The
Academy NEWSLETTER

THE AMERICAN ACADEMY
OF
CARDIOVASCULAR PERFUSION
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SUMMER 2011

Inside This Issue

"Mutual Interests"

I recently spent a protracted weekend in the City of Brotherly Love attending a series of meetings around the annual meeting of The American Association of Thoracic Surgery (AATS).

All day Friday was spent, with fellow Academy representative Linda Mongero, convening with The Accreditation Committee for Perfusion Education (AC-PE). This committee is an arm of the Commission on Accreditation of Allied Health Professions (CAAHEP) and is made up of perfusionists representing the American Society of Extracorporeal Technology (AmSECT) , the American Academy of Cardiovascular Perfusion (AACP), the American Board of Cardiovascular Perfusion (ABCP) and the Perfusion Program Director's Council (PPDC), in addition, representatives of the Society of Thoracic Surgeons (STS), the AATS and the Society of Cardiovascular Anesthesiologists (SCA). The AC-PE sets the standards and guidance for Perfusion Programs as well as recommending CAAHEP accreditation. I apologize for the alphabet soup but the point I would like to make is that each group had real people sitting at the table. The discussion was caring, respectful and very intelligent. Several prospective initiatives were launched to clarify guidance to programs, to ascertain the best set of outcomes by which to assess perfusion programs, and an effort to understand what the expectations of cardiac surgeons are concerning perfusion education. The value of such an open discussion with our physician colleagues cannot be overestimated and the level of constructive interest in our profession was impressive.

Saturday was spent at the inaugural program for perfusionists, physician assistants and nurse practitioners at the annual meeting of the AATS. This was an intellectually lively meeting organized by Dr. Michael Argenziano of Columbia-Presbyterian. The subjects were an array of controversial issues in cardiac, thoracic and intensive care medicine. Many topics were presented by a practitioner followed by some "testy" pro/con debates. Two of the participants were our own Linda Mongero and Jeff Riley. The program and the effort to reach out to the allied health community by the AATS is another example of a renewed commitment to "multidisciplinarianism" (my take on multiculturalism).

Sunday evening I had the good fortune to meet with The American Heart Association's Leadership Council for Cardiac Surgery and Anesthesia. I was asked by the current chair, Dr. Frank Sellke of Brown University and Rhode Island Hospital, to represent perfusionists. This Council is made up of some of the intellectual heavyweights in the field who maintain an interest in research. They were curious to know more about our professional organizations and how they might solicit our involvement. The incoming chair of the group, Dr. John Ikonomidis of the Medical University of South Carolina, asked for the opportunity to speak at our next annual meeting.

Continued on Page 11

33rd Annual Seminar of The American Academy of Cardiovascular Perfusion

Omni Royal Orleans Hotel
New Orleans, Louisiana
January 26-29, 2012

Thursday, January 26, 2012

9:00 AM – 1:00 PM	Council Meeting
10:00 AM – 3:00 PM	REGISTRATION
2:30 PM – 4:30 PM	Fireside Chats
4:30 PM – 5:30 PM	REGISTRATION
5:00 PM	Opening Business Meeting *Fellow, Member, Senior and Honorary Members*
5:30 PM – 8:00 PM	Sponsor's Hands-On Workshop & Reception

Friday, January 27, 2012

7:00 AM	REGISTRATION
8:00 AM – 9:30 AM	Scientific Session
9:30 AM – 10:00 AM	Break
10:00 AM – 11:30 PM	Scientific Session
11:30 PM – 1:00 PM	Lunch
1:00 PM – 3:30 PM	Special Scientific Session (Panel)
3:30 PM – 5:30 PM	Fireside Chats
6:30 PM	Induction Dinner *Fellow, Senior, Honorary Members & Guests*

Saturday, January 28, 2012

7:00 AM	REGISTRATION
8:00 AM – 9:30 AM	Scientific Session
9:30 AM – 10:00 AM	Break
10:00 AM – 11:30 PM	Memorial Session
11:30 PM – 1:00 PM	Lunch
1:00 PM – 3:30 PM	Special Scientific Session (Panel)
3:30 PM – 5:30 PM	Fireside Chats
5:30PM	Closing Business Meeting *Fellow, Senior and Honorary Members Only*

Sunday, January 29, 2012

8:00 AM – 10:00 AM	Scientific Session
10:00 AM – 12:00 PM	Fireside Chats

Letter to the Editor

The recent article in the American Academy of Cardiovascular Perfusion 2011 Spring Newsletter by C.T. Walker raises important issues regarding the performance of the current generation of cerebral oximeters. I make the following comments on these issues based on my 20-year research and clinical experience with transcranial near-infrared reflectance spectroscopy (NIRS). In the spirit of full disclosure, I am a member of the Covidien and Somanetics speakers' bureaus. However, this commentary is exclusively my product.

1. Mr. Walker's observation that several two- and three-wavelength NIRS devices identified a signal from an apparently healthy young male as indeterminate should be considered as strong evidence that the patient represented a technical "outlier". In most individuals, the hemoglobin chromophore is the sole significant influence on photon absorption differences at the target wavelengths. In outliers, the presence of an additional intracranial chromophore with absorbance in this range creates ambiguity in the pattern of photon absorption (Boulos PR 2007 Arch Ophthal 125:380). This ambiguity potentially confounds measurement of oxygen saturation by invalidating the standard assumptions used in the computational algorithm. Under these circumstances, oximeter performance ideally indicates the unreliability of any resultant measurements. Would a pilot prefer an altimeter that displayed a plausible false value to one that clearly indicated an error condition?

2. In the absence of a universally accepted reference standard for brain oxygen saturation, it is currently not possible to directly compare the accuracy of various NIRS devices. The results described by Mr. Walker could have just as easily been explained by claiming that only the new four-channel device produced a false value, while all the other devices correctly determined that the outlier patient's transcranial signal was indeterminate.

3. Since outliers are by definition a rare phenomenon, there are as yet no peer-reviewed publications describing the influence of unknown quantities of an unknown chromophore on the trending performance of various NIRS devices. Similarly, the impact of an unknown chromophore on established alarm criteria is unknown.

4. It is important for potential users of this technology to distinguish marketing claims from scientific fact. The facts are these:

a. Numerous peer-reviewed scientific reports have compared the performance of two- and four-wavelength cerebral oximeters over a wide range of oxygen saturation and found no significant advantage to the use of the additional wavelengths. (Gagnon RE 2002 J Clin Mon 17:385)

b. Similarly, the characteristics of the baseline value normal distribution curves for two- and four-wavelength oximeters are the same. (Thavasathy M 2003 Anaesthesia 57:999)

c. To my knowledge, there are no peer-reviewed reports that have demonstrated significantly improved measurement accuracy of a system using two light sources compared with a single-source system.

5. This controversy is yet another example of the importance of adherence to scientifically rigorous evidenced-based medicine.

I feel your readership deserves an unbiased and scientifically valid description of these clinically important issues.

Sincerely,

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The Student Section

The Role of TEG During ECMO

***Satya N Chaudhary**, MCA*
Class of 2011
Rush University
Chicago, Illinois

Introduction to ECMO

Extracorporeal life support with the use of an artificial heart and lung is called Extracorporeal Membrane Oxygenation (ECMO). ECMO provides for temporary controls of gas exchange and perfusion and stabilizes patients physiologically and allows time for diagnosis, treatment and recovery (1). The major limitation of ECMO is bleeding and thrombotic complications which are related to contact of blood with the non-biological surface of the ECMO circuit. This interaction may lead to a massive inflammatory and clotting response (2). Anticoagulation is necessary to prevent thrombosis, but this increases the risk of bleeding, sometimes leading to premature separation from ECMO especially in neonates and infants (3).

Anticoagulation during ECMO

Heparin continues to dominate anticoagulation therapy for ECMO because it has a rapid onset of action, is easily reversible, inexpensive, widely available and well tolerated by pediatric and adult patients. Heparin's anticoagulation properties are achieved by inhibiting thrombin and factor Xa generation by binding to and activating antithrombin (AT). The goal of anticoagulation for ECMO is to prevent life-threatening thrombosis and excessive bleeding. Inadequate anticoagulation causes clot formation, premature oxygenator failure, and thromboembolism whereas excess heparinization may limit ECMO pump flow, decrease tissue oxygenation, increases the risk of cannulation site bleeding, increase the need for blood product transfusions, and further fluid and electrolyte imbalance. The coagulation management in newborn becomes more challenging because of premature birth, underdevelopment of the coagulation system (both concentration and capability) (4).

Activated Clotting Time (ACT) is considered the gold standard test for monitoring anticoagulation during ECMO. The most widely used range for the ACT with heparin during ECMO has been 180 to 220 seconds (5). It is a functional test that measures the intrinsic and common coagulation pathways. Heparin's anticoagulant response may vary from patient to patient, so, traditionally, heparin dosing has ranged from 20 to 70 u/kg/h (6). Since the complete suppression of thrombin is not the goal of ECMO, heparin dosing must depend on laboratory testing. Thus, a rapid, bed site point of care test which can access the functional measures of clotting such as TEG is important to guide diagnosis and treatment (7).

Introduction to Thromboelastography (TEG)

TEG is a bed site, point of care anticoagulation monitoring system which compliments other methods currently being used to improve patient care. It is a viscoelastic monitoring system which measures functional aspect of all components of clot formation, strength and lysis. During ECMO, coagulation assessment with the TEG provides useful information for the rapid diagnosis of hemorrhagic conditions, which may help to guide transfusion therapy (8). TEG results are simplified by both graphical and numerical presentation of results, highlighting of abnormal results and computerized analysis of the trace (9). 37% of the ELSO registered centers have incorporated the TEG into their management of ECMO (10). The value of the TEG for ECMO and CPB has become more recognized over the last decade with the application of additives such as heparinase, TF, and kaolin to expand its capabilities (11).

Clinical uses of TEG in ECMO

Transfusion Therapy: ECMO patients require aggressive transfusion therapy. The TEG has enabled clinicians to make more rapid decisions about transfusion resulting in more timely administration of blood products. Algorithms based on TEG parameters have led to a significant reduction in transfusion requirements (12). The TEG provides a bigger picture of patient's coagulation status, and has been shown to be superior to other tests of coagulation such as PT, PTT, fibrinogen or activated clotting time in the management of bleeding diastasis (13).

The TEG studies can rapidly detect specific causes of bleeding and help in implementation of blood component therapies. The thromboelastograph is capable of monitoring both enzymatic activation and platelet function separately and can help differentiate between surgical bleeding, Von Willebrand's factor deficiency, general clotting factor deficiencies, low fibrinogen levels, poor platelet function, or coagulation disturbances caused by hypothermia and a host of hypercoagulable and hyperfibrinolytic states (7).

A TEG study is generally performed every 24 hours and is used to guide component therapies with the following trigger points: Platelet transfusions for a maximum amplitude (MA) < 51 mm. Cryoprecipitate transfusions for an alpha angle (α) $<55^0$. Fresh frozen plasma transfusions for a reaction time (R) > 8 minutes. Blood product transfusion is given anytime: platelet counts <100000 $X10^9/\mu L$, hemoglobin <12 g/dL and fibrinogen <1.5 mg/dL (7).

Platelet Therapy: During ECMO, platelets are constantly exposed to the extracorporeal circuit and to heparin. This recurring platelet dysfunction in the presence of a "normal" platelet count results in frequent transfusions (14). Modified TEG can measure platelet function by maximum amplitude but it is not sensitive enough for dose adjustment of antiplatelet therapy. Recently, however, TEG platelet mapping has become available and has been used to monitor antiplatelet therapy in patients receiving aspirin, dipyridamole or clopidogrel (15). The combination of TEG, Platelet Count, and PT testing may minimize platelet transfusion and so extend the life of the oxygenator (4).

Fibrinolysis: TEG may be a good substitute laboratory test to detect fibrinolysis and hyperfibrinolysis and determine fibrinogen requirements. A prolonged *r* with the kTEG cannot distinguish between low fibrinogen and heparin, but a prolonged *r* with hTEG is consistent with low fibrinogen (4). Levels of fibrinogen < 50 mg/dL commonly occur in neonates and infants during CPB and ECMO (16). Muntean et al. (17) has recommended maintaining a fibrinogen level of 100 mg/dL during ECMO.

Recombinant activated Factor VII: Recombinant activated FVII (rFVIIa) is indicated primarily for treatment of hemophilia patients and for patients with FVII deficiency. There are no good laboratory methods for monitoring the efficacy of FVIIa or predicting its effectiveness. The TEG, however, is considered to be a good test to predict the efficacy and risk of thrombotic complications of rFVIIa. rVIIa is always administered after the oxygenator.

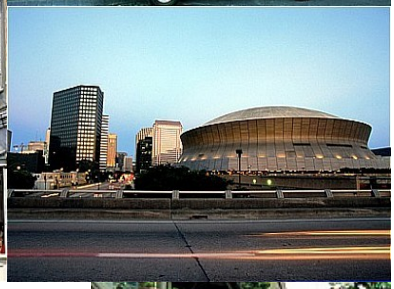
FFP and clotting factor: Transfusion of clotting factors is more frequently based on PT, fibrinogen levels and INR rather than on TEG. Although FFP contains most of the clotting factors, there is more bleeding post CPB in infants after the administration of FFP than after the administration of cryoprecipitate (18). If the bleeding and all the coagulation tests are normal, FFP administration may be helpful as a volume expander, and may aid in maintaining adequate flows and osmolality during ECMO.

Neonates and Infants: Miller et al. demonstrated the functional integrity of the coagulation system of neonates and infants with the thromboelastogram (TEG) even though clotting factors concentration is less and is not fully matured (19). In fact, a 'more coagulable state' was reported based on TEG values in the individuals 1 to 3 months of age compared with adults (20). Profound reduction in coagulation components and thrombocytopenia occur in neonates and infants with initiation of ECMO compared with adults (16). The TEG of infants demonstrates that even with lower plasma levels than adults they still clot effectively (19).

Moreover, TEG is also applicable in hypercoagulability, detecting trace amounts of heparin, factor XIII deficiency and polycythemia.

Continued on Page 10

2012 Annual Seminar



New Orleans, Louisiana

January 26-29, 2012

Transportation options from the airport:

- Airport Taxi Service: Approximately $33 one way for up to two passengers:
  $14 per person for additional passengers

- Airport Shuttle: Approximately $20 one way per person;
  $38 round-trip
  (advance purchase required)

Our Host Hotel

Omni Royal Orleans Hotel
New Orleans, Louisiana
(Located in the French Quarter)

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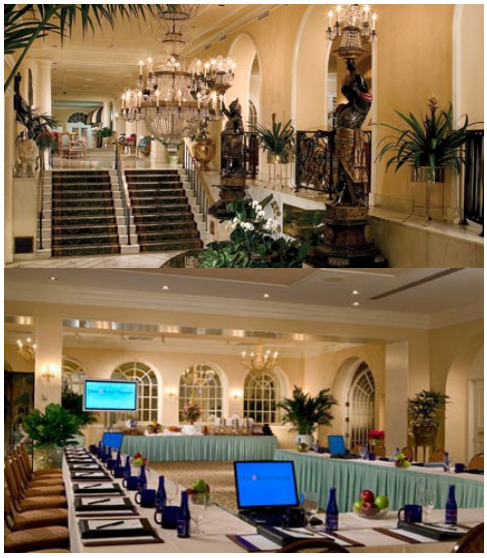
$159.00 per night



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- Individual climate control

ON BYPASS

FATIGUE & EXTENDED WORK HOURS AMONG PERFUSIONISTS

Ashleigh Trew, BS
Perfusion Student

SUNY Upstate Medical University

Syracuse, New York

There is no argument to the fact that sleep deprivation and fatigue negatively impact performance and mood (Table 1). In fact, studies have correlated that after 24 hours of wakefulness, psychomotor function is equivalent to having a blood alcohol concentration of 0.1% -- legally intoxicated in most states![2]

Table 1: Fatigue Effects on Human Functioning [1]
• Cognitive slowing
• Impaired vigilance
• Increased performance variability
• Problem solving decays
• Memory degrades
• Motivation declines
• Sleep intrudes into wakefulness

Steven Howard, MD from Fatigue and the Practice of Anesthesiology
http://www.apsf.org/newsletters/html2005/spring/01fatigue.htm

This study was presented at the 32nd Annual Seminar of The American Academy of Cardiovascular Perfusion, Reno, Nevada, 2011.

What about you, have you ever performed CPB after working all night? Have you ever felt unsafe behind the pump due to sleep deprivation? Have you ever had an unpleasant bathroom experience in the O.R. during extended work hours? Is sleep deprivation a safety concern for perfusionists?

Survey Stats

Time Frame:
May-July 2010

Participants:
445 CCPs
27% Chief Perfusionists
67% Staff Perfusionists
6% Other

Methods:
On-line survey
www.surveymonkey.com

Table 2

To find out, we surveyed the perfusion community (Table 2) to understand the prevalence of fatigue behind the pump and, also the current opinions of this issue.

Survey results showed that performance of cardiopulmonary bypass (CPB) after 17, 23, 36 hours of wakefulness was reported by 83%, 63% and 15% respondents respectively. Microsleep during CPB was reported by 49.5% of respondents. Additionally, 76% indicate that they

have been concerned about their ability to perform their job adequately due to fatigue related acute sleep deprivation. A fatigue related minor error was reported by 66% while 6.7% admit having a serious perfusion accident believed to be due to fatigue (Table 3).

Table 3 : Survey Results Snapshot

Reported longest duration of wakefulness while performing CPB	
17 hours	83% of CCPs
23 hours	63% " "
>36 hrs	15% " "
Perfusionists who report microsleep event while performing CPB	49.5%
Perfusionists who report that they have been concerned about their ability to safely perform their job due to fatigue	76%
Reported CPB incidents believed to be fatigue-related	
Minor errors	66% of CCPs
Serious accident	6.7% " "

Regarding bathroom requirements while on CPB, 87.5% have felt extremely uncomfortable at least once, 19.9% have relieved themselves in the operating room at least once, and 22.3% have left the pump unattended by a perfusionist to use the restroom at least once (Table 4).

Automobile accidents attributed to an extended period of work and fatigue was reported by 6.9% and another 44.4% reported a near miss auto accident.

Concerning critical phases of bypass, 51.5% believe that they perform less effectively when fatigued.

Opinions regarding workplace management were as follows; 48% believe that fatigue can play a role in our profession and managers should do what they can to provide a rested

Table 4: Bathroom requirements during extended hours on CPB

While performing CPB ...

- I have felt extremely uncomfortable at least once: 87.5% of CCPs
- I have been forced to relieved myself in the O.R. at least once: 19.9% of CCPs
- I have left the pump unattended by a perfusionist to make an emergency bathroom break at least once: 22.3% of CCPs

staff but unfortunately it is impractical to set work limits, 32.2% believe fatigue issues should be taken more seriously and specific work limit guidelines should be stated by our professional organizations and, 13.4% believe that limits should be established, legislated, and enforced by state or federal authorities.

Based upon this preliminary survey data, it appears that fatigue and acute sleep deprivation may be a significant safety concern in the perfusion community. Further research must be performed to understand actual performance degradation that may occur in fatigued perfusionists performing CPB.

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*The full manuscript of this article has been submitted to the journal **Perfusion** for possible publication.*

Continued from Page 5

Limitations of TEG

There is no single global test that can evaluate overall hemostasis adequately. TEG is an established device today used for monitoring coagulation, guiding transfusion or component therapy and predicting postoperative complications due to hypercoagulability (21). However, regarding the prediction of postoperative bleeding by TEG recently findings have shown conflicting results (22). Patient's age and hematocrit level may affect the result obtained by TEG. Additionally, TEG is difficult to standardize and inadequate user training or poor device maintenance may introduce significant errors of measurement.

Future of ECMO and TEG

Management of anticoagulation and transfusion triggers during ECMO continues to evolve. This has been a very slow process. The challenge that the profession faces is matching the new technologies with adequate studies that can confirm the efficacy of the new devices or tests. Heparin coated ECMO circuit are more biocompatible. This has been shown to attenuate activation of the inflammatory/ hemostatic system, reduce anticoagulation, and prolong extracorporeal support. Heparin bonded circuits may be used in all patient except in those with a documented history of heparin induced thrombocytopenia (HIT) (23, 24). Research on non-thrombogenic surfaces holds the promise of prolonged extracorporeal circulation without anticoagulation and without bleeding. During the next decade we may see ECMO circuits that are much simpler to set up and use, are safer, and are less complicated and easier to manage in any ICUs where patients with profound respiratory and cardiac failure are treated (1). In short, ECMO is a major commitment of resources to a patient complicated by a number of problems that require a multidisciplinary team approach to achieve the best outcomes.

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"Mutual Interests"

Continued from Page 1

Monday got an early start with the meeting of the editorial board of The Journal of Thoracic and Cardiovascular Surgery, a group I was appointed to by the Editor-in-Chief, Dr. Lawrence Cohn, of my own Brigham and Women's Hospital in Boston. Dr. Cohn was the first editor of this respected publication to include perfusionists and anesthesiologists on the editorial board and has opened the subject matter to include all the disciplines and technologies involved in cardiothoracic care.

We are entering a new era of collaboration in our specialty. The historic lines between groups are fading. The enlightened are coming together to afford better outcomes for our shared patients and to facilitate improving the process of care. We, as perfusionists, are being challenged to take a seat at the table. In order to do that effectively we must be prepared to intelligently discuss our methods and decision making with ample reference to the literature, the state-of-the-art of the practice and our own collective experience. We are challenged to understand the pathophysiology of those we care for, and the surgical techniques used to treat our shared patients. We are challenged to function as true consultants in planning and executing the operations. We are being invited to take our place in this community of mutual interests.

Daniel J. FitzGerald CCP, LP
President, AACP

AACP 2012 New Orleans

Important Academy Dates

The ACADEMY ANNUAL MEETING DEADLINES

ABSTRACT DEADLINE	**October 15, 2011**
MEMBERSHIP DEADLINE	**November 26, 2011**
PRE-REGISTRATION	**January 3, 2012**
HOTEL REGISTRATION	**January 3, 2012**
2012 ANNUAL MEETING	**January 26 - 29, 2012**

Others Meetings

Perfusion Downunder – The Winter Meeting
Hayman Island
Whitsundays
Australia
August 6-8, 2011
Website: www.perfusiondownunder.com

Case Reports in the Sun VII (CRITS)
Sponsored by the Florida Perfusion Society
Renaissance International Hotel and Plaza
Tampa, Florida
September 8-11, 2011
Website: www.floridaperfusion.com

Update on Perfusion Devices
Medical University of South Carolina
Charleston, South Carolina
October 13–15, 2011
Contact: 843-792-2298
Email: hannm@musc.edu
Website: http://www.musc.edu/upd

Dynamic Changes in the Cardiac Patient Population: Challenges for Technologies and Perfusion Techniques
Cornell Medical Center in NYC
Sponsored by NYSSP/ NFFPE
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