N E W S L E T T E R

Society of Critical Care Anesthesiologists SOCCA

INTERCHANGE

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President's Column: SOCCA Highlights from 2014

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The Society for Critical Care Anesthesiologists (SOCCA) strives to expand the learning opportunities and resources available to its members and critical care anesthesiologists and 2014's educational offerings are a representation of this focus. The year was filled with new initiatives, programs to mentor up-and-coming critical care anesthesiologists, and an invigorating selection of educational opportunities plus so much more.

Here are just a few of the SOCCA highlights from 2014:

SOCCA 27th Annual Meeting aligned with IARS 2014 Annual Meeting

For the first time in 2014, SOCCA held its meeting in conjunction with the International Anesthesia Research Society (IARS), on Friday, May 16, 2014 in Montréal, Canada for double the educational and networking opportunities for its attendees. The program championed SOCCA's mission to advance the education of anesthesiologists in the care of critically ill patients and to foster the knowledge and practice of critical care medicine by anesthesiologists. Session topics included right ventricular function, pulmonary hypertension, mechanical assist devices, updates on important publications, biomedical and health informatics in the intensive care unit and a special interactive case management panel.

Critical Care SOCCA-Sponsored Learning Opportunities at the IARS 2014 Annual Meeting

At the IARS 2014 Annual Meeting and International Science Symposium in May in Montréal, Canada, SOCCA offered two workshops, a Problem-Based Learning Discussion, a Review Course Lecture, and a Panel. SOCCA brought back the hugely popular *SOCCA Critical Care Ultrasound Workshop*, to IARS attendees for another year. To add to the interactive training opportunities for critical care anesthesiologists at the meeting, SOCCA provided an additional workshop, *SOCCA Perioperative ACLS Simulation Workshop*. Other education sessions included a dynamic RCL, *Anesthesia Advanced Circulatory Life Support*, an interactive panel, *From The ICU to the OR: Critical Illness Intraoperative Decision in the OR*, and a case-based PBLD, *A Complex Challenge: Spinal Instrumentation Requiring Aggressive Resuscitation Techniques and Multimodal Analgesia.*

Education Session at the American Society of Anesthesiologists 2014 Annual Meeting

Attendees at the American Society of Anesthesiologists (ASA) 2014 Annual Meeting in New Orleans were able to take advantage of the SOCCA-sponsored subspecialty panel, *Trauma and Critical Care Pearls for the Non-Intensivists*. During this session, a panel of expert speakers drew from multiple trauma cases to illustrate emerging issues that arise during the management of the trauma patient presenting for surgery. The presenters provided valuable knowledge to take away, including a strategic plan for securing a definitive airway in a patient with a supraglottic airway device, factors that contribute to trauma-induced coagulopathy, and benefits and pitfalls of fixed ratio and goal-directed coagulopathy management.[1]

Resident Mentorship Program

Residents gained valuable knowledge and career development tips during a special educational track offered during the SOCCA 27th Annual Meeting and Critical Care Update. The SOCCA mentorship program matched resident attendees with mentors to offer another perspective on critical care and guidance to these up-and-coming anesthesiologists. SOCCA continues to value and provide resources to young and promising anesthesiologists in the field, fostering the next generation of thought leaders in critical care.

ICU Residents' Guide

SOCCA offered a new training resource for residents this year — the SOCCA ICU Residents' Guide. Developed by faculty across the nation, this valuable guide contains 45 chapters of important information residents need to know for their ICU rotation presented in a user-friendly format. Available in iBooks and PDF formats, the guide is provided complimentary to resident and fellow members as a benefit of SOCCA membership.

First Match for Critical Care Using San Francisco Match for Fellowship, Sponsored by SOCCA

SOCCA sponsored the first match program for critical care using San Francisco Match for fellowship, coordinated by Dr. Benjamin Kohl. This new anesthesiology critical care program features a minimum of 12 months of training with nine months of the training focused on care for the critically ill patients in the ICU.

As 2014 comes to a close, SOCCA will continue to bring education, advocacy and networking opportunities to meet the specialized needs of intensivists and practicing anesthesiologists. In 2015, SOCCA will look for new ways to provide critical care anesthesiologists with the knowledge they need to succeed in their career and advance the care of critically ill patients. Be sure to renew your SOCCA membership for 2015 and enjoy all the new year has to offer! With you as a member, SOCCA is a stronger organization!

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Contents

Case-Based Learning: Is My Patient Ready for Extubation?

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Case (thanks to Dr. Megan Anders):

A 77-year-old female presents to the hospital with dyspnea, nausea, vomiting and chest pain. She is diagnosed with acute coronary syndrome and immediately placed on heparin and nitroglycerin infusions.

1. Her medical history is significant for symptomatic bradycardia with pacemaker placement, diabetes, hypertension and obesity.
2. Echocardiogram shows preserved LV function with apical dyskinesis. Moderate aortic (AV) regurgitation and severe mitral (MV) valve regurgitation are seen on echo.
3. Cardiac Catheterization reveals a 90% stenosis of the left main and proximal right coronary arteries, and 50% OM2 and 70% proximal LAD stenoses.

She is taken emergently to the OR for 3-vessel coronary artery bypass grafting (CABG) and MV repair. Her intra-operative course is complicated by difficult airway (moderate mask, grade 4 laryngoscopy which required a Bougie for intubation), prolonged time on bypass (168 min), and prolonged aortic cross clamp time of 128 minutes. She had a moderate intra-op blood loss requiring transfusion (5 PRBC, 1 platelet, 6 FFP) and required norepinephrine and milrinone to separate from bypass due to a low cardiac output. Post-operatively she is transferred to the ICU intubated on milrinone for further resuscitation and hemodynamic stabilization.

1. Post–operative day (POD) 0: Following stabilization in the ICU she had an attempted spontaneous breathing trial (SBT), which she failed due to tachypnea and tachycardia.
2. POD 1: Milrinone is weaned, mean arterial pressure is between 60-65 mmHg without vasopressor support. Her sedation is held for a ventilator wean to extubation. She passes a spontaneous breathing trial on CPAP 5, PS 5, FiO_2 40% with a respiratory rate of 24, TV 0.29L, rapid shallow breathing index (RSBI) 82.7 and a minute ventilation 7.1L. She is awake and following commands. She has minimal secretions, but a weak cough.

Is Patient Appropriate for Liberation from Ventilation?

Criteria for readiness for separation from the ventilator[1]: *(patient meets criteria if a check is present)*

- Patient on minimal ventilator support (SpO2 ≥ 90%, FiO2 ≤40%, PEEP ≤5 cmH2O)✓
- Hemodynamic stability
- Awake and following commands✓
- Sedation held✓
- Ability to cough assessed✓
- Less than three endotracheal suctions required during last 4 hours✓
- No further procedures requiring sedation or surgery✓

Weaning Predictors:

1. Weaning variables have only shown modest accuracy in predicting weaning outcome.[2]
2. A trial in 37 centers, in 8 countries studied 900 mixed medical-surgical patients ventilated for > 48 hrs. Despite being assessed as ready for extubation after passing SBT, 13.4% failed extubation.[3]

Why the Push to Extubate this Patient on the First Post-operative Day?

1. To avoid prolonged ventilation with the concomitant need for sedation, which may result in ongoing vasopressor support, increased fluid administration, and fluctuating mental status.
2. Acute lung injury secondary to ventilator-associated pneumonia (VAP), sepsis, Acute Respiratory Distress Syndrome (ARDS), pulmonary embolism, barotrauma, and pulmonary edema are among the complications that can occur in patients receiving mechanical ventilation. These complications can lead to prolonged mechanical ventilation, longer stays in the ICU and hospital, increased healthcare costs, and increased risk of disability and death. Mortality in patients with acute lung injury on mechanical ventilation may be as high as 60% for patients 80 years and older.[4]
3. Time to extubation following cardiac surgery is a recorded quality metric, which is reported and is expected to be < 48 hrs. following cardiac surgery.
4. Early extubation (Fast Track) following cardiac surgery has been shown to be safe.

The Cochrane Summaries reviewed six controlled studies reviewing Fast Track extubation (within 8 hours of skin closure following cardiac surgery) and found it to be safe with reduced ICU length of stay.(5) Unfortunately these studies were limited to elective cardiac surgery patients who were <70 years old. Most studies excluded "high risk" patients. This patient with her age and co-morbidities had a 30% chance of mortality or morbidity following a MV repair and CABG, as calculated by The Society of Thoracic Surgery online risk calculator.

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Case-Based Learning: Is My Patient Ready for Extubation?

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Risk Factors for Reintubation[3] (general):

- Older age✓
- Positive fluid balance✓
- Initial intubation for pneumonia
- RSBI (respiratory rate/VT) ✓– the higher the RSBI is the greater likelihood of being reintubated (our patient has a 20% chance of being reintubated with a RSBI of 82)

Perioperative Predictors of Extubation Failure[6] (specific to the post cardiac surgery patients):

- Age > 65✓
- Pre-op in-patient hospitalization
- Arterial Vascular Disease
- Pulmonary HTN
- Severe LV dysfunction✓
- Cardiac Shock✓
- HCT < 34% ✓
- BUN > 42
- Albumin < 4
- DO2 < 320 mL/min/m2
- Redo operation
- Surgery on thoracic aorta
- Transfusion > 10 units✓
- CPB > 120 minutes✓

She is extubated on POD 1 and acutely decompensated with tachypnea, tachycardia, hemodynamic instability and increased work of breathing (WOB) associated with acute desaturation. Non-invasive positive pressure ventilation was attempted but failed, and she is re-intubated within 4 hours of her extubation.

The Mechanics of Extubation Failure[7]:

Weaning ventilator support and liberation from mechanical ventilation is well tolerated by most patients recovering from their illnesses, but for some patients with underlying cardiopulmonary disease, the work load and hemodynamic changes associated with negative pressure ventilation following extubation can precipitate hemodynamic instability.

"The mechanics of transitioning from positive pressure to negative pressure ventilation cause significant mechanical stress on both the heart and the lungs and this should be taken into account when contemplating extubation of the high-risk patient."

Pressure and volume changes in the thorax impact biventricular preload and afterload. Upon extubation, the elastic and resistive loads of the lungs are augmented and cause exaggerated swings in intrathoracic pressure and volume, which in turn impact right heart filling and ejection, left ventricular ejection volume and the interdependent function of the ventricles.

In spontaneously breathing patients, air flow in the tracheobronchial tree can become less laminar and more turbulent as the patients' respiratory rate increases, which can impact airway resistance, leading to an increase in dynamic load and the WOB. The other major factor in WOB is lung compliance, which is impacted by the presence of surfactant and interstitial or alveolar edema (as in the patient under discussion).

Positive pressure reduces expiratory airway resistance and stents open the lung, facilitating lung emptying. COPD patients with poor elastic recoil are at risk for air trapping as terminal airways collapse when pleural pressure exceeds airway pressure. This dynamic airway collapse also occurs in patients with excess lung water (ARDS, interstitial edema with positive fluid balance). Air trapping causes hyperinflation, which decreases the effective tidal volume and increases the transpulmonary pressure impacting both the right (RV) and left ventricular (LV) output.

RV: Intra-alveolar vessels are exposed to alveolar pressure, which increases with dynamic hyperinflation. The increased pulmonary vascular resistance further impedes RV outflow, which can lead to RV over distension and failure.

RV/LV Interdependence: The RV and LV share an intraventricular septum and the RV dysfunction will result in the intraventicular septum bowing (septal shift) into the LV, which will impact the LV filling and stroke volume (SV). This in turn raises LV diastolic pressure, which increases left atrial pressure (LAP) and can result in worsening pulmonary edema.

LV: Intrathoracic pressure falls with spontaneous breathing. This drop in pressure is greater than the intraluminal LV pressure drop creating increased transmural wall stress, which negatively impacts LV systole and increases impedance to ejection. This is exacerbated by the decrease in SV from the septal shift, and results in increased left filling pressures, which can cause the development or exacerbation of pulmonary edema.

The mechanics of transitioning from positive pressure to negative pressure ventilation cause significant mechanical stress on both the heart and the lungs and this should be taken into account when contemplating extubation of the high-risk patient.

Does this Affect Her Outcome?

Extubation failure is an independent predictor for prolonged ventilation, prolonged ICU and hospital stay and an increased risk for death, transfer to a long-term care or rehabilitation facility.[8] She ultimately underwent a tracheostomy and had a prolonged and complicated ICU stay, which terminated in her transfer to a long-term ventilator facility, where she died shortly after transfer.

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Double Your Educational Opportunities in a Tropical Paradise with Two Days of Critical Care Education

Attend the SOCCA 2015 Annual Meeting on Friday, March 20 and stay for the Critical Care sessions at the IARS 2015 Annual Meeting on Saturday, March 21.

This year, SOCCA offers two days of critical care education. Attend the SOCCA 28th Annual Meeting and Critical Care Update, Friday, March 20, 2015 for a stimulating program that will include examining and challenging current practices in critical care and presenting exciting new research and technology.

Stay for a second day of critical care sessions at the IARS 2015 Annual Meeting and International Science Symposium on Saturday, March 21, 2015. SOCCA will be sponsoring a Review Course Lecture, a Panel, a Workshop, and a Problem-Based Learning Discussion (PBLD) session.

Register by January 23, 2015 and Save!

Online Registration is available at www.SOCCA.org

Society of Critical Care Anesthesiologists
SOCCA

Late-Breaking Abstracts

Submit Your Late-Breaking Research Today at www.SOCCA.org!

Deadline: December 29, 2014

SOCCA 28th Annual Meeting and Critical Care Update

Friday, March 20, 2015

Hilton Hawaiian Village Resort
Honolulu, Hawaii

Presented prior to the IARS 2015 Annual Meeting and International Science Symposium

Join the leaders in critical care anesthesiology as they examine and challenge current practices in critical care medicine and discuss recent cutting-edge discoveries at the SOCCA 28th Annual Meeting and Critical Care Update.

Program Schedule*

7:00 am – 7:30 am . . . Coffee with Exhibitors
7:30 am – 8:00 pm . . . Continental Breakfast
8:00 am – 8:05 am . . . Welcome and Introduction

SESSION I
• Acute Infectious Diseases in the ICU

8:05 am –10:00 am. . . . . From Ebola to Enteroviruses – What You Need to Know About Emerging Pathogens
Infectious Risks to Health Care Personnel in the ICU
Disaster Management in the ICU – Are We Ready for the Next Pandemic?

10:00 am –10:30 am. . . . . Break with Exhibitors

SESSION II
• New Evidence, New Investigators and New Directions

10:30 am –11:30 am. . . . . Important Publications You Might Have Missed
11:30 am –11:45 am. . . . . Young Investigator Award Presentation

11:45 am –12:00 pm . . . . ASA Address

12:00 pm – 1:15 pm . . . . Lunch

SESSION III
• Atrial Fibrillation: An Update You Won't Want to Miss!!

1:20 pm – 2:25 pm . . . . Towards the Prevention of Postoperative Atrial Fibrillation
What's New in the Management of Atrial Fibrillation?

2:30 pm – 3:00 pm . . . . Lifetime Achievement Award

3:00 pm – 3:30 pm . . . . Moderated Poster Session

3:30 pm – 3:45 pm . . . . Break with Exhibitors

SESSION IV
• Interactive Case Management

3:45 pm – 4:55 pm . . . . Interactive Case Management

4:55 pm – 5:00 pm . . . . Closing Remarks

5:00 pm – 5:45 pm . . . . SOCCA Annual Business Meeting

5:00 pm – 6:00 pm . . . . Resident/Fellow Program

5:45 pm – 7:00 pm . . . . Reception with Exhibitors

*Preliminary schedule as of press time and subject to change

Accreditation Statement
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the International Anesthesia Research Society (IARS) and the Society of Critical Care Anesthesiologists (SOCCA). The IARS is accredited by the ACCME to provide continuing medical education for physicians.

PRO: Point-of-Care Ultrasonography in Critically Ill Patients Performed by Intensivists

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Introduction:

Ever since the first published use of echocardiography in clinical practice by Edler et al. in 1854, the technology and use of surface echocardiography has grown rapidly. Real-time three-dimensional echocardiography can now be obtained to create a diagnostic picture of the cardiovascular system. Portable hand-held echocardiography devices are being developed and may very soon replace the stethoscope in many situations. It has proven to be a safe, versatile and effective tool with the capability to guide management in real time and improve patient outcome.

"There are many indications and uses for bedside echocardiography in the ICU."

Within the last decade, the use of right heart catheterization (RHC) for diagnostic and monitoring purpose in critically ill patients has increasingly been replaced by less invasive techniques due to its multiple risks and the lack of evidence supporting its use. In many ICUs, bedside sonography has emerged as a superior diagnostic tool with capabilities to monitor and guide therapy.

In addition, as opposed to conventional echocardiography performed by consultant cardiologists, critical care echocardiography is carried out and interpreted in real-time by the intensivist at the bedside. The benefits include instant accessibility 24 hours a day, production of an immediate differential diagnosis, and the abilities to interrogate interactions between the heart and lungs and immediately evaluate efficacy and tolerance of a specific therapy.

There are many indications and uses for bedside echocardiography in the ICU. Surface echocardiography can help in cases of sudden cardiac failure from sources such as coronary ischemia, tamponade, aneurysmal disease, pulmonary embolism with right heart strain, endocarditis, and severe valvular failure. Surface echocardiography can also assist in the diagnosis and management of acute respiratory failure, ARDS, and intracardiac shunt/PFO. In addition, bedside echocardiography could potentially be useful in the assessment and management of an unstable patient with sudden chest trauma or cardiac arrest.

In all the instances above, Doppler echocardiography can provide a rapid and comprehensive evaluation of the hemodynamics and volume responsiveness. By accurately identifying the mechanism of shock and acute respiratory failure, critical care echocardiography allows for immediate changes in the therapeutic strategy. Therapeutic modalities (e.g. fluid challenge, initiation of vasopressor or inotropic agents) and their immediate results can easily be monitored.

In conclusion, surface echocardiography is a non-invasive, bedside test that can successfully be used to assess, diagnose and treat critically ill patients. Surface echocardiography is safe, versatile, and can offer a wealth of diagnostic information to guide therapy in a real-time setting.

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CON: Point-of-Care Ultrasonography in Critically Ill Patients Performed by Intensivists

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Introduction:

In the last decade, the use of point-of-care surface ultrasonography by intensivists in the management of critically ill patients has grown exponentially. Practice and training recommendations are emerging to ensure safe use of this modality. It is not surprising that the ACGME has included obligatory point-of-care surface sonography training in the ICU fellowship curriculum.

Brief History:

Following the use of ultrasound echo sounding the depth of the ocean (Behm 1921), there was growing interest among physicians in the 1930s and 40s for therapeutic and diagnostic use of ultrasound. A French physiotherapist Andre Denier, in 1946 proposed that ultrasound can be used to produce images of interior body structures. However, he and others initially failed in their attempts at instrument construction. On the 29th of October 1953 the first cardiac echocardiogram was recorded.[1] Ultrasonography found its application in cardiology and obstetrics with introduction early in the 1970's.

Point-of-Care Surface Sonography:

The FAST (Focused Assessment with Sonography for Trauma) protocol was the first point-of-care protocol introduced in clinical practice.[2] Trauma surgeons and emergency physicians were first to incorporate training and began performing the FAST exam in their practice. Critical care physicians adopted protocols relevant to critical care, such as focused exam of the heart, ultrasound evaluation of the lung, sonographic assessment in the hemodynamically unstable patient and during cardiac arrest (Focused Echocardiographic Evaluation in Life support). In anesthesiology, diagnostic ultrasonography was first adopted by cardiac anesthesiologists with the use of intraoperative transesophageal echocardiography (TEE). In the last decade anesthesiologists started adopting relevant point-of-care protocols for patient evaluation in the preoperative holding area, as well as in the PACU and ICU settings. Technological advances, the development of less expensive portable devices and hand-held instruments, together with growing interest and enthusiasm, brought wide spread use of surface ultrasonography to physicians in many clinical specialties. Although the learning curve for an abbreviated, targeted exam is steep, what may be neglected with this approach is teaching of the fundamentals of ultrasonography. Critics of the "abbreviated exam approach" argue that physicians with limited skills and knowledge may cause a delay in diagnosis.

Discussion:

Today ultrasonography training is initiated at the medical student level. There are medical schools that are encouraging the use of portable

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CON: Point-of-Care Ultrasonography in Critically Ill Patients Performed by Intensivists

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"The American College of Emergency Physicians has taken the initiative with the American Society of Echocardiography to delineate focused emergency medicine ultrasound."

sonographic devices, as the stethoscope is insidiously becoming the "physician symbol of the past." Although it is very appealing for the bed-side physician to supplement the physical exam with a powerful tool such as imaging with a portable ultrasound device, we should not forget the limitations of point-of-care surface sonography. The American College of Emergency Physicians has taken the initiative with the American Society of Echocardiography to delineate focused emergency medicine ultrasound. The consensus statement published stressed the importance of adequate physician training and that practice guidelines should be outlined by the governing specialty body.[3] The proposed "Experience Pyramid," dividing expertise expectations into four levels is an attractive starting point. Since publication in 2012, moving forward, we need to address some of the more serious questions.[5, 6]

Qualifications, Practice Standardization and Certification

We currently have a generational gap between currently trained intensivists, many with limited experience in point-of care surface sonography, and the next generation of intensivists who now acquire skills in medical school, residency and during ICU fellow training. Introduction of TEE in cardiac anesthesiology practice underwent greater scrutiny and certification was adopted early. The invasive nature, potential for serious complications, and need for consent involved with this modality certainly played an important role for this approach taken by the national board of echocardiography and cardiovascular anesthesiologists. However, one should not forget that once an intensivist performs and interprets bedside sonographic images, incomplete evaluations, poor documentation, misdiagnosis and the inability to recognize life threatening conditions are valid concerns.

How do we ensure that we are introducing qualified ICU practitioners into practice when it comes to point-of-care surface sonography?

Although certification does not guarantee quality, it appears that in order to standardize our practice expectations, a point-of-care surface sonography intensivist certification process may be the best approach. The currently proposed "Pyramid of Success" represents an important step towards setting expertise level expectations and structured training permits supervised fellow growth.

As the adoption of point-of-care sonography appears to be an inevitable course for critical care physicians, there is much work ahead. Fellowship programs have a responsibility to ensure high standards for graduating ICU fellows, and initiatives designed to achieve this should include faculty development, continued medical education, quality assurance and outcome research.

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Editorial Notes

Editorial Policy

The opinions presented are those of the authors only, not of SOCCA. Drug dosages, accuracy and completeness of content are not guaranteed by SOCCA.

A Note from the Editor to SOCCA Members:

If you would like to contribute a review for a Fellowship Program at your institution in a future issue of the SOCCA Interchange, please contact: jmcgrath@iars.org

FAER
Foundation for Anesthesia Education and Research

Applications Sought for FAER Research Grant Funding

Opportunities for Faculty Members and Trainees, Apply by Feb. 15

The board of directors of the Foundation for Anesthesia Education and Research (FAER) is pleased to announce FAER's 2015 research grant funding opportunities.

FAER provides research grant funding for anesthesiologists and anesthesiology trainees to gain additional training in basic science, clinical and translational, health services and education research. For early-career anesthesiologists interested in pursuing careers as physician-scientists, FAER grants can be an important starting point. These grants aim to help anesthesiologists develop the skills and preliminary data they need to become independent investigators.

2015 FUNDING OPPORTUNITIES

The following research grant funding opportunities are available to anesthesiologists and anesthesiology trainees. The application website for the winter/spring 2015 grant funding cycle is open now through February 15, 2015.

For more information regarding FAER grants and eligibility requirements, visit **FAER.org/research-grants** or email Jody Clikeman at JodyClikeman@faer.org.

Mentored Research Training Grants

Research Areas: Basic Science (MRTG-BS), Clinical and Translational (MRTG-CT), Health Services Research (MRTG-HSR)*
Purpose: To help physician anesthesiologists develop the skills and preliminary data to become independent investigators
For Whom: Faculty members who completed core anesthesiology residency within the past 10 years
Funding: $175,000
Duration: Two years
Percent Research: 75%
*The MRTG-HSR is jointly sponsored by the Anesthesia Quality Institute (AQI).

Research Fellowship Grant

Research Areas: Basic Science, Clinical and Translational, Health Services or Education
Purpose: To provide significant training in research techniques and scientific methods

For Whom: Anesthesiology trainee after the CA-1 year
Funding: $75,000
Duration: One year
Percent Research: 80%

Research in Education Grant
Research Areas: Education Research
Purpose: To improve the quality and impact of anesthesiology education research
For Whom: Faculty member of any rank (junior or senior faculty)
Funding: $100,000
Duration: Two years
Percent Research: 40%

RESEARCH GRANT APPLICATION DEADLINES

Winter/Spring Funding Cycle
Online application opens November 1, 2014
Applications due February 15, 2015
Award notifications made by May 15, 2015
Project start date July 1, 2015 or January 1, 2016

Summer/Fall Funding Cycle
Online application opens June 1, 2015
Applications due August 15, 2015
Award notifications made by November 15, 2015
Project start date January 1, 2016 or July 1, 2016

RESEARCH GRANT ELIGIBILITY CRITERIA – UPDATED FOR 2015

The FAER Grant Management Committee has made a few changes and clarifications to the eligibility criteria and rules for research grant funding from previous years.

- Applicants may submit only one grant application per award cycle.
- Tuition is not allowed in the budget for any grant.
- The applicant and the primary mentor for the grant must be at the same institution.

To view the complete eligibility requirements and application guide, visit **FAER.org/research-grants**.

Flip 'Em For Real: Is Prone Ventilation Ready for its Close-Up?

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As any intensivist knows, acute respiratory distress syndrome (ARDS) is a challenging and frustrating condition to treat. It strikes both the old and the young, has a high mortality rate, and frequently coincides with shock and other forms of organ dysfunction. In 2000, the landmark ARDSNet trial demonstrated the benefit of low tidal volume protective ventilation in ARDS.[1] Unfortunately, this was one of the bright lights in what has otherwise been a long series of therapies demonstrating improvements in oxygenation and ventilation but no improvement in mortality. While inverse-ratio ventilation, inhaled nitric oxide, and high-frequency oscillation have all showed some promise, results are inconsistent. Steroids and muscle relaxants have their adherents, but their administration carries risks and they remain controversial.

It has long been recognized that patients suffering from refractory hypoxemia may improve substantially when moved from supine to prone position.[2] This is likely due to recruitment of atelectatic lung, improved drainage of secretions, and the more uniform transpleural pressure gradient that occurs when patients are prone.[3] In animal models, prone positioning has also been shown to attenuate lung injury.[4] However, it has been only in the past 15 years that a substantial body of clinical research has been built assessing the effects of this technique on overall morbidity and mortality. It seems to be an opportune time to review the evidence for and against this potentially useful treatment.

In one of the earliest large randomized controlled trials (RCTs) on prone ventilation, carried out by Gattinoni and colleagues, 302 patients with ARDS were randomized to receive at least 6 hours per day of ventilation in the prone position or to standard care in the supine position.[5] In this trial, prone positioning resulted in an improvement in oxygenation in 70% of patients, often within the first hour; oxygenation in the prone patients improved significantly more over the course of the study than in supine patients.

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However, prone patients had a greater risk of decubitus ulcer formation, especially at sites such as the thorax, cheeks, iliac crests, and knees, which bear more weight in the prone position. Despite this, overall rates of other complications such as airway dislodgement and removal of venous access were similar between groups. A post-hoc analysis found lower 10-day mortality in the prone group than the supine group when patients with the most severe hypoxemia, the highest Simplified Acute Physiology Scores (SAPS II), or the highest tidal volumes were considered. However, since this was not a pre-determined analysis, and the mortality difference did not persist further than 10 days, the significance was unclear.

An RCT by Guerin and colleagues followed in 2004. In this study, 791 patients with hypoxemic acute respiratory failure were randomized to at least 8 hours per day of prone positioning. Notably, while a substantial proportion of the patients had ALI/ARDS, the majority were intubated and ventilated for pneumonia.[6] This trial, unsurprisingly, also demonstrated better oxygenation in the prone group, as well as a lower rate of ventilator-associated pneumonia, potentially because of better drainage of secretions. However, there were no differences in any mortality measures between the groups, nor was their a difference in time to extubation, and the prone group had higher rates of pressure ulcers, endotracheal tube obstruction, and airway malposition. The results of this study seemed destined to put a damper on enthusiasm for the technique.

Despite these results, a 2006 RCT by Mancebo and colleagues again evaluated prone ventilation in patients with severe ARDS. 136 patients were enrolled within 48 hours of being diagnosed with ARDS; the objective was to keep them prone for 20 hours per day until vent weaning could be initiated. While the group who received prone ventilation had lower ICU and hospital mortality, this difference did not reach significance in the univariate analysis. However, the patients in the prone group had higher SAPS II at baseline; when multivariate analysis was performed, the prone group exhibited a significant mortality benefit.[7] Notably, in this study, patients were turned prone for an average of 17 hours per day, less time than originally planned but considerably longer than in previous trials. There were suggestions of real benefits (and maybe a dose effect) appearing, but the picture was still unclear. Also, because this trial included fewer patients than the other RCTs preceding it, it was possible that the lack of statistical significance was due to inadequate power, not a lack of benefit.

In their prospective, multicenter, randomized, controlled trial published last year (and well summarized by Drs. Tam and Osorio in the

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Flip 'Em For Real: Is Prone Ventilation Ready for its Close-Up?

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previous issue of the Interchange), Guerin and colleagues enrolled 466 patients with severe ARDS, as defined by a PaO_2:FiO_2 ratio less than 150, who had been receiving mechanical ventilation for less than 36 hours.[8] All patients randomized to the experimental treatment were transitioned to the prone position within one hour of randomization and were kept in that position for at least 16 hours. Patients in the supine group were kept in a semi-recumbent position, and both groups received lung-protective ventilation with titrated PEEP via a predetermined protocol. Notably, all of the ICUs involved had used prone positioning regularly for at least 5 years. The study also included a specific protocol for how to reposition patients from supine to prone.

A total of 466 patients were included in the final analysis — 229 in the supine group and 237 in the prone group. The two groups were well matched in terms of coexisting conditions, respiratory mechanics, and ventilator settings at inclusion, although the supine group had slightly higher Sequential Organ Failure Assessment (SOFA) scores and vasopressor use, while the prone group had a higher rate of neuromuscular blocker administration. Patients in the prone group underwent an average of 4 prone sessions, with a mean duration of 17 hours per session. In the first week, patients in the prone group had significantly higher PaO_2:FiO_2 ratios and lower levels of PEEP and FiO_2 than the supine group. The prone group had lower rates of mortality at day 28 (32.8% vs. 16%) and day 90 (41% vs. 23.6%), and these differences remained highly significant even when the results were adjusted for possible confounders such as SOFA score. Patients in the prone group were also more likely to be successfully extubated by day 90 than those in the supine group, had more days free from mechanical ventilation, and had shorter ICU length-of-stay. Importantly, while there were roughly twice as many cardiac arrests in the supine group as the prone group (31 vs. 16), rates of complications were otherwise similar between the two groups.

So what is the take-home message of this latest addition to the literature? First, it appears that the potential benefit from prone positioning in ARDS is now more or less confirmed. While previous studies have shown conflicting results, this trial highlights a plausible explanation – the patients in earlier studies were receiving a "dosage" of prone ventilation that was inadequate to reveal mortality benefits. In addition, Guerin and colleagues utilized prone positioning much earlier than is frequently done in clinical practice, as opposed to relying upon it as a rescue technique. It may be that turning patients prone early in their disease process may maximize potential benefits by reducing stress on injured lung tissue and therefore limiting further inflammation. This would be a similar mechanism to the one hypothesized to underlie the benefits found for lung-protective ventilation in ARDS.

However, this study does come with a note of caution. Previous randomized trials of prone positioning in ARDS found that many adverse events were attributable to the position itself (i.e. decubitus ulcers). The ICUs where this most recent study was conducted had a great deal of experience with the logistics of prone positioning, and therefore may have been able to avoid complications that would occur in less experienced hands. A quick informal poll of colleagues in medicine and nursing confirms that the fear of complications and extra nursing effort is a large obstacle to implementing prone positioning. However, lack of familiarity with an evidence-based treatment should not be a reason to avoid that treatment, but instead should inspire us to build up our skills and become more comfortable. Progress in medicine always involves effort, training, and organization. It may be time for us to "face up" to our fear of turning patients face down.

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