Transport Bulletin

May/June '01

American Association for Respiratory Care

Notes from the Chair

by Jerry A. Focht, RRT, NREMT

As I write this column in mid-April, I am preparing to attend my second year of the Medical Transport Leadership Institute sponsored by the Association of Air Medical Services. This is a continuing education and certification course for managers or others seeking a greater understanding of the medical transport industry. It is a great course, and I highly recommend it.

I was unable to attend the Critical Care Transport Medicine Conference in San Antonio this spring, but I have spoken to numerous attendees, all of whom thought the meeting was a great success. One of those attendees was Sharon Segobia, who will also be presenting at the AARC International Respiratory Congress in San Antonio this December. It's not too soon to start thinking about presenting at next year's CCTMC, which will be held in Las Vegas. This is an excellent opportunity for us to promote transport RTs within the larger transport community.

Speaking of promoting transport RTs, we will have a booth for transport therapists at the Air Medical Transport Conference in Orlando, FL, this September 24-26. I will be seeking volunteers to man the booth, so if you're planning to attend the conference, please contact me and let me know if you can help out. Also, don't forget to nominate a fellow transport RT for our annual Specialty Practitioner of the Year Award. I have received some very good nominations so far, but would like to consider as many names as possible for this important award.

Lastly, we are currently searching for an internet coordinator to replace David Lucero. Again, interested parties may contact me at the addresses/numbers located on page 2. ■

Notes from the Editor

by Steven E. Sittig, RRT

As I sit down to write these "Notes," I can hardly believe it is already the first part of April. Here in Minnesota I can finally look out the window and not see snow everywhere. It has been a long winter for us, but at last it is time to put away the winter survival gear and get ready for summer.

In this issue we have a *Program Focus* from Daryl Weaver from Sioux Valley Hospital in Sioux Falls, SD. I had the privilege of being a team member of Sioux Valley's Intensive Air Program before I accepted my position here at Mayo. Intensive Air is a very busy program that incorporates many specialty teams to meet the patient's needs. It was also my first exposure to transport and was a great program to be a part of. I recently went back to South Dakota and visited Sioux Valley. Despite having been gone for over ten years, I saw many familiar faces. I had an enjoyable visit and it was great to see everyone. My thanks to Daryl for writing the article and to Gordy Gunderson and Ruth Krueger for helping get this article to print.

This issue also features a CAMTS update from Tom Cahill, who just returned from a recent CAMTS meeting, along with an article on sleep deprivation in transport and a report on acute lung injury based on papers presented at the recent SCCM conference.

If anyone was fortunate enough to attend the CCMTC in San Antonio, I'd like to ask you to submit a short article on what was covered at the conference. I was lucky enough to attend last year's conference in Las Vegas and enjoyed the multidisciplinary environment. Trading information and swapping transport stories with flight nurses and paramedics made me realize that while we all may have different professional titles, we share a deep desire to be of service to those in need of advanced medical care.

Of course, we do need to promote our special role in transport. During a recent phone conversation, Jerry Focht and I came

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up with the idea of asking the membership if they had any good pictures of RTs in transport. We are hoping to put together a new poster display for the AMTC conference in Orlando. Other ideas are being tossed around to possibly use these photos to help promote the section to other RTs who may not be aware of our specialty section. So if you have any photos that portray us in our role during transport, please contact me via e-mail or phone and we can discuss how you could forward them to me.

I'd also like to invite all of you to submit ideas, topics, and/or articles for this *Bulletin*. I am always available to assist new authors in getting an idea into print. So please feel free to contact me via e-mail or by phone and we can get things started.

Lastly, it has been nice to see the listserve become busier as members trade information and discuss issues. That is what it is there for, and I encourage you to utilize this forum to interact with your fellow section members.

Until next time may all your transports end safely for you and your patients. ■

CAMTS Report: *The Times, They Are a Changing*

by Thomas J. Cahill, RRT, NREMT-P

As the Chinese proverbs says, "May you live in interesting time." That is certainly the case for transport professionals involved in the accreditation process at CAMTS. The Board had a very busy and productive meeting in San Antonio, addressing several issues concerning the new 2001 standards and adopting a new accreditation action — Conditional Accreditation.

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Conditional Accreditation allows new services to submit a PIF within four months of start-up instead of waiting for one year, as previously required. Under Conditional Accreditation, a site survey will be scheduled with just one surveyor to verify that the program's developing policies and processes are in compliance with the accreditation standards. Programs that achieve Conditional Accreditation will not be permitted to advertise as "Accredited by CAMTS." But they will receive a letter from the Board that can be distributed to states and counties that require CAMTS accreditation, as well as to other interested parties, such as managed care companies.

Of course, new medical transport services are not required to submit a PIF in four months. They may choose to wait the one year before submitting a PIF in order to achieve full accreditation for a three-year period.

Competencies and currencies traditionally measured by certifications in familiar courses such as ACLS, PALS, TNATC (formerly FNATC) etc., were also discussed at length during the meeting. Instead of just relying on titles (MD, RN, EMT-P) and competencies in these courses when reviewing appropriate care, the new accreditation standards will be placing more emphasis on acuity levels and interventions. In other words, the 2001 standards will be more specific in describing methods to demonstrate competencies in each of the patient care types transported by a service. There will be more information about this concept as we develop the standards, and drafts of the 2001 standards will be available for public opinion. The Board also plans to hold a Public Forum at the September AMTC Conference to take comments on the revised standards.

In other news, the Board announced that the "Best Practices" book is now available and can be ordered on the CAMTS web site for $100.00. Visa and MasterCard orders are accepted. This publication features examples of policies, education programs, QM, and safety programs that have been recognized by the Board as outstanding over the past ten years. The index lists and credits the medical transport services that contributed to the book.

Lastly, the Board deliberated on 17 accreditation decisions, with the following results:

14 Full accreditations
2 Provisional actions
1 Deferred action

The following services were fully accredited for the first time:

Air Med Team —
Redding, CA RW

Austin/Travis County STAR Flight —
Austin, TX RW

Children's Critical Care Transport —
Kansas City, MO RW/FW/G

Flight For Life —
Las Vegas, NV RW

Hermann Hospital Life Flight —
Houston, TX RW/FW

Life Flight Eagle —
Kansas City, MO RW

MedLink Air —
LaCrosse, WI RW

Saint Alphonsus Life Flight —
Boise, ID RW/FW

The following services were reaccredited:

Airlift Northwest —
Seattle, WA RW/FW

CareFlight —
Dayton, OH RW/G

CareFlite —
Dallas, TX RW/FW

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Inova Medical AirCare —
Falls Church, VA RW

Mediplane, Inc. dba REACH —
Santa Rosa, CA RW/FW

Midwest Medflight —
Ypsilanti, MI RW

For a complete listing of all accredited services, please visit the CAMTS web site at www.camts.org. ■

Sioux Valley Hospital USD Medical Center Intensive Air Flight Program

by Daryl Weaver, BS , RRT

Sioux Valley is a 476-bed hospital that employs over 3500 people and has centers of excellence in cardiology, oncology, neuroscience, emergency and trauma, women's, and children's. As a comprehensive medical center, we offer a variety of health care services, including stroke, neonatal intensive care, family health, behavioral health, poison control, sports medicine, and wellness. Sioux Valley also has the only CAMTS-accredited flight program in the state of South Dakota. More than 14,000 patients have been transported by our flight program.

Intensive Air began operations in 1977 under a government grant aimed at improving pregnancy outcomes. At that time South Dakota had a high infant mortality rate. Prenatal mothers and infants were transferred from rural areas to the more specialized hospitals using a Cessna 401. We added adult and pediatric transport teams in 1982. The primary aircraft was a King Air 90, with a Cessna 401 as backup. The fixed aircraft were leased from Business Aviation in Sioux Falls, SD.

In 1986, rotor wing transport with an Agusta helicopter was added to complement the existing transport service with accident and scene response. The helicopter was leased from Rocky Mountain Helicopters in Provo, UT. In 1989, Sioux Valley purchased two King Air 90 fixed wing aircraft and obtained a license to operate the aircraft. A King Air B 200 was purchased in 1992 as the primary aircraft, and the King Air 90 was used as the secondary aircraft. A year later, a Bell 222SP helicopter was leased and put into service, and in 1996 a second King Air B 200 was purchased to replace the King Air 90. In 1998, a Bell 230 helicopter was purchased by the hospital, and the rotor wing operations were added to the hospital's operating license.

Today, Intensive Air has three dedicated aircraft, including two Beechcraft King Air 200 fixed wing aircraft that can transport anywhere in the continental United States and Canada. They fly with speeds up to 300 mph. We have one Bell 230 helicopter which transports within the range of 150 miles with a speed of 150 mph. When enroute fueling is available, the helicopter can fly longer distances. All aircraft are owned and operated by Sioux Valley Hospital. The aircraft utilized for a transport is determined by the condition of the patient, weather conditions, cost, and the distance to the referring hospital. The decision is made by the medical director in consultation with the flight crew and the communication center. Each of the aircraft is capable of transporting two patients. Team configuration will depend on the severity of the patient's condition and the type of problems he or she has.

Intensive Air is composed of four specialized transport teams: adult, maternal, pediatric, and neonatal, with advanced training in cardiac, trauma, burns, pediatrics, maternal, and neonatal emergency care. There is also a dedicated respiratory transport team with specialized training to assist any of the teams. All teams transport in both the helicopter and fixed wing aircraft. Ground transport is available upon request.

The adult team consists of a flight nurse and a flight paramedic. A respiratory therapist is available, if needed. The adult team transports medical and trauma patients 15 years and older and responds to all scene calls regardless of age. The adult team transports approximately 65% of our patients. The nurses on the adult team work in the ER and are directed by the ER physicians when out on transport.

The communications center will ask the referring facility the following questions about the patient being transferred. Does the patient have a patent airway? Does the patient have adequate breathing? Is the patient's circulatory status stable? Does the patient have a GCS of 8 or below? If the answer is no to any of these questions, a respiratory therapist is sent on the flight. Types of patient transports where an RT is included in the adult flight team are as follows: decompensated respiratory conditions such as anaphylaxis, hypoventilation , exacerbation of COPD, asthma, CHF, intercranial bleed, near drowning, facial burn, or any type of shock. The helicopter and fixed wing aircraft have the Hamilton transport ventilator aboard, but these are basically used only as backup. We either take the Biomed IC2A, Impact or Crossvent III transport ventilators. During adult transports we assist in patient assessment, looking at ABGs, CXR, RR, HR, Sats, and breathing pattern to determine what, if any, respiratory therapy is indicated. We also assist with intubations, propaq cardiac monitor placement, IV line insertion, I-STAT blood gases, and ETCO2 monitoring. We have the capabilities of transporting balloon pumps as well.

The neonatal team consists of an NICU flight nurse and the clinical nurse practitioner. The neonatal team transports all critically ill newborns. The ICN team works in the NICU and is directed on transports by a neonatologist. The RT's role with this team is a little more involved — we go on just about all of these flights. On these transports we use the biomed MVP10 infant pressure ventilator. We assist in the initial assessment and, along with the CNP, decide what respiratory therapy, if any, is needed. We work closely with the flight nurse in administering oxygen, checking temperature and blood sugars, helping setup IV pumps, and applying sat, cardiac leads, and blood pressure cuffs. We also are responsible for running I-STAT blood gases after the CNP draws them. We help the CNP with bagging and intubations and then decide what vent settings to use.

The maternal team consists of a labor and delivery flight nurse and a flight paramedic. They transport all maternal patients. A combination ICN/maternal team is often utilized if delivery is imminent. Respiratory therapy is available if requested. The maternal team is directed by a perinatologist or OB/GYN physician. The combination team is directed by both specialty physicians.

The pediatric team consists of a pediatric ICU flight nurse and a flight medic. As with the ICN team, respiratory therapy goes on most of these transports. The pediatric team transports patients age 14 and under. This team is directed by a pediatric intensivist on all medical transports. The ER department physicians direct all pediatric

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trauma transports. A combination pediatric-neonatal transport team is utilized for non-trauma infants two days to one month of age who have already been discharged from the hospital after birth. The pediatric intensivist generally directs these transports unless the neonatologist has requested the transport. Respiratory has about the same responsibilities on these flights as on the ICN flights.

Each of the four transport teams is available for transport 24 hours a day. The adult flight team has two teams available at all times, and specialty teams have one team available. Respiratory has two therapists available during each shift to go on flights. Expected response time is 10 minutes for the rotor wing and 40 minutes for the fixed wing. Dispatch for air transports is provided by the communications center, which also answers all health information and physician triage calls. The communications center is staffed by RNs. The ER is level II verified.

Intensive Air medical team members are required to maintain clinical competency in the skills required to safely and effectively care for patients within their specialty. Flight team members are validated in invasive and noninvasive procedures yearly using animal or mannequin labs, procedure and equipment validation labs, and/or documentation of clinical experience.

Currently, 13 RTs in our department are members of the flight team. They must be certified in either NALS, PALS, or ACLS, according to area of specialty. Every year the therapists are validated on the various transport ventilators, ETCO2 monitor, Propaq cardiac monitor, and different ways to aerosolize medications. We also familiarize ourselves with the flight nurses' Thomas packs so we know where to help find equipment. We have our own flight packs specifically for the adult, pediatric, and adult helicopter flights. We are required to do on site safety training every six months for the helicopter and once a year for the fixed wing aircraft.

Sioux Valley Intensive Air has a very busy program, with 1250 transports in 1999. Of these, 818 were adult, 206 were pediatric, 173 were neonatal, and 53 were maternal. In addition, the Intensive Air teams often make themselves available to local communities for scheduled public relations visits. ■

Fatigue: *A Common Element in the Transport Environment*

by Steven E. Sittig, RRT

All of us who do patient transport have run into the call for a transport near the end of a busy shift. Your adrenalin levels have just bottomed out from the last transport, and your only wish is to go home. You tell yourself that if you had only gotten another hour of sleep before you came to work, you would feel more ready for this late transport. You briefly consider a cup of coffee or a caffeine-loaded soda, but the potential of needing to go to the bathroom while in-flight is less appealing than being tired. As you lift off, you feel a little more awake. Your only hope is that the patient is more stable than indicated by the report you received. Then this could be a rapid assessment, stabilization, and return flight home. The thought of a warm bed and a soft pillow sneak into your thoughts as you fly to your patient.

Fatigue is a normal physiological response to sleep loss and circadian rhythm disruption. It is characterized by decreased physical and mental efficiency. Common signs and symptoms of fatigue include sleepiness, overall discomfort, irritability, depression, apathy, and physical and emotional isolation from others. Also, loss of appetite, slurred speech, visual fixation, impaired visual perception, difficulty concentrating, slowed reaction time, impaired short term memory, and poor judgment.

Many of the stressors we encounter in the transport environment, such as noise, vibration, linear and angular acceleration (G forces), low humidity, and high ambient temperature, may aggravate these signs and symptoms. Additionally, there are things that we, ourselves, do that may aggravate these signs and symptoms of fatigue, such as poor physical conditioning, inadequate diet or nutrition, inadequate hydration, and excessive caffeine consumption. (The last one really hit me hard as I sat writing this article at 2 a.m. with my second can of Diet Mountain Dew for the shift nearby.)

Conditions that contribute to fatigue include the time since awakening, the amount of time doing the task, sleep debt, and circadian rhythm disruption. As fatigue progresses it is responsible for increased errors of omission, followed by errors of commission and microsleep. Microsleep is characterized by involuntary sleep lapses lasting from a few seconds to a few minutes.

At times, fatigue and sleepiness may be less evident to transport personnel, especially during preparation for departure and actual takeoff. However, once underway, fatigue and sleepiness tend to manifest themselves. In cases of extreme fatigue, an involuntary and uncontrolled shutdown of the brain may occur. Regardless of motivation, professionalism, or training, an individual who is extremely sleepy can lapse into sleep at any time, despite the potential serious consequences to the patient and team operation.

Sleep and sleep loss

Sleep is defined as a period of rest for the body and mind during which bodily functions are partially suspended and consciousness is temporarily interrupted. Sleep is as essential as food and water for the well being of an individual. The average healthy adult is accustomed to a single, prolonged period of sleep of approximately eight hours. During a typical 24-hour day, there are two normal periods of sleepiness between the hours of 3-5 a.m. and 3-5 p.m. This shows that no matter which shift you work, you are affected by this inherent period of sleepiness. (I always suspected that it was the fact that the hospital cafeteria opened at 2 a.m. that made me feel so tired around 3.)

Sleeping less than eight hours per day can result in sleep loss, and this loss can be cumulative. After sleep loss, the most notable feature of recovery of sleep is its increased depth, rather than duration. In other words, following sleep loss you do not have to sleep the same number of hours you lost — even though you may feel like it at the time. In addition to circadian rhythm disruptions and excessive caffeine consumption, sleep loss can be caused by sleep disorders, bad sleep habits, and uncomfortable sleeping environments.

Circadian rhythm is defined as a biological cycle of approximately 25 hours that determines the physiological behavior of all body functions. These rhythms are influenced by the succession of day and night, timing of food consumption, and changes

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in ambient light, physical activity, and social activities. These circadian rhythms can be disrupted by a sudden change in individual work/rest schedules (shift work) and a sudden relocation to a different time zone. There are various factors that affect one's ability to adapt to new circadian rhythms:

1. Different body functions adapt at different rates.
2. Adaptation takes longer with age.
3. The greater the difference between the time of origin and the local time, the longer it takes to adapt.
4. Adaptation to a backward schedule (longer daytime hours-west bound flights) is faster than to a forward schedule (shorter daytime hours-east-bound flights).

The west bound flight factor really made sense to me, particularly after the flight we completed to Japan last year (see June/July 2000 Transport *Bulletin*). In fact, NASA was consulted on the planning of the flight path to allow the team to remain in the daylight longer to help them avoid jet lag. Manifestations of circadian rhythm disruption, or incomplete adaptation to a new circadian rhythm, include difficulty falling asleep, difficulty remaining asleep, daytime sleepiness, and decreased physical and mental performance.

Of course, knowing what causes fatigue is one thing. Knowing how to control it is another. What can you do to help prevent fatigue? Although what works for one person may not work for another, the following suggestions may be helpful:

- Develop an appropriate sleep routine that includes eight hours of high quality sleep in a quiet, dark environment in a comfortable bed.
- Do not eat a heavy meal or drink large amounts of liquids before going to bed.
- Do not consume alcohol or caffeine for at least 3-4 hours before going to bed.
- If you are having trouble getting to sleep, get up and find a relaxing activity that helps you fall asleep. Activities such as reading, a hot bath, or listening to soft music may be helpful.
- Eat a balanced diet to avoid hypoglycemia.

Those of us who do patient transport know that our schedules are not always conducive to getting eight good hours of sleep a night — or, in some cases, even a day. The call for transport can come at any time of the day or night and might involve crossing several time zones. Awareness of ways to help avoid fatigue can help you make it through a busy shift. Your patient, his or her family, and your team members will appreciate having you at your best. ■

Update on Acute Lung Injury: *Mechanisms of Action*

by Greg S. Martin, MD

***Editor's Note**: The following report is based on papers presented during the 30th International Educational and Scientific Symposium of the Society of Critical Care Medicine. It was originally published by Medscape and is being reprinted here with permission. For a complete citation, see end of article.*

Introduction

Research in the field of critical care medicine has evolved dramatically in the past two decades. During that time, physicians have recognized the basic inflammatory nature of many critical illnesses. Acute respiratory distress syndrome (ARDS), and its less inclusive sibling, acute lung injury (ALI), have been the focus of intense research during this time. As a result, we now possess a much greater understanding of the contributing roles of many inflammatory mediators in this lethal condition.

In ALI, the ratio of arterial to inspired oxygen is 300 mm Hg or less, bilateral infiltrates appear on radiography, and pulmonary artery occlusion pressure is 18 mm Hg or less. In ARDS, the ratio of arterial to inspired oxygen is 200 mm Hg or less, bilateral infiltrates appear on radiography, and pulmonary artery occlusion pressure is 18 mm Hg or less.

It is estimated that ALI/ARDS affects approximately 150,000 persons annually in the United States alone.[1] Though improvements in intensive care and a better understanding of the pathophysiology of this syndrome have resulted in a slow decline in the mortality rate, it continues to hover near 40%. Sepsis, a clinical syndrome related to serious infections, is the predominant cause of ALI/ARDS worldwide, with traumatic injuries and other acute inflammatory conditions accounting for the remaining cases. Lead investigators from around the world convened at the Society of Critical Care Medicine symposium in San Francisco, CA, to discuss the most recent research linking the inflammatory nature of severe illnesses to ALI/ARDS.

The role of mechanical ventilation in inflammation

Our understanding of how critically ill patients interface with mechanical ventilators has been lacking until very recently. The ability of a mechanical ventilator to create or ameliorate lung injury is now well substantiated, with recent clinical proof of benefit from simple changes in mechanical ventilation modalities. The mechanisms behind the inflammatory nature of ALI/ARDS and ventilator-induced lung injury (VILI) were the topics of discussion of an expert panel of physician-scientists. Arthur S. Slutsky, MD,[2] of St. Michael's Hospital in Toronto, Ontario, Canada, discussed ventilator-induced inflammation, covering the physiologic factors leading to injury and the role of mechanical ventilation in pulmonary and systemic inflammation. Through successive preclinical investigations, our comprehension of mechanical ventilation as an "engine" for inflammation is rapidly increasing. In particular, we now recognize that ventilation of normal lungs (at least experimentally, in animals) with injurious modes of mechanical ventilation may lead to an injury pattern indistinguishable from ALI/ARDS. Furthermore, this injury allows the lung to participate in translocation of noxious external stimuli, as evidenced by intratracheal bacteria being recovered from the bloodstream in an animal model of VILI. Finally, this injury pattern is associated with heightened pulmonary and systemic inflammatory cytokine elaboration and apparent increases in remote cellular apoptosis and organ failure. In humans, injurious modes of mechanical ventilation lead to increased elaboration of inflammatory cytokines that correlate with greater degrees of organ dysfunction (so-called multiple organ failure, or

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MOF).[3,4] Though not proven conclusively, the hypothesis that propagation of tissue injury (for instance, through harmful mechanical ventilation strategies) leads to systemic inflammation and organ failure is increasingly solid. The importance of these findings cannot be understated, given that ALI/ARDS patients most frequently succumb to extrapulmonary organ failure, related to our ability to provide intensive respiratory support.

The role of neutrophils in ALI/ARDS

The role of white blood cells in ALI/ARDS was discussed by Greg Downey, MD,[5] of the University of Toronto in Toronto, Ontario, Canada. Examination of tissue specimens from patients with ALI/ARDS reveals diffuse (though heterogeneous) damage to the alveoli of the lung. The cellular lining of the alveoli is a critical barrier for lung function, serving to assist transport of fluids and solutes, maintaining a surfactant layer for alveolar patency, and impeding the free movement of substances. Dr. Downey presented electron microscopy images depicting large holes in the alveolar lining cells, much like the mortar being removed from a paved stone path, thus rendering the barrier permeable to white blood cells and other undesirable materials. As such, the white blood cell may serve as both a producer of inflammatory molecules and an inducer of other inflammatory-producing cells.

How this phenomena leads to ALI/ARDS is clear, but the link to therapeutic intervention is less well defined. Despite a growing understanding of the innate pathways responsible for producing inflammation, numerous therapeutic agents have failed in preclinical and clinical trials. As always, a new slew of strategies awaits rigorous testing, though the human genome project is shedding new light onto the best potential therapies. Scientists believe that identifiable genetic variations ("polymorphisms") may serve as both prognostic indicators and points of therapeutic intervention. In the past two years, genetic polymorphisms in the tumor necrosis factor alpha gene have been associated with alterations in the human response to sepsis, such that patients with certain polymorphisms have significant differences in mortality.[6] Our knowledge of how variations in genetic expression may determine the host responsiveness to infection is a burgeoning field.

The link between the cardiovascular system and respiratory failure

The precise role of the cardiovascular system in respiratory failure such as ALI/ARDS remains poorly understood. John J. Marini, MD,[7] of Regions Hospital in St. Paul, MN, has begun to investigate these interactions, working from the realization that experimental lung injury occurs in a gravitational distribution. If this is true, could the pulmonary vasculature play a direct role in the production of lung injury? Microscopic images of alveolar injury, such as in ALI/ARDS, reveal capillary fractures that may serve as conduits for transfer of blood, air, or inflammatory mediators between the alveoli and capillary bed. Dr. Marini, in ex vivo models, has shown that pulmonary arterial pressure, rather than pulmonary blood flow, modulates lung injury with coincident increases in permeability and edema as well as reductions in lung compliance. The relationship between pulmonary capillaries and the cyclic opening and closing of alveoli remains unclear, though indirect evidence points to true structural fatigue occurring within the lung parenchyma. These changes are similarly influenced by the mode of mechanical ventilation, such that increased respiratory rate (and, thus, increased alveolar cycling) independently worsens VILI. Further work remains, but the clinical relevance of our enhanced understanding of how pulmonary arterial pressure and ventilator rate may contribute to VILI is clear. Fluid loading is often required in critically ill patients and early in the course of ALI/ARDS, though fluid restrictive strategies appear to result in improved outcomes.[8,9] Less directly, vasoactive agents, permissive hypercapnia, and increases in airway pressure may all alter pulmonary vascular pressure. What role Dr. Marini's findings play relative to these common treatment regimens is yet unclear in the clinical arena.

Ventilator-induced lung injury in ARDS: The relevance of animal studies

The clinical relevance of animal models of VILI was further addressed by Marcelo Amato, MD,[10] of the University of Sao Paulo in Sao Paulo, Brazil, through discussion of previous clinical trial results. To date, five major randomized, controlled trials have been conducted to investigate the role of mechanical ventilation in ALI/ARDS patients. While three studies failed to demonstrate a benefit to such patients, the largest and most recent trial documented favorable benefits for reduced tidal volume ventilation. To reconcile these differences, Dr. Amato reviewed the methods involved in these studies. The first study, published in the *New England Journal of Medicine* by Stewart and colleagues,[11] randomized patients at risk for ALI/ARDS to an airway pressure-limited strategy of ventilation. This study failed to observe a difference in outcome (i.e., survival) from such a simple treatment strategy.

A group led by Dr. Amato[12] published a study in the same issue of the *New England Journal of Medicine* with a striking difference in mortality for ARDS patients treated with a pressure-limited ventilation strategy targeted by respiratory system pressure-volume curves. Though impressive, this study was greeted with skepticism because of heightened mortality in the control group relative to the expected mortality for patients with ALI/ARDS. Two subsequent studies, by Brochard and colleagues[13] and Brower and colleagues,[14] randomized patients with established ALI/ARDS to a reduced tidal volume ventilation strategy. Similar to Stewart and coworkers, these studies failed to find a difference in mortality.

The largest trial, reported last year by the National Institutes of Health-sponsored ARDS Network in the *New England Journal of Medicine*, documented a 25% relative reduction in mortality using a similar reduced tidal volume ventilation strategy.[15] In this study, patients in the treatment group received mechanical ventilation at 6 mL/kg of ideal body weight, compared with 12 mL/kg in the control group. Reconciling these seemingly contradictory results requires reviewing the data from each trial. The studies by Stewart, Brochard, and Brower[11,13,14] reported the smallest differences in inspiratory plateau pressure (the airway pressure measured at the end of inspiration by pausing the ventilator before exhalation can occur) between groups, while Amato and the ARDS Network studies[12,15] achieved greater differences. This difference may account for the disparity between patient outcomes, supported by a combinatorial analysis of data from the studies. By analyzing combined data from these studies, Dr. Amato reported similar relative mortality risk when patients are stratified by airway pressure achieved with the various protocols.

The experimental and animal model data discussed by each of these experts provide a concise summary of our expanding knowledge of how patients

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interact with a mechanical ventilator. We now realize how a device we have long depended upon to save the lives of critically ill patients may, in fact, be contributing to the severity of their condition. Strategies targeted to reduce airway pressure through reductions in tidal volume undoubtedly improve outcomes. Based upon this knowledge, solid recommendations can be made for the care of ALI/ARDS patients, such that tidal volume ventilation of 6 mL/kg should be used with a secondary goal of maintaining inspiratory plateau pressure at 35 cm H_20 or less. Reduced tidal volume ventilation can be applied safely, as in the ARDS Network study where arterial pH was allowed to fall near 7.20 without adverse effect. Though we now have a specific treatment strategy for a long-suffering illness, progress is only beginning. Preclinical and clinical trials are ongoing that may lead to even further reductions in mortality for this lethal condition, and our ability to assess genetic risk may allow for more individual therapy of such patients.

Martin GS. Update on acute lung injury: mechanisms of action. Medscape Critical Care Conference Summaries from the 30th International Educational and Scientific Symposium of the Society of Critical Care Medicine; February 10-14, 2001; San Francisco, California. Available at: http://www.medscape.com/medscape/cno/2001/SCCM/Story.cfm?story_id=2075.

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Specialty Practitioner of the Year

Don't forget to nominate a fellow section member for Specialty Practitioner of the Year!
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The recipient of this award will be determined by the section chair or a selection committee appointed by the chair. Each nominee must be a member of the AARC and a member of the section.

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I would like to nominate _____ for Transport *Specialty Practitioner of the Year* because

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Nominee	***Your Name***
Hospital	Hospital
Address	Address
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