



INTERFACE

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Great Presentations and Attendance at 2013 Annual Meeting

By Jesse M. Ehrenfeld, MD, MPH

Dear STA Members,

It was my distinct pleasure to Chair the 2013 STA Annual Meeting in Phoenix, Arizona. This was the best attended STA Annual meeting in the history of the organization. Our keynote address "Using IT to Control Variability in Medical Practice & Improve Medical Outcomes," by Bill Stead, MD, set the stage for an informative set of talks which covered: patient safety, automation, monitoring, data visualization, and regulatory concerns. We had 33 distinguished speakers from all over the world who each shared their knowledge and expertise. The presentations were universally outstanding and all attendees found the information valuable and rated the lectures very highly. The joint FAER/STA session on "Regulate or Innovate: Can We Do Both?" was a great success. Finally, we had just shy of 40 abstracts accepted for presentation this year. These posters showed the breadth of activity STA members are engaged in, and are a true testament to the organization's role in supporting our younger anesthesiologists and those in training. I want to personally thank the Board of Directors of the STA for their help and support during this process and for giving me this opportunity, FAER for continuing to support our joint research session, as well as our friends and supporters from industry.

We look forward to seeing you next year in Orlando during the 2014 STA Annual Meeting, which will be held January 15-18.

Sincerely,
Jesse M. Ehrenfeld, MD, MPH

Annual Meeting Photos continued on page 3



A view from the back of the General Session Meeting room at the 2013 Annual Meeting.

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Dr. George Blike (left) handing Dr. Jesse Ehrenfeld (right) his plaque for Chairing the 2013 Annual Meeting.



Andy Tsai and Carol Lee of ReFlex Wireless, the STA 2012 Engineering contest winners.



(From L to R) Dr. David Feinstein, Jane Svinicki and John Pawlowski at the dinner event on Friday evening.



(From L to R) Dr. Dusan Damjanovic, Dr. Kenneth Hobroyd and Dr. Jeff Mandel in the exhibit hall.

Meeting Recap Photos continued on next page

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A panoramic view of the general session meeting room.



Attendees of the 2013 Engineering Challenge session.



Friday's luncheon on the lawn. The heaters kept attendees warm!



A panoramic view of the meeting's opening reception in the exhibitor hall.



President's Message

By John Pawlowski, MD, PhD, 2013 STA President

Welcome to the Society for Technology in Anesthesia. We are celebrating our 24th year and remain dedicated to the identification, analysis, and clinical application of technologies to advance the field of anesthesia and to improve the lives of our patients. Born in a time of rapid expansion of computing power

and internet technologies, the early STA faced issues such as reliability and application of computers in the operating room. Medical simulation was just starting. Budgets were unlimited. Those were heady times.

The STA now deals with the interoperability of dozens of computers in the operating room, switching to newer information systems, issues of data confidentiality and cyber terrorism. Current topics of interest for our members at recent meetings have included sensor technologies to prevent respiratory arrests, non-invasive alternatives to current monitors, hemodynamic monitors to provide doctors with early warning of problems, data analysis to quantify best clinical practices, drug infusion systems to improve patient sedation and lessen side effects, non-invasive alternatives to current monitors, and anesthetic nanotechnology. In all of these systems, there needs to be sensitive training of the clinicians, the development of robust products and the timely feedback to industry to recommend changes and to fix problems. The STA is uniquely situated to effect these changes. We welcome both clinicians and members of allied medical technology industries. For the 24 years, we have offered full and unrestricted membership to doctors and engineers, scientists and clinicians. At our meetings, members from hospitals and industries have listened to the lectures, panels and workshops and have forged new understandings of the technologies and technical challenges in our field.

For the coming years I have four goals to focus on: Meeting, Meaning, Membership and Money.

• GOAL #1 Meeting

The annual meeting in January represents the major and unifying effort of our society. Each year, the STA convenes in some nice spot to bring together some of the best minds and the most relevant topics for the use of technology in anesthesia. The next meeting is in Orlando Florida, run by Drs. Joan Spiegel and Brian Rothman, and features such topics as: Entrepreneurship, Directions in Patient Safety, Choosing the next AIMS, Big Data, and Closed Loop anesthesia. Each meeting has Essentials of Anesthesia sessions to welcome newcomers as well as informal workshops and focus groups to challenge longtime members. The meetings are small, with a feeling of community, informality, and intimacy. Once you have experienced an STA meeting, you may never leave our society.

In addition to the annual meeting, the STA develops and presents an annual panel at the ASA, the IARS, and FAER. Last year, the STA organized and ran a panel at the ISAP, in which I was privileged to participate. These kinds of associations will continue to foster understanding between component societies and improve our knowledge of the interdependence of emerging technologies.

My goal is to add 2 new component societies to our expanding network of interactions at academic meetings.

• GOAL #2 Meaning

In order to continue, the STA needs to remain relevant, informative, fun and instructive to its members. The STA also needs to bring technology to the anesthesia community without a huge technology department; with few resources and fewer people to customize systems and to troubleshoot problems.

My goal is to add 2 lectures, 1 panel and 1 workshop to address nonacademic and rural settings, community and public hospitals, offices and clinics.

Presidents Message continued on page 9





Report from the Executive Director

By Jane A. Svinicki, CAE

In January each year many people evaluate their current work, family, and lifestyle and decide to set some new goals. New Year's resolutions have somewhat dropped out of favor, but the desire to set goals at the beginning of year is ingrained in most of us.

But attempts to lose weight, save money, exercise, stop smoking, and many of the other most popular goals fail. As a regular at my gym, I see that all those newbies that start after January 1st are gone within a week or two.

Why do people fail at their goals? Because change is super hard!

For the Svinicki Association Management, Inc. (SAMI) staff, our tradition is to have a staff retreat once a year and consider our company goals for the year. This year the retreat was the first couple of days in January. Thank you to everyone at STA for your understanding, since the office was closed.

Since the retreat is an overnight activity, the first day is all fun and the second day we meet for a half-day. Because of the nature of the work we do planning your meetings, members of our staff frequently travel together. But that is business, and the focus is on you, our client, as it should be. The retreat is an opportunity for our staff to travel together without client responsibilities.

Why do we have a company retreat? I could say it is the need for planning, or goal setting, or to review best practices, but really it is about our staff. It is a chance to say thanks, to have some fun, and to get to know each other better. At the SAMI retreat, the focus is on SAMI, what we do for our clients and how we can do it better. Everyone has the opportunity to contribute their ideas on how to make SAMI a better place to work – for each other as staff and our clients.

For 2013, several of our SAMI primary goals center on the ideas of excellence and recognition.

SAMI is pursuing accreditation of our company as a certified association management firm by the AMC Institute. This process requires us to evaluate all our processes and procedures. It is a tedious activity, but it will ensure the best quality management of our clients.



Some of the SAMI staff at the Potluck Salad Bar for Jane's birthday.

SAMI is supporting several staff in pursuing their Certified Association Executive (CAE) designation. This will ensure our staff has the knowledge and tools to provide excellent management to your organization and members.

SAMI is going to recognize 10, 15 and 20 year client anniversaries. In 2013, two SAMI clients will celebrate 20 years of management with SAMI. That is an amazing amount of time to be in a stable business relationship.

Of course we also want to lose weight, exercise more, increase revenue, and cut unnecessary expenses. We decided to change our regular pot-luck 'taco bar lunch' to a pot-luck 'salad bar lunch'. We also decided to have music in the office on Friday afternoons, switch out regular desk chairs to balance balls to improve our core muscles and have an office 'pet' (stuffed because real ones are not allowed).

Will we actually accomplish our goals? We are committed to them. One thing is certain, we will never accomplish any goals if we do not set them.

We have already had our first salad bar lunch pot-luck on my birthday in January. That's a start.

Sincerely,

Jane A. Svinicki, CAE
Executive Director

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¹ The Joint Commission Sentinel Event Alert Issue 49, August 8, 2012

² Taenzer AH et al. *Anesthesiology*. 2010;112(2):282-287

³ Taenzer AH et al. *Anesthesia Patient Safety Foundation Newsletter* Spring-Summer 2012.

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President's Message *continued from page 5*• **GOAL #3 Membership**

The STA has long attracted the technophiles, the change agents and the deep-pocketed geeks of our specialty. I respect and admire these people. On occasion, I feel like one of them- but I also feel welcomed and supported by them. We need the technically conversant to continue to advance and drive the improvement of systems to help us provide quality anesthesia care. We also need the translators- those people who understand these systems and who can make technology useable by clinical providers. I encourage the residents in anesthesia training programs to become involved in the STA. We continue to provide free membership to residents and to award a Resident Research Prize to reward scholarly work in the field of technology and anesthesia.


My goal is to increase the total membership in the STA by 20%. I plan to focus on the anesthesia providers in smaller group practices to achieve this goal.

• **GOAL #4 Money**

The problems of a small society are the same as that of a small family: finite reserves and a budget that requires constant attention. The current management company run by Jane Svinicki keeps us lean, trims our extra baggage, and watches for bargains. We continue to rely on membership dues, corporate sponsors, and creative fundraising to stay on track for the future.

My goal is to increase the reserves by 100% and to increase the corporate donations by 20% (Lifetime memberships are available).

Feel free to explore our webpage and to contact us directly. I am sure that you will find the STA to be a comfortable collection of innovators, tinkerers, the curious and the adventurous.



John Pawlowski, MD, PhD
STA President

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2013 STA Abstract Winners

Honorable Mention

"The Use of Mobile Computing Devices in Anesthesia Resident Education: A Cross-Sectional Survey Study"

Presenting Author: John S. Sun, BS

Co-Authors: Anna M. Clemenson, BA; Monica C. Garbin, MA; Larry F. Chu, MD,MS

Honorable Mention

"Single Breath Detection During Spontaneous Ventilation Using Alar Photoplethysmography"

Presenting Author: Richard Melker, PhD, MD

Co-Authors: Michael Stahl, MS; Timothy Morey, MD; Mark Rice, MD; Judith Wishin, RN; Donn Dennis, MD

Honorable Mention

"Variability in Crystalloid Perfusion During Abdominal Surgery – How Anesthesia Information Management Systems (AIMS) Help to Assess Fluid Administration in an Academic Medical Center"

Presenting Author: Marc Lilot, MD

Co-Authors: Joseph Rinehart, MD; Christine Lee, BS; Maxime Cannesson, MD, PhD

Best Clinical Application

"Reduction in Red Blood Cell Transfusions During Neurosurgery with Noninvasive and Continuous Hemoglobin Monitoring"

Presenting Author: Wael Aweda, MD

Co-Author: Fawzy Mahmoud, MD

Excellence in Technology

"IMPRINT: A Blended-Learning Online and Simulation-Based Curriculum to Promote Intern Wellness and Increase Medical Knowledge During the CB-1 Year"

Presenting Author: Ankeet Udani, MD

Co-Authors: Anna Clemenson, BA; Kyle Harrison, MD; Monica Garbin, MA; Larry Chu, MD, MS

Best in Show

"Successful Transition to Anesthesia Residency Training: A Multicenter Study of an Online Distance-Learning Program Designed to Prepare Interns for Anesthesia Residency Training"

Presenting Author: Matthew J. Erlendson, BA

Co-Authors: Lynn Ngai, BS; Monica Cristina Garbin, MA; Larry Chu, MD, MS

Abstracts continued on next page

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The Use Of Mobile Computing Devices In Anesthesia Resident Education: A Cross-Sectional Survey Study

Presenting Author: John S. Sun, BS, Research Assistant, Stanford Anesthesia Informatics and Media (AIM) Lab

Co-Authors: Anna M. Clemenson, BA, Research Assistant, Stanford Anesthesia Informatics and Media (AIM) Lab, Monica C. Garbin, MA, UNICAMP Brazil, AND Dr. Larry F. Chu, MD, MS, Director of Stanford Anesthesia Informatics and Media (AIM) Lab

Introduction: Recently, there has been an increased interest in integrating mobile computing devices, such as the iPad, into medical education. Five months ago, the Stanford Anesthesia residency program provided mobile computing devices (iPad 3, Apple, Cupertino, CA) to 63 of our residents for the duration of their residency. A cross-sectional survey study was conducted in order to understand how these residents are using mobile computing devices for anesthesia education. Specifically, we sought to understand how often the residents were using the mobile computing devices, in what ways they were using the devices, and how this has impacted their anesthesia residency training.

Methods: iPad Information: We provided our residents with 64 GB wifi iPad 3 units, which were preloaded with Anesthesiology Journals (Anesthesia & Analgesia, Anesthesiology, NEJM Journal), Crisis Code (an application to teach crisis management principles in the context of ACLS, iLarynx (a fiberoptic intubation simulator), ePocrates (a drug reference guide), ComunicaTOR (an operating room translation application), StanMed (a critical care medicine application) and Ether Mobile (a paging application). Textbooks installed on the iPads included: Miller's Anesthesia, Seventh Edition, Obstetric Anesthesia Handbook, Fifth Edition, Datta, Smith's Anesthesia for Infants and Children, Eighth Edition, Handbook of Neuroanesthesia, Fourth Edition, Handbook of Ambulatory Anesthesia, Second Edition, Essentials of Pain Medicine, 3rd Edition, Complications of Regional Anesthesia, Second Edition, Clinical Anesthesia Procedures of the Massachusetts General Hospital, Eighth Edition, Case Studies of Near Misses in Clinical Anesthesia, Brock-Utne, Anesthesia Student Survival Guide, and Anesthesia Intensive Care and Pain in Neonates and Children.

Survey Design: After testing for reproducibility and clarity, we deployed our survey to our 63 anesthesia residents. The survey asked the residents questions about how they used the iPad for studying and residency tasks.

The survey included 9 open-ended questions, and 17 multiple-choice questions. We organized the questionnaire into three general domains:

- **General Information:** We collected demographic information from the students such as gender, age, and previous experience with mobile technology.
- **iPad Usage:** We collected information about when the residents were using the iPads, and the impact on their desktop computer use.
- **iPad Applications:** We collected information about individual applications that we preloaded onto the iPad.
- **Data Analysis:** After we received our results, we analyzed them using a mixed-method. The open-ended collected data

was entered into NVivo 10 and the questions were analyzed using qualitative methods.

Results: 90.2% of Stanford Anesthesia Residents agree or strongly agree that an iPad would enhance their ability to learn anesthesia. 85.7% of residents surveyed also agreed or strongly agreed that iPads were under-utilized in anesthesia education.

After receiving the iPad, 64.3% of our residents said that they were using their personal desktop computer less. When asked what frequency the residents used their iPad, 46.4% used them daily, 39.3% used them every other day, and the remaining 14.3% used them once a week.

The two main activities that the residents used the iPads for most frequently are e-mail and reading medical books or papers. The places that the residents are using the iPad most often are at home, followed by inside the OR, and then inside coffee places. The main reason stated for using it at home was because the iPad was too bulky to carry with them at all times.

We also asked the residents how useful the iPad provided by Stanford was for specific activities. 85.7% of residents said that the iPads were useful or very useful for accessing medical papers and 95% said that the iPads were useful or very useful for studying. 71.4% thought the iPads were useful or very useful for clinical issues.

Out of the individual applications that we provided to the residents, the applications rated most useful were the books and journals. One of our residents stated: "[the iPad] has revolutionized access to texts and primary literature for studying and preparing every day."

Conclusions: We found that a majority of our residents reported that the iPad is underutilized in medical education. Our survey has shown us that when given iPads, the majority of our residents use their iPads almost daily, and that the iPads have been reported to be useful for studying and accessing medical books and journals. The residents have also reported that they are reading more, chiefly because the iPad is an excellent resource for studying at home and outside of the operating room clinical environment.

However, the residents did voice concerns that they would lose the iPad because of its small size and inability to securely store the device in the clinical environment. Some residents also reported that the iPads were too bulky to carry around in the operating room. Future work in exploring the use of mobile computing devices may focus on implementation of the iPad Mini as a more portable option for in anesthesia medical education.



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1. ASA Standards for Basic Anesthetic Monitoring, Committee of Origin: Standards and Practice Parameters (Approved by the ASA House of Delegates on October 21, 1986, and last amended on October 20, 2010 with an effective date of July 1, 2011) www.asahq.org/.../standards%20Guidelines%20Stmts/Basic%20Anesthetic%20Monitoring%20202011.ashx. Accessed March 21, 2011.


2. Stoelting R, Overdyk F. Anesthesia Patient Safety Foundation, Conclusions and Recommendations from June 08, 2011 Conference on Electronic Monitoring Strategies to Detect Drug-Induced Postoperative Respiratory Depression. <http://www.apsf.org/announcements.php?id=7>. Accessed August 25, 2011.

3. Standards for Basic Anesthetic Monitoring. American Society of Anesthesiologists. http://www.asahq.org/For-HealthcareProfessionals/~/_media/For%20Members/documents/Standards%20Guidelines%20Stmts/Basic%20Anesthetic%20Monitoring%202005.ashx. Accessed June 20, 2011.



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Single Breath Detection During Spontaneous Ventilation Using Alar Photoplethysmography

Presenting Author: Richard Melker, PhD, MD; Xhale, Inc. and Department of Anesthesiology, Gainesville, FL

Co-Authors: Michael Stahl, MS, Assurance Biosense, Gainesville, FL; Timothy Morey, MD; Mark Rice, MD; Judith Wishin, RN; Donn Dennis, MD (TM, MR, JW, DD Department of Anesthesiology, Gainesville, FL)

Introduction: Opioid-induced respiratory depression (ORD) is life-threatening and multifactorial. Many post-operative patients receive patient controlled analgesia. Accurate detection of ORD is challenging, prompting the APSF to highlight it and seek novel monitoring and intervention solutions.

Photoplethysmography (PPG) measures blood volume from at least one LED and a photodiode (PD) as in pulse oximeter sensors. Central PPG (cPPG) was coined to describe measurements above the thoracic inlet where intrathoracic pressure and thus cardiorespiratory changes are reflected.

We studied two hypotheses: 1) cPPG sensors placed on the nasal ala (NA), a site with a rich vascular supply with minimal-to-no sympathetic innervation, can accurately detect individual breaths in spontaneously breathing patients during minor surgery; and 2) the ability to detect individual breaths with NA PPG will be useful in designing technology for early detection of ORD.

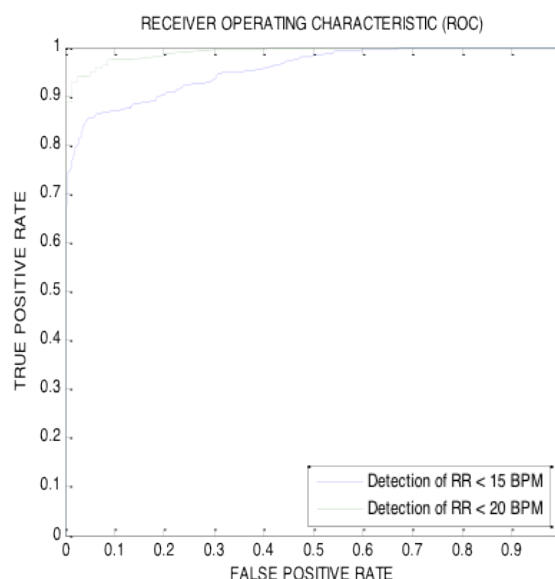
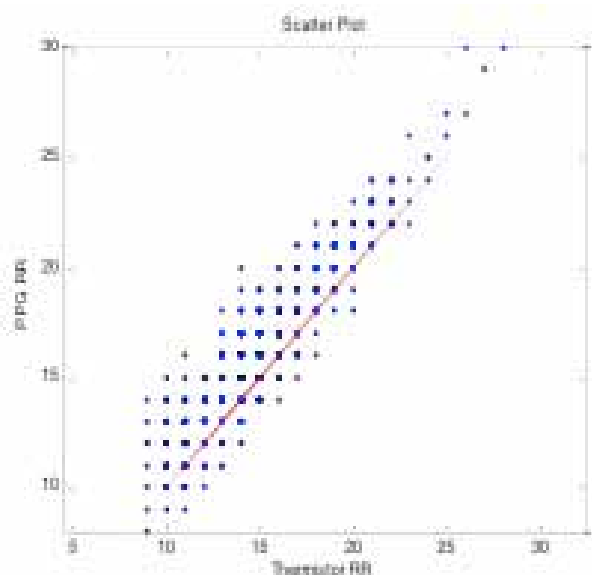
Methods: With WIRB approval, 39 outpatients were studied with standard monitoring, and an NA sensor (Assurance Biosense, Gainesville, FL) placed on either ala and connected to an OxyPleth oximeter (Dixtal Medical, Wallingford, CT). High resolution raw data was collected for further analysis. The

accuracy of breath detection from NA PPG was determined using one minute epochs of thermistor flow (TF) as the “gold standard.” (Respiratory rate [RR] in breaths per minute [BPM] from the NA PPG was compared to RR from the TF.)

21 hours of valid data was analyzed. NA PPG data was separated in the time domain into two components: one synchronous with heart rate, and the other containing low frequency events including individual breaths and 40 derived parameters of which 4 were selected to detect single breaths.

Results: Left figure - scatter plot of TF RR v. NA PPG RR. The Pearson coefficient between RR detected with TF and NA PPG was $r=0.94$, $r^2=0.88$ (computed using Matlab, Natick, MA). Right figure - ROC curves for detecting when RR is <20 BPM (green) and <15 BPM (blue) for NA PPG. AUC=0.99 for 20 BPM; 0.96 for 15 BPM.

Conclusion: Because NA PPG correlates well with TF in detecting individual breaths in spontaneously breathing patients, this new technology holds the promise of reliable breath and respiratory rate detection with a low incidence of false alarms. We believe that future refinements in sensor design and processing algorithms will further improve the accuracy of alar PPG to detect respiratory events, including ORD.



Variability In Crystalloid Perfusion During Abdominal Surgery – How Anesthesia Information Management Systems (Aims) Help To Assess Fluid Administration In An Academic Medical Center

Presenting Author: Marc Lilot, MD, Department of Anesthesiology & Perioperative Care, UCI Medical Center, Orange, CA

Co-Authors: Joseph Rinehart, MD, Christine Lee, BS, and Maxime Cannesson, MD, PHD Department of Anesthesiology & Perioperative Care, UCI Medical Center, Orange, CA

Background: Restrictive crystalloid infusion associated with colloid goal directed therapy has been reported to be an effective balanced fluid strategy¹ during abdominal surgery²⁻³. Standardization of care with an approved protocol has the proven ability to decrease morbidity and mortality and decrease hospital length of stay⁴. Using the anesthesia information management system we explored, without applying a standardized fluid management protocol, how much variability in crystalloid infusion delivery existed during abdominal surgery at our academic medical center.

Methods: This study is a monocentric retrospective analysis. We extracted related clinical data from cases involving general anesthesia for abdominal procedures performed at UC Irvine medical center from January 2009 to December 2011 from the AIMS (SIS™; Surgical Information Systems, Alpharetta, GA). Data was grouped per anesthesiologist in order to examine the variability among the specific providers. Exclusion criteria included estimated blood loss over 500ml, blood transfusion during anesthesia, and less than 6 cases per anesthesiologist during that period. Prostatectomies were also excluded from provider analysis because of the specific resuscitation guidelines for those procedures. We corrected the crystalloid infusion for urine output, blood loss, and colloid using the following formula: crystalloid + colloid - estimated blood loss - urine production. Results are expressed in mL/kg/hour. Data are presented as median [interquartile range]. Statistical analysis was performed with Excel 2007 and SPSS 19.

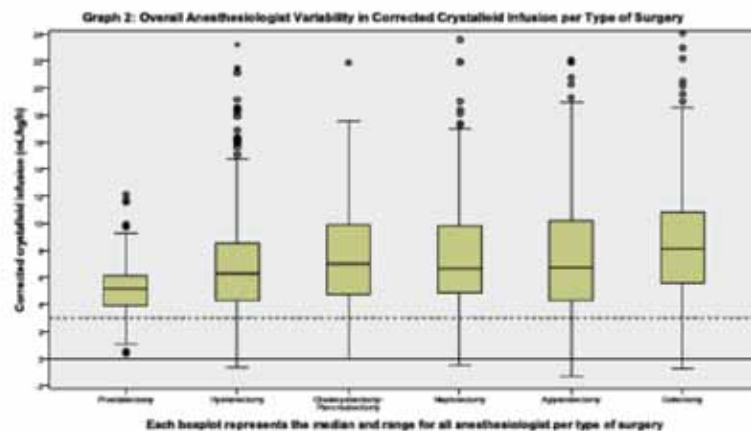
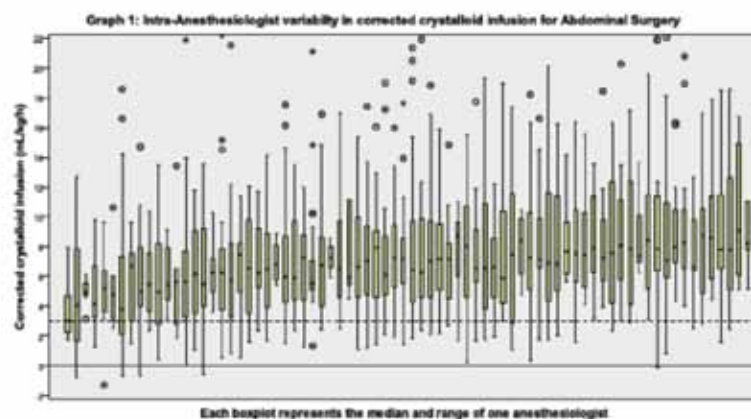
Results: A total of 2251 appropriate cases were found in the AIMS based on procedure. After exclusion criteria were applied, 1303 cases performed by 76 anesthesiology providers were analyzed. (Graph 1) The average median corrected crystalloid infusion across all providers was 6.7 [4.5-10.0] mL/kg/h. The smallest anesthesiologist interquartile range was [4.6-6.0]mL/kg/h (with 7 cases), the highest anesthesiologist interquartile range was [3.8-13.6]mL/kg/h with (6 cases). When grouped by surgical procedure, 1292 cases (appendectomy, colectomy, hysterectomy, nephrectomy or cholecystectomy-pancreatectomy) were analyzed. We included the 280 prostatectomy cases with the same case exclusion criteria for comparison (Graph2). The average median corrected crystalloid infusion across all surgeries was 6.6 [4.5-9.3]mL/kg/h. The smallest surgery interquartile range was for prostatectomies [3.9-6.2]mL/kg/h with 280 cases, and the highest one was for appendectomies [4.2-10.2] mL/kg/h with 243 cases.

Conclusion: Despite numerous literature recommendations in fluid management for abdominal surgeries, we find a large case-to-case variability among providers in crystalloid infusion

during abdominal surgery. The AIMS allowed for retrospective analysis to assess the current practice and to further develop protocol for standardization in fluid management during abdominal anesthesia.

References

1. Chappell D, Jacob M, Hofmann-Kiefer K, Conzen P, Rehm M. A rational approach to perioperative fluid management. *Anesthesiology* 2008;109:723-40.
2. Forget P, Lois F, de Kock M. Goal-directed fluid management based on the pulse oximeter-derived pleth variability index reduces lactate levels and improves fluid management. *Anesth Analg* 2010;111:910-4.
3. Joshi GP. Intraoperative fluid restriction improves outcome after major elective gastrointestinal surgery. *Anesth Analg* 2005;101:601-5.
4. Rahbari NN, Zimmermann JB, Schmidt T, Koch M, Weigand MA, Weitz J. Meta-analysis of standard, restrictive and supplemental fluid administration in colorectal surgery. *Br J Surg* 2009;96:331-41.



Reduction In Red Blood Cell Transfusions During Neurosurgery With Non-invasive And Continuous Hemoglobin Monitoring

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Background: While blood loss during surgery is a known risk factor, red blood cell (RBC) overuse increases patient risk and cost of care. Hemoglobin concentration (Hb) is used as a primary indicator for RBC transfusion, but laboratory measurements are only available intermittently and results can be delayed in the period between blood draw and laboratory analysis. Noninvasive and continuous Hb (SpHb) monitoring provides real-time trends in the direction of Hb, such as indicating stable Hb when it may be perceived to be dropping and rising Hb when it may be perceived to not be rising fast enough. SpHb monitoring has been shown to reduce RBC transfusion frequency and average units transfused per patient in a randomized controlled trial in moderate to low blood loss orthopedic surgery.¹ The objective of this study was to evaluate SpHb monitoring impact on RBC transfusions in high blood loss surgery.

Methods: Following ethics committee approval, we conducted a prospective cohort study in patients scheduled for neurosurgery at an academic, tertiary hospital. During the study period, one patient scheduled for neurosurgery the next day was randomly selected using the sealed envelope method to be screened for SpHb Group inclusion. Following enrollment into the SpHb Group, the other patients also scheduled for surgery on the same day were screened for inclusion into the Standard Care Group. A total of 106 patients were enrolled with an average age of 39.8±14.9 years. The Standard Care Group (n =61) received typical anesthesia care including estimated blood loss (EBL) assessment and intraoperative Hb measurements from the central laboratory. Blood samples were taken when EBL was ≥15% of total blood volume. RBC transfusion was initiated if Hb was ≤10 g/dL and continued until the EBL was replaced and Hb >10g/dL was confirmed. The SpHb Group (n = 45) was monitored with a Pulse CO-Oximeter and multi-wavelength sensor (Radical-7 monitor version 7748, R2-25 adult ReSposable sensor revision "E", Masimo, Irvine, CA). The SpHb Group followed the same transfusion practice as the Standard Care Group except the anesthesiologist was guided by the addition of SpHb, with blood samples still taken pre- and post-transfusion. Differences in variables were assessed with the Student t-test method. Potential cost savings from RBC transfusion reduction were estimated using an activity-based RBC cost range (\$522 to \$1,1832).

Results: As shown in Table 1, there were no differences in baseline Hb, patients transfused (%), or pre-transfusion Hb. In the SpHb Group, there were a lower number of RBC units transfused over all subjects, lower number of RBC units transfused in subjects receiving transfusions, lower % of transfused patients receiving >3 RBC units, lower Hb increase after RBC transfusion was initiated, and shorter time to transfusion after transfusion need was established. Based on the average 0.9 RBC unit reduction per patient in the SpHb Group, SpHb monitoring could save \$470 to \$1,065 per patient monitored and \$469,800 to \$1,064,700 per 1,000 surgeries performed.

	Standard Care Group (n=61)	SpHb Group (n=45)	p-value
Baseline Hb (g/dL)	11.8±1.6	11.6±0.8	NS
Patients transfused, %	49	44	NS
Pre-transfusion Hb (g/dL)	8.3±1.2	8.6±1.2	NS
Hb increase after transfusion (g/dL)	2.6±1.2	1.8±0.9	<0.05
RBC transfusions per subject, units	1.9±2.3	1.0±1.5	<0.001
RBC transfusions per subject receiving a transfusion, units	3.9±1.7	2.3±1.5	<0.01
Transfused patients receiving >3 RBC units, %	73	32	<0.01
Time to transfusion after need established (min)	50.2±7.8	9.2±0.7	<0.001

Conclusions: SpHb monitoring reduced intra-operative RBC transfusions during high blood loss surgery. Based on the RBC reduction shown with SpHb monitoring, hospitals could significantly reduce costs with this approach.

References

1. Ehrenfeld JM et al. ASA. 2010. LB05 (abstract).
2. Shander et al. Transfusion. 2009;50:753-65.

ImPRINT: A Blended-Learning Online And Simulation-Based Curriculum To Promote Intern Wellness And Increase Medical Knowledge During The Cb-1 Year

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Introduction: ImPRINT is a yearlong blended-learning on-line- and simulation-based course for current interns prior to matriculation into the Stanford Anesthesia residency program. By using a “flipping the classroom” structure (e.g. having interns do online “homework” before attending class) that combines online lectures, group discussion, and high fidelity simulation, ImPRINT’s primary goal is to educate students on common clinical situations encountered during the CB-1 year. Furthermore, ImPRINT also promotes intern wellness and focuses on developing a growing relationship with the anesthesiology department.

Methods: 17 interns meet once a month for a yearlong course on clinical education and simulation. A learning management system (Moodle, Perth, Australia) is used to organize and deploy the curriculum. Students are assigned to watch a video podcast given by a faculty member or resident prior to each monthly in-person teaching session. Each in-person session begins with a pre-module assessment of medical knowledge and wellness that is taken on computers located in the teaching lab from the learning management system. This is followed by a 30-minute group discussion of module topic facilitated by faculty and senior resident facilitator or expert. Students then participate in a 45-minute immersive, high fidelity simulation of module topic, followed by part-task training for 30 minutes. The meeting closes with a 25-minute debriefing of all module activities and a post-module assessment survey of medical knowledge and wellness. The results shown in this abstract are a preliminary analysis of the pre- and post- module surveys of the ACLS curriculum component of this course, the module for which we currently have complete evaluation data.

Analysis Method: The data was analyzed with a mixed-method analysis. Open-ended collected data was entered into NVivo 10 and the questions were analyzed using qualitative methods. Answers to multiple-choice questions were analyzed using simple statistics. The surveys were deployed online using the Survey-monkey survey system.

Results: Students were asked to rank the following ACLS activities on a scale from 1 to 4, with 1 being the most educationally beneficial and 4 being the least: podcast lecture, small group discussion, immersive high-fidelity simulation (mock code), and task training (mannekin practice, venipuncture, etc.) All students ranked immersive high-fidelity simulation as the most educational with an average score of 1.0, and with task training being the second-most educational activity with a score of 2.0. Students were then asked to rank the same activities on a similar scale that indicated which module was the most enjoyable. Again, immersive high-fidelity simulation and task-training ranked first and second most enjoyable with an average score of 1.11 and 1.78 respectively.

In addition, the pre-module survey found that while 69.2% of students felt “somewhat prepared” to be a contributing member of an adult code team, only 23.1% felt “prepared” and 0% felt “very prepared.”. The post-module survey found that 50% of students felt “prepared” and 21.4% of students felt “very prepared.”

Conclusion: ImPRINT, which is blended learning online course that uses high-fidelity simulation to educate students about common clinical scenarios encountered during internship. The unique blended-learning structure of the curriculum emphasizes high-fidelity simulation and part task trainer use during in-person teaching sessions. This is made possible through the shifting of didactic teaching components to an online podcast that is done prior to the in-person teaching sessions (i.e. “flipping the classroom”). Our learning management system provides a framework and structure to the course to ensure online components are completed prior to teaching sessions. By utilizing an innovative learning program blending online learning with simulation, ImPRINT provides CB-1 interns in the Stanford Anesthesia residency program with a unique hybrid approach to learning that leverages online content delivery of didactic lectures to enable time for high-fidelity simulation and part task training activities. Our preliminary results show that interns prefer simulation as an in-person learning module and prefer online learning prior to attending an educational session.

Successful Transition To Anesthesia Residency Training: A Multicenter Study Of An Online Distance-Learning Program Designed To Prepare Interns For Anesthesia Residency Training

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Background/Introduction: START is an innovative, distance-learning online educational program taught during the PGY-1 internship year. It has been shown in a previous single institution study to ease the transition from internship to residency (JGME, in press March 2013). The purpose of this multicenter observational study is to test whether this 10-month program increases anesthesia knowledge, increases interns' self-assessed preparedness to begin anesthesia training, and to determine if these results are generalizable across 4 anesthesia training programs in the United States: Stanford, Yale, Mount Sinai, and UC Davis. Recently, the START program has been incorporated into the 2012-2013 curricula at Harvard, UMass, Jefferson, and Baylor. Recent additions for the START 2013-2014 program include University of Alabama, University of Calgary, University of Saskatchewan, UC San Diego, and Tulane.

Methods: START is an online distance-learning program administered to interns once per month using the Moodle learning management system (Moodle, Perth, Australia). Each monthly online learning module is comprised of five components: short video podcasts, longer coursecast video lectures, interactive/collaborative activities, pre- and post-quizzes, and an evaluation/feedback component. 75 interns participated in the 2011-2012 START program. 75 interns from the previous year who did not go through the START program were used as historical controls and did not participate. Assessment in changes in anesthesia-related knowledge are measured with pre- and post-quizzes for each module. A survey assessing preparedness to perform 14 basic anesthesia skills was administered before and after START, utilizing a five-level Likert scale. Survey data on subjective feelings of preparedness for residency, stress levels, and connectedness to faculty and institution were further assessed via a five-level Likert scale five months following the completion of the 2011-2012 START program. Qualitative analysis was performed using QSR International's NVivo 10 software (NVivo qualitative data analysis software; QSR International Pty Ltd. Version 10, 2012) on open ended questions. 37 prior START participants completed the follow up survey.

Results: Our results show that the START program improves anesthesia knowledge. Quiz scores on anesthesia knowledge improved significantly when pre-curriculum knowledge assessments were compared with with post-curriculum tests. The average learning improvement across all four sites was 34.5% ($p < 0.0001$) and was not significantly different between sites (p -value of interaction = 0.235). Intern's self-assessed feelings of preparedness to begin residency increased on average by 48% after completing the START program ($p < 0.0001$). In addition there was a significant difference in the self assessed-preparedness

scores compared to controls who did not take the course (20.8 vs. 14.1, $< .0001$). In quantitative data analysis 94.6% of interns answered, "agree" or "strongly agree" when asked if they felt more prepared to begin their anesthesia residency after completing the START program. Student comments have been for the majority positive, expressing appreciation for having START during their internship year (Table 2). Between the four institutions, 81% of interns who completed the follow up assessment survey reported that START helped them to feel less stressed about the beginning of their residency. Qualitative data analysis show that 36 of 37 interns felt more prepared for residency after completion of the START program. When asked if they felt the schools cared more about their education, 91.9% of the residents say "yes".

Conclusions: START is a distance learning online educational program that results in improvement in anesthesia knowledge, feeling more prepared to begin anesthesia residency, and ultimately resulted in interns feeling cared about by their home institution and less stressed about beginning their first year residency.

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Sunday, October 13, 2013

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Register at stahq.org!

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