studies are needed in PH and other non-traditional pulmonary conditions to further the understanding of the impact of pulmonary rehabilitation on disease management.

Introduction

Pulmonary hypertension (PH) as described in the 2009 American College of cardiology Foundation/American Health Association Consensus Document, is a complex, multidisciplinary disorder.[1] While previously considered a rather rare occurrence, the revised World Health Organization (WHO) classification of pulmonary hypertension has been expanded to include: pulmonary artery hypertension (PAH), pulmonary hypertension associated with left heart disease, pulmonary hypertension associated with lung disease and hypoxemia, pulmonary hypertension due to chronic thrombotic and /or embolic disease and miscellaneous categories such as pulmonary hypertension associated with sarcoidosis, histocytosis, lymphangiomatosis, and compression of pulmonary vessels.[2] The diagnosis of pulmonary hypertension is generally determined after other causes of dyspnea and fatigue are eliminated. Clinically, pulmonary artery hypertension is defined as a sustained elevation of pulmonary artery pressures to greater than 25 mmHg at rest or greater than 30mmHg with exercise and man pulmonary capillary wedge pressure of less than 15mmHg.[3] Regardless of the etiology the disease is characterized by nonspecific complaints which may include breathlessness, chest pain, syncope, and peripheral edema that develops insidiously. Based on a national prospective study conducted between 1981 and 1985, it was reported that the mean time from onset of symptoms to diagnosis of pulmonary hypertension was 2.03 + 4.9 years.[4] More recently, the results from a national registry of pulmonary hypertension in France were published. The authors of that study reported a mean time of onset between symptoms and diagnosis to be 27 months, or 2.25 years, very comparable to the National Institute of Health (NIH-PPH) registry published in 1987.[5] Because the earliest symptom typically experienced by the patient is the gradual onset of exertional dyspnea, this is often erroneously attributed to poor physical fitness. The dyspnea and the resultant diminished physical activity in these patients lead to deconditioning of the cardiovascular and musculoskeletal systems, creating a vicious cycle that results in an increasingly progressive loss of physical function, a reduced quality of life, and an increased risk for morbidity and death. The prognosis of pulmonary artery hypertension is not good, with an approximate 15% mortality within one year on modern therapy.[6] Some predictors of a poor prognosis include poor exercise capacity as measured by the six minute walk (6MWT) distance, an elevated brain natriuretic peptide (BNP), high right atrial pressure, significant right ventricular dysfunction, evidence of right ventricular failure, and low cardiac index.[1] More optimistically, four variables were associated with an increased 1-year survival rate; WHO functional class I, a 6MWT distance > 44m, BNP of < 50pg/ml and DLCO 80% of predicted.[7]

Exercise Training

Controversy has existed regarding the treatment of pulmonary hypertension. Early studies discouraged the use of exercise training including enrollment in a pulmonary rehabilitation program due to the potential for increased risk of sudden cardiac death and acute increases in pulmonary artery pressure associated with strenuous exertion. Exercise intolerance in PH has been well documented. Symptoms that develop during the course of exercise can be attributed to the following four

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Table 1. Outcome Measure Description Statistics

Description of Evaluation	N	Mean	SD	Min	Max
Pre 6MWD (meters)	8	226.25	75.36	130	339
Post 6MWD (meters)	7	311.29	64.83	238	439
Pre Peak Dyspnea (Borg)	8	6.25	0.87	5	7
Post Peak Dyspnea (Borg)	7	2.93	1.64	0	5
Pre SF-36 (max 100)	8	35.13	16.35	17	64
Post SF-36 (max 100)	7	55.43	18.37	33	80

Table 2. Wilcoxon Signed Rank Analysis *p=<0.05

Description of Evaluation	Z	α
Post 6MWD	-2.366	0.018*
Post Peak Dyspnea	-2.388	0.017*
Post SF-36	-2.201	0.028*

pathophysiologies: failure to perfuse the ventilated lung thus increasing dead space, failure to increase cardiac output in response to exercise, and exercise induced hypoxemia in many PH patients, which can increase hypoxic ventilatory drive.[8] Because of this intolerance, exercise in the past has not been supported. More recent studies however have caused this position to be re-evaluated. Several studies have found that clinically supervised exercise training can in fact improve skeletal muscle strength, exercise tolerance and endurance in pulmonary hypertension.[9-12] The most recent study by Chan showed improvement in 6MWT distance, cardiorespiratory function and a patient self-reported quality of life scores in female patients with Group 1 PH from brisk treadmill walking alone.[19] This increase in exercise tolerance is thought to be mainly attributed to progressive, non-interval exercise at sub-maximal level and improvements in hemodynamics resultant from developments in standard medicinal treatment regimens. Treatment of PH is comprehensive and includes supportive pharmacotherapy such as anticoagulants, diuretics and supplemental oxygen, coupled with disease specific medications such as vasodilators and antiproliferative agents. In addition, avoidance of potentially exacerbating agents such as caffeine and non-steroidal anti-inflammatory (NSAIDS) are encouraged. Patients who are non-responsive to pharmacotherapy may be considered for lung or lung-heart transplantation. Despite the developing evidence of the role of exercise training in the treatment of pulmonary hypertension, current guidelines recognize the clear lack of consensus regarding a specific exercise regimen, so recommendations are limited to low-level graded walking exercises as tolerated.[1] Considering the nature of the existing data on exercise regimens for patients with pulmonary hypertension and the role of said regimens in a comprehensive pulmonary rehabilitation program, it is speculated that comprehensive pulmonary rehabilitation program would have more positive effects on exercise tolerance and quality of life for these patients than standard exercise programs alone.

Pulmonary Rehabilitation

Pulmonary Rehabilitation is defined as "an evidence-based, multidisciplinary and comprehensive intervention for patients with chronic respiratory disease who are symptomatic and often have decreased daily life activities." Integrated into the individualized treatment of the patient, pulmonary rehabilitation is designed to reduce symptoms, optimize functional status, increase participation and reduce healthcare costs through stabilizing or reversing systematic manifestations of the disease."[13] The goals of pulmonary rehabilitation can be very individualized, but regardless of disease process, the goal is to reduce symptoms, decrease disability, and improve the overall quality of life for individuals with chronic disease. In order to work toward the goals of pulmonary rehabilitation, programs should offer patients and family members, if indicated, education, exercise training, psychosocial, behavioral, and therapeutic interventions, ongoing evaluations, outcomes assessments, and other interventions as appropriate.[14] Interventions should be geared toward unique problems and needs of each patients. Comprehensive pulmonary rehabilitation programs typically have four broad major components: exercise training, education, psychosocial/behavioral interventions, and outcomes assessment.

The American Association of Chest Physicians (ACCP) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) guidelines for pulmonary rehabilitation emphasize endurance training, utilizing periods of sustained exercise for 20-30 minutes for two to five days a week.[15] Endurance training of the upper extremities to improve arm function is particularly important since many activities of daily living involve use of the arms. Upper extremity training can be accomplished using arm ergometry, lifting free weights, and resistance training with elastic bands. All can effectively improve arm endurance.[12] Lower extremity endurance training may be accomplished with stationary cycle, treadmill walking or ground walking. Strength training is an important component of exercise treating because peripheral muscles weakness has been shown to contribute to exercise capacity in patients with chronic lung disease.[16] Studies using exercise as an outcome measure have demonstrated an increase in exercise performed or a decrease in dyspnea for a given level of exercise, or both.[9,11] Significant increases in maximal exercise capacity measured during incremental exercise testing have been observed after pulmonary rehabilitation. Ries et al demonstrated that improvements in physical function resulting from participation in a pulmonary rehabilitation program with a strong exercise-training component diminish after patients complete the program.[17]

While benefits directly attributable to the educational component of pulmonary rehabilitation have not been fully documented, education has been shown to be an integral component of comprehensive pulmonary rehabilitation program.[18] Education helps patients to possess a better understanding of their disease process, allowing for the formation of reasonable expectations regarding potential outcomes of rehabilitation. It also leads to a better understanding of the physical and psychological changes that occur with chronic illness, and helps patients and their families explore ways to cope with hose changes. The education portion of the program can be provided in small groups or on an individual basis. A number of topics are addressed in the educational sessions, including pathophysiology of the disease, medication management, and energy conservation. Patients also may be educated on breathing techniques, nutrition, infection control, self-assessment, and pacing.

Purpose

In order to examine the effects of a comprehensive pulmonary rehabilitation program, typically assessed outcomes include exercise endurance, exercise capacity, and walking distance, as well as health-related quality of life and health care utilization. It is important that valid and responsive assessment tools be utilized. The American Thoracic Society has indicated that

published studies of health-related quality of life (HRQL) in patients with pulmonary hypertension are rare, with the few studies that exist focusing on primary pulmonary hypertension. To date, few papers focusing on pulmonary rehabilitation and patients with pulmonary hypertension have appeared in the literature. Unfortunately there are no studies of comprehensive approaches to treatment pursued with adequate scientific rigor, and as a result conclusions regarding the efficacy of a comprehensive pulmonary rehabilitation program as an adjunct in the treatment of PH are hard to determine. This study evaluated the effect of a comprehensive pulmonary rehabilitation program on physical functioning, and health related quality of life in patients with a medical diagnosis of PH. It was speculated that a comprehensive pulmonary rehabilitation program such as used in this review could specifically address these issues while providing assessment and feedback to the subjects about their progress in these areas.

Study Design/Methods

A retrospective chart review was completed to collect data and evaluate changes in exercise tolerance, endurance, and dyspnea levels as measured through pre and post comprehensive pulmonary rehabilitation six minute walk testing, as well as changes in health-related quality of life as measured pre and post pulmonary rehabilitation using the Short Form-36 (SF-36) quality of life questionnaire. Information was collected regarding patient medical history and diagnosis in order to gauge disease severity according to New York Heart Association/World Health Organization (NYHA/WHO) functional classification, in the event the classification was not provided by the referring physician in the referral documentation. Additional information collected included general information regarding the methods of rehabilitation utilized, length of treatment, and disease specific medication usage. The information regarding 6MW testing and the SF-36 quality of life questionnaire was collected from existing medical records at two points in the patient chart: at admission and upon discharge. The information was analyzed using SPSS Statistics software to determine if there was any statistically significant changes post-comprehensive pulmonary rehabilitation therapy. For the purposes of this study, comprehensive pulmonary rehabilitation program is defined as a multidimensional continuum of services directed to person with pulmonary disease. Participation in the program for subjects was determined necessary by the referring physician in conjunction with the PR medical director, respiratory therapist, physical therapist, and other treating disciplines such as dietary or social services as indicated. As a minimum, the program was delivered by an interdisciplinary team of specialists including respiratory therapists and physical therapists with oversight by a medical director with the goal of achieving and maintaining the individual's maximum level of independence and function. The medical director is a licensed physician who has training and experience in the treatment of patients with pulmonary disease. This physician certified prior to initiation of rehabilitation services that he had reviewed and agreed with the plan of care, indicating that the patient is capable of safely participating in the program. The comprehensive pulmonary rehabilitation program consisted of the following components for all participants:

Exercise Training: The exercise training component of the program was designed to increase the subject's functional independence and activities of daily living (ADL) by enhancing strength, endurance, flexibility and balance. Strength training consisted of weight training and/or use of exercise resistance bands, as well as exercises that use only the body's weight, such as leg lifts. Endurance training included walking on a treadmill or on a pre-defined route, walking up and down stairs and arm and let bicycle ergometer training.

Respiratory Care Training: Respiratory Care training included individual instruction in breathing techniques such as pursed lip and diaphragmatic breathing, titration of oxygen therapy, aerosolized medication therapy, and proper/safe use of respiratory therapy equipment.

ADL Training: The goal of this training was energy conservation and work simplification, and incorporated such activities as paced breathing, optimizing body mechanics, advance planning, prioritization of activities, and use of assistive devices.

Disease Management Education: The education component of the program included education about pulmonary hypertension, types, dosages, and frequency of medications used, and proper use of all oral and / or inhaled respiratory medications and delivery devices. In addition, this component covered reasonable expectations of the potential benefits of pulmonary rehabilitation, as well the importance of maintaining an exercise regimen in the home following completion of the program. End-of-life issues were addressed if patients felt the need to discuss this with the therapist or social worker.

Psychosocial Evaluation and Intervention: Psychological and behavioral problems such as anxiety, depression difficulties in coping with chronic lung disease, and reductions in self-efficacy (ability to cope with illness) contribute to the compromised state of advanced respiratory disease.8 Evaluation of each patient was accomplished with standardized Mood Scale Assessment, a standard mental health assessment instrument that is designed to detect the presence of depression and need for psychological intervention. Psychosocial intervention can be in the form of referral to an appropriate health care provider for treatment of depression and/or anxiety, patient education sessions, and support groups and was provided when deemed necessary.

Outcome Assessment: Assessments were performed and outcomes data collected routinely on all subjects upon enrollment and at discharge to determine the individual patient's response to therapy and to evaluate the overall effectiveness of the program. Measurement of the individual's change in performance served to reinforce the importance and magnitude of gains made during the program. Measures assessed included degree of disability, quality of life, and pulmonary function-related data.

Subjects

Being a retrospective review of existing data from a single clinical site, potential subjects were limited by a small overall population and by only a three year clinic operating history. The research group included all patients with a diagnosis of WHO group 1 pulmonary hypertension that were referred by their physicians to a single-site outpatient rehabilitation facility for participation in a comprehensive pulmonary rehabilitation program. Exclusion criteria included (1) a history of previous exercise training or previous participation in a pulmonary rehabilitation program less than a year prior to the of initial evaluation unless hospitalized and (2) inability to complete the rehabilitation program due to hospitalization, non-compliance, death or any other circumstance. A total of 8 subjects were

included in the study, 7 females and 1 male of which 5 were Hispanic, and 3 Caucasian. The average age of the subjects was 60, ranging from 50 to 71 years of age. All 8 subjects completed the PR training program in regard to fulfilling their specific goals, but only 7 completed the post program evaluation. This individual's post results have been eliminated from the statistical analysis.

Recruitment and Consent Procedures

Subjects were not actively recruited or consented for this study as this was a retrospective review of patient medical records who had previously participated in the department's outpatient comprehensive pulmonary rehabilitation program and who met all established inclusion criteria for this study.

Results

Descriptive statistics (Table 1) demonstrate improvement in all three outcome measures post comprehensive outpatient pulmonary rehabilitation. Wilcoxon signed ranked analysis determined that these improvements were significantly significant with $p<0.05$ (Table 2). A previous study published in 2006 demonstrated a treatment-related increase in walking distance of 96 meters in patients with pulmonary hypertension who had completed exercise and respiratory training very comparable to the 85 meter increase in the 6MWD found in this study 9. Changes related to (Table 2) are pre and post pulmonary rehabilitation: 6MWD ($p=0.018$), Borg Scale ($p = 0.017$) and SF-36 Quality of Life ($p=0.028$).

Conclusion

A comprehensive pulmonary rehabilitation program can be a valuable adjunct to treatment for patients with pulmonary hypertension. The interdisciplinary nature of the program yielded greater activity tolerance and subsequent improved community mobility and subjective quality of life in patients who participated. Although limited by sample size, this study should inform future investigations into potential candidates for pulmonary rehabilitation, outside of the traditional and dominant COPD patient population.

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require mechanical support for their breathing. The NIOV System can easily be incorporated into any in-patient, out-patient, or at home pulmonary rehabilitation program to significantly reduce dyspnea, improve oxygenation, offload respiratory muscle effort, and improve exercise endurance.

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Abstracts — A brief look at current research

ANTIBIOTICS FOR COUGH

Visit complexity, diagnostic uncertainty, and antibiotic prescribing for acute cough in primary care: a retrospective study, by Whaley, et al: Guidelines and performance measures recommend avoiding antibiotics for acute cough/acute bronchitis and presume visits are straightforward with simple diagnostic decision-making. We evaluated clinician-assigned diagnoses, diagnostic uncertainty, and antibiotic prescribing for acute cough visits in primary care.

We conducted a retrospective analysis of acute cough visits — cough lasting ≤21 days in adults 18-64 years old without chronic lung disease — in a primary care practice from March 2011 through June 2012.

Of 56,301 visits, 962 (2%) were for acute cough. Clinicians diagnosed patients with 1, 2, or ≥ 3 cough-related diagnoses in 54%, 35%, and 11% of visits, respectively. The most common principal diagnoses were upper respiratory infection (46%), sinusitis (10%), acute bronchitis (9%), and pneumonia (8%). Clinicians prescribed antibiotics in 22% of all visits: 65% of visits with antibiotic-appropriate diagnoses and 4% of visits with non-antibiotic-appropriate diagnoses. Clinicians expressed diagnostic uncertainty in 16% of all visits: 43% of visits with antibiotic-appropriate diagnoses and 5% of visits with non-antibiotic-appropriate diagnoses. Clinicians expressed uncertainty more often when prescribing antibiotics than when not prescribing antibiotics (30% vs. 12%; $p < 0.001$). As the number of visit diagnoses increased from 1 to 2 to ≥ 3, clinicians were more likely to express diagnostic uncertainty (5%, 25%, 40%, respectively; $p < 0.001$) and prescribe antibiotics (16%, 25%, 41%, respectively; $p < 0.001$).

Acute cough may be more complex and have more diagnostic uncertainty than guidelines and performance measures presume. Efforts to reduce antibiotic prescribing for acute cough should address diagnostic complexity and uncertainty that clinicians face. [BioMed Central, BMC Family Practice 2013, 14:120]

COPD

Chronic obstructive pulmonary disease and exacerbations: Patient insights from the global Hidden Depths of COPD survey, by Barnes, et al: Although chronic obstructive pulmonary disease (COPD) is a major global health burden there is a lack of patient awareness of disease severity, particularly in relation to exacerbations.

We conducted a global patient survey using an innovative, internet-based methodology to gain insight into patient perceptions of COPD and exacerbations in a real-world sample typical of today's working-age COPD population.

Two thousand patients with COPD (53%), chronic bronchitis (52%) and/or emphysema (22%) from 14 countries completed an online questionnaire developed by the authors. The Medical Research Council (MRC) breathlessness scale was used to delineate symptom severity. Over three quarters of patients (77%) had experienced an exacerbation, with 27% of MRC 1 and 2 patients and 52% of MRC 3, 4 and 5 patients requiring hospitalization as a result of an exacerbation. While a majority of MRC 1 and 2 patients (51%) reported being back to normal within a few days of an exacerbation, 23% of MRC 3, 4 and 5 patients took several weeks to return to normal and 6% never fully recovered. A high proportion of patients (39%) took a wait and see approach to exacerbations.

Despite the high prevalence of exacerbations and their negative impact on quality of life, 73% of MRC 1 and 2 patients and 64% of MRC 3, 4 and 5 patients felt that they had control of their COPD. However, 77% of all patients were worried about their long-term health, and 38% of MRC 1 and 2 patients and 59% of MRC 3, 4 and 5 patients feared premature death due to COPD. [BioMed Central, BMC Pulmonary Medicine 2013, 13:54]

POLLUTION

Longitudinal study of respiratory function and symptoms in a non-smoking group of long-term officially-acknowledged victims of pollution-related illness, by Tanaka, et al: Air pollution is known to be a leading cause of respiratory symptoms. Many cross-sectional studies reported that air pollution caused respiratory disease in Japanese individuals in the 1960s. Japan has laws regulating air pollution levels and providing compensation for victims of pollution-related respiratory disease. However, long-term changes in respiratory function and symptoms in individuals who were exposed to air pollution in the 1960s have not been well studied. This study aimed to investigate longitudinal respiratory function and symptoms in older, non-smoking, long-term officially-acknowledged victims of pollution-related illness.

The study included 563 officially-acknowledged victims of pollution-related illness living in Kurashiki, Okayama who were aged approx 65 years in 2009. Data were retrospectively

collected from yearly respiratory symptom questionnaires and spirometry examinations conducted from 2000 to 2009.

Respiratory function declined significantly from 2000 to 2009 ($p < 0.01$), but the mean annual changes were relatively small. The change in mean vital capacity was 40.5ml/year in males and 32.7ml/year in females, and the change in mean forced expiratory volume in 1second was ?27.6ml/year in males and 23.9ml/year in females. Dyspnea was the only symptom that worsened significantly from 2000 to 2009 in both sexes (males: $p < 0.05$, females: $p < 0.01$).

Our results suggest that the high concentrations of air pollutants around 1970 resulted in a decrease in respiratory function and an increase in respiratory symptoms in the study population. From 2000 to 2009, the mean annual changes in respiratory function were within the normal range, even though the severity of dyspnea worsened. The changes in respiratory function and symptoms over the study period were probably due to aging. The laws governing air pollution levels and providing compensation for officially-acknowledged victims of pollution-related illness in Japan may be effective for respiratory disease cause by pollution. [BioMed Central, BMC Public Health 2013, 13:766]

HEALTH INFO SECURITY

Privacy and information security risks in a technology platform for home-based chronic disease rehabilitation and education, by Henriksen, et al: Privacy and information security are important for all healthcare services, including home-based services. We have designed and implemented a prototype technology platform for providing home-based healthcare services. It supports a personal electronic health diary and enables secure and reliable communication and interaction with peers and healthcare personnel. The platform runs on a small computer with a dedicated remote control. It is connected to the patient's TV and to a broadband Internet. The platform has been tested with home-based rehabilitation and education programs for chronic obstructive pulmonary disease and diabetes. As part of our work, a risk assessment of privacy and security aspects has been performed, to reveal actual risks and to ensure adequate information security in this technical platform.

Risk assessment was performed in an iterative manner during the development process. Thus, security solutions have been incorporated into the design from an early stage instead of being included as an add-on to a nearly completed system. We have adapted existing risk management methods to our own environment, thus creating our own method. Our method conforms to ISO's standard for information security risk management.

A total of approximately 50 threats and possible unwanted incidents were identified and analyzed. Among the threats to the four information security aspects: confidentiality, integrity, availability, and quality; confidentiality threats were identified as most serious, with one threat given an unacceptable level of High risk. This is because health-related personal information is regarded as sensitive. Availability threats were analyzed as low risk, as the aim of the home programs is to provide education and rehabilitation services; not for use in acute situations or for continuous health monitoring.

Most of the identified threats are applicable for healthcare services intended for patients or citizens in their own homes. Confidentiality risks in home are different from in a more controlled environment such as a hospital; and electronic equipment located in private homes and communicating via Internet, is more exposed to unauthorized access. By implementing the proposed measures, it has been possible to design a home-based service which ensures the necessary level of information security and privacy. [BioMed Central, BMC Medical Informatics and Decision Making 2013, 13:85]

PULMONARY REHAB

Facilitating education in pulmonary rehabilitation using the Living Well with COPD program for pulmonary rehabilitation: a process evaluation, by Cosgrove, et al: Standardized evidence-based materials and mechanisms to facilitate the delivery of the education component of pulmonary rehabilitation are not widely available. The aims of this study were: 1) to adapt the self-management program Living Well with COPD (LWWCOPD) program, for embedding in pulmonary rehabilitation; and, 2) to conduct a process evaluation of the adapted program.

The adaptations to the LWWCOPD program were informed by focus groups, current practice, relevant research and guideline documents. Pulmonary rehabilitation sites used the adapted program, the LWWCOPD program for pulmonary rehabilitation, to deliver the education component of pulmonary rehabilitation. A process evaluation was conducted: elements included reach (patients' attendance rates), dose delivered (amount of program delivered), dose received (health professional and patient satisfaction) and fidelity (impact on patients' knowledge, understanding and self-efficacy on the Understanding COPD questionnaire). Descriptive statistics (mean, SD) were used to summarize demographics and key data from the feedback questionnaires. Qualitative feedback on the program was collated and categorized. Changes in the Understanding COPD questionnaire were examined using paired t-tests.

The LWWCOPD program for pulmonary rehabilitation was delivered in eleven hospital- and community-based programs (n=25 health professionals, n=57 patients with COPD). It consisted of six weekly 30-45 minute sessions. The process evaluation showed positive results: 62.3% of patients attended ≥ 4 education sessions (reach); mean (SD) 90 (10)% of the session content were delivered (dose delivered); the majority of sessions were rated as excellent or good by health professionals and patients. Patients' satisfaction was high: mean (SD) Section B of the Understanding COPD questionnaire: 91.67 (9.55)% (dose received). Knowledge, understanding and self-efficacy improved significantly: mean change (95% CI): Section A of the Understanding COPD questionnaire: 26.75 (21.74 to 31.76)%, BCKQ 10.64 (6.92 to 14.37)% (fidelity).

This rigorous process evaluation has demonstrated that the LWWCOPD program for pulmonary rehabilitation can be used to deliver high quality, consistent and equitable education sessions during hospital and community-based pulmonary rehabilitation. This program is now available worldwide (http://www.livingwellwithcopd.com/living-well-and-pulmonary-rehabilitation.html). [BioMed Central, BMC Pulmonary Medicine 2013, 13:50]

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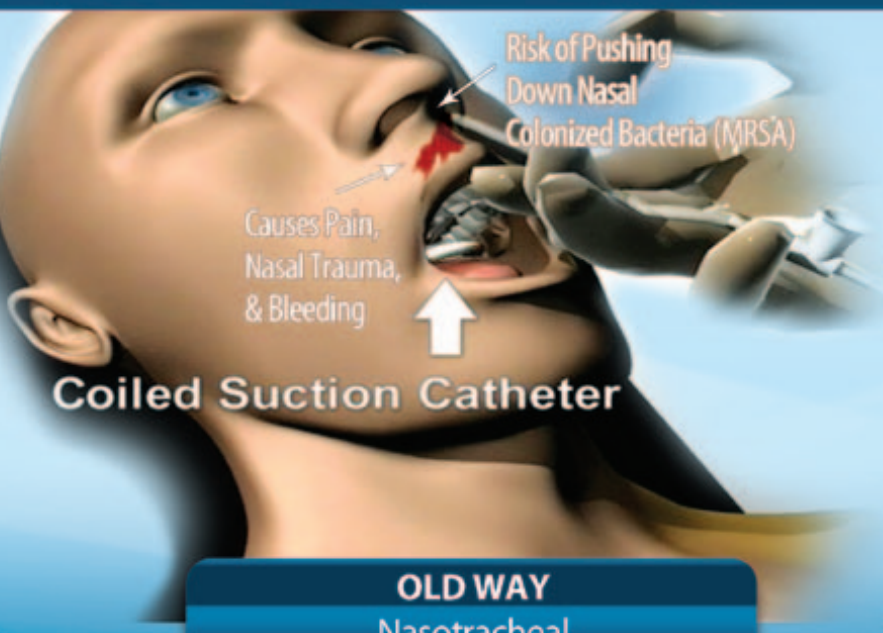

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