N E W S L E T T E R

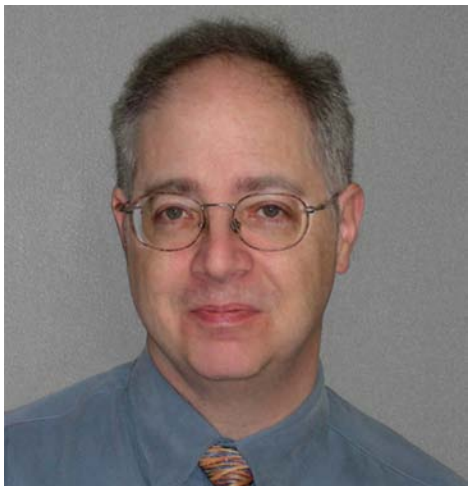
INTERCHANGE

SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS

Volume 22 Number 2 2011 www.SOCCA.org

President's Message

Busy Times



Michael F. O'Connor, M.D.

Over the past several months, our newly renamed Society has become or remained engaged in a variety of activities that are of great importance to its members.

The use of ultrasound in anesthesia and medicine is exploding, thanks to dramatic reductions in the cost of these units, significant improvement in their performance, and increasing expertise with these devices amongst our colleagues. This revolution happened far more quickly than anyone anticipated, and globally, institutions have lagged behind practice. This situation creates both liability and opportunity. The liability is that outsiders with various agendas might soon create an overlay of regulation and certification that could stifle or strangle the continued expansion of this technology. The opportunity is created by the present vacuum of both regulation and certification. Most of our membership employs ultrasound to facilitate central line insertion. Many or most of our members anticipate learning to use this technology to perform bedside echocardiographic assessment of patients in crisis, evaluate the pleural space for air and fluid, and evaluate the acute abdomen. In addition to using this technology to facilitate cannulation of vessels, it is almost certain that intensivists will soon be routinely employing it to evaluate patency and flow as well. A variety of statements have already been issued by a variety of societies, and several offer workshops for training in the use of ultrasound.

With the permission of the Board of Directors, a Task Force on Critical Care Ultrasound has been formed, and is being chaired by **Michael Wall, M.D.** of Washington University and **Danny Talmor, M.D.** of Beth Israel-Deaconess Hospital. Other task force members include **Benjamin Kohl, M.D., Elliott Fagley, M.D., Mathias Merkel, M.D., Aliaksei Pustavoitau, M.D., Michael Haney, M.D.** and **Daniel Brown, M.D.** The task force has already planned a half-day ICU oriented ultrasound workshop for *the day prior* to our Annual Meeting in Chicago. The group is charged with several other tasks, including assembling and reviewing statements by other societies regarding ICU ultrasound, possibly generating a statement for approval by the Board of Directors, and perhaps most importantly, generating guidance about the most reasonable training syllabus for certification or credentialing of our members in ultrasound in the ICU. It is unclear whether we will craft our own content and system, or partner with one or more other societies. All of this is a substantial project, and it is certain that Drs. Wall and Talmor will need more bodies to do all of the work as we go forward. As I write this, it is very likely that our 2012 meeting will be preceded by a day-long workshop in critical care ultrasound. There are many ways to get your group up to speed in Critical Care Ultrasound. We intend to invite representatives from institutions that have already enjoyed substantial success with this to tell their stories in a series of articles in our newsletter. Starting with this issue, the *SOCCA Interchange* will start publishing a series of articles covering issues that the task force is working on, under a section titled "Ultrasound in Critical Care Series" (see page 3).

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Planning for the Fellowship Program Directors Breakfast has already begun. **Ben Kohl, M.D.** is already working on discussion topics. One item that is certain to be on the agenda is incorporating ultrasound/echo training into critical care fellowships. Stay tuned for further details. Program directors everywhere owe a debt of gratitude to **Steve Deem, M.D.**, who recently established a long-overdue list-serve for fellowship program directors.

Maintenance of Certification in Critical Care (MOCCC) via the ABA is going to be a major undertaking for most of our members and for

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Remember, payment of your dues allows you to enjoy the full privileges of SOCCA membership.

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

The SOCCA Interchange is published by the Society of Critical Care Anesthesiologists, 520 N. Northwest Highway, Park Ridge, IL 60068-2573; (847) 825-5586.

Ultrasonography in Critical Care: SOCCA Recommendations for Training in Critical Care Ultrasound

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SOCCA Recommendations for Training in Critical Care Ultrasound

At the Program Directors' Breakfast on the final morning of the SOCCA meeting in San Diego, Dr. Benjamin Kohl (University of Pennsylvania) delivered a thought-provoking presentation on the use of ultrasound technology in the critical care environment. In that presentation, he asked a very poignant question: "Should we be training our fellows in the use of ultrasound in the ICU?" The response from those in attendance was a near-unanimous "Absolutely!"

Upon further discussion, it became clear that very few of us, however, are doing so. The identified barriers to training included lack of equipment, lack of training among faculty, lack of a defined syllabus, lack of a certificate of competency, difficulties in developing a robust quality assurance and quality improvement platform, and image storage and billing difficulties.

With the barriers identified, SOCCA President Dr. Michael O'Connor (University of Chicago) identified a group of interested and enthusiastic members and tasked us with overcoming those barriers and incorporating monitoring ultrasound competency into the arsenal of skills of Anesthesia Intensivists.

In a recent edition of *Critical Connections*, Dr. Aliaksei Pustavoitau (Johns Hopkins) discussed the many variables to be considered when purchasing ultrasound equipment for use in the ICU environment. With considerations ranging from cost of the each ultrasound machine to unit durability, he touches on the five most important questions to ask in regards to the hardware and software packages available from equipment providers. Most importantly, the decision about purchase should be based on intended clinical applications; these are limited only by the physical properties of ultrasound and the provider's imagination.

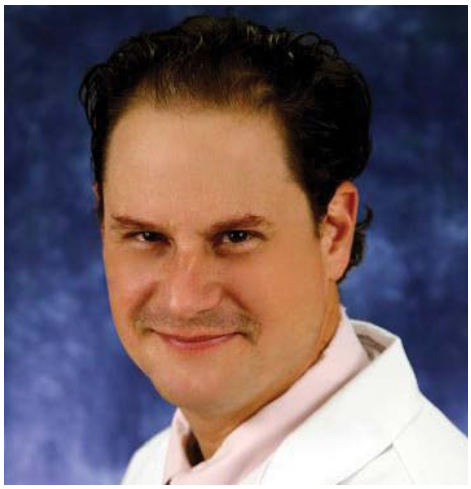
Historically, few anesthesia intensivists have received extensive training in surface ultrasound during their training. Over the past ten years, the utility of the modality has become more obvious and the equipment has become much more user-friendly. Additionally, we, as Anesthesiologists, have a long track record as early adopters of new monitoring modalities, as well as a recent history of successful incorporation of ultrasound into our intraoperative practice: TEE. With those considerations in mind, SOCCA will be offering a half-day course at our 2011 meeting in Chicago. Additionally, there are a number of ultrasound courses offered by other national groups.

As for training our fellows, there is clearly a need for a minimum of one month of exposure to a well-defined ultrasound curriculum. Realizing that the development of a critical care ultrasound program may be a significant hurdle for some programs to overcome, we will address the "nuts and bolts" of program development at the annual meeting as well. A number of programs, including but not limited to, Mayo Clinic Rochester, Beth Israel-Deaconess, Stanford, and Oregon Health Sciences have implemented very successful programs. Many others, including Johns Hopkins, Washington University, the University of Chicago, and the University of Washington are in the process of developing programs. Tips for building upon successful models will be explored in greater detail at the annual meeting as well.

A few of the keys to developing a successful ultrasound program were discussed in San Diego. The need for the development of a robust quality assurance and quality improvement program is essential. The QA and QI components necessarily rely upon the ability to store images, and the availability of faculty members sufficiently knowledgeable in the use of the modality to be able to provide constructive criticism to those less familiar. Collegial relationships with echocardiographers and radiologists, especially in the early phases of development, are essential in setting up a successful program conforming to current standards of care.

The use of ultrasound as a monitoring modality is clearly becoming an important part of critical care practice, as evidenced by recent position papers from the American Society of Echocardiographers, the American College of Emergency Physicians, the American College of Chest Physicians, and the American College of Surgeons. Improvements in ultrasound technology have made the equipment cheaper, more durable, and more reliable. Training is readily available to anesthesia intensivists, including a course to be offered at the upcoming SOCCA meeting in Chicago. A well-defined ultrasound curriculum should be incorporated into fellowship training programs, and here we recommend a prescribed one-month experience during training. Eventually, there will be a process of certification and national standards for critical care ultrasonography developed in a manner similar to the current perioperative transesophageal echocardiography pathway. Realizing that there may be operational obstacles to the achievement of these goals, there will be a number of offerings at the SOCCA annual meeting in Chicago discussing strategies to surmount those obstacles.

Ultrasonography in Critical Care: How to Do a QA/QI Program



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Introduction:

There is growing experience among critical care physicians in the clinical use of ultrasound TTE and TEE (transthoracic and transesophageal echocardiography) in the intensive care unit. Published protocols to date are designed as focused examinations.

Information obtained with bedside echocardiography, provides the trainee with rapid and invaluable diagnostic and monitoring information complementing standard diagnostic tools for management of critically ill patients.

Ultrasound has an established role for guidance of central line placement. The incidence of complications has been greatly decreased with the use of ultrasound guidance. Training in ultrasound guidance of central line access should be highly recommended. To date there is a number of developed protocols for diagnostic ultrasound use in the intensive care unit.

The "FATE" (Focused assessed transthoracic echocardiography) protocol provides comprehensive information on cardiac function and assessment of pleural spaces for presence of pleural effusions.

"RUSH" (Rapid ultrasound in shock) exam represents a bedside echo assisted algorithm in the diagnosis and management of shock.

"FAST" (Focused assessment with sonography for trauma patients) exam is a bedside exam that has been developed as a rapid screening test.

In the cardiothoracic intensive care unit, TEE is a valuable tool for comprehensive evaluation of cardiac surgery patients. TEE is a preferred to TTE when the information provided by TTE is limited or echo image acquisition by TTE cannot be obtained. Comprehensive TTE and TEE exam is probably out of the scope for training in CCM. Focused echo examination my pose a risk of incomplete cardiac diagnostic information. However, specific clinical questions that affect patient management can be reliably answered. For the purpose of echo training in CCM, I suggest echo training to include focused examinations.The FATE and RUSH protocols would represent examinations that can be standardized for training. CCM fellowship programs that train fellows in trauma should include the FAST exam. TEE training could be offered by programs that have the equipment and expertise.

QA/QI Program:

The purpose of this review is to provide a framework for an ultrasound in CCM quality assessment and improvement program.

Framework includes:

1. Establishment of entity council for echocardiography in the SCCM to oversee the education process
2. Define methodology and curriculum of training
3. Determination of adequate training (number of supervised exams)
4. Certification and maintenance of proficiency process
5. Continuing education process
6. Reporting system of adverse events (for TEE)

1. National or regional entity overseeing the education process

Establish committee (work group) with committee chair that will oversee educational process and report to the members of the council for echocardiography in the SCCM on an annual basis.

Work of the committee will include:

- Program application process
- Curriculum and program requirements
- Fellowships program review (criteria and frequency).
- Creation and maintenance of online courses in echocardiography as part of CME

2. Methodology of Training

Quality assessment and implementation of quality improvement programs consists of a process to oversee established standards for echo training.

- Fellows in CCM are required to have a formal, structured education in echocardiography defined in "curriculum and program requirements" of each fellowship.

The basic components of echo training in critical care includes:

- Basic principals of physics in echocardiography
- Image acquisition
- Image quality, consistency
- Standardized examination
- Image interpretation

3. Determination of Adequacy of Training

Number of supervised exams needs to be defined to reach adequate proficiency and fulfill certification examination eligibility. To improve image acquisition, quality, consistency and interpretation, faculty supervised exams and study review sessions with fellows of completed exams should be delineated in the educational curriculum.

4. Certification and Maintenance of Proficiency Process

With completion of a fellowship program and minimum requirements of echo training curricula, respected candidates meet eligible requirements to sit for a certification examination and fulfill requirements for certification.

Maintenance of proficiency and the certification of respected experts in echocardiography is accomplished through the process of continued education and maintenance of privileges criteria.

5. Continuing Education Process

Continuing education process includes minimum required CME credits rewarded to maintain proficiency. CME credits can be obtained through a number of established programs of continued education. This would include:

a) National and international conferences
b) Online courses administered by the society of critical care medicine and echocardiography
c) Attendance of recognized courses at the national level
d) Attendance of Echo departmental conferences that meet educational criteria for CME

6. Reporting System of Adverse Events

Programs that offer TEE training as an integral part of their curriculum would have to include a reporting process of adverse events. This reporting system would integrate data from the hospital, state to the national level. List of reportable events should be available to programs and provided by the council for echocardiography in the SCCM .

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President's Message

Continued from page 1

SOCCA as well. The details are complicated, but boil down to this: the ASA has been charged with coordinating much of the Maintenance of Certification for diplomats of the ABA, including those with certification in critical care. The ASA has in turn approached SOCCA via its Board of Directors, appealing to us to help craft ACE/SEE style questions for MOCCC Part 2, and to assist in the development of critical care themed Practice Improvement and Simulation modules for MOCCC Part 4. We are in the process of developing a Memorandum of Understanding with the ASA, and will almost certainly be seeking a substantial number of volunteers from amongst our members to participate in this effort. One of our overarching goals will be to keep the time and monetary expense associated with MOCCC to the absolute minimal acceptable to the ABA. We hope to negotiate MOCCC CME credit for those who participate in the development of these materials. Going forward, it seems inevitable that participation in running MOCCC will be a continuous activity by members of our Society.

The other business of the Society continues to be conducted alongside these projects. **Ron Pauldine, M.D., Vivek Moitra, M.D.** and **Laureen Hill, M.D.** have a solid outline for our meeting program in October. It looks fantastic. A revised version of the Residents' Guide is being created under the guidance of **Sherif Afifi, M.D.** and **Miguel Cobas, M.D.** The Board of Directors will be meeting on May 21, 2010 at the IARS in Vancouver. All members are welcome to attend. Finally, everything we accomplish is facilitated by **Christine Dionne**, whose efforts are essential for every function of our Society.

PRO: Routine Laboratory Testing In The Intensive Care Unit

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The role of routine laboratory testing in the intensive care unit (ICU) has long been debated. Despite numerous observational and retrospective studies that have advocated abandoning the performance of routine laboratory testing vis-à-vis cost-effectiveness and patient outcomes,[1-5] a survey of intensivists revealed only a small minority have adopted this practice.[6]

How could this be? I believe the answer is more complex than the absence of prospective, randomized data. With progressively advanced care offered to patients with expanding co-morbidities, our patients demonstrate a higher severity of illness with lower physiologic reserve than their predecessors. Today's ICU patients are older, often immunocompromised, and may demonstrate multiorgan dysfunction secondary to nosocomial infections of resistant strain organisms.

Concomitantly, diagnostic testing, including imaging, has become more sensitive, reliable, and less expensive. Furthermore, an increasing number of tests are available utilizing pediatric tubes, point-of-care, and inline bedside microanalysis thus minimizing the risk of anemia.[7] Therefore, it may be appropriate to question the time-honored rule of waiting for symptoms to make a diagnosis. The deployment of sensitive and accurate laboratories to avert the "usual suspects" as determined by a physician experienced in the care of these patients may avert physiologic morbidity. As for expense, the costs associated with routine "targeted" laboratories pale in comparison to the costs associated with extensive diagnostic and therapeutic modalities necessary when our patients get behind the "physiologic power curve". Two common examples are monitoring serum creatinine to diagnose kidney injury and electrolyte monitoring for patients with a history of intermittent atrial fibrillation.

> "Perhaps, when physicians deem routine laboratory testing no longer indicated, we should instead question our patient's true ICU indication."

We all incorporate routine laboratory data in our daily practice. Targeted surveillance testing offers the potential to avert major morbidity at minimal cost. While the formal answer awaits prospective randomized trials, we are left with the recommendations of many that few follow. Perhaps, when physicians deem routine laboratory testing no longer indicated, we should instead question our patient's true ICU indication.

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CON: Routine Laboratory Testing in the Intensive Care Unit **Go Green With Red!**

Michael Woo, M.D.

A recent retrospective poll suggesting widespread extraneous blood tests in preoperative evaluation should remind us that blood does not grow on trees. The dawn of “going green” has sprouted recycling opportunities (and families of bins) in our O.R.s. It is time to revisit this in the critically ill.

Less Blood Loss Is Less Blood Lost

The most tangible reason to restrict blood tests is to decrease phlebotomy-induced anemia. An easier medical argument cannot be made. Avoid anemia. Transfuse less. In some studies (retrospective), patients left the ICU sooner when less blood tests were ordered. Theoretical benefits to the patient include less blood drawing events. Less blood draws in critically ill patients will decrease stopcock handling. Less handling of intravenous devices may decrease bacteremia events.

Defensive Draws

Is it possible to reduce blood draws motivated by political or medicolegal pressures? Can astute care reduce unnecessary ABG's? Certainly the border between flamboyant phlebotomy and laboratory neglect is a broad margin and not a thin line. As much as one generation criticizes the next for substituting CT scans for physical exams, can America reduce the bloodletting of defensive medicine?

If we can, perhaps we could minimize arterial or central lines left in situ solely for lab draws. One day, we might attribute decreased catheter associated bloodstream infections with thoughtful lab ordering.

T&S: Thoughtful and Selective

Chemistry panels are a standard in diagnostic medicine. Their history and utility are indisputable. So routine is their use that providers regularly order full panels when all they need is the individual test. Selective ordering may increase the utility of pediatric sized tubes. One can only theorize that ordering a percentage of tests reduces workload of a laboratory. Downstream benefits might include faster turnaround, and on the provider end, a better signal to noise ratio (easier to review less numbers that have more meaning).

An example of selective ordering includes liver function tests. In hepatic workup, the LFT panel works fine. After diagnosis, is the full panel necessary? Tracking the total protein doesn't help when you are watching solely the transaminases. When treating hyponatremia, can you check the 'lytes one less time?

The Sanguine Truth

Defensive medicine is necessary. Routine lab screens, like routine AM chest radiographs, have some value. Typical interventions of feedback and education fade in time. One alternative to promote change is institutionalized protocols, which removes physician autonomy. If effective change is going to happen, conservation must start with the physician. In order to save more, we must draw less.

Suggested Readings:

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PRO: Neuromuscular Blocking Agents in the ICU

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In medicine, therapies periodically fade in popularity. Sometimes, though, a modality that has fallen out of favor stages a comeback due to new evidence. Use of neuromuscular blocking agents (NMBAs) in critical care is poised to become one such therapy. While NMBAs were once used more frequently in critically ill patients to facilitate mechanical ventilation, their use has waned recently due to studies showing better outcomes with lighter, interrupted sedation,[1] as well as concerns over prolonged muscle weakness.[2] However, in a recent study, Papazian and colleagues showed that administering a 48-hour infusion of an NMBA in the early stages of acute respiratory distress syndrome (ARDS) conferred an absolute 9% reduction in mortality.[3] Why would this be the case? The authors theorize that early muscle relaxation facilitates patient-ventilator synchrony, allowing for better lung recruitment and preventing atelectasis and regional overdistension of the lung. This then leads to decreased levels of shear stress on alveoli, causing less atelectrauma and inflammation, eventually improving organ failure and other outcomes. This makes intuitive and physiologic sense, as patients with severe lung injury can be seen to "de-recruit" quickly with any asynchrony or "bucking the vent." The reduction of atelectrauma and inflammation is also the mechanism widely thought to underlie benefits from low tidal-volume ventilation[4] and high positive end-expiratory pressure.[5] While deep sedation may improve synchrony, the patients in the study in question were well-sedated before initiation of NMBA infusion, so the beneficial effects seem to go above and beyond those of heavy sedation itself.

However, the question remains: does this potential benefit outweigh the risks of NMBAs, such as neuromyopathy and weakness? In the Papazian study, there was no difference between the rates of neuromuscular weakness at 28 days or at ICU discharge between the NMBA and control groups. And while the combination of corticosteroids and NMBAs is thought to impart a particularly high risk for neuromyopathy, the authors found no significant effect of NMBAs on strength in the subgroup of patients receiving steroids.[6] Indeed, many of the studies that have implicated steroids and NMBAs in the development of ICU-acquired weakness were conducted in patients receiving high-dose corticosteroids and long courses of paralytics, such as those with status asthmaticus, and these results may not apply to more moderate steroid doses and shorter courses of neuromuscular blockers. Indeed, severity of inflammation may be the most reliable predictor of ICU-acquired weakness,[7] and therapies that reduce propagation of the inflammatory response may thus be helpful. The authors' choice of NMBA may be beneficial as well: cisatracurium, which is eliminated via Hoffman degradation and thus has a duration of action independent of liver and kidney function, has more predictable recovery profile than steroidal NMBAs. Benzylisoquinoliniums like cisatracurium may also confer a lower risk of myopathy.[8]

While no intervention is without risk, NMBAs are noteworthy as the only pharmacotherapy shown to reduce mortality and days on the ventilator in ARDS. There is likely some risk associated with their use in conjunction with corticosteroids, aminoglycosides, and other potentially weakness-inducing agents, but this seems to be mitigated by limiting their administration to a short time period. And while NMBAs can interfere with daily sedation interruption, use of technology such as brain-function monitors may help titrate sedation until paralysis is discontinued.[9] While NMBAs may not be appropriate in every clinical situation, they are certainly a valuable tool and one deserving of reconsideration.

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CON: Neuromuscular Blocking Agents in the ICU

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In a recent publication by Papazian et al, an absolute mortality risk reduction of 9.6 percent was found in patients receiving forty-eight hours of a cisatracurium infusion in the initial period of the Acute Respiratory Distress Syndrome (ARDS) at 28 days.[1] This study is unique in that it is the first pharmacological treatment for ARDS associated with a concomitant reduction in mortality and days on the ventilator. However, this study and more importantly the widespread use of neuromuscular blockers (NMBs) in acute respiratory failure should be viewed with skepticism. This study had several methodological flaws including the lack of train-of-four (TOF) measurements and the absence of the evaluation of physical activity at any point during the study. Furthermore, muscle weakness was evaluated only at 28 days which may have missed later forms of acute quadriplegic myopathy. The proposed benefit of this treatment was increased ventilator-patient synchrony and reduction of atelectrauma and ventilator induced lung injury (VILI) in the early form of the disease. However, with careful attention to sedation and the proper use of medications such as opiates, sedative hypnotics and benzodiazepines clinicians can achieve this same level of ventilator synchrony. This would also minimize VILI and potentially lead to mortality reductions in ARDS without potentially devastating side effects, but has yet to be studied.

Three decades have now passed since the first described case linking neuromuscular blockade and myopathy.[2] This occurred in a patient with status asthmaticus that was also receiving steroids. While NMBs have beneficial effects such as facilitating mechanical ventilation, reducing intracranial pressure and oxygen consumption they are not without untoward side effects. The most devastating of these include critical illness polyneuropathy (CIP) and critical illness myopathy (CIM) which are associated with increased duration of ventilator weaning and hospital stays.[3] The incidence of these disorders is already too high as approximately 50 percent of patients who are in the intensive care unit (ICU) for more than 7 days acquire some form of CIP or CIM.[4] These are both more common with the aminosteroids, but not completely unheard of with benzylisoquinoliniums. In fact, the use of neuromuscular blockade infusions has been found to be an independent risk factor for CIP/CIM in two previous citations.[5,6] In addition many patients still receive corticosteroids or aminoglycosides for acute refractory distributive shock and severe sepsis which may potentiate the harmful effects of neuromuscular blockers.[7] Finally and maybe most importantly, with health care expenses spiraling out of control the widespread use of NMBs cannot be recommended. The United States currently spends a disproportionate amount (1 percent of GDP) on critical care alone often with poor outcomes.[8] Adding the cost of increased usage of NMBs would certainly increase pharmaceutical costs in the ICU. Importantly, it would also raise other potential expenses such as higher lengths of stay, more days on the ventilator and the greater need for long-term rehabilitation facilities in patients developing CIP/CIM. These greatly outweigh the pharmaceutical costs associated with NMBs and would put further strain on an already weakened and fragile health care system.

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Dabigatran vs. Warfarin in Atrial Fibrillation (RE-LY Trial)

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Atrial fibrillation is the most common chronic cardiac dysrhythmia in the United States and its incidence increases with age. The ideal anticoagulant for this common chronic disorder would be one that is taken orally, is safe and effective as standard therapy, with a predictable pharmacodynamic and pharmacokinetic profile, and be reversible if necessary. Until recently anticoagulation management for this dysrhythmia was limited to aspirin and warfarin. Warfarin is a drug with slow onset, numerous drug and food interactions, unpredictable dosing and the need for frequent monitoring. Additionally, this drug is known to increase the risk of hemorrhagic stroke even if managed correctly. It requires transfusion of blood products for rapid reversal of anticoagulation.

Dabigatran etexilate is a new, oral, direct competitive thrombin inhibitor with rapid onset (a peak serum concentration within 2 hours of ingestion) and short duration of action. Dabigatran has fixed dosing with no routine monitoring required. It has limited drug interactions (rifampin) and no food interactions. It is taken as a prodrug (dabigatran etexilate), which is hydrolyzed, to active dabigatran in an acidic environment. Bioavailability of the drug is 3-7 percent and is thus formulated with tartaric acid to increase drug dissolution and absorption. Active dabigatran binds to both free and thrombus bound thrombin and prevents further fibrin clot formation. It has a serum half-life of 12-17 hours and is 80 percent excreted by the kidneys.

In September of 2009, Connolly et al published the Randomized Evaluation of Long-Term Anticoagulation Therapy (RE-LY) trial in the New England Journal of Medicine. The RE-LY trial is an industry-funded, prospective, randomized, non-inferiority trial comparing two doses of dabigatran (110 mg BID and 150 mg BID) to warfarin therapy with a target INR of 2.0 to 3.0. This was a large trial, enrolling 18,113 patients from 951 clinical centers in 44 countries. These patients were followed for two years following enrollment.

Patients included were required to have EKG-documented atrial fibrillation and at least one risk factor for embolic stroke as determined by the $CHADS^2$ criteria. Exclusion criteria included serious heart valve disease, recent stroke, increased risk of bleeding, renal or acute hepatic insufficiency, or were pregnant. The patients were then randomized to three equal groups: one to each dose of dabigatran (110 mg and 150 mg) and one to warfarin. The only blinding was with respect to the dose of dabigatran.

Both doses were shown to be non-inferior to wafarin with respect to the primary endpoint, stroke or systemic embolism. Dabigatran 150 mg BID was actually shown to be superior to warfarin, with a relative risk for stroke or systemic embolism of 0.66, with a p-value of <0.001. The larger of dose of Dabigatran was also shown to be more efficacious than the 110 mg BID dose ($P=0.005$). Dabigatran in either dose also led to a decreased risk of intracerebral or life-threatening hemorrhage when compared to warfarin, though the risk of minor gastrointestinal bleed was increased in the higher dose dabigatran group.

Of note, the warfarin group was only maintained at the therapeutic goal of INR 2.0 – 3.0 64 percent of the time that they were followed. This is, however, comparable to rates of INR maintenance reflected in previous studies of 65-75 percent ideal INR.[1] There was a significantly higher rate of discontinuance of dabigatran (21 percent in both groups) than warfarin (17 percent) at 2 years. This appears to be largely due to a higher rate of dyspepsia in the dabigatran (2.1 percent) vs. warfarin (0.6 percent). The authors attribute this to the tartaric acid pellets and low gastric pH necessary for absorption.

The initial publication reported a slight increase in the risk for myocardial infarction (MI) for the group taking dabigatran 150 mg BID. The revised numbers published more recently, however, reveal that there was in fact no statistically significant difference with respect to MI. This is not surprising, as the lower dose did not show this adverse effect in the original paper, and it is counterintuitive that increasing the dose would increase the risk of a traditionally thrombotic complication.

Dabigatran 150 mg BID has been approved by the FDA for prevention of thromboembolism in atrial fibrillation. There is potential for its widespread use, and research is ongoing for numerous other indications. Dabigatran is also being evaluated against warfarin for the prevention of venous thromboembolism {VTE} (The RE-COVER Trial) and against enxoaparin in orthopedic prophylaxis (The RE-NOVATE Trial). Both trials have shown non-inferiority to warfarin with similar hemorrhagic events in both groups.

Indications for the use of dabigatran include non-valvular atrial fibrillation, VTE, inability to achieve stable INR on warfarin, and earlier transition to oral anticoagulant therapy. Contraindications include renal failure, indications without data (mechanical heart valves, and heparin-induced thrombocytopenia.

Though the FDA also approved a 75 mg dose for patients with chronic renal insufficiency, this dose has not been clinically studied.

A Pharmacoeconomic assessment based on this study determined that at as long as the

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Dabigatran vs. Warfarin in Atrial Fibrillation (RE-LY Trial) Continued

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drug could be acquired for $13.70 per day, this drug would be cost effective. This is largely due to the lack of need for testing and fewer intracerebral hemorrhages. Currently, however, the drug cost approximately $200-300/month, which will certainly limit its use by patients with limited health insurance or disposable income.

In summary, dabigatran 150 mg BID was shown to be superior to warfarin for the prevention of stroke or systemic embolism in atrial fibrillation. Though it is expensive, increases the likelihood of minor GI bleeding, and is frequently discontinued secondary to dyspepsia, this drug is likely to become a common therapy for patients with a very common disorder. It would be beneficial for all physicians to become familiar with the use and potential complications of this therapy.

MCQ Question:

56 y/o man currently receiving enoxaparin for artial fibrillation. When should dabigatran be started in relation to his enoxaparin?

A. Start dabigatran immediately , overlap both drugs for 3 days
B. Start dabigatran 6 hours after next enoxaparin dose
C. Start dabigatran within 0-2 hours of when next dose is due
D. Just pick warfarin

Answer: C

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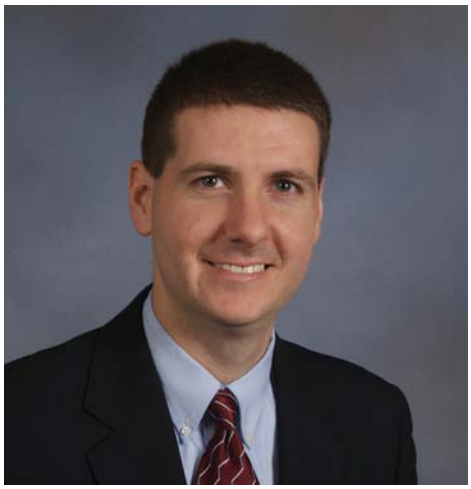
Literature Review



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Article:

Magder S, Potter BJ, De Varennes B, Doucette S, Fergusson D. Fluids after cardiac surgery: a pilot study of the use of colloids versus crystalloids. Crit Care Med. 2010; 38(11):2117-2124.

The controversy over the use of crystalloid or colloid for fluid resuscitation continues to drive multiple research studies, meta-analyses, editorial, letters, etc. in many specific and general areas of discussion *and* contention. Specific populations and procedures have been evaluated using different colloid solutions, protocols, endpoints, and trial design to determine if one product or the other might have specific significant benefit or harm. The recent article by Magder and colleagues describes another study, in another population, using another protocol that compares colloid versus crystalloid resuscitation.

In this prospective, randomized, double-blind, controlled trial of patients who underwent cardiac surgery at a tertiary care hospital, enrolled patients were resuscitated with boluses of either a pentastarch (HES) solution or a 0.9% saline (Saline) solution using a nurse-driven resuscitation protocol. The primary endpoint for this study was the use of catecholamines on the first postoperative day with additional, defined, secondary endpoints of total blood product use, deterioration in renal function, and the new development of atrial fibrillation, pneumonia or mediastinal infection.

Of the 1178 patients who were initially screened, 609 (51.9%) patients were ultimately enrolled; 263 (22.3%) patients were randomized; and the data for 235 (19.9%) patients were ultimately evaluated. There was a statistically significant difference (HES=13 (10.9%) vs. Saline=34 (28.8%); p=0.001) in the number of patients who required catecholamines on postoperative day one. There was also a statistically significant difference in the incidence of pneumonia or sternal wound infection (HES=2 (1.7%) vs. Saline=10 (8.4%); p=0.03). There were no significant differences in the other defined secondary endpoints, including the use of packed red blood cell, the incidence of postoperative renal dysfunction or atrial fibrillation.

This study, therefore, may be more than just another "colloid versus crystalloid" study as it demonstrates a potential improvement in a relevant clinical outcome, vasopressor use, without apparent significant additional nephrotoxicity. Major limitations include the small sample sizes and the CVP-based resuscitation algorithm. Also, it is important to note that the actual financial cost benefit for this strategy remains unclear as there were no differences in ICU or hospital LOS between the groups and no additional cost analysis. Despite these limitations, this study provides ample impetus for a larger, multi-center study to attempt to determine what the true benefits to the use of a colloid-based resuscitation strategy might be in this patient population.

"Despite these limitations, this study provides ample impetus for a larger, multi-center study to attempt to determine what the true benefits to the use of a colloid-based resuscitation strategy might be in this patient population. "

Critical Care Medicine Fellowship

Department of Anesthesiology, Perioperative Medicine and Pain Management Jackson Memorial Hospital and the University of Miami, Miller School of Medicine

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The Jackson Memorial Hospital (JMH) /University Of Miami (UM), Miller School Of Medicine, Department of Anesthesiology, Perioperative Medicine and Pain Management offers three (3) ACGME-accredited critical care fellowship positions per year. Fellows rotate through several intensive care units directly supervised by Critical Care Anesthesiologists and surgeons. The fellows have supervisory responsibility for the residents and interns in the intensive care units and also work closely with nurse practitioners. Each unit offers different clinical material and somewhat varied operational structures from which the fellows learn and broaden their experience. There are elective opportunities in various other intensive care units focusing on medical, neurologically injured, pediatrics, burn patients and others.

The UM medical campus consists of several independent hospitals staffed by the UM faculty. At the heart of this large medical campus is JMH, a 1,550 bed tertiary care teaching hospital. It is one of the largest and most comprehensive teaching facilities in the country with a highly ranked transplant service that includes lung and heart transplants. The Ryder trauma center is one of the busiest in the nation and it is the only level-one adult and pediatric trauma center on the Eastern edge of South Florida. Other hospitals involved in the Critical Care Fellowship include: the Miami Veterans' Affairs Medical Center, an 850-bed hospital with surgical, medical and coronary care units and the UM Hospital, a recently acquired private facility that is available to offer other comprehensive clinical experiences.

Fellows are expected to complete 12 months of clinical training comprised of rotations in the Ryder Center's trauma and burn ICU, Jackson Memorial Hospital's main surgical ICU, Cardiothoracic intensive care unit, and the VA surgical intensive care unit. Fellows also have the option of rotating through any other of the many ICU's at the University of Miami including the Neurosurgical ICU, Coronary Care Unit, Medical ICU, Pediatric ICU and Neonatal ICU. A total three (3) months may be spent on elective rotations, such as echocardiography, transfusion medicine and others according to the interests and experience of the individual fellow.

Research opportunities in a variety of fields are available throughout the department; from the evaluation of novel monitoring devices to the latest advances in ICU care. Fellows are also highly encouraged and are financially supported to attend national conferences. Didactic lectures consist of bi-weekly lectures covering from basic to advanced ICU topics, literature reviews and journal clubs.

Clinical exposure at JMH is one of the strongest aspects of the program. Fellows lead the critical care team in the management of the most challenging medical and surgical cases, trauma and transplant cases on a daily basis. JMH is a large referral center and it is common to have patients on ECMO, Ventricular Assist Devices as well as advanced modes of ventilation. Comprehensive, procedure training is provided and includes transesophageal echocardiography, bronchoscopy and percutaneous tracheostomy. The fellowship program stands by duty hour rules established by the ACGME. Exceptional house staff coverage translates into minimal night and weekend call except for emergency situations, supervisory call from home is the pattern in most rotations.

The city of Miami is one of the top vacation destinations in the United State because of its year-round warm weather, sunshine and beautiful beaches. Florida offers exceptional recreational advantages every day of the year, from snorkeling, golfing or lazing on the beach; to dining at a world-class restaurant or shopping at a high-end boutique. Ideal in winter and pleasant in summer, Miami is a multicultural city with a multitude of options for recreation and cultural exploration for all ages and interests.

The JMH/UM Critical Care/Anesthesiology Fellowship trains outstanding clinicians and leaders in the field Critical Care Medicine. Our Fellowship provides an exceptional opportunity for multidisciplinary training with diverse patient populations in a warm and enjoyable atmosphere of beautiful Miami.

Interested applicants should contact:
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Adult Multidisciplinary Critical Care Medicine Fellowship at The Johns Hopkins Medical Institutions

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Critical care medicine has a long tradition at the Johns Hopkins Hospital. The first intensive care unit (ICU) in the country, a postoperative neurosurgical unit, was developed at Johns Hopkins in 1928 by Walter Dandy, M.D. Thirty years later, Johns Hopkins Bayview Medical Center opened the first fully-staffed ICU in the country. Today, the Johns Hopkins Hospital operates seven adult ICUs, a pediatric ICU, and a neonatal ICU. These units have received both regional and international acclaim for their excellence, especially regarding efforts to improve patient safety. Further ICU expansion is expected with the new critical care tower, which is slated to open in 2012.

The Division of Adult Critical Care Medicine offers a one-year fellowship program that meets all certification requirements of the American Board of Anesthesiology. The program is accredited through the Accreditation Council for Graduate Medical Education and it is a true multidisciplinary program. Our staff physicians have a diverse breadth of expertise and are also leaders in Anesthesiology, Surgery, Pulmonary Medicine, Emergency Medicine, and Neurosciences. As such, formal mentorship is provided from the very beginning to build upon areas of specific interest for the individual fellow.

The mission of the Department of Anesthesiology and Critical Care Medicine is to provide an educational environment that fosters development of clinician leaders in multidisciplinary critical care medicine. Early in the year, fellows participate in a course on evidence-based medicine (EBM), study design, and statistical analysis lead by national experts in the field. Formal journal club provides interaction with clinicians and scientists from various specialties and represents a great learning opportunity. In addition, fellows play a pivotal role in peer, resident, medical student, and departmental education with monthly morbidity and mortality conferences, case conferences, and presentations on selected topics. An educational website was recently developed and has centralized the most relevant EBM resources for Anesthesiology Critical Care Medicine fellows.

The program is integrated with the Department of Surgery's Critical Care Medicine Fellowship, and rotations are centered in a surgical care environment. A wide variety of patients are admitted from all of the surgical specialties, including transplant surgery. Additional "no-call" elective rotations are available in the medical, cardiothoracic, neurosciences, and burn ICUs. Other common elective rotations include, Clinical Research, Infectious Diseases, Nephrology, Cardiology, Pulmonary Medicine, and Clinical Pharmacology. Instruction in transesophageal echocardiography can be arranged through the Division of Cardiology and the Division of Cardiothoracic Anesthesia. Bedside transthoracic echocardiography in increasingly utilized in our ICUs and fellows are encouraged to participate in this learning process. Moreover, a formal bronchoscopy course and practice modules for tracheostomy as well as chest tubes on animal models are also offered.

During and upon completion of the fellowship, ample opportunities exist for clinical and basic science research at one of the many affiliated groups at the Johns Hopkins Medical Institutions. The Center for Innovation in Quality Patient Care, lead by Peter Pronovost, M.D., Ph.D., was created in 2002 to facilitate patient-centered re-engineering of our health care system and to institute innovative care delivery models. The Center helps coordinate the efforts of patients, physicians, nurses, allied health workers, and administrators throughout Johns Hopkins to identify defects, recommend corrective measures, evaluate changes, and nurture best clinical practices. In addition to supporting local patient safety efforts, the Center has worked with various hospitals in the U.S. and internationally.

Nine fellows are accepted each year. Combined fellowships for cardiothoracic anesthesia or other subspecialties are available. Fellows receive four weeks of vacation and a generous educational allowance for books, national meetings and other educational expenses. For further information, please feel free to contact the program director, Theresa Hartsell, M.D., Ph.D., via e-mail at **thartsel@jhmi.edu**. A thorough description of the curriculum, faculty, educational schedule and ongoing research is found on the our web: **http://www.hopkinsmedicine.org/anesthesiology/Education/fellowship/critical_care.cfm**

For any specific questions about a typical day in the life of a critical care medicine fellow at Johns Hopkins, feel free to e-mail me at **dgalusc1@jhmi.edu**.

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