N E W S L E T T E R

# INTERCHANGE

SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS

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President's Message

## In the Middle of History

Michael F. O'Connor, M.D.
President

In medicine, there are jobs *as* rewarding as the practice of critical care, but none *more* rewarding. Many specialties earn more, and many have better lifestyles; none combines the wide scope of science and medicine, and endless stream of interesting clinical material that are inevitable in the practice of critical care. Intensivists, especially anesthesia intensivists, are as content as anyone can be from their profession. This is the present. What does our future hold? In the U.S., the future of health care is being shaped by health care reform.

Few doubt that major changes are coming to medicine. The peer-reviewed journals and lay press are awash with articles predicting the impact of various portions of health care reform. Many speculate, but no one knows. Consultants are making fortunes helping physicians, hospitals, health care systems and insurance companies read the tea leaves. Daunted by the costs involved, more than 1,000 entities have applied for and received waivers of participation, removing at least 3 million citizens from the system controlled by statute. No one knows how large the population of the excused will ultimately be. All of this is complicated by legal challenges brought by more than two dozen states and other parties in a variety of courts; these suits range from technical issues related to the interpretation of specific language of the statutes to challenges to the global constitutional basis of the law itself. As I write this, no one knows how long it will take for the courts to work their way through this morass, or how their opinions will shape the implementation of health care reform. If history is any guide, the language of the court rulings will be as or more important than the language of the original statutes. Speaking of language, it is worthwhile to note that health care reform has introduced a large list of words, definitions uncertain, into the lexicon of medicine. This much is clear: at best, the Health Care Reform Act is only slightly more transparent than the tax code.

> "The federal law enacting health care reform includes specific language requiring the same pay for the same work, regardless of the credentials of the provider. The practice of anesthesia in the operating room, under siege for decades, is threatened as never before."

The federal law enacting health care reform includes specific language requiring the same pay for the same work, regardless of the credentials of the provider. The practice of anesthesia in the operating room, under siege for decades, is threatened as never before. This same language has created similar problems for many of our colleagues in other medical specialties, who now must delineate what care must be provided by physicians, and what care will be relinquished to the domain of nurse practitioners or other extenders. Our colleagues are in for a rude awakening as they discover that theirs is not the only opinion that matters, and that lobbying matters more than reason. Ironically, nurses face similar encroachment from less intensely trained providers who can claim to provide the same service. For instance, nurse midwives are excited that the language of this law compels the same compensation for vaginal delivery as paid to obstetricians for the same service, but distressed that this same language may compel identical compensation to lay-midwives.

Most of this is likely old news. Of all of the subspecialties in anesthesia, the one that combines the least threat from non-physician practitioners and the greatest projected increase in demand for service is… critical care. The demand for intensivists is staggering and projected to grow as far into the future as anyone can reasonably see. No other medical subspecialty faces such a huge gap between demand and providers. Critical care spans medical specialties. In the past, this has been a source of some vexation, but for the immediate future, it is a unique wellspring of broad support

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# EDITORIAL NOTES

## Editorial Policy

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## 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 Chris Dionne at **c.dionne@asahq.org**.

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# CON: Echocardiography Should NOT Be Incorporated Into CCM Training Programs

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*This argument is based on cost and practicality, with a little evolutionary economic theory thrown in.*

## Point 1: Training in echocardiography is prohibitively time-consuming and arduous for a general CCM fellowship of one or even two years' duration.

The first question one might ask is: "How much training (in hours, days or months) yields a given amount of expertise at a given echocardiographic task, with a given level of statistical quality?" In the Melamed et al. *Chest* paper cited by Dr. Goldfarb,[1] the experimental protocol was to train study subjects to be able to evaluate left ventricular function only. Nevertheless, this required "2 h of didactic instruction on echocardiography and 4 h of hands-on training by certified ultrasonographers in image acquisition and visual estimate of the LV function. In addition, independent study by participating intensivists was encouraged by providing digitally stored examples of TTEs in which LV function ranged from normal to severely decreased."

How about practical training in a real ICU setting? In the Price et al. (FOCUS) *Cardiovascular Ultrasound* position paper cited by Dr. Goldfarb,[2] Level 1 competency is the expected degree of proficiency for the ICU practitioner. This would require three or more months of didactic training and performance of hundreds of exams and image analyses.

Conclusion 1a: *One full day of training is needed for one to detect the simplest diagnostic entity with any degree of statistical reliability.*

Conclusion 1b: *To reach Level 1 competency in TTE requires three months of cumulative training, 75 examinations and 150 interpretations of stored examinations; i.e., roughly 25 percent of the total time spent in a one-year fellowship.*

## Point 2: To be of ongoing, state-of-the-art value in diagnosis, training of intensivists would have to be by and from cardiologists, not from other intensivists.

Cardiologists maintain state-of-the-art expertise in echocardiography. In doing so they perform peer-reviewed research, pass ongoing examinations, attend CME and other meetings with peers, pass standards, examine candidates, write texts, etc. So, according to the global academic standard in medicine, they alone are deemed fit to preserve and communicate this body of knowledge. Intensivists on the other hand would struggle just to maintain journeyman echocardiographic skills. Operating the equipment and diagnosing the simplest things with any degree of reliability would max them out. The cost and impracticality of this would be obvious.

Conclusion 2a: *Maintaining the state-of-the-art would remain the purview of cardiologists. This implies learning by tutelage, an expensive approach.*

Conclusion 2b: *Cardiologists would spend a significant fraction of their time training intensivists to perform preliminary studies, which ultimately would have to be verified by cardiologists.*

Conclusion 2c: *Intensivists would perform and read occasional studies, whereas specialist cardiologists read several per hour after trained technicians obtain them. Better information, faster and at less expense, would come straight from cardiologists.*

## Point 3: Clinical medicine, in routine, nonemergent and nondeveloping environments, requires expertise at the highest readily-available level.

A definition of "expert" that rings true with clinicians is that by Niels Bohr, Danish physicist, who said, "An expert is a person who has made all the mistakes which can be made, in a narrow field."[3] In clinical medicine, we have a practical surrogate, which is the widest-accepted standard across specialties: ACGME component board certification. An ACC-certified cardiologist has at least Level 1 skills, but he or she may access many more advanced echocardiographers, and by virtue of training and experience has an intuition about cardiac function that far surpasses that of most intensivists. Why then should echocardiograms be done by intensivists with a fraction of the experience, if cardiologists are readily available?

Conclusion 3a: *Patients and their families and even intensivists would, in the case of doubtful findings by an intensivist, insist on the expertise of the nearby cardiologist.*

*Continued on page 4*

## CON: Echocardiography Should NOT Be Incorporated Into CCM Training Programs

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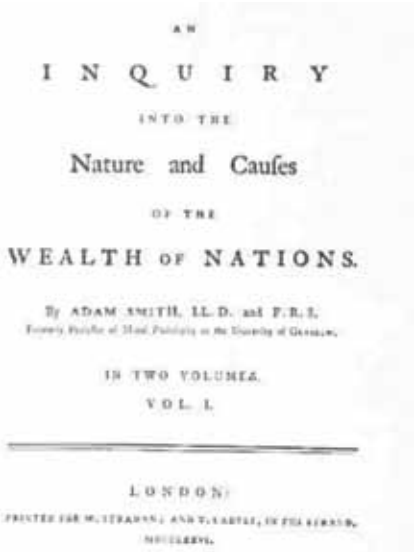
Conclusion 3b: *Most echocardiographic findings of rarity or interest made by intensivists would have to be verified by a certified cardiologist, perhaps doubling costs.*

ART
DE L'ÉPINGLIER. (1)

INTRODUCTION; par M. Duhamel (*).


Point 4: Across-the-board subspecialization is far superior to generalization in terms of efficiency and quality.

The paradigm of specialist expertise in exchange for cooperation from other specialists is not an isolated issue in clinical medicine. It is actually a question of great importance in classical economics and applied mathematics, known commonly as "division of labor." Not so long ago it was dealt with at length by the Enlightenment philosophers Henri-Louis Duhamel du Monceau[4] [*"l'Art de l'Épinglier"- The Art of the Pin-Maker.* (1761)] and by Adam Smith[5] [*An Inquiry into the Nature and Causes of the Wealth of Nations. (1776)*]. Du Monceau and Smith believed that subspecialization of labor (even down to distinguishing the processes of making shafts versus the heads of pins) was *the* greatest cause of growing productivity and source of wealth of a country. Here is the money quote from *The Wealth of Nations:*

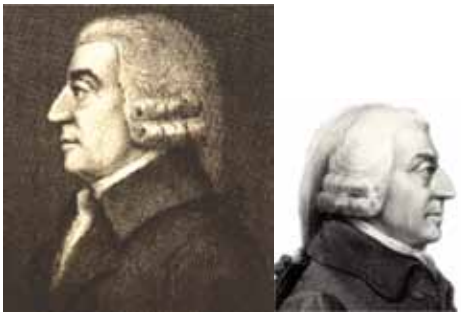


AN
INQUIRY
INTO THE
Nature and Causes
OF THE
WEALTH OF NATIONS.
By ADAM SMITH, LL.D. and F.R.S.
IN TWO VOLUMES.
VOL. I.
LONDON:

THE greatest improvement in the productive powers of labor, and the greater part of the skill, dexterity, and judgment with which it is anywhere directed, or applied, seem to have been the effects of the division of labor.


It is no stretch to assert that our two specialists, cardiologists and intensivists, will always do better, separately and *in cooperation each other*, than if they set out to cross-train in their own and the other's task. Overwhelming accumulated experience in economics supports this, from the 18th century Industrial Revolution onward.

Dr. Goldfarb's point about inefficiencies in the current system is well taken. Delays in getting help from nearby cardiologists must be minimized. According to Smith, du Monceau,



and even more recently, evolutionary economic theorists such as Martin Nowak[6], the specialists *absolutely cannot act alone*; they must cooperate and trade avidly among themselves

for Smithian efficiency to occur. In other words, when an echo is needed, it must be readily available or the argument falls flat. Fortunately, the longstanding rule among medical specialists is to cooperate with others and excel among one's own, and echocardiography in the ICU is no exception.

Conclusion 4: *Time and energy spent educating intensivists in echocardiography would be better spent streamlining the cooperative processes and exchange of information between intensivists and cardiologists - all to the benefit of the patients.*

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## President's Message

*Continued from page 1*

for the subspecialty. Internists, surgeons, anesthesiologists and pediatricians agree about very little, but all agree that the practice of critical care is the practice of medicine. No other subspecialty can claim this. The future of anesthesia in the U.S. is uncertain; the future of critical care is much less so.

What does this mean to me? That for as far as I can see into the future, intensivists should be able to find reasonable jobs with less difficulty than almost any other specialists or subspecialists in medicine. Also, that the practice of critical care will continue to be among the most interesting and rewarding in all of medicine. Perhaps most importantly, it will allow me to continue to encourage medical students and residents to seek training in anesthesia and then critical care.

Speaking of recruiting residents to the specialty, thanks to **Alan Lisbon, M.D., Jeff Jensen, M.D., Sam Galvagno, D.O.** and **Carlee Clark, M.D.,** SOCCA has had a recruiting presence at each of the regional resident's meetings this year. Membership remains near its all-time high, thanks in no small part to the efforts of our membership committee, led by **Sam Galvagno, D.O.**

Planning for the SOCCA Annual Meeting proceeds apace. **Ron Pauldine**, **M.D., Vivek Moitra, M.D.** and **Laureen Hill, M.D.** are assembling a terrific and innovative program. Once again, thanks to the efforts of **Mike Wall, M.D.** and **Danny Talmor**, **M.D.,** we will be offering a half-day ultrasound workshop on Thursday, October 13, the day *before* our Annual Meeting. The newsletter continues to thrive with terrific content under the leadership of **Jean Charchaflieh, M.D.** and **Liza Weavind, M.D**. Be sure to look for the series of submissions from members of the ultrasound task force over the next year.

Like the new logo and masthead? Special thanks to **Chris Doyle, M.D.**, whose efforts produced these cutting-edge logos as part of our name-change. She is also our webmaster, which is one of those thankless jobs that even small societies such as ours often take for granted.

Now that we have diminished the obstacles to expanding our international membership, how should we go about expanding it? Bring your ideas to any of the members of the Board. This is an agenda item for all of our members. Special thanks to **Heidi Kummer, M.D.** and **Pat Murphy, M.D.** who have been recruiting international members since we changed our bylaws.

Finally, **Sherif Afifi, M.D.** and **Miguel Cobas, M.D.** are in the process of assembling the next version of our Residents' Guide. More news as the next version comes closer to completion.

# PRO: Echocardiography SHOULD Be Incorporated Into CCM Training Programs

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Assessing cardiovascular status remains one of the greatest challenges in caring for patients in the ICU. Many patients are hypotensive, and the intensivist is tasked with optimizing pump (myocardium), tank (preload) and tone (afterload). For many years, pulmonary artery catheters (PA-C) were the mainstay for evaluating and optimizing these patients. Recently, however, the safety and efficacy of pulmonary artery catheters have been called into question.[1,2]

Echocardiography can also be used to assess cardiovascular status. With relatively simple maneuvers, one can visualize the heart, IVC and surrounding structures to obtain valuable information about the function of the circulatory system. In fact, echo is as effective as PA-C for assessing many of the cardiovascular parameters, including pulmonary artery systolic and occlusion pressures.[3,4,5] Echo can provide additional information as compared with a PA-C, including wall-motion abnormalities, ejection fraction, valvular anomalies, PFOs, and pericardial effusion/tamponade. Clinicians can obtain a bedside visual assessment to clinical status and real-time response to intervention. Echo is minimally invasive and, therefore, associated with less morbidity than PA-C. And unlike placing a PA-C, which requires a fully sterile prep and drape, there is almost no preparation required (especially for transthoracic echocardiography), so information can often be obtained more quickly.

Until recently, intensivists have relied on cardiologists for obtaining their images. This often entails contacting the cardiology service, waiting for the sonographer to obtain the images and again waiting for the physician to interpret the results. With so many layers, the results are often delayed. Many intensivists, therefore, have undertaken to perform their own bedside echo exams. When bedside echocardiography in the ICU is performed by an intensivist, images can be obtained and interpreted within the clinical context and interventions can be made immediately. The efficacy of the intervention can be reassessed without having to ask the sonographer to return for a second study.

The question remains as to whether intensivists are the appropriate clinicians to perform bedside echo on critically ill patients. Manasia et al. performed limited transthoracic echo (TTE) on 91 critically ill patients to assess LV size, function and volume, and to rule out significant pericardial effusions. They were able to successfully obtain images 94 percent of the time and interpret their studies correctly 84 percent of the time when reviewed and repeated by an echocardiographer. Their data yielded new cardiac information that changed their management in 34 percent of patients. They obtained useful information that did not change immediate management in 47 percent of patients. Mean "goal-directed TTE" acquisition time was 10.5 +/- 4.2 minutes. With these results, they concluded that with a formal training program, surgical intensivists can successfully performed and correctly interpret a limited TTE in critically ill patients. "This study supports incorporating bedside, goal-directed, limited TTE into intensivists' training programs."[6]

Studies such as this one have been replicated to show that with minimal training, intensivists can successfully obtain and interpret both transthoracic and transesophageal echocardiographic data.[7,8,9] In 2008, the guidelines published by the WINFOCUS (World Interactive Network Focused on Critical UltraSound) ECHO-ICU Group supported training intensivists in the use of focused echocardiography.[10]

In summary, incorporating focused echocardiographic exams into the training of intensivists has been shown to allow these clinicians to provide safer and more efficient care to critically ill patients.

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# Ultrasonography in Critical Care Series: How to Establish a Critical Care Echocardiography Program: The OHSU Experience


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We recently upgraded our ultrasound equipment in all of our intensive care units (ICUs), which created the technical capability to perform transthoracic echocardiography (TTE) at the bedside on our critically ill patients. Quickly, it was clear the machines were smarter than we were. In addition, we realized that members of our team had widely varying levels of echo experience. To avoid a frustrating experience for everyone, we decided to establish a critical care TTE education program for our ICU faculty. The goal was to acquire and maintain competency in obtaining high-quality studies with reliable interpretation. In collaboration with cardiologist Kevin Wei, M.D., we designed a training and proctoring program. Kevin was part of the American Society of Echocardiography/Emergency Medicine working group that defined their scope of practice[1] and is very familiar with use of TTE by non-cardiologists.

A substantial body of literature suggests non-cardiologists can acquire the necessary skills for a focused TTE in a reasonable amount of time.[2,3] We limited our focus to four pathologies that require rapid recognition and treatment: 1) pericardial effusion with tamponade, 2) LV systolic dysfunction, 3) RV systolic dysfunction and 4) hypovolemia.

Our training plan consists of didactics reviewing ultrasound physics, standard image location and probe positioning, normal findings and pertinent findings of the four pathologies. Each of the theory sessions is followed by hands-on scanning under the supervision of an experienced sonographer. The focused exam follows a standardized approach in image acquisition: 1) long axis parasternal view, 2) short axis parasternal view, 3) apical views (4-chamber, 2-chamber and 3-chamber view) and 4) subcostal view (4-chamber and IVC assessment). Initial scans were performed in the echocardiography lab on healthy volunteers to gain proficiency in standard image acquisition. This is followed by time spent with one of our sonographers in the unit or the echo lab. Scans performed within the proctoring process are stored and uploaded to our central imaging server. A standardized, preliminary report is created for each study by the performing intensivist, and the study is then formally over-read by the mentoring cardiologist. Direct feedback is provided in person to the proctored intensivist, including (if available) comparison with comprehensive (i.e., a full exam performed by a sonographer and interpreted by a board-certified echocardiographer) echocardiography study results. Troubleshooting to improve image acquisition and possible misinterpretations can be discussed within hours of study acquisition. We found that ensuring that intensivist-acquired studies are reliably stored in the same archiving system used by cardiologists was both pivotal and challenging, requiring significant coordination with IT. The proctoring process is completed after a minimum of 25 scans have been performed including at least one demonstrating each of the four pathologies. To complete the proctoring process, the intensivist is required to demonstrate acceptable image quality as determined by the proctor, as well as pass a written exam.

We are currently in the process of proctoring the second generation of faculty intensivists and plan to have trained the majority of the group by September 2011. We were surprised at the extent to which the interaction between intensivists and cardiologists improved through this process. However, it is fair to say that we had to overcome some hurdles. This included the technical challenge of moving images through the network, making the required time commitment to get through the curriculum and the practice scans, and most importantly receiving the needed feedback to improve our performance and to ensure that this process was consistent with our institutional credentialing committee. In order to ensure ongoing feedback and continuing improvement of our skills, we continue to have close interaction with our cardiology echo lab and established an institutional review board (IRB)-approved database to track our studies and compare them with comprehensive echo reports.

In the absence of a formal mechanism of ensuring competency and proficiency in focused echocardiography, our approach has allowed us to implement this in an organized and well-accepted fashion within our institution. We hope others can adopt similar approaches within their institutions and integrate this important monitoring tool in their critical care practice.

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# Ultrasonography in Critical Care Series: How to Start a US Program From the Ground Up

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In the past decade, the use of portable ultrasound machines by noncardiologists has rapidly increased.[1-3] It is now well-recognized that a focused echocardiographic examination, tailored for gross assessment of volume status, left and right ventricular function, presence or absence of pericardial effusion, is an important tool in patient care.[4-6] Furthermore, data suggest that focused echocardiographic examinations can be learned and carried out proficiently by physicians with limited training in echocardiography.[7,8] There is, therefore, a need for critical care programs to establish curricula that will provide this training.

In contrast to the guidelines that exist for perioperative transesophageal echocardiography,[9] none exist regarding the knowledge base and practice required for a clinician to be considered competent in point-of-care transthoracic echocardiography (POC-TTE). This lag in guidelines highlights the relative novelty of portable echocardiography technology, but it also reflects the larger and more varied needs of its target clinicians, whose members include intensivists, emergency physicians and internal medicine physicians.

In this article we discuss how we created an ultrasound training program in Stanford's Department of Critical Care Medicine, hoping our approach and experience can be useful to health care providers seeking to establish similar programs in their respective critical care units.

Before setting up the ultrasound teaching program, it will be important to define the objectives regarding the participants, the curriculum, the equipment and the interactions with other teams in the hospital.

## Participants

Two groups will be involved in the ultrasound training program: the teaching team and the students. Ideally, the main instructor will possess a broader, deeper knowledge base than what is contained in the actual curriculum materials developed. If possible, the instructor should be a certified echocardiographer, experienced in scanning as well as interpreting echocardiographic data from critically ill patients. Students can be at any level of training — residents, critical care fellows or attendings interested in learning a new tool — but they should be a focused, stable group. After gaining experience, they will later be able to train subsequent students and a larger group. At Stanford, though everyone in these three groups is welcome to participate in the echocardiography didactics, our focus is on the critical care fellows.

Once it is decided that training in echocardiography is to be included in the critical care fellowship, the next step is to establish whether the training will be mandatory or elective. Each approach has advantages and disadvantages. In a mandatory program, instructors will presumably be highly committed, but organizing protected time for training students may be difficult in a busy clinical program. Although the initial investment in a mandatory program will be high, better inter-student teaching possibilities will ensue, and bedside ultrasound will be integrated into patient care. On the other hand, because an elective program will address a smaller group of trainees with a special interest in ultrasound, it may be easier to obtain protected time for students and give them more individualized training.

At Stanford, we decided to make basic training in POC-TTE mandatory for all critical care fellows, with the possibility to take an elective rotation in POC-TTE to have access to further training.

Don't forget ancillary staff when launching a new ultrasound program. A nursing staff aware of the objectives of POC-TTE and its role in patient care is more amenable than an unaware staff to facilitating the performance of repeat echocardiograms in critically ill patients.

## Curriculum

When you create your curriculum, bear in mind the scope of the program; for example, the intent of point-of-care echo in the institution as well as the depth of teaching anticipated (basic 2D echo versus advanced color and Doppler techniques).

Formal didactic lectures should cover key concepts in echocardiography, including transthoracic windows for assessment of cardiac anatomy, left and right ventricular function, pericardial effusion and volume status. The lectures should provide practical examples of the role and limitations of POC-TTE in the management of critically ill patients. Ideally, most didactic lectures should occur at the beginning of the program to allow students to learn concepts and understand training aims. Each didactic lecture should address clearly stated objectives and be heavily biased toward visually presenting example images appropriate for analysis as well as examples of misleading images.

Didactics should be structured so that students graduate from being passive to active learners. Lectures should be quickly followed by one-on-one scanning training to ensure adequate development of a student's scanning skill set. Students should be given protected time for these scanning sessions.

Early on, a simulator model for TTE may be helpful in orienting students to the anatomy and planes of each view; however, training on patients with the support of a skilled provider is critically important. In our program, the scanning sessions are organized as follows: 1) The clinical team provides the scanning team a list of patients to scan, a rapid description of the patients' status, and a question to address, for example, "*what is the patient's volume status"* or "*is the left ventricular function normal"*? 2) After performing POC-TTE, the scanning team reports and discusses the results of the ultrasound examination with the clinical team, which integrates these results into the patient's management. 3) After a few months, all clinical fellows are trained in POC-TTE and they use focused echocardiography routinely to assess and manage patients during their clinical rotations.

Presently, no clear guidelines exist as to how many complete scans or how many scanning hours must be obtained with an instructor. At Stanford, we attempt to provide each fellow with an average of 20 hours scanning time with an instructor. Once comfortable obtaining basic images, the student scanner can hone these skills by scanning patients already scheduled for a formal TTE. The student can then compare his/her images with those obtained by a professional echocardiographer, allowing for refined and objective feedback.

As the course progresses, important points will be continuous training and quality control. Students should be asked to perform unsupervised echocardiographic exams and form their own interpretations. Our goal is for each fellow to perform at least 30 unsupervised examinations. The role of the instructor will be to review the quality of the images acquired, the adequacy of their interpretation and to give feedback to the students. Trouble-shooting sessions can then be created as needed. The organization of regular TTE reviewing sessions can also facilitate the sharing of student experiences regarding image acquisition as well as the images obtained with the rest of the team.

Objective assessment of trainees' capabilities in scanning and interpreting POC-TTE data should be emphasized. To assess the student's fund of knowledge, a written exam can be designed, based on echocardiographic films, to ensure that the student can correctly interpret pathognomonic echocardiographic images. We use a web-based test that incorporates both technical (e.g., orientation of the transducer for each view) and interpretive questions (e.g., questions about previously acquired that represent a wide scope of diseases). If available, use an echo simulator to assess the combination of scanning and interpretation skills. Once POC-TTE becomes a routine tool in managing critically ill patients, organize periodic Q and A sessions as a way to measure and control quality.

## Equipment

An important aspect of starting an ultrasound program is acquisition of one or more new echocardiography devices. In making choices, be sure to consider sturdiness, portability, versatility, ease of use and quality of images, as well as the extent of the equipment's capability (point-of-care versus more advanced). Because these devices are expensive, establish clear guidelines about who can access the device, who will be responsible for access and who will maintain the device. In addition, devise a protocol for acquiring and storing images, as reviewing them will be integral to learning. Images can be stored on a local network or an independently maintained network such as PACS. In our institution, the ultrasound devices are kept in a locked room, accessible only to fellows and nurses. For review and storage purposes, the echocardiographic examinations and their interpretations are uploaded in the cardiac echolab PACS system. The POC-TTE images and report are merged with the formal patient's echo folder.

## Interactions

Other important considerations are promoting interactions between the point-of-care echocardiographers and existing clinical teams. These interactions produce valuable feedback and training that supplement the formal didactics. In addition, as other clinical teams come to value the insight obtained from point-of-care testing, students' roles in the clinical decision-making process in the hospital will expand. It is therefore critically important that the fellows trained in POC-TTE have a sense of both the strengths and limitations of the data that they may provide.

In conclusion, point-of-care transthoracic echocardiography is a valuable tool in a clinician's arsenal and can improve clinical decision-making. If dedicated faculty, protected time for students, proper equipment, and planned, explicit interactions are built into an institution's echocardiography program, patients, trainees, educators and clinicians will all benefit.

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# Organization Profile: Looking for a Doctor in the House… and Senate

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Here are just a few of the tough issues on the national agenda where training and experience might make a physician an especially valuable contributor to congressional debate.

- The ongoing health care debate and the fate of Medicare and Medicaid.
- Availability and regulation of prescription drugs.
- Funding for and oversight of medical research.
- Emergency preparedness.

## A comparable list could surely be assembled for state legislatures.

The new Congress will include 19 doctors in the House and two in the Senate – but only one of these is a woman, ophthalmologist Nan Hayworth. (Another woman physician, Donna Christensen, is a non-voting delegate to Congress from the U.S. Virgin Islands.) With our nation facing daunting problems on every front, an expert's knowledge and way of approaching problems seem more urgently needed than ever in the halls of government. We must draw on the full mix of available talents, interests, backgrounds and experiences when choosing the leaders who will set our policies. The Center for American Women and Politics (CAWP), a unit of the Eagleton Institute of Politics at Rutgers University, has long contended that our country suffers when we form our governing bodies from only a small pool of possibilities – traditionally, white men from a narrow range of professions.

That's why CAWP has joined forces with California political strategist Mary Hughes to create The 2012 Project. This national, non-partisan campaign aims to increase the number of women in legislative office (at the Congressional, state and local levels) by identifying and engaging accomplished women 45 and older from fields and industries that have been underrepresented in government. Health is one of those fields, along with finance, science, technology, energy, environment, small business and international affairs. Outreach to women of color and diverse backgrounds is also a priority.

Women who are well-established in their careers and approaching the end of their most time-consuming family responsibilities may be looking for new ways to apply their energies. To them, we say, "Run for office in 2012!"

## Why The 2012 Project?

The year 2012 presents a once-in-a-decade opportunity for women to increase their numbers in office. Following the 2010 census, every congressional and state legislative district in the country is being redrawn, and new and open seats will be created. We know that political newcomers, including women, have more success winning open seats. By significantly increasing the number of women who run for office during the post-reapportionment election year, we can increase the number of elected women.

Electing more women is in part a matter of fairness. More than half the U.S. population is female, but at no level of government do women hold even as many as a third of the available offices. The 2010 elections saw the first significant drop in the number of women officeholders, particularly at the state legislative level; only about 17 percent of the U.S. Congress is female, along with just six governors and less than a quarter of all state legislators. Ranking nations around the world based on the proportion of women in their national congresses or parliaments, the U.S. is tied with Turkmenistan in 73rd place, according to the Inter-Parliamentary Union.

If it were just a numbers game, many might find the underrepresentation of women in government a less-than-urgent problem. But research from CAWP and others has demonstrated that having women in public office changes both the political process and the policies that emerge from it.

## Women Make a Difference: Addressing Women's Well-Being

Take the case of women's health. A CAWP study of Congress found that female representatives were stronger advocates for victims of domestic violence, for women's health, and for funding of breast cancer research and

screening. As one example, prior to 1992, most National Institutes of Health-funded medical trials were conducted on groups of men only, and those results were simply assumed to apply to women. One congresswoman joked at the time that "even the lab rats were white males." After 1992, Congresswomen Pat Schroeder (D-CO) and Olympia Snowe (R-ME) led their female colleagues in calling attention to the flawed practices and forced NIH to include women in clinical trials. Today, women lawmakers remain in the vanguard of those monitoring funding and rules surrounding gender-based health issues.

Women like these don't just change the content of the public agenda; they also alter the way the governing process works. Both women and men in legislatures agree that women have brought greater openness to government, opting for more inclusiveness and more "sunshine" to ensure that all affected parties have a chance to listen and speak up as laws are written.

## 2012: Positioning Women for Power

What will it take to get more women into public office? Drawing on research, The 2012 Project starts from the assumption that women may need some prodding, or even an invitation, to run. A recent CAWP study found that most women state representatives ran for their first elective office because of encouragement. Women were far less likely than men to be "self-starters" who said their initial decision to run for office the first time was entirely their idea.

So The 2012 Project is meeting women on their own ground – whether in publications such as this one that professionals read, or at meetings where people gather to talk shop – and issuing those invitations. And among the inviters are women who know both the rewards and the stresses of office-holding, because they've "been there, done that." The 2012 Project faculty of former elected women lawmakers and other public officials is sharing the facts about women's underrepresentation and the need for a national, coordinated effort to elect more women. When they speak, faculty members share why they ran, what they accomplished, and the difference it makes to have women setting the agenda and making decisions about public policy.

Once women are convinced to look seriously at the possibility of taking the next step toward a candidacy, The 2012 Project can connect them to the leadership institutes, think tanks, campaign training programs and fundraising networks in their own states. Dozens of organizations have joined us as allies, indicating their readiness to reach out to potential candidates with essential training and services that can help them make the decision to run and equip them for success.

## What If I Want to Run?

If you're convinced of the need, but don't know where to begin, The 2012 Project can help. The process begins when you visit the website at **www.the2012project.us** and click "Take Action" – or e-mail **info@the2012project.us**. You can email the same address if you'd like a speaker for your organization about The 2012 Project and the need for more women to run. We look forward to watching you and your colleagues becoming tomorrow's legislative leaders!

# First Annual SOCCA Ultrasound Workshop

On Thursday, October 13, 2011, from 1-5 p.m. at the Hilton Chicago, the Society of Critical Care Anesthesiologists (SOCCA) will be conducting its first annual ultrasound workshop. This course will cover an introduction to critical care ultrasound (CCU) and will include introductory lectures on transthoracic echocardiography of RV and LV function and severe valvular heart disease, thoracic ultrasound, basic abdominal ultrasound, ultrasound for vascular access and rescue transesophageal echo. Following the didactic session, there will be small-group, hands-on stations to practice the skills taught in the lectures. Each small group will have an instructor and will use live models, simulators and state-of-the-art ultrasound equipment from Siemens, GE, Phillips, Zonare, Sonosite, ImaCor and Mindray North America. This workshop will be open to only 42 participants, so sign up early. Registration information will be available late July on the SOCCA website **www.socca.org**. We look forward to seeing you at this exciting workshop!

# Literature Review: Is ECMO the Next Revolution in Resuscitation?

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Shin TG et al. Extracorporeal cardiopulmonary resuscitation in patients with in-hospital cardiac arrest: A comparison with conventional cardiopulmonary resuscitation. *Critical Care Medicine.* 2011; 39(1):1-7.

In medical practice, many novel interventions are initially perceived as experimental or highly aggressive. In some cases, research and experience eventually validate these interventions as safe and effective and they enter wider practice. Others fade from use or remain salvage therapies.

One such new modality is the use of extracorporeal membrane oxygenation (ECMO) in cardiopulmonary resuscitation (CPR). ECMO provides oxygenation, carbon dioxide removal and some degree of hemodynamic support. It has long been used in pediatric patients with severe respiratory failure, especially due to neonatal respiratory distress syndrome (RDS). More recently, ECMO has become more widely used in adults, including as a mechanical support in cases of in-hospital cardiac arrest. While there have been several studies showing promising effects of this therapy,[1] randomized trials are understandably difficult to conduct. In a recent study published in *Critical Care Medicine*, a group from Samsung Medical Center in Seoul, South Korea, evaluated their experience with "extracorporeal resuscitation" and compared it with conventional resuscitation. Samsung Medical Center has an ECMO team available at all times, including a cardiac surgeon, and a small, portable ECMO cart that can be rapidly brought to a remote CPR location within five-10 minutes, facilitating the institution of ECMO in patients outside the operating room, catheterization lab or intensive care unit.

This was a retrospective, observational study. Patients were enrolled between age 18 and 80 who underwent CPR for more than 10 minutes after a witnessed in-hospital cardiac arrest between 2003 and 2009. ECMO-assisted CPR was considered particularly in patients who had prolonged arrest (>10-20 minutes), recurrent arrest, or severe cardiac disease/heart failure that would make successful conventional CPR less successful. Exclusion criteria for ECMO included age > 80 years, severe neurologic damage, current intracranial hemorrhage, advanced malignancy, trauma with uncontrolled bleeding, sepsis, irreversible end-organ dysfunction and previous DNR status. Patients in the ECMO, or E-CPR, group were matched with patients who underwent conventional CPR, or C-CPR, via a propensity analysis. Variables used in this analysis included age, gender, comorbidities, cause of arrest, location of arrest, duration of CPR and disease severity score. Patients were exactly matched based on time period and initial rhythm. After matching, the two groups were compared using a multivariate analysis. The primary outcome of interest was survival to discharge with minimal neurologic impairment, as defined by the Glasgow-Pittsburgh cerebral performance categories score. Secondary outcomes included in-hospital survival and six-month survival with minimal neurologic impairment.

Individuals in the matched groups had a mean age of roughly 61 and were predominately male. They had a high rate of cardiovascular disease and, indeed, over 90 percent of arrests were deemed to be cardiogenic in nature. Roughly half of all arrests occurred in the ICU, O.R. or cath lab. The initial rhythm was most frequently pulseless electrical activity (PEA), followed by ventricular tachycardia/fibrillation (VT/VF), and mean duration of CPR was 38 minutes. Notably, looking at the primary outcome, 23 percent of E-CPR patients made it to hospital discharge with minimal neurologic impairment, as opposed to 5 percent of C-CPR patients. The odds ratio was 0.06, strongly favoring E-CPR, in the multivariate analysis. With regard to six-month survival with minimal impairment, the hazard ratio was 0.38, also favoring E-CPR. These results held up when adjusted for propensity scores. Similar results were found in the subgroup of patients with a cardiogenic cause of arrest. As one might expect, these results were magnified in the subgroup of patients with arrests longer than 30 minutes; 19.2 percent of these patients survived when given E-CPR, as opposed to 1.9 percent with C-CPR.

This study had several limitations. As a retrospective observational study, there may have been significant confounding variables that were not accounted for in the multivariate analysis, and bias may have been introduced in how attending physicians decided which patients to select for ECMO. Also, because most of the propensity-matched patients had cardiogenic arrests, it is unclear if E-CPR would benefit patients who arrest from non-cardiac causes.

So should ECMO see broader application in CPR? The answer to this loaded question depends largely on resource availability and patient population. If ECMO is easily available, patients with severe cardiac disease suffering a consequent cardiac arrest may benefit from the use of this therapy. For all others, the jury is still out, and ECMO will likely remain on the outskirts of respectability.

*Continued on page 14*

# Literature Review: BV Analysis and PAC, Compared to PAC Alone

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*"A prospective randomized trial using blood volume analysis in addition to pulmonary artery catheter, compared with pulmonary artery catheter alone, to guide shock resuscitation in critically ill surgical patients"*

Mihae Yu, Kevin Pei, Sharon Moran, Kurt Edwards, Shirley Domingo, Susan Steinmann, Maimona Ghows, Takiguchi, Andrew Tan, Fedor Lurie and Danny Takanishi, Jr., Shock. 2011; 35(3):220-228.

The optimum end point of fluid resuscitation in critically ill patients remains unknown. Measuring central pressures (CVP, PCWP) does not always accurately reflect intravascular volume status. Measurement of actual blood volume (BV) has been proposed as a potentially more accurate end point of resuscitation.

In this prospective, randomized trial of 100 critically ill surgical patients in septic shock, severe sepsis and respiratory failure, patients were randomized to:

1. **Control Group**, which received pulmonary artery catheter(PAC)-guided resuscitation and Hct to guide PRBC transfusion.
2. **Intervention** Group, Blood Volume Analysis (BV) in addition to PAC measurements were used for fluid resuscitation and PRBC transfusion.

Goals of the study were: assessment of the number of times blood volume data resulted in change in treatment; whether treatment resulted in favorable or unfavorable response; whether there were differences in ventilator, ICU or hospital days; and whether there were differences in mortality.

## Measurements:

Resuscitation start time was defined as the time of arrival to the ICU or PAC catheter insertion. This was accomplished within 24 hours of PAC insertion using the preset guidelines.

Tissue ischemia was measured using lactic acid level and the PtCO2 response to FiO2 of 1.0, called OCT. (non-invasive surrogate for SVO2 in patients without a PAC).

Blood volume (BV) analysis:

Using BVA analyzer, BV was determined from serial of 5 blood samples after injection of human albumin tagged with Iodine 131. Baseline Hct was determined prior to albumin injection. After 12 min of mixing, radioactivity was measured at 12, 18, 24, 30 and 36 min and extrapolated to time zero to calculate plasma volume (PV) with use of norm based on body composition, (deviation from ideal body weight - Metropolitan Formula).[1] The red blood cell volume (RBCV) was derived based on the calculation: Hct = (RBCV)/(RBCV + PV), total BV = PV + RBCV. These measurements were done at four different time points after resuscitation-BV1 12-36 hrs; BV2 -24-36 hrs after BV1; BV3 24-36 hrs after BV2; and BV4 5 -7 days after study enrollment. All patients staying in the SICU for 5 days regardless of their randomization received four BV tests. However, the medical team carrying for the control group was blinded to the results of these tests.

## Analysis:

Independent – samples t-tests and chi-square tests or Fisher exact test were used to analyze continuous and nominal data respectively. The level of significance was set to 0.05.

## Results:

The baseline characteristics of the two groups were similar. There was a significant survival advantage in the BV group. Although the BV group had 5.4 less ventilator days and 11 less hospital days, these differences were not statistically significant. Within the first 36 hours of resuscitation, there were no differences in outcome between the control and interventional group. However, from day 2 to day 7, the control group demonstrated significantly lower Hct and higher deviation from the ideal PV and BV values compared with the BV group. In addition, during the first 7 days, BV information if available in the control group would have changed treatment in a significant number of times as compared to the intervention group (the BV group). Therapeutic interventions included timing for transfusion, diuresis and fluid administration.

## Discussion:

The results of this randomized trial suggest that our estimates of intravascular volume (central venous pressure, PCWP or other PA catheter measurements) and current triggers for PRBC transfusion (hemoglobin and hematocrit level) are inferior in guidance of fluid replacement, transfusion and diuresis in critically ill septic shock patients when compared to the blood volume measurements. Benefits of BV analysis occur after the initial resuscitation, when the patients have total body fluid elevated with edema and weight gain. The optimum PV

*Continued on page 14*

and RBCV associated with survival in critically ill patients may differ from the optimum BV in a normal population. The authors aimed for a slightly elevated blood volume goal (0 – 16%).[2] In this study BV measurements showed a better relationship to clinical parameters and outcome. It appears that timeliness of treatment played a significant role that resulted in better outcome in BV group underscoring the importance of meticulous fluid management for clinical outcomes beyond the first 24 hours resuscitation. Based on BV measurements that were done for a limited number of subjects in the BV group beyond the first 7 days, tailored and individualized fluid management is likely needed throughout the hospital stay in order to achieve the best possible clinical outcomes. It is worth pointing out that even in the BV group, treatment alterations were required 44% of a time reflecting the need for ongoing, continuous monitoring as the patients do experience the rapid and continuous changes in their intravascular volume. As both study groups had advantage of having the PAC and or CVP measurements, it appears that a combination of the PAC/CVP and BV measurements can be used to optimize patient care. Hospital and ICU LOC, and the number of ventilator days were not significantly different between the groups, but this is likely due to small sample size. To date, early goal directed resuscitation in sepsis and septic shock is the only method that has been shown to improve mortality.[3,4] In the perioperative management of surgical patients a number of studies have shown decrease length of ICU and hospital stay when resuscitation was guided with non-invasive cardiac output monitors in a goal directed protocol.[5] Guidance of resuscitation with BV measurements in critically ill patients holds a promise of improving patient care.

This study had several limitations. It appears that a sample size was small based on large SD, assuming that the data are normally distributed. It is a single center study limiting generalizability of the study results. The study period is limited to the first 7 days, and not for the entire hospital stay. It would have been desirable to see the randomization procedure and the flow of participants through the trial.

In summary, this is an important study that demonstrated decrease in mortality in SICU patients with severe sepsis and septic shock wherein directly measured BV data were used in addition to PAC measurements to guide fluid replacement and PRBC therapy. These results require further investigation with a larger multicenter trial to confirm reproducibility and broader use of this methodology.

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## Multiple-Choice Question:

What is the best endpoint of resuscitation in patients with sepsis and septic shock during ICU care, after 24 hours of treatment?

A. PA catheter resuscitation guidance to achieve mixed venous saturation (SVO2) 65-85%, Hgb greater than 7/mg/dl, normal lactic acid level and adequate urine output.
B. PA catheter and blood volume measurements (Plasma volume, red blood cell volume, total blood volume) to achieve a mixed venous saturation (SVO2) 65-85%, adequate hemodynamics, normal lactic acid level, adequate urine output and blood volume measurement goal: blood volume (BV) 0-16%, red blood cell volume (RBCV) 0-20% of ideal.
C. Pulse contour analysis resuscitation guidance to achieve euvolemia by "passive leg rest" - stroke volume variation less than 12%, adequate hemodynamics, Hgb greater than 7mg/dl, normal lactic acid level, adequate urine output.
D. PICCO catheter resuscitation guidance to achieve adequate intravascular volume status (Global end diastolic volume index -GEDI, Pulse pressure variation - PPV, Stroke volume variation - SVV), adequate oxygen delivery and consumption – central venous saturation- (ScVO2) 70-90%, adequate hemodynamics, normal extravascular intrathoracic lung water, Hgb greater than 7 mg/dl, normal lactic acid level, adequate urine output.

Answer: B

## Literature Review: Is ECMO the Next Revolution in Resuscitation?

*Continued from page 12*

### Endnotes


1. Chen YS, Lin JW, Yu HY, et al. Cardiopulmonary resuscitation with assisted extracorporeal life-support versus conventional cardiopulmonary resuscitation in adults with in-hospital cardiac arrest: An observational study and propensity analysis. *Lancet* 2008; 372: 554–61.


### Multiple Choice Question:

Based on the article by Shin et al., extracorporeal membrane oxygenation (ECMO) would most likely be a useful strategy in which of the following clinical situations?

A. An 88-year-old man with ischemic cardiomyopathy and cardiogenic shock.
B. A 35-year-old woman in pulseless electrical activity from bleeding and hypovolemia after a motor-vehicle collision.
C. A 59-year-old woman who is found pulseless and apneic due to a subarachnoid hemorrhage.
D. A 70-year-old man in ventricular fibrillation after an acute myocardial infarction.
E. A 61-year-old woman with metastatic renal cell carcinoma, pneumonia, and an acute hypoxic respiratory arrest.

Answer: D

# Literature Review: Proportional Assist Ventilation (PAV)

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Application of positive pressure to patients who are spontaneously breathing can be challenging.[1] Pressure support ventilation (PSV) is the most prevalent mode utilized for spontaneously breathing patients, but proportional assist ventilation (PAV), a newer mode that is now feasible with recent advances in ventilator technology, may be considered in selected cases. The objectives for this concise review are to explain the concept of PAV and to briefly review relevant evidence that may support its use in certain clinical settings.

## Principles of PAV

Introduced in the late 1980s and first described by Younes et al. in 1992,[2] PAV is a mode of synchronized partial ventilatory support designed to generate pressure assistance in proportion to a patient's own respiratory effort.[3] To comprehend this mode, familiarity with the *equation of motion* is helpful.[1, 3-5]

$$P_{total} = P_{vent} + P_{mus} = (V_T \times E) + (Flow \times R)$$

Total pressure ($P_{total}$) is equal to the sum of patient-generated muscular effort ($P_{mus}$) plus ventilator-generated pressure ($P_{vent}$). $P_{mus}$ $+P_{vent}$ are influenced by the product of tidal volume ($V_T$) times elastance (E; 1/compliance) plus flow times airways resistance (R). Current ventilators, such as the Puritan Bennett 840 (PAV+® software, Coviden, Dublin, Ireland), are capable of measuring flow, resistance and elastance.[1] $P_{vent}$, which is *fixed* with PSV, is adjusted *dynamically* with PAV on a breath-to-breath basis with the delivery of a proportional amount of inspiratory pressure. For example, if the PAV level is set at 50 percent, the ventilator provides 50 percent of the calculated pressure, with the remaining pressure generated by the patient. PAV applies pressure in direct proportion to $P_{mus}$, thus improving coordination with the patient's ventilator demands. Pressure, flow, volume and time do not need to be set by the clinician since the patient controls these variables.

## Comparisons With PSV

A principal advantage of PAV over PSV is improved ventilator-patient synchrony. Xirouchaki et al. demonstrated improved maintenance of spontaneous breathing and less asynchrony when PAV was compared to PSV in a randomized trial of 208 patients.[6] In this study, fewer patients randomized to PAV required a change to controlled mechanical ventilation compared to PSV (OR 0.44, 95% CI, 0.21-0.95, p=0.04). PAV has also been shown to unload the inspiratory muscles and reduce the work of breathing more than PSV[7] and may be more comfortable for patients.[8] In a randomized crossover trial of 13 patients, PAV was found to improve sleep in the ICU compared to PSV, with fewer arousals per hour of sleep (16 vs. 9, p=0.02) and better quality of sleep as measured by polysomnography.[9] These benefits may have important implications for decreasing the incidence of delirium and psychological stress in ICU patients.

Despite favorable improvements in patient-ventilator interactions, most studies to date have failed to show well-defined benefits for PAV in terms of other outcomes such as length of stay, mortality or ventilator days, when compared to PSV.[3, 10] Furthermore, while current data suggest that PAV can sustain the same patients requiring PSV, the mode has yet to be formally studied in surgical patients.[1]

## Use in ARDS and COPD

Two small studies have examined the role of PAV compared to PSV or CPAP for ARDS and COPD. PAV was compared to PSV, and used for a brief duration (30 minutes) in a population of 12 patients with ARDS due to sepsis.[11] PAV improved cardiac index (4.4 ±1.6 vs. 4.1±1.3, p<0.05), but there were no other significant benefits in terms of dead space ventilation, oxygenation, or other respiratory or hemodynamic parameters. Patients on PAV had significantly lower tidal volumes (7.7±1.9 vs. 8.0 ±1.6) and higher respiratory rates (24.5±6.9 vs. 21.4±6.9). The authors concluded that both PAV and PSV had clinically comparable short-term effects on gas exchange and hemodynamics.[11] In a study of nine hypercapneic COPD patients in hypoxemic respiratory failure, PAV was found to have significantly fewer missed respiratory efforts compared to PSV (1.7 to 13.6 vs. 0.2 to 5.4, p<0.05), although the clinical significance of this finding was unclear.[12] No other significant differences were found in terms of hemodynamics or oxygenation parameters. It should be noted that in both of these studies, ventilator software to continually monitor and adjust for compliance and elastance was not employed.

## Conclusion

Despite the absence of clinical data to support a clear outcome benefit, PAV remains an intellectually appealing ventilator modality from a physiological standpoint. Though clinical

*Continued on page 19*

# PRO/CON: The Role of Muscle Relaxants in Emergent Intubation

*The airway team is called to a medical floor to intubate a 75-year-old patient in respiratory distress. The patient apparently aspirated and now has an oxygen saturation of 89% on 100% $O_2$ via "non-rebreather mask." Our pro/con debate focuses on whether a muscle relaxant should be used for emergent intubations outside of the operating room.*

## Pro

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Muscle relaxants are used during airway management to improve intubating conditions and facilitate successful tracheal cannulation. Intubation without the use of muscle relaxants carries a significant risk for laryngeal and vocal cord morbidity.[1] Rapid sequence induction (RSI) is almost uniformly performed in emergent settings in order to expediently establish a definitive airway. Complications (such as aspiration and airway trauma) are increased when patients are not paralyzed and the success rate of RSI is increased with paralysis.[2] The major complications of emergent intubation are hypoxemia, hypotension and airway-related complications.[3] The use of muscle relaxants has been shown to be associated with a significant decrease in hypoxemia and airway-related complications.[4] For emergent intubations, RSI is a vital component in the establishment of a definitive airway. Multiple attempts when manipulating the airway should be avoided in order to minimize iatrogenic trauma and hemodynamic response. Even though the use of paralyzing agents outside of the operating room or emergency department is somewhat controversial, the need for optimal intubating conditions to achieve a secure airway is imperative, and paralyzing agents will undoubtedly improve the ease of intubation.[5]

The risk of the "cannot intubate-cannot ventilate" scenario has been widely used to discourage the use of muscle relaxants for emergent intubation. However, this risk is extremely low. Ketherpal et al. reported that in the operating room, only four out of over 53,000 patients could not be intubated and ventilated.[6] While one might argue that these only reported on non-emergent patients, the use of muscle relaxants has also evolved as standard of care for intubations in the Emergency Department.[2] Furthermore, in a recent evaluation of over 6,000 trauma patients, where neuromuscular blockade was administered for intubation, only four patients required emergency tracheostomy.[7]

There is compelling evidene to support the safety of muscle relaxation use in emergent airway management. In the hands of a skilled operator, the benefit of a paralyzed patient outweighs the risk. Paralysis affords greater hemodynamic stability, improved visualization of vocal cords, and increased likelihood of a secured airway on the first attempt.

## Con

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In the operating room, anesthesiologists routinely use paralytics to facilitate tracheal intubation. Outside of this relatively controlled environment, where anesthesiologists may be responsible for securing the airway, the use of muscle relaxants is controversial and may be more dangerous.

The main argument against use of muscle relaxants outside of the O.R. is the rare but real risk of a "cannot ventilate-cannot intubate" situation. The literature does not provide an accurate incidence of this event, but regardless, one might argue that even a single such situation costing a patient life is one too many. If the operator is trained, the use of a laryngeal mask airway (LMA) might avoid catastrophic situations; however, if non-anesthesiologists are called on to perform emergent intubations, they may not be familiar with this device. And, in many hospitals, surgical back-up is not readily available should a "cannot ventilate-cannot intubate" situation occur.

For rapid intubations, either succinylcholine or rocuronium, a nondepolarizing muscle relaxant (NDMR) is commonly used.[3] These medications are not without risk. Succinylcholine has numerous side effects. While the increase in serum potassium after dosing is clinically insignificant in most healthy individuals, patients requiring emergent intubation throughout the hospital may have spent days to weeks in bed or have one or more of the other conditions classically associated with fatal hyperkalemia after induction with succinylcholine.[8] Consequently, when arriving in the middle of the night to assess a patient in respiratory distress, with limited available clinical history we generally default to rocuronium. But rocuronium comes with its own set of complications. Compared to succinylcholine, it has a slower onset time and provides slightly inferior intubating conditions. Moreover, while listed in the class of intermediate-acting drugs, rocuronium's duration of action is unpredictable.[9] The prolonged action of NDMRs virtually ensures a patient will remain paralyzed long after induction sedatives have worn off, and there may be a high risk of awareness if adequate sedation is not provided.[10] While this is secondary to the need to rapidly secure the airway in an emergency, we should be aware that there is risk for psychological sequelae if adequate post-intubation sedation is not ensured.

The skill of the operator is the most significant factor contributing to successful intubation.[11] As such, if a team experienced in airway management is available to perform the intubation, then muscle relaxants may often be safely used.[12] Though video-assisted intubation is gaining popularity, it is unknown how this developing technique will change the performance and outcomes of emergent intubation.

Nonetheless, it is important to emphasize that safe airway management without the use of muscle relaxants is possible, and this approach is routinely used in some institutions with either topicalization and/or induction agents alone or in combination with narcotics.[13] In summary, while muscle relaxation may facilitate better visualization of the vocal cords, its routine use, specifically NDMRs, should only be employed by physicians who regularly perform emergent airway management.

*The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.*

## Expert Opinion

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The use of muscle relaxants for emergent intubation has long been an issue of debate. Recent evidence suggests that the use of muscle relaxants may decrease complications associated with emergent airway management. However, one must be aware of the risk of the "cannot ventilate-cannot intubate" situation. The question of whether or not to use muscle relaxants for emergent intubation might best be addressed by identifying in what situations "cannot ventilate-cannot intubate" is likely to occur. Kheterpal and colleagues studied operating room intubations and found that patients who are overweight, have a beard, overbite or have a high Mallampatti classification carry an increased risk for failure to mask ventilate and intubate.[14] In these patients, caution in the use of muscle relaxants might be prudent. In addition, hospital resources might dictate the use of muscle relaxants.[15] For example, in a tertiary care center with attending anesthesiologist supervision and the availability of immediate surgical airway consult, the risk of muscle relaxant is probably minimal On the other hand, for the clinician less skilled in airway management functioning as a sole provider, the risk benefit ratio for the use of muscle relaxants might be different. In our institution, we use a team approach to emergent airways consisting of a critical care attending, fellow, resident, respiratory therapist and back-up trauma surgeon for immediate surgical airway management. With this highly skilled team approach, we have had success with routine use of muscle relaxants.

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## Multiple-Choice Question:

Choose the correct statement regarding emergent intubation:

A. Rocuronium produces superior intubating conditions when compared with Succinylcholine.
B. Use of muscle relaxants is associated with increased complications during rapid sequence intubations.
C. Rocuronium is contraindicated in patients with hyperkalemia, prolonged immobilization, and recent burns.
D. Use of nondepolarizing muscle relaxants for emergent intubation may increase the incidence of awareness in patients while they are still paralyzed.

Answer: D

# Fellowship Review: UAB Anesthesiology/CCM Fellowship

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It is my pleasure to introduce you to The University of Alabama at Birmingham (UAB) Anesthesiology/Critical Care Fellowship.

The UAB Hospital is the centerpiece of the UAB Health System, which consists of four distinct hospital settings. It is located in the Medical District of Birmingham on the University of Alabama at Birmingham campus. Ranked highly among major research centers and clinics, UAB Hospital is a 900-bed facility, which provides patients with a complete range of primary and specialty care services, as well as the most up-to-date treatments and innovations in health care. UAB Hospital is a major center for clinical research and the home of some of the top medical programs in America.

In 2004, UAB Hospital received a new "front door" to affirm our commitment to world-class care for patients across Alabama, the Southeast, and throughout the world. This 885,000-foot, 11-story cutting-edge facility opened in November 2004. The new hospital includes more than 40 operating suites and four intensive care units — trauma and burn intensive care, surgical intensive care, neuroscience intensive care, and cardiovascular intensive care, and a 38,000-square-foot emergency department. Furthermore, UAB is a major quaternary referral center for the state of Alabama, Mississippi, western Georgia, southern Tennessee and Florida's northern gulf coast. It has the state's only level 1 trauma center.

The anesthesiology/critical care fellowship program at UAB consists of nine clinical and three elective months, per ACGME guidelines. The Department of Anesthesiology has directorship of the Surgical Intensive Care Unit and the Neursociences Intensive Care Unit. Critical care fellows also have primary rotations in the Trauma-Burn ICU and the Pediatric Intensive Care Unit. Each clinical setting provides abundant opportunities to hone clinical and leadership skills on complex and challenging patients.

Fellow education is paramount at UAB. Each of the clinical faculty is very active and respected for both bedside and didactic teaching. While there is a critical care core curriculum for both fellows and ICU residents, the critical care fellows take part in a more advanced seminar-style learning experience that goes beyond the basics of ventilator management or treatment of sepsis. The critical care seminars focus on the latest innovative topics in critical care in a less formal setting that actively encourages lively discussion and debate. A simulation program tailored to the critical care fellowship curriculum will begin July 2011. Furthermore, a web-based curriculum, consisting of recorded didactic lectures, PowerPoint presentations, and mini-board style examinations provide our fellows with a cutting-edge educational program without the constraints of learning solely in a classroom setting.

Because of the diversity and richness of its clinical programs, UAB offers myriad options for fellows to tailor elective time to their interests and needs. For example, we work closely with the Division of Cardiothoracic Anesthesiology, whose faculty has developed a curriculum for obtaining basic TEE certification. Other popular rotations include critical care nephrology, led by Dr. Ashita Tolwani, who is nationally known in the field, the Medical Intensive Care Unit, and Infectious Diseases, in which UAB is recognized as a world leader.

Dynamic and growing, the Critical Care Fellowship at UAB offers the trainee the opportunity to work in a world-class medical center, which also happens to be located in a vibrant, beautiful city with classic southern charm and hospitality. Birmingham is nestled in the rolling foothills of the Appalachian Mountains and has nationally recognized restaurants as well as deluxe shopping and entertainment venues. Being located just four hours from the beautiful gulf coast beaches is an added plus.

# Call for ABA Critical Care Medicine Question Writers

The ABA Critical Care Medicine Examination Committee is seeking nominations for new question writers. Question writers will be responsible for preparing 15 multiple-choice questions per year from specifically assigned sections of the Critical Care Medicine Examination content outline. Question writers will be appointed for a three-year term during which they receive guidance and feedback from the Critical Care Medicine Examination Committee.

Qualified applicants must have valid, unexpired certification in critical care medicine. **Nominees certified in 1999 or earlier must be recertified in critical care medicine.** Individuals may self-nominate or be nominated by another ABA diplomate. If an individual is nominated by another ABA diplomate, the individual will be contacted to ensure that s/he is willing to be considered for a position.

The nomination and appointment process is as follows:

- To apply, please forward a letter of nomination with a copy of a current curriculum vitae and current contact information to the American Board of Anesthesiology, Inc., 4208 Six Forks Road, Suite 900, Raleigh, NC 27609-5735 or by fax to (866) 999-7503.
- Following receipt of the nomination and CV, the ABA will forward instructions on writing three multiple-choice questions, two of which will be from assigned areas of the content outline and one question in a content area of the applicant's choice. These questions must be submitted to the ABA no later than **August 1, 2011** and will be the basis for selecting new question writers.
- New question writers will be notified by October 1, 2011 and will receive their first writing assignments in early 2012.

## Proportional Assist Ventilation (PAV)

*Continued from page 15*

experience with PAV remains limited in the U.S., with improved ventilator technology, it is possible that this mode may become more prevalent for spontaneously breathing patients who require positive pressure. While there are still many questions left unanswered, the potential benefits relating to improvements in patient comfort, sleep and ventilator synchrony may justify the use of PAV in selected patients.

*Note*: An algorithm for applying and adjusting PAV on the Puritan Bennett 840 ventilator is available. Email **sgalvag1@jhmi.edu** for more information.

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### Multiple-Choice Question:

Based on the available evidence, an advantage of proportional assist ventilation (PAV) compared to pressure support ventilation (PSV) is:

A. Decreased length of stay for traumatically injured adults requiring mechanical ventilation.
B. Improved maintenance of spontaneous breathing and less patient-ventilator asynchrony.
C. Improved oxygenation and ventilation for spontaneously breathing patients with ARDS.
D. Decreased time-to-ventilator discontinuation in surgical patients.
E. Improved survival in patients with cardiogenic pulmonary edema.

Answer: B

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