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President's Message

By Brian S. Rothman, MD, Vanderbilt University

On behalf of STA, many thanks are in order. We deeply appreciate and thank Dr. Joseph Orr for his leadership and guidance over the past year as STA's President. The result of his efforts can be seen in our increased membership and continued financial strength, as well as new and stronger ties to other organizations, both nationally and internationally. Dr. Joan Spiegel, outgoing Past President, and Heidi Hughes, outgoing At-Large Industry Director, also deserve our thanks for their significant time and effort serving on the STA Board.

Program Co-Chairs, Dr. Jorge Galvez and Dr. Patrick McCormick, along with Dr. Jonathan Wanderer as the Abstract Chair, assembled an outstanding Annual Meeting for us this year in at the Four Seasons Resort in Palm Beach, Florida. The focus on both technology and the surgical home provided our membership vital updates on current topics that will impact our specialty and healthcare as a whole, both in the short- and long-term. Combined with the efforts of Marie Marinello from SAMI, the Annual Meeting coordination and execution was seamless. We congratulate Marie's solo management of our STA meeting for the first time. Well done!!

We would like to give a special thank you to all our corporate sponsors. The interactions between the sponsors and the attendees are meant to benefit everyone, and I hope that everyone's expectations were exceeded. As sponsors, you make the Annual Meeting possible, and we look forward to seeing you all next year.

One of many positive changes already this year was the distinct decrease in the mean meeting attendee age. Credit goes to Dr. Charlene Swift and Dr. Lisa Chan and the newly formed Digital and Social Media Committee. Using a coordinated strategy and a lot of hard work, they put STA on the social media map and drew in new blood from several programs across the country. We now have many newly interested residents that translated into over 30 new resident members to the Society. Their success has garnered further Board support in the form of funding, and we look forward to our investment delivering more value for our members and increased membership over the next year.

We would also like to thank Fresenius Vial SAS for the three-year research award grant that concluded this year. Their contribution certainly advanced using technology to improve healthcare. We now welcome Neurowave Systems who is supporting a three-year research grant that promotes

President's Message *continued on page 5*

In This Issue!

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1. Michard F, Biais M. Rational fluid management: dissecting facts from fiction. Br J Anaesth 2015

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Report from the Executive Director

By Jane Svinicki, CAE

Understanding Millennials

Recently I was participating in a strategic planning session for a professional association with 500 members. The participants were discussing what challenges the organization faces. A member survey conducted to prepare for the session, showed that almost 1/3 of the members were in practice 21 or more years. The membership was clearly aging, and those participating in the session were Baby Boomers and Gen Xers. One growth solution was to attract more millennial members to the organization.

I am not a millennial, but I do have 14 employees and 13 of them are millennials. About 2-3 times a year, one of them will tell me that I am fortunate that they have stayed at our company for so long. Short job tenure is typical of millennials. But why?

In my experience, it is not that millennials are not hard-working, smart or loyal. They are all of these things and more, but they must be engaged in their work or they will look elsewhere for meaning.

So I turned to one of our millennial employees to get some advice on engaging them. Here are three suggestions from a staff member about employing millennials that I have adapted for an organization that also desires to engage with millennials.

> "1.0 Meet with them to discuss their performance and ideas. Millennials really thrive on appreciation and positive feedback. By holding a set meeting, you are able to provide praise for the things that they are doing well and to hear any ideas that they would like to share with you. Being able to engage with a manager or mentor is more likely to make the employee want to engage with the company and company culture."

What this means for an organization: Millennials want interaction with other members and leadership. They want their volunteer tasks to have meaning and matter to the success of the organization.

> "2.0 Promote a sense of community within the workplace. Millennials are known to crave a team-based culture to contribute to their happiness in the workplace. A sense of community fosters the collaboration and promotion of ideas, which can also lead to positive business outcomes. If an idea progresses into a positive business outcome, the team that developed the idea will be more likely to remain engaged and see the idea through."

For the organization: Think of the organization as a community with a purpose. But do not limit that community to face-to-face interaction, or 9am to 5pm or Monday through Friday. The community is online, social media, email, list serves, and phone conferences.

> "3.0 Create a more flexible work environment. Work-life balance is a top priority for millennials and supporting that balance is a key to having an employee that is engaged. You can create a flexible work environment through flexible start/end times, providing personal time/flex time and allowing for remote working to accommodate certain schedule needs."

For the organization: Millennial volunteers want the organization to be flexible about participation. Give them the goal and the framework, but let them direct the work, the collaborators and the methods. Don't be surprised if the result is a successful technology based tool delivered at 3am.

The number of millennials in the workforce, and therefore future members of your organization, will continue to increase over the next few years. Don't let the opportunity to engage with this dynamic group pass. They could be the future of our organization.

Jane A. Svinicki, CAE
Executive Director

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2016 Engineering Challenge Recap

By Jeff Mandel, MD, MS, Assistant Professor of Anesthesiology & Critical Care, Perelman School of Medicine at the University of Pennsylvania, Philidelphia, PA

The 2016 Engineering Challenge's mission was to use the Emotive Epoc, a consumer device that provides EEG via a Bluetooth connection, to observe the response of an anesthesiologist to the sound of a pulse oximeter dropping from 100 to 85. The intent of the challenge was to develop a monitor for decreased vigilance in anesthesiologists.

Again this year, we had two teams - University of Utah and Children's Hospital of Philadelphia. The Utah team was comprised of Patrick R. Kolbay and Sean C. Ermer, while the CHoP entry was from Ali Jalali, a Postdoctoral fellow at Villanova. Both teams were able to generate EEG signals from the headsets under controlled conditions, and gave informative presentations. A poll of the audience was taken, and by a small margin, Ali Jalali was declared the winner, making three years in a row for CHoP.

This was the first year that the Engineering Challenge was held on Saturday morning as a solo session, and was well attended. We look forward to next year's challenge, which will be announced shortly!

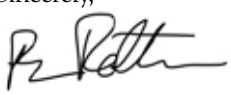
President's Message *continued from page 1*

improvements to quality in healthcare. A special thank you is in order to Dr. Thomas Hemmerling who has worked diligently over the last several years to ensure that the research award grants persist.

We successfully transitioned to our new Board members in January. The energy and interest at the Saturday morning Board meeting was remarkable. Fortunately, we decided to get a larger room! I would like to thank everyone in attendance for the thoughtful and respectful discussion centered on the proposal to pursue an Affiliated Subspecialties Society status with the ASA. Our collective introspection was incredibly valuable. Examining who we are and what we want as a society, specifically how industry member equality is at STA's core, allowed us to temper our mission as a Society.

Lastly, we have begun working diligently on our contributions to the IARS meeting in May, the ASA meeting and Ty Smith dinner in October, and the STA Annual Meeting next January in San Diego, California. This is going to be another outstanding year for STA, and I look forward to being part of what we accomplish.

Sincerely,



Brian S. Rothman
STA President

2016 STA Gravenstein Lecture

By James Szocik, MD, STA Communication Committee Chair

The 2016 STA Gravenstein lecture was delivered by Dr. Steven Barker, PhD, MD. (COI notice: I am a co-author with Dr. Barker on several book chapters). The overarching theme was the unique interaction between industry and medicine as embodied in the STA. Steve started with a recap of previous Gravenstein award winners, stating how honored he is to join that illustrious group.

His favorite quote is from George Santayana, The Life of Reason, 1905: "Those who cannot remember the past are condemned to repeat it". This led to Steve's two levels of wisdom: Level 1, learn from your mistakes; and level 2: learn from others' mistakes! He recommended reading Robert Coram's book Boyd: The Fighter Pilot Who Changed the Art of War, 2002, referring to Major Boyd's OODA loop: Observe, Orient, Decide, Act. After this brief preface, Steve relayed a brief history of "how he got to where he is".

Chronologically, he obtained a BS in physics from Harvey Mudd College in 1967, went on to receive his PhD in aeronautics from Caltech in 1972, and became a tenured professor at UCLA. Steve then started his second career by going to medical school at University of Miami (1981), anesthesiology residency (1981-84) and working at UC Irvine Med Center from 1984-1995. He was chair of the department at UC Irvine from 1990-95, chair at University of Arizona from 1995-2013, president of the STA in 1998, section editor at A & A 2001-2006, ABA examiner from1996-2009, and numerous other honors and achievements. His top lessons from being a chair were: "Quit when it stops being fun, have a timeline, and don't make administration into being a career".

Steve has been involved with consulting for over 14 different companies from 1984 to the current day. He disclosed his consultant status with Masimo as Chief Science Officer and member of the board of directors. In this spirit he delved into the different aspects of conflict of interest, contrasting the difference between engineering, where consulting was expected and encouraged, and medicine, where all interactions were presumed to be "tainted" and greed driven. In summary, disclosure is good, but outright banning of interactions is bad. To support his thesis, he cited the book Pharmaphobia, by Thomas P. Stossel and multiple examples of innovation that resulted by the cross-fertilization of medicine and the corporate world, utilizing the OODA loop for progress.

Medicine and Industry may be an odd couple, but they produce great children including: Transesophageal Echocardiography, Electronic Medical Records, Pulse Oximetry, Capnography, High potency narcotics, Sevoflurane, Desflurane, Propofol, and more.

The loop of development involved clinicians (physicians) with a problem and industry (inventors) attempting a solution. Oftentimes the first attempts do not work, but an iterative process results in improvement and a working solution. As the world and knowledge becomes more specialized, more, not less, cross-involvement between industry and medicine becomes necessary. The problems are more complex, and so are the solutions. There are few people who have crossed the line dividing industry and medicine. The STA is a unique organization where both medicine and industry share equally. We need more.

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Another Successful STA Annual Meeting!

Author: *Patrick J. McCormick, 2016 Annual Meeting Co-Chair*

For the STA 2016 Annual Meeting, we returned to the popular location used for our 2012 Annual Meeting, the Four Seasons Resort in Palm Beach, Florida. For the program this year, Dr. Jorge Gálvez and I wanted to inspire the membership with a keynote and panels themed around innovation. Our keynote speaker, Dr. Bimal Desai, illustrated several examples of innovation leading to solutions for influenza analysis, infectious disease antibiograms and decision support for genetic testing results. Panel discussions ranged from FDA policy for approval of target controlled infusion pumps to a detailed investigation of near-infrared fluorimetry for measuring perfusion. Below is a brief recap of the meeting in photos. More details of the meeting discussions can be found on the STA website at http://www.stahq.org/events/annual-meeting/.

Keynote speaker, Dr. Bimal Desai, giving examples of innovation.

Drs. Steven Barker, Kevin Tremper and James Szocik at a break.

Dr. Michael Hutchens discussing near-infrared fluorimetry for estimating cardiorenal function.

Dr. Steve Shafer discussing why target controlled infusion pumps have not yet been approved in the USA.

2016 Annual Meeting Photos *continued on next page*

2016 Annual Meeting Photos *continued from previous page*

The open Board of Directors meeting is held before and after the main program every year.

Drs. Jeff Mandel and Jorge Gálvez (wearing an eMotiv EPOC headset) at the STA Engineering Challenge.

Dr. Brian Rothman, STA President, moderating the panel on the perioperative surgical home.

Our live Twitter board displayed what attendees were excited about.

Past President, Dr. Joseph Orr presenting plaques to Annual Meeting Co-Chairs, Drs. Jorge Gálvez and Patrick McCormick.

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2016 STA Abstract Winners

Best of Show
Title: Capnography Reduces the Risk of Adverse Outcomes During Gastrointestinal Endoscopic Procedures with Sedation Administration
Presenting Author: Michael Jopling, MD, NorthStar Anesthesia, Springfield Regional Medical Center

Best Clinical Application
Title: Reduced Operating Room Fire Hazard Using Intelligent Supplemental Oxygen Delivery
Presenting Author: Kyle Burk, BS, University of Utah

Excellence in Technology
Title: Utilization of Immersive 360 Degree Spherical Videos and Google Cardboard in Medical Training and Simulation: A Novel and Multi-Dimensional Way of Learning
Presenting Author: Shoeb Mohiuddin, MD, University of Illinois Hospital & Health Science System

Honorable Mention
Title: Mathematical Modeling of Endotracheal Intubation in Children
Presenting Author: Ali Jalali, PhD, Children's Hospital of Philadelphia

Capnography Reduces the Risk of Adverse Outcomes During Gastrointestinal Endoscopic Procedures with Sedation Administration

Presenting Author: *Michael W. Jopling MD, NorthStar Anesthesia, Springfield Regional Medical Center, Springfield, OH, USA*
Co-Author: *JieJing Qiu, MS, Medtronic, MITG, Health Economics and Outcome Research, Mansfield, MA, USA*

Background/Introduction: While published evidence to date suggests that capnography monitoring during gastrointestinal endoscopic procedures reduces the incidence of hypoxemia, the association of capnography sensor use with incidence of adverse outcomes during these procedures has not been studied. Thus, our aim was to investigate the incidence of rescue events and adverse outcomes during gastrointestinal endoscopic procedures performed with sedation administration for an overall hospital patient population and for matched patients with and without capnography sensor utilization.

Methods: This was a retrospective analysis of all hospital patients between 2008 and 2013 reported in the Premier Database. Inpatients and outpatients undergoing diagnostic and procedural esophagogastroduodenoscopy (EGD), endoscopic retrograde cholangiopancreatography (ERCP), and colonoscopy were identified using a combination of CPT/ICD-9 codes. Analysis inclusion criteria also included patients with report of sedative medications, but excluded patients who received inhaled anesthesia agents on the procedure day. Patients were grouped into four mutually exclusive categories: (1) pulse oximetry (SpO2) only, (2) capnography only, (3) SpO2 and capnography, and (4) neither SpO2 nor capnography. Comparisons between groups were made using multivariate logistic regression (MLR) analysis adjusted for age, gender, race, comorbid conditions, and hospital characteristics. Propensity-score matching was also used to compare patients with capnography sensor use to patients on whom only a SpO2 sensor was used. The standard differences were calculated to measure how well the matched groups balanced. Key outcome measures included the incidence of rescue events, defined by administration of naloxone and/or flumazenil, and death.

Results: The inpatient analysis population included 258,262 patients and the outpatient population included 3,807,151 patients. Overall, capnography sensors (with and without SpO2 sensors) were used in approximately 2% of patients, regardless of inpatient/outpatient classification. As expected, the inpatient population tended to be older (mean age: 64.3 years vs. 57.4 years) with a higher mean Charlson Comorbidity Index (2.53 vs. 0.39). For both the inpatient and outpatient populations, patients were predominantly white and approximately 50% male/female. For the inpatient population, MLR analysis for the PS matched samples indicated that the capnography sensor use was associated with 47% reduction in the odds of death (OR: 0.528 [95% CI: 0.401, 0.696]; p<0.0001), and 10% reduction in odds of naloxone and/or flumazenil administration (OR: 0.905 95% CI: [0.645, 1.271]; p=0.5661), compared to patients using SpO2 sensor only. For the outpatient population, the MLR analysis using PS matched samples indicated that capnography sensor use was associated with 82% reduction in the odds of death (OR: 0.178 [95% CI: 0.016, 1.990]; p=0.16), and a 62% reduction in the odds of naloxone and/or flumazenil use compared to patients with SpO2 sensor use only (OR: 0.385 [0.286, 0.520]; p<0.0001).

Conclusions: In hospital inpatients and outpatients undergoing gastrointestinal endoscopic procedures performed with sedation administration, capnography sensor use was associated with a reduced likelihood of rescue events and death. The use of capnography in these procedures is warranted.

Reduced Operating Room Fire Hazard Using Intelligent Supplemental Oxygen Delivery

Presenting Author: *Kyle Burk B.S., Joseph Orr Ph.D., Derek Sakata M.D.; University of Utah, Departments of Anesthesiology and Bioengineering*

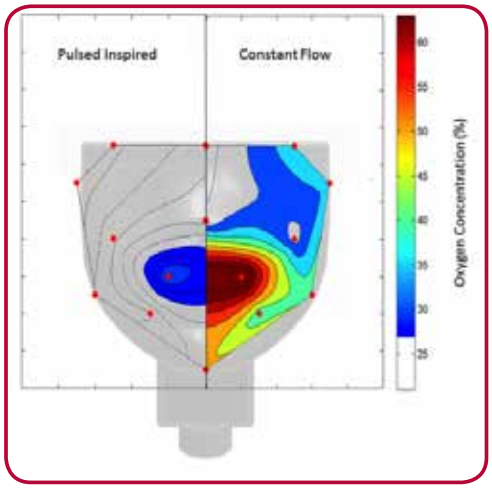
Introduction: Fires in the operating room are a major hazard [1]. Mehta et al. reported that 1.9% of all operating room adverse events that resulted in closed insurance claims were caused by fires with electrocautery as the ignition source for 90% of these fires. Most (85%) of electrocautery fires occurred during head, neck, or upper chest procedures (high-fire-risk procedures) [2]. Delivered O2 served as the oxidizer in 95% of electrocautery-induced OR fires and 84% of these occurred when oxygen was given with an open delivery system (nasal cannula or mask) [2]. A significant hazard for fire exists with a 26% or greater oxygen concentration [3]. Using standard oxygen flowmeters, O2 flows continuously into the patient's nostrils even during exhalation resulting in wasted O2 that flows between the surgical drapes and into the room greatly increasing the amount of fire promoting oxidizer in the operating room.

We have developed an intelligent oxygen flowmeter that reduces the volume of open source O2 delivered by carefully limiting O2 flow to periods during the early phase of inhalation, stopping O2 flow completely during expiration and limiting the rate and duration of oxygen flow during the pause phase of breathing. In our tests, the novel system achieves superior oxygen delivery while using only 60% less oxygen thereby reducing the amount of possible oxidizer by 60% and as much as 90% as respiration rate decreases. The prototype determines respiration rate (RR) and inspiratory effort by measuring intranasal pressure through a cannula port. The system uses measured RR to adjust the O2 volume delivered during each inspiration.

Methods: We used a 3-D printed model of the human airways placed under simulated surgical drapes to compare delivery modes. The model was connected to a test lung that was configured to breathe spontaneously at various rates and volumes. Oxygen was delivered through a nasal cannula at 2 and 4 L/min. Oxygen was given at flow rates of 2 and 4 L/min using both conventional (constant flow) and controlled (pulsed inspired) mode. We analyzed the oxygen concentration at specific places on the face of the model under the drapes (red circles on figure) and interpolated to build a concentration map on the face.

Results: Across all settings and flow rates, the average oxygen concentration under the drapes using pulsed flow r was 38% lower than when using continuous flow oxygen. The average oxygen concentration under the drapes using the pulsed oxygen was 25.0% while it was 40.6% using constant flow. The maximum observed oxygen concentration was 83.27% when using constant flow of 2 l/min and was 35.36% using pulsed flow. We measured the oxygen concentration in the lung simulator to assess oxygenation. Pulsed oxygen resulted in 88% higher average oxygen concentration in the lung. The plot below shows a map of oxygen concentration under surgical drapes on a 3-D printed model of the face at 4 breaths per minute and 2 L/min oxygen flow. The left side of the plot corresponds to pulsed flow delivery and the right plot corresponds to conventional (constant) flow. Note that oxygen delivery to the simulated lung was higher using pulsed flow for every simulated setting.

Discussion: Using intelligent control of oxygen flow allows for a reduction in oxygen waste and hazard while increasing the amount of oxygen inhaled by the patient. Intelligent pulsed oxygen delivery may keep oxygen levels below the 26% threshold for significant fire hazard.



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Utilization of Immersive 360 Degree Spherical Videos and Google Cardboard in Medical Training and Simulation: A Novel and Multi-Dimensional Way of Learning

Presenting Author: *Shoeb Mohiuddin, MD*
Co-Authors: *Danial Roshan, MD; Heike Knorpp, MD All authors are from the University of Illinois at Chicago, Department of Anesthesiology*

Background: The current Millennial generation of medical residents more often use online and mobile devices to access key information and resources compared to the use of textbook sources employed by the previous Gen X population. Many of these trainees have used online media for the majority of their education and are skillfully adept at employing electronic hardware and software. Currently, there is a second emergence for consumer virtual reality (VR) which has not generated this much interest since the 1990s. Compared to that time, huge technological advancements have been made to develop standards, convincing levels of immersion, and content. While not VR, 360 degree videos serve as an affordable and easily reproducible gateway to the immersive experience which VR poises to offer. Use of this new medium, creates a whole new opportunity to enhance the resident's educational experience that was not previously able to be achieved.

Methods: A 360 degree video spherical camera was utilized to record a two minute video demonstration of Basic Life Support training from a certified ACLS instructor. The video was edited using video software that rendered the video in a 360 degree video mp4 format. The video was subsequently upload to popular video website, YouTube, which accepts and plays the 360 video format standard (link for video listed below). Mobile smartphones using both Apple iOS and Android operating systems were placed in a Google Cardboard Version 2.0 approved cardboard box viewer. Testers loaded the previously recorded video using the YouTube app on their smartphones, secured their phones in the cardboard box viewer, and either held the cardboard box viewer to their face or secured the viewer with a Velcro head strap. Testers were freely able to view the training video in any 360 degree direction from the fixed standpoint of the camera by just turning their head. This was accomplished using the smartphones built in accelerometers which is used frequently to re-orientate the screen as users move the device. This feature was utilized by the YouTube app to coordinate head movement and rotation around the video.

Results: The initial trial to develop a basic 360 degree medical video was successful. Testers displayed ease of use playing the 360 degree video using the YouTube app in both iOS and Android operating systems. Testers also reported satisfaction with viewing the 360 degree video on their smartphones without a cardboard box viewer. However, they acknowledged using a cardboard box viewer creates a more immersive environment which is not able to be accomplished just using a smartphone alone.

Conclusions: A novel method for medical training was explored. The advantages of 360 degree videos over conventional 2D videos include the ability to view multiple apparatuses and events concurrently, improve situational awareness, and mimic the ability for the viewer to be physically present in the room. Future work will aim to optimize video quality and hardware to enhance the viewers immersion. Further medical curriculum development will aim to not only produce videos for procedures but also develop actual medical simulation as well.

Video link: https://youtu.be/Wfs_MqaaXkE

**For optimal viewing of 360 degree video, please view in the YouTube app on both iOS/Android smartphone/tablet devices or using the Google Chrome Browser for desktop.*

Mathematical Modeling of Endotracheal Intubation in Children

Presenting Authors: *Ali Jalali, PhD[1,2], Arul Lingappan, MD[1]*
Co-Authors: *Mohammed Rehman, MD[1], C. Nataraj, PhD[2]*
[1] The Department of Anesthesiology and Critical Care Medicine, The Children's Hospital in Philadelphia, Philadelphia, PA; Bioinformatics Group
[2] Center for Data Analytics and Dynamic Systems, College of Engineering, Villanova University

Introduction: In major pediatric surgeries, the airway is often secured with an endotracheal tube (ETT), and mechanical ventilation is subsequently initiated. Clinicians utilize auscultation of breath sounds and capnography to verify correct ETT placement. However, anesthesia providers often delay timely charting of endotracheal intubation. Event documentation latency results in decreased efficacy of clinical decision support systems (CDSS). Automatic detection of endotracheal intubation time would thus enhance better real time time data capture to support CDSS.

Data: We gathered retrospective data from 100 randomly selected children who received endotracheal intubation at our institution, a tertiary care pediatric hospital. Each patient's data included ventilator parameters (peak inspiratory pressure [PIP], positive end-expiratory pressure [PEEP] & tidal volume [TV]) and vital sign measurements (respiratory rate [RR], end tidal carbon dioxide [EtCO2], heart rate [HR], and blood pressure [BP]).

Methods: The morphology of most of the ventilation variables such as RR, PIP, PEEP and TV depends heavily on the ventilator mode and settings. For instance, breathing could be spontaneous or under ventilator control. Moreover, controlled forms of ventilation could deliver either a preset peak inspiratory pressure or tidal volume. Hence, we were able to develop an algorithm using only EtCO2. EtCO2 data from mask ventilation in children is noisy since patient movement and inaccurate mask placement will result in leakage thus affecting the recordings. EtCO2 from ETT recordings on the other hand are more robust. To detect this transition from high frequency noisy recording to lower frequency stable recordings, we apply the continuous wavelet transform (CWT) on the data. The CWT is capable of locating the temporal shift in frequency, which makes it feasible for this study. We use Haar mother wavelet function for CWT and then calculate the CWT coefficients at level 50. We then define variation index as $C_v = \frac{\sigma^2}{\mu^2}$ where, **σ** and μ are standard deviation and mean values of the CWT coefficients respectively. The steps of the designed algorithm are as follows:

(i) set i=1, $C_v^0 = 0, \Delta C_v = 0,$
(ii) initial window length N
(iii) while $\Delta C_v > \epsilon$
(iv) calculate CWT coefficients at scale 50 (x),
(v) $s = (x(1), x(2), \dots, x(N))$
(vi) calculate C_v^i,
(vii) calculate $\Delta C_v = C_v^i - C_v^{i-1}$,
(viii) N=N+1, i=i+1
(ix) end,
(x) return N

The time at sample *N* is the intubation time.

Results: For this problem we set initial *N* = 10 samples (1 sample = 15 seconds), and **ε** = 0.05. Our results show that the algorithm can correctly detect intubation time in 78 cases. In 17 cases it can detect intubation time within 3 samples of the actual time. The algorithm fails to converge and does not flag intubation in only 3 cases. In other words, results show that the algorithm is capable of detecting intubation in 97% of cases, and it can correctly detect intubation time within one minute in 95% of cases. Figure (1) represents a sample of results where algorithm correctly picks up the intubation time.

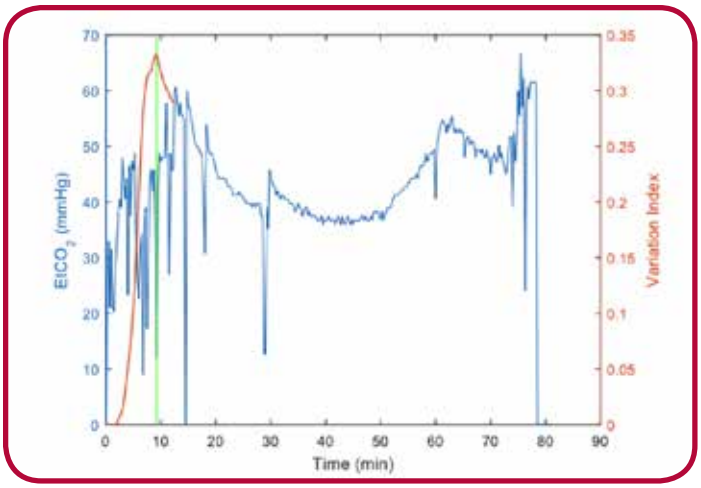

Figure (1): *The plot of variation index shows that the maximum variation happens at the time of endotracheal intubation (denoted by the green line).*

Discussion: Mathematical modeling of the endotracheal intubation is valuable clinically since it is the first necessary step in automatic detection of tube malpositioning (i.e. inadvertent supraglottic ETT placement or mainstem intubation), which may have life- threatening consequences. Future directions of work will focus on validating the algorithm on prospective data. Eventually, we hope to increase the accuracy of the detector by developing a hybrid algorithm using machine learning techniques and utilize the detector to guide real- time CDSS.

Resident's Corner: A Reflection on my First STA Meeting

By James Xie, MD, Resident, Brigham and Women's Hospital

Earlier this January 2016, I had the privilege of attending my first Society for Technology in Anesthesia meeting. After some reflection, here are my takeaways:

1) It is never too early to get started: I had only finished the first six months of my CA-1 anesthesia year when I joined STA. At the time, I wasn't sure what I would be able to contribute to the organization, but when Dr. Charlene Swift, co-chair of the Digital and Social Media committee reached out to residency programs around the nation to recruit new members for the committee, I enthusiastically joined. I knew that STA would be a good organization to nurture my interest in applying my engineering background to anesthesia care. However, little did I know what a joy it would be to actually attend the meeting: I heard many inspiring talks, participated in engaging workshops, checked out the latest innovations in anesthesia technologies, met new mentors, and made new friends in the anesthesia-technology community. As Dr. Ty Smith said, "Start early, learn a lot!"

2) Innovation is the lifeblood of biomedicine: Although "innovation" has become a buzzword, the underlying principles of discovery, iteration, and execution that underpin innovation have never been more important. This point was driven home by keynote speaker Dr. Bimal Desai, CMIO at Children's Hospital Philadelphia and founder of Haystack Informatics - a company that uses informatics techniques to detect HIPAA security breaches in patterns of healthcare data access. The STA meeting exposed me to the many ways technology can be used to deliver better care, whether it takes the form of the hardware and software used to deliver and monitor anesthesia, techniques to capture and analyze large data sets, or ways to better coordinate care in the perioperative setting. Given the many areas of need, it is fantastic that STA is fostering trainee participation to ensure a continuous pipeline of the next generation of innovators. At the Young Researchers Workshop, Dr. Barrett Larson shared his experience founding Leaf Healthcare and as participants, we practiced pitching solutions to a clinical problem. I took home many lessons about the process of innovation and entrepreneurship, especially the importance of clearly discerning and defining clinical needs.

3) Partnerships between academia and industry are not inherently contentious: In this era of strict conflict of interest policies, I have had few interactions with industry in a clinical setting. At STA, industry members are not only present, but are also active participants in the lectures and discussions. It was refreshing to not only hear about, but also see in action, the synergistic relationship between academics and the private sector. For example, without industry-academic collaboration, where would pulse oximetry be today? As Dr. Steve Barker cheered on in his Gravenstein Award talk: "Academics and industry: let's keep doing it, let's make great things happen!" Obviously, conflict of interest policies exist for a reason, but it is important to consider the implications of how best to commercialize new ideas and scale them up so that their impact can reach more patients.

4) There's a whole world of anesthesia out there: While STA is based in the United States, its members come from all over the world. It was fascinating hearing about technologies such as targeted controlled infusions. I had read about the concept, but it was far different hearing from anesthetists who use it on a daily basis. I could not help but think, what other techniques and technologies could I learn about from my international colleagues? STA provides the forum for this collaboration and learning. This year's panel on closed loop delivery of both inhaled and intravenous anesthetics featuring Dr. Jan Hendrickx, Dr. Steve Shafer, and Bahram Parvinian was a great overview of the current technologies and regulatory considerations for bringing closed looped systems to the U.S.

Although this was my first STA meeting, it certainly will not be my last!

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