

## APSF President Robert K. Stoelting, MD *A Tribute to 19 Years of Steadfast Leadership*

by Jeffrey B. Cooper, PhD

Any startup organization has a critical test of sustainability when it makes its first leadership transition. The APSF had the experience in 1997 when our beloved founder and leader, Dr. Jeep Pierce, passed on the reins of his Presidency to the first successor. Jeep had the proverbial big shoes to fill. Who could take on that role and not only sustain, but grow our vital yet still adolescent band of anesthesia patient safety advocates? It was our exceptional good fortune that Dr. Bob Stoelting was willing to take the challenge. Nineteen years later, Dr. Stoelting, too, has passed on the reins to a successor. We all owe so much to Bob for the continued, steady effort to not just keep anesthesia relatively safe, but to also make it even safer. He has been a remarkable leader, colleague, and passionate crusader for our common goal: *that no patient shall be harmed by anesthesia.*

Dr. Stoelting came to the position of President of the APSF (POTAPSF) as one of anesthesiology's most esteemed academic leaders. This is what was written about him when he assumed the APSF Presidency in 1997:

*Dr. Stoelting, most recently ASA Vice-President for Scientific Affairs until this year, is a native of Indianapolis, Indiana, who received his undergraduate and medical educations at Indiana*

*University before anesthesiology residency at the University of California, San Francisco. After two years at the NIH, Dr. Stoelting joined the faculty (Anesthesia and Pharmacology) at Indiana University in 1970, rising rapidly to become Professor and Chairman of Anesthesia in 1977. Also extensively involved in ASA committees and administration for many years, Dr. Stoelting was a District Director before becoming Vice-President for Scientific Affairs. Possibly best known as an educator for his prodigious and prestigious authorship of important and very widely used textbooks (Basics of Anesthesia, Pharmacology and Physiology in Anesthetic Practice, and Anesthesia and Co-Existing Disease as well as co-editing Clinical Anesthesia with Drs. Barash and Cullen and editing periodicals such as the Yearbook of Anesthesiology and Advances in Anesthesia), Dr. Stoelting has been a Director and the President of the American Board of Anesthesiology. He has been Chairman of the ACGME Anesthesiology Residency Review Committee, and is a Director of the Foundation for Anesthesia Education and Research. This Spring, he will deliver the T.H. Seldon Memorial Lecture to be entitled "Anesthesiology—a medical specialty with unique challenges and opportunities" at the Annual Meeting of the International Anesthesia Research Society (for which he has also served as Chair of the*



Robert K. Stoelting, MD

*Board of Trustees). Dr. Stoelting brings this truly remarkable background to his new role as the leader of the APSF, which will benefit greatly as it moves forward into the next century from the vision and wisdom. Dr. Stoelting has gained from the extraordinary breadth and depth of his career.<sup>1</sup>*

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## Conflict in the Operating Room: Impact on Patient Safety Report from the ASA 2016 Annual Meeting's APSF Workshop

by Mark A. Warner, MD, and David J. Birnbach, MD, MPH

The APSF Board of Directors Workshop entitled "Conflict in the Operating Room: Impact on Patient Safety" was held on Saturday, October 22, 2016, at the McCormick Place Convention Center in Chicago, IL. This workshop used six actual case scenarios (Table 1) to trigger discussions and reflections on the very real, negative impact that conflicts between personnel in the perioperative period can have on

patient safety. If you are like many of us and enjoy learning from actual cases that have teachable moments, you can find the scripts for these scenarios on the APSF website (www.apsf.org). It takes only a simple mouse click to access them from the website (top buttons, far right, "ASA 2016"). We encourage you to read them; each takes only a single minute to read and the script is written in the style of a short

stage play. The outcomes for each scenario are provided and include both patient outcomes and medicolegal, institutional (e.g., loss of privileges), and licensure results associated with the conflicts.

The names and locations used in the scenarios are modified for privacy reasons but the stories are real. We served as moderators for the workshop;

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NEWSLETTER

The Official Journal of the Anesthesia Patient Safety Foundation

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## APSF Newsletter

### *guide for authors*



The APSF Newsletter is the official journal of the Anesthesia Patient Safety Foundation. It is published three times per year, in June, October, and February. The APSF Newsletter is not a peer-reviewed publication, and decisions regarding content and acceptance of submissions for publication are the responsibility of the editors. Individuals and/or entities interested in submitting material for publication should contact the editors directly at [Lee@apsf.org](mailto:Lee@apsf.org) and/or [greenberg@apsf.org](mailto:greenberg@apsf.org). Full-length original manuscripts such as those that would normally be submitted to peer review journals such as *Anesthesiology* or *Anesthesia & Analgesia* are generally not appropriate for publication in the Newsletter due to space limitations and the need for a peer-review process. Letters to the editor and occasional brief case reports are welcome and should be limited to 1,500 words. Special invited articles, regarding patient safety issues and newsworthy articles, are often solicited by the editors. These articles should be limited to 2,000 words. Ideas for such contributions may also be directed to the editors. Commercial products are not advertised or endorsed by the APSF Newsletter; however, upon occasion, articles about certain novel and important technological advances may be submitted. In such instances, the authors should have no commercial ties to, or financial interest in, the technology or commercial product. The editors will make decisions regarding publication on a case-by-case basis.

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# Tribute to Dr. Robert K. Stoelting, APSF President 1997-2016

## “Tribute,” From Cover Page

APSF was incredibly fortunate that Bob Stoelting was ready and eager for even more national service, leadership, challenge, and impact. While that might have been via the ASA, he chose to dedicate the next phase of his career to patient safety via APSF. Despite his vast knowledge and experience in anesthesiology, Bob hadn't yet focused on patient safety alone. However, through his participation and leadership in APSF, he adroitly directed his energies forward. Like everything he has done in his life, he undertook this responsibility with total dedication, passion for learning, wisdom, and effective leadership. His prior experience in clinical anesthesia, research, and academic and organizational leadership in the field prepared him better than anyone to take on this prestigious role.

There are so many wonderful, effective qualities about Bob Stoelting that have enabled APSF's continued influence. Most important is his leadership style. The 19-member multidisciplinary Executive Committee is the main working instrument of APSF, and we are not a shy bunch. The discussions at meetings are always collegial and respectful, but sometimes intense. We have a lot of opinions and are not always good at self-policing. Bob was fantastic at keeping us on track, yet allowing creativity to emerge. He always guided the group to seek consensus, which we almost always could achieve. Yet, when consensus was not initially present, he diplomatically steered us to a place where we could agree on a direction or decision that led to positive changes for patient safety. APSF was fortunate that this was one of many of Bob's leadership attributes.

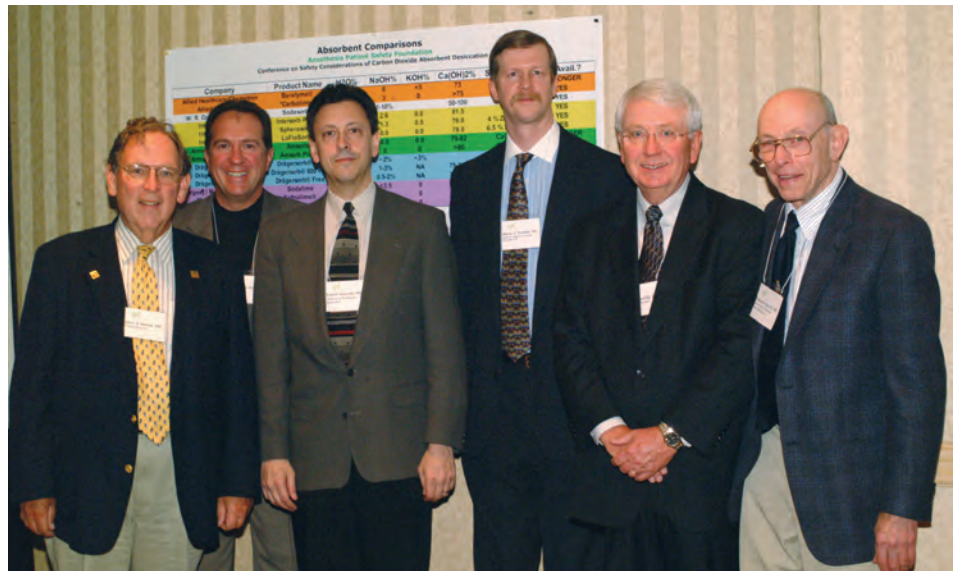
For the 31 years since the founding of APSF, I've experienced a substantial turnover of the Executive Committee membership as members retired. What is so remarkable is how the original culture of dedication, trust, and mutual respect has endured. That is in no small measure a result of how Bob Stoelting models and enables the behaviors that are essential to the continuity of that culture, which I believe have been essential to our ongoing effectiveness. I have never experienced such an extended level of collegiality and mutual respect in any organization. It's what has kept me going at the same level of interest and commitment all these years. Like Jeep before him, Bob has made that possible by how he helps shape the composition of the team and how he leads it, with a light, but highly leveraged touch. Bob (similar to his predecessor) perpetuated the axiom that anesthesia patient safety is a multidisciplinary, collaborative process. He has always embraced ideas from a variety of providers, business leaders, and national organizations to further the quest to improve patient safety. In all that he does, he conveys his respect for all of us (on the executive committee and



*Dr. Stoelting led the development of the widely downloaded “Fire Safety Video” for prevention of on-patient fires in the operating room.*



*Dr. Stoelting provided decisive leadership for developing numerous patient safety initiatives by convening relevant stakeholders at targeted conferences and workshops.*



*Left to right, Drs. Dorsch, Olympio, Kharasch, Woelck, Stoelting, and Eger speak at the APSF Conference on Safety Considerations of Carbon Dioxide Absorbents on July 27, 2005, in Chicago, IL. (APSF Newsletter. 2005;20:25.)*

beyond!), that he holds and lives with the highest ethical standards, that he listens and is entirely open to dissent, and can change his mind based on what he learns from others. Most notable is that he does all of this with humility and grace.

I haven't heard Bob Stoelting espouse a specific philosophy or strategy for how patient safety in anesthesia should be maintained and continuously improved. Instead, it is my interpretation that he has guided APSF and its patient safety strategy through continuous, steady progress. Rather than big leaps forward or forced changes in behavior, patient safety is a continual series of small steps that make everyday work and processes safe. It's not a big bang or a revolution, but rather a continuous evolution. As individual providers and their organizations change their practices to be safer, the culture changes. It's not just the changing of practices; it's the growing commitment and enlightened attitudes to continuously make anesthesia safer, project

by project. He understands that culture change is the sum total of what we do as individuals, not a magical force or prescribed, demanded actions. He has instantiated this philosophy through the steady stream of projects and concepts that are the product of what APSF does. That product has been disseminated primarily via the *APSF Newsletter*, which is now distributed widely to about 122,000 people around the world, and available free of charge to anyone on our website. The message of APSF is further disseminated via the workshops and consensus conferences that Bob either has led himself or guided us on the Executive Committee to develop and lead every year.

The following observations don't provide a complete history of the 19 years that Bob has been at the helm of APSF. However, they are examples of specific projects and programs he has championed

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# Stoelting: A True Icon in Anesthesia and Patient Safety

## “Tribute,” From Preceding Page

to illustrate how this philosophy of issue-by-issue safety improvements has affected change:

### APSF Consensus Conferences (now known as the annual Stoelting Conference)

Bob promoted these events, which have become one of the important mechanisms by which we identify solutions to current patient safety issues and, from those, choose which initiatives to promote vigorously. Each year, the Executive Committee, under Bob’s guidance, chose a topic and leader to run the conference. Through his skillful management of APSF talent and creativity, almost entirely from volunteers, we’ve shared the workload and had a diversity of topics and speakers.

### Setting Audible Critical Alarms

Bob overcame controversy to steer APSF to make a strong statement about the need to set critical audible alarms, rather than disabling them to avoid possible false positive signals that subsequently could lead to unsafe situations or adverse events (<http://www.apsf.org/newsletters/html/2004/winter/01workshop.htm>).

### CO<sub>2</sub> Absorbent Interactions with Volatile Anesthetics

This was the topic of the first APSF consensus conference (2005), which was convened because of the concern for the potentially dangerous by-products and flammable reactions that could occur with exposure of volatile anesthetics to CO<sub>2</sub> absorbent. This meeting led to solid recommendations promulgated through the *APSF Newsletter* (<http://apsf.org/newsletters/html/2005/summer/01co2.htm>).

### Monitoring to Prevent Postoperative Respiratory Depression or Opioid-Induced Ventilatory Impairment (OIVI)

Through Bob’s leadership and advocacy, APSF has taken a strong stand to promote postoperative monitoring for early detection of respiratory depression related to residual opioids. APSF has hosted multiple consensus conferences and workshops on this topic as well as produced an educational video for prevention of this high acuity patient safety issue ([http://www.apsf.org/newsletters/html/2007/winter/01\\_opioids.htm](http://www.apsf.org/newsletters/html/2007/winter/01_opioids.htm); <http://www.apsf.org/resources/oivi/>).

### Beach Chair Position

The hazards of positioning with inadequate cerebral perfusion were identified, and research into this important issue was funded. Potential preventive measures, such as maintenance of adequate cerebral perfusion using correction for height differences between the brain and the site of blood pressure measurement, were recommended. As a result, awareness of this patient safety issue has been heightened among anesthesia professionals today ([http://www.apsf.org/newsletters/html/2009/spring/01\\_cerebral.htm](http://www.apsf.org/newsletters/html/2009/spring/01_cerebral.htm); [http://www.apsf.org/newsletters/html/2010/winter/01\\_workshop.htm](http://www.apsf.org/newsletters/html/2010/winter/01_workshop.htm)).

### Medication Safety

This has been one of Bob’s great interests. The APSF has convened several workshops and consensus conferences on this topic, produced an educational video, and published numerous reports and articles on it in the *APSF Newsletter*. While awareness of this issue surely is higher, deep solu-



*Dr. Stoelting initiated the annual APSF conference in Phoenix, AZ, where relevant stakeholders are invited to participate in the development of consensus statements for specific patient safety issues. The APSF has recently named this annual meeting the “Stoelting Conference” in honor of Dr. Stoelting’s tireless dedication to patient safety.*

tions that stick are still elusive. The APSF has advocated for the “Standardization, Technology, Pharmacy/Pre-filled/Pre-Mixed, Culture (STPC)” paradigm for optimal management of medications ([http://www.apsf.org/newsletters/html/2010/spring/01\\_conference.htm](http://www.apsf.org/newsletters/html/2010/spring/01_conference.htm); <http://www.apsf.org/resources/med-safety/>).

### Postoperative Visual Loss

Bob worked alongside multiple organizations and stakeholder groups to educate providers about this topic and promoted research and preventive efforts. The APSF convened a consensus conference and produced an educational video on this debilitating patient safety issue ([http://www.apsf.org/newsletters/html/2013/winter/06\\_conference.htm](http://www.apsf.org/newsletters/html/2013/winter/06_conference.htm); <http://www.apsf.org/resources/povl/>).

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*Drs. Stoelting and Pierce pose at the APSF ASA booth.*

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# Nineteen Years of Leading APSF Patient Safety Initiatives

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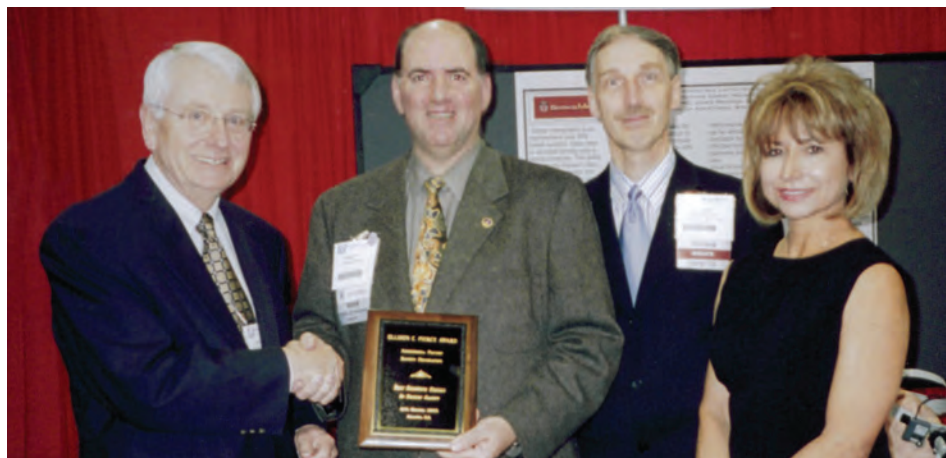
## Emergency Manuals/Checklists

Bob spearheaded and co-chaired the 2015 Annual APSF Consensus Conference on Implementing Emergency Manuals/Checklists. The conference attendees and faculty concluded that the APSF could play a lead role in advocating, educating, and researching the implementation of the highest quality manuals/checklists in the operating room to make patients safer ([http://www.apsf.org/newsletters/html/2016/February/08\\_EmerManuals.htm](http://www.apsf.org/newsletters/html/2016/February/08_EmerManuals.htm)).

## Videos Dissemination of APSF Initiatives

Approximately 10,000 copies of videos related to specific patient safety problems such as on-patient fires in the operating room, medication safety, opioid-induced ventilatory impairment, and postoperative visual loss have been distributed from APSF either via download or DVDs from the [apsf.org](http://www.apsf.org) website. The fire safety video alone has been distributed or accessed 8,000 times and is used to raise awareness and teach health care professionals how to prevent and respond to operating room fires (<http://www.apsf.org/resources/fire-safety/>).

Given Bob's larger-than-life, well-deserved reputation in our specialty, those who don't know him may think he's very serious and formal. They would be mistaken. He has a remarkable sense of humor. It may not be immediately evident to those who don't know him well and who respect him so much as a senior statesman for our specialty, but he's a master of one-liners and self-deprecating stories. It's these attributes that make him so good at leading meetings; they enable his team to discuss intense issues in a productive and even enjoyable environment. He is a



Dr. Stoelting presents the Ellison C. “Jeep” Pierce, Jr., MD, Best Scientific Exhibit in Patient Safety Award at the 2005 ASA meeting. This annual award encourages development of patient safety projects from all anesthesia professionals. The award in 2005 was for the project “Macintosh- and IBM-compatible Laptop-based Videography of Airway Management for Teaching Airway Management and Record Keeping” from Brett L. Arron, MD, Richard Gillerman, MD, and James E. Peacock, RN, of Rhode Island Hospital, Providence, RI. Dr. Stoelting (left) presents the award while Committee Members Richard Prielipp and Tricia Meyer look on. (APSF Newsletter 2005-2006;20:82.)

prodigious worker. Most importantly, his love of his wife, Natalie, and family is inspiring. He genuinely cares for people and has a warmth and charm that shine when he sees mentees succeed.

All of us on the Executive Committee are happy for Bob that he has chosen to move on to the next phase of his life. He's still full of vigor and will surely explore new and stimulating things. He also successfully steered us through the process of selecting his successor, Mark A. Warner, MD, fulfilling his responsibilities, as always, to APSF and the anesthesia community. He will be missed at the head of our EC table for all that he has brought these many years. We wish him the best and thank him for all that he has given to the APSF and to

anesthesia patient safety. All patients having the experience of anesthesia are better off for his having been our selfless, dedicated, and effective leader.

Jeffrey Cooper currently serves as Executive Vice President of the APSF and he has been an active member of the APSF Executive Committee from 1985 to the present. He is also Professor of Anaesthesia at Harvard Medical School in the Department of Anesthesia, Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA.

### Reference

1. APSF Newsletter. Winter 1997. <http://www.apsf.org/newsletters/html/1997/winter/leadership.html>. Last accessed 1/2/2017.



## Introducing the New President of APSF



Mark A. Warner, MD  
New APSF President

Dr. Mark Warner received his undergraduate degree from Miami (Ohio) University in 1976, his MD degree from the Medical College of Ohio in 1979, and his subsequent training in anesthesiology at Mayo Clinic. He is currently the Annenberg Professor in Anesthesiology at the Mayo Clinic and emeritus Executive Dean of the Mayo Clinic College of Medicine. Mark has served as Chair of the Department of Anesthesiology, the physician leader of Mayo's hospitals, and a member of Mayo's Board of Governors.

Mark has been in the leadership of a number of national anesthesiology organizations. He served as President of the American Society of Anesthesiologists, the American Board of Anesthesiology, and the

Academy of Anesthesiology. He also has been an editor for *Anesthesiology*, the journal of the American Society of Anesthesiologists.

He and his wife, Mary Ellen, also an anesthesiologist at Mayo Clinic, have four grown sons. Two of them are anesthesiologists at Mayo Clinic. Mark is an experienced pilot and sky-diver. Mary Ellen and Mark spend much of their spare time traveling to see their grandchildren and working on their farm.

Dr. Warner brings his years of experience, incomparable leadership skills, and incredible breadth of knowledge to the APSF as current President.

He can be contacted at his email address, [warner@apsf.org](mailto:warner@apsf.org).

# Conflict Scenarios at the APSF Workshop

## “Conflict,” From Cover Page

anesthesiologists Emily E. Sharpe, MD, Bridget P. Pulos, MD, and Amy C. Pearson, MD (each from Mayo Clinic, Rochester, MN), joined us in acting as the characters in the scenarios. As you might expect, surgeons, nurses, and anesthesiologists were key players in the actual scenarios.

There is remarkable educational value in reading the scenarios and reflecting on them and the impact that the conflicts in each had on the patients’ outcomes. Here are our observations based on reflections and comments from the 167 workshop participants, each of whom joined discussions with colleagues after the cases were individually introduced:

### Outcomes Matter

The first three scenarios, including their outcomes, were presented and discussed in small groups. Participants subsequently asked that the last three of the six scenarios be presented without sharing their outcomes until the small group discussions had occurred. The participants found that knowing the outcomes swayed their opinions and introduced biases into their perspectives on each of the characters. This “hindsight bias” phenomenon has been well known (*Psych Bull* 1990;107:311-27). It influences many medicolegal and regulatory actions taken against providers. Examples include larger jury awards when harmed patient plaintiffs are present during trials and more significant negative actions by licensing boards when patient outcomes are known at the times of deliberation. Test your own potential hindsight bias by reading several of the workshop’s six scenarios and their outcomes (“Hey, I knew that might happen.”), and then reading several of the scenarios without their outcomes (“Wow! I wouldn’t have thought that would have happened.”). All of us can learn by understanding this phenomenon.

## Anesthesia Professionals Matter

In several of the scenarios, anesthesia providers likely had the ability to add positive influences into perioperative conflicts—and failed to provide the reasonable, knowledgeable, and calming influences that they could have. Everyone in the workshop’s audience agreed that proactive avoidance of potential conflicts by pre-event collaborations and discussions was the best approach to preventing perioperative conflicts. However, when they have already occurred and are ongoing, failure to engage and de-escalate building conflicts (e.g., avoidance) and succumbing to biases (e.g., choosing sides and hierarchical influences) result in lost opportunities to resolve or positively impact them. Anesthesia providers have the professional status to promote resolution of perioperative conflicts if they are willing to engage and if they use their interpersonal skills to influence those involved in the conflicts. Societal expectations are that anesthesia professionals should and must protect their patients. This includes protecting them from the potential harm that may result from perioperative interpersonal conflicts.

*Dr. Warner is currently President of the APSF and the Annenberg Professor in Anesthesiology at the Mayo Clinic. He is emeritus Executive Dean of the Mayo Clinic College of Medicine and former Chair of the Department of Anesthesiology at the Mayo Clinic.*

*Dr. Birnbach is currently a member of the APSF Executive Committee and APSF Board of Directors. He is Vice Provost of the University of Miami and Professor of Anesthesiology, Obstetrics and Gynecology, and Public Health. He is Senior Associate Dean and the Director of the University of Miami-Jackson Memorial Hospital Center for Patient Safety.*

*Neither author has any financial conflicts to disclose associated with this article.*

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Table 1: Conflict Scenarios Used at the APSF Workshop	
1.	Anesthesia professional refuses to follow institution’s sterile precautions policy during central venous catheter placement; conflict between O.R. nurse and anesthesia professional
2.	Surgeon refuses to delay elective procedure of a patient who has multiple co-morbidities, hyperkalemia, and overdue dialysis; conflict between surgeon and anesthesia professional
3.	Orthopedist demands to use new bone cement that has not yet been introduced into the medical center; conflict between O.R. nurse and surgeon
4.	Surgeon refuses to allow transfusion of a patient who has lost 1 liter of blood; conflict between surgeon and anesthesia professional
5.	Surgeon will not return to hospital to re-explore a patient whom the anesthesia professional believes is bleeding profusely into his abdomen; conflict between surgeon and anesthesia professional
6.	A high-volume obstetrician demands to perform a weekend elective cesarean section for placenta accreta although it is against medical center policy; conflict between obstetrician, institutional medical director, and anesthesia professional



# Large Anesthesia Groups/Practice Management Companies Discuss the Impact of Production Pressures on Patient Safety with APSF Leaders

by Robert K. Stoelting, MD

On September 8, 2016, the Anesthesia Patient Safety Foundation (APSF) invited representatives of large anesthesia groups and practice management companies to meet with members of the APSF Executive Committee to discuss the patient safety implications of production pressures.

Thirty-five attendees representing 24 large anesthesia groups or practice management companies participated in the half-day session (Table 1). These 24 entities represented a wide geographical cross-section of the United States and a variety of practice models that included all categories of anesthesia professionals. The American Society of Anesthesiologists (ASA), American Association of Nurse Anesthetists (AANA), and American Academy of Anesthesiologist Assistants (AAAA) were also represented.

As an introduction to the conference, Robert K. Stoelting, MD, APSF president, described the three options that he believes are available for APSF safety recommendations to become “best practices.” One option is for professional associations (ASA, AANA, AAAA) to adopt APSF safety recommendations in the form of policy statements (Practice Advisories) that would be applicable to all association members. A second option is “spreading the word” among individual anesthesia professionals via social media and educational materials (conference reports in the *APSF Newsletter*, APSF educational videos). A third option for effecting change and the **principal reason to**

Anesthesia Associates of Ann Arbor	NorthStar Anesthesia (Irving, TX)
Anesthesia Associates of Massachusetts (Boston, MA)	Northwest Anesthesia Physicians, Springfield, OR
Atlantic Anesthesia	Old Pueblo Anesthesia (Tucson, AZ)
Cleveland Clinic (Cleveland, OH)	Physician Anesthesia Services
Community Health Systems (Franklin, TN)	PhyMED Healthcare Group (Nashville, TN)
Department of Veterans Affairs	Sheridan Healthcorp
Gulf Shores Anesthesia Associates	Southern Arizona Anesthesia (Tucson, AZ)
Integrated Anesthesia Associates (East Hartford, CT)	Tejas Anesthesia (San Antonio, TX)
Kaiser Permanente	US Anesthesia Partners
Kaiser Permanente Nurse Anesthetists Association (KPNAA)	Valley Anesthesiology and Pain Consultants (Phoenix, AZ)
Mayo Clinic (Rochester, MN)	Vanderbilt University School of Medicine (Nashville, TN)
North American Partners in Anesthesia (NAPA)	West Central Anesthesiology Group

**involve large anesthesia groups and practice management companies** is APSF’s hope that these entities would individually endorse and adopt selected APSF safety recommendations that are relevant to their practices and resources. Dr. Stoelting proposed that “closing the loop” on APSF safety practices” represents an opportunity for large anesthesia groups and practice management

companies to embrace relevant anesthesia patient safety initiatives advocated by APSF.

Following these introductory comments, the safety implications of production pressures were discussed with podium presentations by Drs. David M. Gaba, Samuel DeMaria, Mary Ann Vann, Myriam P. Garzon, and Brian J. Camma-

**See “Comments,” Next Page**



**Save the Date**  
Wednesday, September 6, 2017



**Stoelting Conference**  
Royal Palms Resort and Spa, Phoenix, AZ

## Perioperative Handoffs: Achieving Consensus on How to Get it Right

Handoffs in health care are potential patient safety risks, but are also opportunities to identify missed problems. Perioperative handoffs, including those occurring intraoperatively, from the OR to PACU or OR to ICU, have both common and unique issues. In this 1-day consensus-building workshop, APSF aims to identify critical elements of handoff processes, including how to conduct handoffs safely and how to implement new handoff processes that work locally.

Jeffrey B. Cooper, PhD, and Meghan B. Lane-Fall, MD, MSHP, will be the co-moderators of this workshop, which will include expert presentations and panel discussions. The primary focus of this meeting will be achieving consensus about key issues through closely facilitated working groups. If you have expertise or an interest in helping to improve handoffs, consider participating.

**If you are interested in attending, please contact Julie Tuohy, APSF administrator, at [tuohy.julie@mayo.edu](mailto:tuohy.julie@mayo.edu). Space is limited.**



Jeffrey B. Cooper, PhD



Meaghan B. Lane-Fall, MD, MSHP

# Large Anesthesia Groups/Practice Management Companies Tackle the Problem of Production Pressures

## “Comments,” From Preceding Page

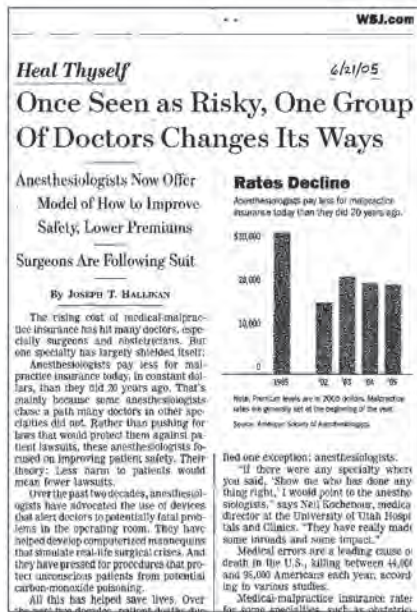
rata. Common observations from their presentations are summarized in Table 2.

During the final hour of the conference, attendees were divided into small groups to meet with members of the APSF Executive Committee to discuss four questions relevant to patient safety and production pressures. The comments and recommendations from the small groups are summarized in Table 3.

As the moderator of the conference and author of this report, I am taking the liberty of expressing a personal editorial viewpoint based on the small group comments to Question 4 (Table 3): **Are there “production pressures” that have a recognized or potential positive impact on patient safety?** As background, a front page article in the June 21, 2005, *Wall Street Journal* entitled, “Once Seen as Risky, One Group of Doctors Changes Its Ways,” observed, “Rather than pushing for laws that would protect them from patient lawsuits, these anesthesiologists focused on improving patient safety.” Perhaps, anesthesia professionals can turn the “negative knee jerk reaction to production pressures” into a patient safety opportunity by endorsing and following the small group responses to Question 4 (Table 3).

Large anesthesia groups and practice management companies in partnership with APSF have a unique opportunity to pursue our common goal that “no patient shall be harmed by anesthesia.”

Robert K. Stoelting, MD  
Immediate Past President, APSF



Wall Street Journal Article from June 21, 2005, featured the APSF, along with the ASA, as leading the way to improve patient safety in anesthesia.

**Table 2: Observations Based on Podium Presentations**

Production pressure is overt or covert pressure to place production, not safety, as a priority.
Anesthesia professionals must recognize that production pressures exist and continue to be pre-eminent patient advocates by supporting and practicing a culture of safety.
When efficiency and quality become unbalanced, patient safety implications can ensue.
Experience in nonmedical areas shows that incentives to put production ahead of safety may cause catastrophic accidents.
Ultimately, risk to the patient must be balanced by potential benefit to the patient, not to clinicians or the organization.
External pressures to work faster and more efficiently, and internal pressures to keep working despite fatigue or to get along with colleagues, may have detrimental effects (stress, burnout) on the anesthesia professional’s health.

**Table 3: Comments and Recommendations Based on Small Group Discussions**

<p><b>Question 1:</b> In your practice, what do you consider to be the most important “production pressure” patient safety issues in terms of potential harm to patients?</p> <ul style="list-style-type: none"> <li>Excessive focus on time and not safety</li> <li>Limited staffing numbers (especially satellite locations), often driven by budget issues</li> <li>Push to go fast and limit use of resources</li> <li>Multiple rooms as first start</li> <li>Emphasis on turnover times</li> <li>Inappropriate patient selection</li> <li>Difficult elective cases during off-hours</li> <li>“All about the money” economic pressures with disregard for safety</li> <li>Patient demand: “I want my surgery NOW!”</li> <li>Timely arrival of surgeon</li> <li>Pressure to start prior to receiving lab or test results that are pending</li> <li>Potential for missed information about patient</li> </ul>	<p><b>Question 3:</b> How can APSF best address patient safety issues presented by “production pressures?”</p> <ul style="list-style-type: none"> <li>Highlight the evolving dangers of production pressures in an <i>APSF Newsletter</i> article</li> <li>Publish a report of this conference</li> <li>Publish vignettes or case reports of harm</li> <li>Sponsor conferences to increase awareness of this issue</li> <li>“Close the loop” with anesthesia professional organizations to develop multimedia curricula on issues related to safety and production pressures</li> <li>Develop a “request for proposal” to study this topic</li> </ul>
<p><b>Question 2:</b> In your practice, how have you confronted and neutralized the patient safety issues created by “production pressures?”</p> <ul style="list-style-type: none"> <li>Confront budget and administrative structure with safety concerns</li> <li>Create a culture of respect, cooperation, and communication</li> <li>Create a preoperative anesthesia clinic</li> <li>Preoperative anesthesia clinic</li> <li>Staggered operating room starts</li> <li>Use a second anesthesiologist’s opinion/chief quality officer to back up and review decisions</li> <li>Multidisciplinary efforts to reduce wasteful steps and improve information exchange</li> <li>Use of secondary metrics (patient satisfaction surveys) to support improvements/changes</li> </ul>	<p><b>Question 4:</b> Are there “production pressures” that have a recognized or potential positive impact on patient safety?</p> <ul style="list-style-type: none"> <li>Can make the anesthesia professional more efficient while still safe—a new norm</li> <li>Promotes development of checklists, protocols and standardization</li> <li>Encourages the anesthesia professional to function as a consultant</li> <li>Facilitates increased communication and collaboration</li> <li>Creates the potential to reduce waste and inefficiency</li> </ul>



## Immediate Past President's Report Highlights Accomplishments of 2016

by Robert K. Stoelting, MD

Since the majority of APSF activity in 2016 has occurred during my presidency, I am preparing this annual "president's report" over my name but as the "immediate past president" on the date this report appears.

It was my privilege to serve as president of the Anesthesia Patient Safety Foundation (APSF) from October 1997–October 2016. At the October 22, 2016, annual meeting of the APSF Board of Directors, Mark A. Warner was elected APSF president. Dr. Warner is a current member of the APSF Executive Committee and highly qualified to lead APSF in the years to come. Over the past 19 years, I have experienced the unique opportunity to work with colleagues who approach anesthesia patient safety with a passion and a volunteer spirit that is a credit to our profession and the APSF vision that "no patient shall be harmed by anesthesia."

As in my previous annual reports, I believe it is important to recognize that APSF, as an advocacy group, does not write standards. Recommendations developed and promulgated by APSF are intended to assist professionals who are responsible for making health care decisions. Recommendations promulgated by APSF focus on minimizing the risk to individual patients for rare adverse events rather than necessarily on practices that balance all aspects of population health quality and cost. APSF does not intend for these recommendations to be standards, guidelines or clinical requirements nor does application of these recommendations guarantee any specific outcome. Furthermore, these recommendations may be adopted, modified, or rejected according to clinical needs and restraints. APSF recognizes that these recommendations are subject to revision as warranted by the evolution of medical knowledge, technology, and practice.

### Ellison C. Pierce, Jr., MD, Patient Safety Memorial Lecture

A highlight of the opening session of the annual meeting of the American Society of Anesthesiologists in Chicago, IL, on October 22, 2016, was the fifth annual ASA/APSF Ellison C. Pierce, Jr., MD, Patient Safety Memorial Lecture delivered by Alexander A. Hannenberg, MD. Dr. Hannenberg's topic was *Patient Safety Beyond Our Borders: Different but the Same* (see lecture report, page 68).

This named lectureship continues to be part of the annual ASA meeting and provides sustained recognition for the vision and contributions to anesthesia patient safety made by Dr. Pierce as the founding president of APSF.



Retiring APSF President Robert K. Stoelting, MD.

### APSF Board of Directors Workshop

The APSF Board of Directors Workshop occurred on Saturday, October 22, 2016, and was moderated by Mark A. Warner, MD, and David J. Birnbach, MD. The topic for this 2-hour workshop was *Conflicts in the Operating Room: Impact on Patient Safety*. During this workshop, actual operating room events that potentially impacted patient safety were presented and the attendees were divided into small groups to offer comments on how the events were managed (see workshop summary, cover page).

### Distractions in the Anesthesia Work Environment: Impact on Patient Safety

APSF sponsored a consensus conference on patient safety implications of distractions in the anesthesia work environment on Wednesday, September 7, 2016 (Phoenix, AZ) (see conference summary, page 59).

### Large Anesthesia Groups and Practice Management Companies: How Can APSF Help Everyone Be Safe? Impact of Production Pressures on Patient Safety

APSF sponsored a half-day meeting on patient safety implications of production pressures on Thursday, September 8, 2016, (Phoenix, AZ) with members of large anesthesia groups and representatives from practice management companies (see conference report, pages 55).

### Research

The APSF Committee on Scientific Evaluation chaired by Steven K. Howard, MD, received 46 letters of intent and invited eight investigators to submit completed applications for studies beginning January 1, 2017. In October 2016, the committee recommended funding three research awards totaling \$598,004 (see Grant Awards report, page 64).

In addition to the traditional research awards, APSF continues its support of the **APSF Safety Scientist Career Development Award (SSCDA)** (\$150,000 over 2 years). The current recipients are Amanda R. Burden, MD (Cooper Medical School/Rowan University) and Ankeet Udani, MD (Duke University).

The APSF Committee on Education and Training, chaired by Maria van Pelt, CRNA, PhD, with assistance of committee members, Brian J. Cammarata, MD, Sandeep Markan, MD, and Lianne Stephenson, MD, sponsored the second annual **APSF Resident Quality Improvement (QI) Recognition Program**. Program submissions consisted of a brief written narrative and video describing the resident's quality improvement topic. The 2016 resident winners were M. James Lozado, DO, University of Texas Medical Branch/Galveston (Preoperative Anemia Protocol, 1st place) and Jon A. Holzberger, MD, University of Kentucky (Ampules and Glass Particle Contaminations, 2nd place). The resident winner's department received a cash award of \$1,000 and \$500 for the first and second place awards, respectively.

APSF is the largest private funding source for anesthesia patient safety research in the world. When the first grants were funded in 1987, funding for anesthesia patient safety was virtually unknown. Since 1987, APSF has awarded 109 grants for a total of more than \$10,342,231. The impact of these research grants is more far-reaching than the absolute number of grants and total dollars, as APSF-sponsored research has led to other investigations and the development of a cadre of anesthesia patient safety investigators.

### APSF Newsletter

The *APSF Newsletter* (122,210 recipients including all members of the ASA, AANA, AAAA, ASDA, and AOCA) continues its role as a vehicle for rapid dissemination of anesthesia patient safety information. Robert C. Morell, MD, retired as senior co-editor with the October 2016 issue of the *APSF Newsletter*, ending a 17-year association with the *Newsletter* as associate editor (1999–2001), editor (2002–2009), and senior co-editor (2010–

See "2016 Highlights," Next Page

# Numerous APSF Patient Safety Initiatives in 2016

## “2016 Highlights,” From Preceding Page

2016). APSF thanks Dr. Morell for his many years of devotion to anesthesia patient safety and the *APSF Newsletter*. Lorri A. Lee, MD, becomes senior co-editor with the February 2017 issue of the *APSF Newsletter*, and Steven B. Greenberg, MD, has been appointed as co-editor.

## Communication

The APSF website design and content ([www.apsf.org](http://www.apsf.org)) continues under the direction of APSF executive vice president, George A. Schapiro. Online donations to APSF are possible via the website.

Richard C. Prielipp, MD, continues as the Patient Safety Section editor for *Anesthesia & Analgesia*.

## APSF-Sponsored Panels

APSF sponsored a panel entitled *More Myths of Anesthesia Patient Safety* at the May 2016 annual congress of the International Anesthesia Research Society in San Francisco, CA. The panel was moderated by Richard C. Prielipp, MD.

APSF sponsored a 1-hour session on “emergency manuals” at the September 2016 AANA annual meeting in Washington DC. The panel was moderated by Maria Magro, CRNA, PhD.

APSF will sponsor a panel entitled *Production Pressures: Impact on Patient Safety* on December 11 during the 2016 annual meeting of the NYPGA. This panel will be moderated by Mark A. Warner, MD.

## Prevention and Management of Operating Room Fires

To date, more than 8,400 individual requests for the complimentary copy of the *Prevention and Management of Operating Room Fires* DVD ([http://www.apsf.org/resources\\_video.php](http://www.apsf.org/resources_video.php)) have been received. In addition, APSF has created a poster depicting the risks of alcohol-based preps ([http://www.apsf.org/resources\\_safety.php](http://www.apsf.org/resources_safety.php)).

## Medication Safety in the Operating Room

To date, more than 3500 individual requests for the complimentary copy of the 18-minute educational DVD entitled, *Medication Safety in the Operating Room: Time for a New Paradigm* ([http://www.apsf.org/resources\\_video2.php](http://www.apsf.org/resources_video2.php)) have been received. APSF will again address “medication safety” during an APSF-sponsored conference on September 7, 2017 in Phoenix, AZ.

## Educational DVDs

In addition to the educational DVD on “operating room fire safety” and “medication safety,”

APSF also offers complimentary copies of the following educational DVDs (visit the APSF website for details, [www.apsf.org](http://www.apsf.org))

- Opioid-Induced Ventilatory Impairment (OIVI): Time for a Change in the Monitoring Strategy for Postoperative PCA Patients (Executive Summary, 7 minutes)
- Perioperative Visual Loss (POVL); Risk Factors and Evolving Management Strategies (Executive Summary, 10 minutes)
- APSF Presents Simulated Informed Consent Scenarios for Patients at Risk for Perioperative Visual Loss (POVL) (18 minutes)

## Residual Muscle Relaxant-Induced Weakness in the Postoperative Period: Is it a Patient Safety Issue?

APSF believes that residual neuromuscular blockade in the postoperative period is a patient safety hazard that could be addressed by improved use of monitoring of the pharmacologic effects of non depolarizing neuromuscular blocking drugs, particularly quantitative monitoring, along with traditional subjective observations. The February 2016 issue of the *APSF Newsletter* included an editorial and articles addressing this patient safety issue.

## Financial Support

Financial support to the APSF from individuals, specialty and components societies, and corporate partners in 2016 has been most gratifying. This sustained level of financial support makes possible the undertaking of new safety initiatives,

the continuation of existing safety initiatives, and funding for anesthesia patient safety research. The ability of APSF to provide research grants is particularly dependent on the level of financial support received from our financial sponsors.

## Online Donations

The link for online donations to APSF is <http://www.apsf.org/donate.php>. Contributions may also be mailed to the Anesthesia Patient Safety Foundation, 1061 American Lane, Schaumburg, IL 60173-4973.

## Recognition of Retiring and New APSF Directors

APSF thanks retiring Board Directors Susan Carter, RN, Heidi Hughes, Terri G. Monk, MD, Roger A. Moore, MD, Robert K. Stoelting, MD, Shane Varughese, MD, and Robert J. White. APSF welcomes new directors Douglas A. Bartlett, Steven B. Greenberg, MD, Armi Holcomb, RN, Rachel Hollingshead, RN, Steven K. Howard, MD, and Marjorie P. Stiegler, MD.

## Concluding Thoughts

As in the previous annual report, I wish to reiterate the desire of the APSF Executive Committee to provide a broad-based consensus on anesthesia patient safety issues. Comments and suggestions from all those who participate in the common goal of making anesthesia a safe experience are welcomed. There still remains much to accomplish and everyone’s participation and contributions are important.

Best wishes for a prosperous and rewarding 2017.

Robert K. Stoelting, MD  
Immediate Past President

*The Anesthesia Patient Safety Foundation  
gratefully acknowledges an educational grant from*

**Medtronic**  
Further, Together

[www.medtronic.com](http://www.medtronic.com)

**in full support of the  
APSF/Medtronic Research Award (2017)**

## Distractions in the Anesthesia Work Environment: Impact on Patient Safety

by Maria Magro, PhD, CRNA, and Matthew Weinger, MD

Distractions in the perioperative work environment can be attributed to many sources. When considering distractions, one must distinguish those that are externally imposed from those that are internally motivated. Many of the externally imposed distractions may be considered interruptions from the environment, other team members, or technology. Internally motivated distractions, those under the complete control of the anesthesia professional, may include patient care-related (looking up lab results on the EMR) or non-patient care-related (texting a friend about dinner plans) activities. The anesthesia professional can choose to immediately react to, to defer responding to, or to ignore internal and/or external distractions. All types of distractions can affect vigilance, situational awareness, and the ability to respond promptly to changes in the patient's condition that, in turn, can pose a risk to patient safety.

APSF believes that the role of both external and self-induced distractions and potential adverse effects needs to be addressed through open discussion, education, research, the review and potential revision of policy statements, and possibly other yet unidentified interventions. To make progress in this area, APSF held a conference entitled "Distractions in the Anesthesia Work Environment: Impact on Patient Safety" in Phoenix, AZ on September 7, 2016. The Conference's goal was to 1) delineate the most important types of external and self-induced distractions occurring in anesthesia professionals' different work environments; 2) identify those distractions most likely to pose patient safety risks (i.e., high-risk distractions); and 3) develop recommendations for decreasing the incidence of high-risk distractions and to reduce the risk to patient safety when distractions of all types occur. A full report of the findings from this important conference will appear in the next (June 2017) APSF Newsletter.

Matthew Weinger, MD, currently serves as Secretary of the Executive Committee of the APSF and is Professor of Anesthesiology at Vanderbilt University.

Maria Magro, PhD, CRNA, currently serves on the Executive Committee of the APSF and chairs the Committee on Education and Training of the APSF. She is an Associate Clinical Professor and Nurse Anesthesia Program Director at Northeastern University, Boston, MA.

Neither author has any disclosures related to this article.

**Editors' Note:** The following article is reprinted and modified with permission from *Preferred Physicians Medical's (PPM) Risk Management Newsletter, Anesthesia and the Law* (August 2014, Issue 39) on the medico-legal implications of distractions in the operating room.

## Distractions in the Operating Room: An Anesthesia Professional's Liability?

by Brian J. Thomas, JD

We examine the increasing incidents of distractions in the operating room that potentially threaten patient safety and increase anesthesia providers' exposure to litigation and other negative consequences. Specifically, distractions from the use of personal electronic devices in the operating room for purposes not related to patient care are reportedly widespread in the anesthesia community. Plaintiff attorneys are increasingly including allegations of negligent care caused by distractions in the operating room in medical negligence litigation. In this issue, we highlight a case summary involving allegations of "distracted doctoring," the impact the evidence of distractions had on the evaluation of the case, and the significant challenges of overcoming that evidence in the courtroom. We also offer some risk management strategies to assist anesthesia providers in avoiding and minimizing distractions in the operating room.<sup>1</sup>

Technology has advanced many aspects of the practice of anesthesiology including, but not limited to: immediate availability of patient medical records, more efficient communication and connectivity, contemporaneous documentation, improved legibility in the medical record, clinical decision support, and data acquisition, management and analyses. This same technology has also given rise to new patient safety and medicolegal concerns.<sup>2</sup> One emerging concern for many anesthesia practices is the proliferation and use of personal electronic devices (PEDs)<sup>2</sup> in the operating room (OR).

Given the degree to which PEDs have become a fixture in our daily lives, it is not surprising that anesthesia practices are confronted with the challenge of how to effectively manage PEDs in the OR and other patient care areas. From Preferred Physicians Medical's (PPM) vantage point as a medical professional liability insurance company, any distractions in the OR or patient care areas can jeopardize patient safety and/or negatively impact PPM's ability to successfully defend malpractice lawsuits. The use of PEDs for personal or non patient-related activities increases the patient safety concern and compounds the challenge of defending anesthesia providers in the event of an adverse outcome. Distractions related to the use of PEDs have recently surfaced in anesthesia litigation, medical licensing board investigations, and as a basis for facilities to seek revocation of medical staff privileges.

### The Data

The potential for distractions in the OR and other patient care areas is, of course, not limited to PEDs. Reading in the OR, for instance, has been debated for years. Moreover, research on the impact of reading in the OR has been inconclusive. For example, a 2009 study examined the effects of reading in the OR on vigilance and workload during anesthesia care and concluded there were no scientific data that intraoperative reading and non patient-related conversation during low-workload portions of the maintenance phase of anesthesia adversely affect vigilance or multi-tasking.<sup>3</sup> In fact, Slagle et al. suggested that reading may actually improve vigilance under some circumstances by keeping the anesthesia provider intellectually occupied and clinically stimulated, thus averting boredom or mental inactivity.

Admittedly, little scientific data and research regarding the role of PEDs in the anesthesia environment are currently available. The ASA Closed Claims database reports a relatively small (13 of 5822) number of claims related to distractions in the OR.<sup>4</sup> Given the delay associated with studying closed claims, it is not surprising that, to date, the database currently reflects distractions such as printed materials, phone calls, and loud music. Distraction-related claims, however, were judged as substandard care in 91% of claims compared to 50% of other claims. Settlements were made in over 80% of the distraction-related claims for a median payment of \$725,937.

Given the data currently available, most of the commentators and cited authors agree that additional scientific research and data are needed to evaluate the impact of PEDs on anesthesia provider performance. Domino et al. suggested future research should include sophisticated electronic and human-factors methodology to consider the effects of PEDs and other distracting activities on vigilance and performance during simulated and actual anesthesia care.<sup>4</sup>

### The Litigation Problem

Notwithstanding a lack of scientific data of distractions from PED use during anesthesia care, the potential for distraction is a growing concern in the medicolegal arena. In the last several years, PPM has defended multiple lawsuits involving

See "OR Distractions," Next Page

# Distractions in the Operating Room Continue

## “OR Distractions,” From Preceding Page

allegations and evidence of distractions from the personal use of PEDs in the OR and other patient care areas. In PPM’s experience, the mere suggestion that an anesthesia provider was distracted can negatively impact PPM’s ability to defend the anesthesia provider. Texting, “surfing” the Internet, social media, personal cell phone conversations, or playing video games may also create a negative perception among other OR team members that the anesthesia provider was not paying attention to the patient.

Additionally, plaintiff attorneys have no difficulty identifying anesthesiology experts who will testify that the use of PEDs for non patient-related activities in the OR and other patient care areas is well below the standard of care and contrary to the very hallmark of a competent and professional anesthesia provider—vigilance.<sup>3</sup>

Plaintiff attorneys can be expected in such cases to subpoena cell phone records and retain information technology (IT) experts to scour computer hard-drives to obtain metadata as evidence that the anesthesia provider was distracted in the OR. Metadata, the “data about data” created by computer operating systems and applications, allows plaintiff attorneys and their experts to determine, among other information, the exact date and time a web page was visited, a text or e-mail was sent or received, a cell phone call was made or received, the parties’ phone numbers and the duration of the communication. Unlike distractions in the OR allegedly caused by reading or loud music, where the evidence is typically limited to other witnesses’ recollections of the events, the presence of PEDs in the OR provides plaintiff attorneys with a new evidentiary avenue. The increased use of electronic discovery (or “e-discovery”) allows metadata to serve as an “expert witness” to establish a very detailed timeline of electronic activities in the OR.

In PPM’s recent experience, courts have ruled that cell phone records and metadata are discoverable (i.e., parties to the litigation are entitled to obtain that evidence) and such evidence may be admissible (i.e., parties to the litigation are allowed to present that evidence to the jury to be considered in reaching a verdict). PPM’s defense counsel have opined that allegations and evidence of distractions from personal PED use during surgery could potentially shock, anger, and inflame jurors (most of whom have little to no knowledge of the day-to-day activities that occur

in ORs). In PPM’s own cases, defense counsel have suggested that evidence of distraction increases the potential for multimillion dollar verdicts, possibly including punitive damages, against an allegedly distracted anesthesia provider involved in a significant adverse outcome.

## Other Consequences

PPM is aware of several high-profile lawsuits involving allegations and evidence of distractions in the OR that resulted in additional negative consequences including, but not limited to:

- Suspension and non-renewal of privileges at practice facilities
- State medical licensing board investigations and sanctions
- Significant negative media coverage
- Public relations challenges for the individual anesthesiologist and practice group
- Loss of employment
- National Practitioner Data Bank Reporting

## What is the Solution?

In response to the patient safety concerns related to distractions in the OR and other patient care areas from the use of PEDs for non patient-related purposes, several professional societies and organizations have established position statements and guidelines to define appropriate PED use in the OR.<sup>5-8</sup> Other health care institutions, residency programs, and anesthesia practice groups have attempted to address this issue by establishing PED guidelines and policies. These PED policies range from zero-tolerance (e.g., no PED use in OR) to more balanced policies that allow PED use for purposes directly related to patient care, online research and communications between medical staff members, and verifying surgery schedule assignment.

Based on PPM’s experience defending litigation involving allegations of distractions in the OR, PPM recommends that anesthesia providers work with their facilities to establish guidelines and expectations for the entire OR team that balance the benefits of having access to PEDs in the OR with the potential patient safety risks posed by the inappropriate use of PEDs. PED guidelines and policies should have the goal of educating the medical staff about distractions from PED use and its potentially devastating effect on patient safety. Once implemented, PED guidelines or policies

should also be monitored for compliance to ensure the facility and medical staff are promoting a culture of patient safety.

“In addition to PED guidelines and policies, from a risk management perspective, exercising good judgment and common sense is the best way to avoid and minimize distractions in the OR from PEDs,” according to Wade Willard, PPM’s Vice President—Claims. Until additional scientific research and data are available to further evaluate this issue, PPM offers the following risk management strategies to reduce distractions in the OR.

### Risk Management Strategies that may Reduce Distractions in the OR

- Review and comply with practice facilities’ PED guidelines and/or policies
- Implement a “sterile cockpit” “no interruption zone”<sup>7</sup> protocol during critical phases of procedures
- Eliminate all discretionary sources of noise during “sterile” periods
- Avoid loud or distracting music
- Limit personal telephone calls and text messages to urgent or emergent situations
- Forward cell phone calls and transmissions to voice mail or memory
- Silence ring tones
- Keep all telephone calls to a minimum and brief as possible
- Limit OR internet access only to patient-care-related websites
- Avoid discretionary Internet-based activities and browsing
- Minimize nonessential conversation, especially during critical phases
- Limit interruptions from outside staff and others
- Set an example—vigilance and focused attention on the patient are paramount
- Speak up—let others know when their PED use is distracting the OR team

### References:

1. Thomas BJ. Asleep at the Wheel? Distractions in the Operating Room. *Anesthesia and the Law*. August 2014, Issue 39. <https://www.bing.com/search?q=ppm+asleep+at+the+wheel&form=EDGNTC&q=PF&cvd=6383327c93284b5ea67be1017fbc09b2&ppq=ppm+asleep+at+the+wheel> – last accessed December 4, 2016.

<sup>3</sup>The sterile cockpit concept is derived from aviation law that prohibits crewmembers from engaging in any activity except those duties required for the safe operation of the aircraft during critical phases of flight, including taxi, takeoff, landing and all other flight operations conducted below 10,000 feet. “Sterile” periods in health care include, but are not limited to: induction and emergence of anesthesia, critical events during the anesthetic and/or surgery and unanticipated events requiring additional OR team communication.

# Distractions in the Operating Room: A Case Study

## “OR Distractions,” From Preceding Page

The following case highlights some of the significant challenges in defending anesthesia providers in litigation involving allegations and evidence of distractions in the OR:

The case involved a 53-year-old male with medical history significant for atrial fibrillation and smoking who presented for an elective cardiac atrial fibrillation ablation under general anesthesia. The anesthesia provider performed the pre-anesthesia examination and assigned the patient an ASA III classification.

Shortly after the induction of anesthesia and placement of the endotracheal tube (ETT), the cardiologist performed a transesophageal echocardiogram (TEE) that revealed an ejection fraction of 40–45%. Four minutes into the procedure, the patient’s systolic blood pressure dropped into the 80s. The anesthesia provider administered 10 mg ephedrine, but the blood pressure stayed in the 80s, and the pulse rate went up to 180 beats per minute (bpm). The anesthesia provider informed the cardiologist about the changes in vitals, but the cardiologist indicated that he was not concerned about the heart rate because he was trying to locate the source of the atrial fibrillation, and there were no signs of ischemia on the EKG.

The anesthesia provider supported the blood pressure with phenylephrine IV in 200 mcg boluses. He informed the cardiologist of his treatment, and the cardiologist was aware of the events due to the monitors in front of him. The anesthesia provider also lowered the anesthetic inhalational agent (sevoflurane) and gave fluid to maintain blood pressure. The blood pressure was labile and required multiple interventions throughout the case.

The patient’s systolic blood pressure dropped into the 60s on two occasions. The anesthesia provider decided to begin a low-dose dopamine infusion to help control the blood pressure, and he notified the cardiologist of his activities. Once he initiated the dopamine infusion, the systolic blood pressure stabilized in the 90s. About 45 minutes

later, the blood pressure dropped again and the anesthesia provider increased the dopamine infusion and the phenylephrine boluses, at which point the systolic pressure rose to 110. He continued to communicate his treatment choices to the cardiologist throughout the procedure. Although the cardiologist was aware of the volatile shifts in the blood pressure, the anesthesia provider believed that he was not concerned because he continued with the ablation procedure.

Approximately 15 minutes after the systolic pressure had risen to 110, it again dropped into the low 80s. Phenylephrine administration only assisted in bringing it up for a few minutes, and then it dropped into the 50s and would not increase in response to medications. The EKG showed that the patient’s heart was generating electrical impulses, but it became clear that his heart was not beating and he was experiencing pulseless electrical activity (PEA).

A Code was called and the cardiologist suspected the patient was experiencing a cardiac tamponade. Multiple attempts to perform pericardiocentesis were unsuccessful. Another cardiologist arrived to assist and was able to drain 450 to 600 cc of fluid from the pericardial sac. The heart rate was restored and the patient was transferred to ICU. Unfortunately, the patient never recovered from the Code, and was eventually taken off the ventilator and passed away.

The patient’s wife and son sued the anesthesia provider, the cardiologist, and the hospital. The patient’s family alleged the anesthesia provider failed to: recommend that the cardiologist stop the procedure due to the hemodynamic instability caused by the hypotension, properly evaluate the cause of the hypotension that persisted for over two hours prior to the cardiac arrest, and maintain an acceptable blood pressure. The patient’s family alleged further that the anesthesia provider’s negligence contributed to the cardiac arrest resulting in hypoxic ischemic brain injury and death.

Defense experts retained on behalf of the anesthesia provider were supportive of his care.

The anesthesiology expert believed that the anesthesia provider’s treatment of the hypotension met the standard of care, and he appropriately communicated the patient’s changing vitals and hemodynamic status to the cardiologist throughout the case. Further, he opined that the anesthesia provider does not have a duty, or even an ability, to stop the procedure as that decision is up to the cardiologist.

Despite the supportive expert witness, during discovery several nurses present in the OR testified the anesthesia provider was texting and reading articles on the Internet throughout the entire case and even during the Code. The anesthesia provider’s mobile phone records, however, confirmed the anesthesia provider did not receive or send a text during the procedure. In deposition testimony, the anesthesia provider acknowledged he was looking at emails on his mobile phone during the procedure. The Internet log for the computer in the cardiac catheter lab confirmed that the anesthesia provider was accessing the Internet at various times during the procedure. He last accessed the Internet approximately eight minutes before the Code started. While there was no specific evidence the anesthesia provider was on the Internet during the Code, there was electronic evidence that the anesthesia provider was reading news stories on Yahoo and accessing his personal email account during the procedure.

Based on this evidence, defense counsel opined a jury would likely react very negatively to evidence that the anesthesia provider was accessing the Internet and his personal email in the cardiac catheter lab just moments before the Code. In the face of testimony from multiple nurses that the anesthesia provider was using a mobile phone throughout the procedure, and even during the Code, defense counsel was concerned PPM would be unable to persuasively defend the anesthesia provider given this potentially inflammatory testimony.

Based on defense counsel’s evaluation, the anesthesia provider consented to settlement. The parties participated in mediation and the case was settled within the insurance policy limits.

## “OR Distractions” From Preceding Page

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*Brian J. Thomas, JD, is Vice President of Risk Management at Preferred Physicians Medical (PPM), a professional liability company for anesthesiologists, in Overland Park, KS. Mr. Thomas was an invited speaker at the recent APSF Conference on this topic. He has no financial conflicts of interest to disclose.*

# 2016 National Geriatric Surgical Initiatives

by Stacie Deiner, MD, Lee A. Fleisher, MD, Roderic Eckenhoff, MD, and Mark Neuman, MD

This has been a landmark year for geriatrics focused perioperative care and for research highlighting the role of cognitive health on postoperative recovery among older adults. The American Society of Anesthesiologists (ASA) Committee on Geriatric Anesthesia has expanded to have an educational track to provide content for the annual meeting and an abstracts committee with dedicated poster and oral presentation sessions. Geriatrics committee members have been active on the national level to collaborate with ongoing efforts including the American College of Surgeons Coalition for Quality in Geriatric Surgery (CQGS) and the Brain Health Initiative (BHI), (Figure 1: National Geriatric Surgical Initiatives).

## Figure 1: National Geriatric Surgical Initiatives

### Coalition for Quality in Geriatric Surgery (CQGS)

*Primary Sponsor:* American College of Surgeons

*Mission:* to create a quality improvement program based on patient and caregiver centered outcomes

### Brain Health Initiative (BHI)

*Primary Sponsor:* The American Society for Anesthesiologists

*Mission:* to raise awareness regarding identification, prevention, and treatment of postoperative delirium for patients and providers

The CQGS is co-sponsored by the John A. Hartford Foundation. The program's mission is to create a quality improvement program based on patient and caregiver centered outcomes. More than 50 groups participate in the effort including patients and caregiver advocacy groups, nursing, federal, and private payers. About two years ago, an initial discovery phase was carried out where team members visited a diverse group of hospitals to discover the state of perioperative care for the older adult. Based on these visits and expert consensus, more than 200 standards were proposed for the pre, intra, and postoperative period. Issues include informed consent, preoperative cognitive screening, and increased use of geriatric best care practices such as early mobilization and optimization of nutrition and sleep wake cycles. Once the standards were assembled, the full group of stakeholders convened this fall. The group voted on the efficacy and practicality of each measure and discussed the document in breakout groups. The next phase of the project will collate the individual and group



responses. The plan is to roll out standards in 2019 to a core group of hospitals who participated in the initial visits. The eventual plan is to have standards for excellence in geriatric care, which can be implemented in a wide range of hospitals (academic, private, rural, etc.) across the country.

The BHI is sponsored by the ASA. The mission of this group is to raise awareness regarding identification, prevention, and treatment of postoperative delirium for patients and providers. On the provider side, this will involve dissemination and implementation of best practice guidelines. In September, the ASA convened a multi-stakeholder summit to address postoperative delirium, which occurs frequently after major surgery in older adults. The summit included multiple specialty societies who care for elderly patients undergoing surgery including (but not limited to) the American College of Surgeons, the American Association of Orthopedic Surgeons, the American Geriatric Society (AGS), payers such as Center for Medicare and Medicaid Services, the Veterans Administration, public advocacy groups including the American Association of Retired Persons, the Institute for Healthcare Improvement, and federal funders such as the National Institute of Aging (NIA) and the Patient Centered Outcomes Research group. The summit addressed three key questions: 1) Should the public be informed about the risks of surgery and anesthesia on postoperative cognition in the vulnerable brain and be informed of strategies to reduce that risk? 2) How can providers be informed of and galvanized to implement strategies to reduce postoperative delirium and cognitive dysfunction?

and 3) Can funders be educated about the gaps in knowledge regarding these conditions? A series of workgroups have been identified and strategies to address each of these questions are currently underway.

The group consensus was that the public should be made aware of the current state of the evidence and that their engagement will result in improved outcomes. It is clear that the risk of postoperative delirium in an elderly surgical patient far exceeds many other complications that are routinely discussed (heart attack, stroke, death). The group believes that the public needs to be informed regarding delirium for the purpose of education/reassurance and risk reduction when possible. There was general consensus that a campaign should focus on raising patient awareness regarding the signs of delirium, identification by patients and/or their families, education regarding the benefits of "prehabilitation" such as exercise and nutrition, and preparing caregivers for the potential for longer term postoperative cognitive changes. The public awareness campaign will also include information for caregivers about how best to help the elderly return to the baseline brain health such as familiar objects and pictures to assist with reorientation and a commitment to assist with early mobilization.

A similar campaign focusing on provider education across disciplines was discussed, which will highlight recommendations from the AGS Guidelines and the CQGS recommendations. The

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## Brain Health Initiative Seeks to Reduce the Incidence and Duration of Delirium in Patients

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mission of this campaign will be to disseminate existing best practice to providers to reduce the risk of postoperative delirium and delayed cognitive recovery. Key provider stakeholders for this educational initiative include nurses, pharmacists, anesthesiologists, surgeons, internists, and providers in training (residents and fellows). The initiative will work with groups that promote geriatric specialty training such as the Geriatrics for Subspecialists Initiative sponsored by the AGS and the ongoing Maintenance of Certification Program (MOCA) sponsored by the American Board of Anesthesiology.

The provider initiative will create a toolkit for medical professionals which will contain suggestions about how to engage patients and families to discuss delirium. The provider kit will also contain information regarding delirium. Information would include pre- intra and postoperative strategies to prevent delirium with emphasis on:

- preoperative identification of high risk patients (how to take a cognitive vital sign)
- screening for polypharmacy
- awareness of Beers criteria medications (see <http://www.americangeriatrics.org/files/documents/beers/BeersCriteriaPublicTranslation.pdf>, for more information)
- monitoring the brain during anesthesia
- avoidance of antipsychotics
- importance of nonpharmacologic sleep regimens
- early mobilization
- Early Recovery After Surgery (ERAS) measures to promote recovery

The kit will include a pathway or bundled care for patients identified preoperatively as high risk for delirium. The provider tool kit will also contain an algorithm for dealing with agitated delirious patients and utilize materials such as short videos, printable pamphlets, review articles or guidelines, and proposed order sets.

Developing research priorities will require that investigators already engaged in this area, whether laboratory or clinical, meet, discuss, and reach consensus. This consensus is then presented to funding agencies to consider targeted calls for proposals. Currently the working group led by Dr. Roderick Eckenhoff will pursue NIH-supported conference funding, in the next 6 to 9 months. If approved for funding, this meeting will occur in the fall of 2017, and involve 50 to 75 invited investigators working in the area for two days of talks

and breakout sessions, with the goal of identifying critical gaps in knowledge, and a deliverable of a research agenda that will be submitted to NIA, National Institute of Neurological Disorders and Stroke (NINDS), National Institute of Mental Health (NIMH) and National Institute of General Medical Sciences (NIGMS) for consideration of program announcements (PA) and request-for-applications (RFA). The meeting will be international in scope, and the budget will include travel funds for junior investigators.

In summary, the ASA has initiated and is working with other specialty groups to improve the health of older adults after surgery. Many members of the Geriatrics Committee serve as liaisons to these initiatives and communicate progress to the ASA. The CQGS and BHI are major national efforts. The hope is that the two initiatives will work synergistically to advance scientific knowledge in this area to provide foundational knowledge for identification and treatment of delirium and ongoing evidence for best practice. The current timeline calls for CQGS roll out in 2 years and the BHI provider materials to be available over the next 6 months. Both programs will need champions at academic and community centers to roll out the best practices initiative. Providers, groups, and institutions who are interested in becoming involved in the BHI should contact Lee Fleisher (Lee.Fleisher@uphs.upenn.edu). Progress from this year’s initiatives will be reported at next year’s ASA meeting in Boston.

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## TAKE THE SURVEY!

### Hospital Power Failure: A Safety Hazard

Power failures affecting hospitals are a patient safety hazard, particularly in the technology-rich environment of the operating room and procedural areas. We recently published an article in the February 2016 *APSF Newsletter* regarding how to manage power outages in the operating room.<sup>1</sup> The incidence of hospital power outages in the United States and their impact on patient care has not been studied systematically. As a follow-up to that article and to better understand the scope of this problem, my colleagues and I are asking anesthesiologists, anesthesia residents, and CRNAs in the United States to complete an 8-question, anonymous survey that should take less than 5 minutes. Please fill out date and location information to the best of your recollection. Data will be reported in aggregate form with no identifying information about survey participants or hospitals. You can access the survey by the following URL link: <https://goo.gl/ngn1bx> or by scanning the QR code below:



Thank you, in advance, for your participation!

Grete H. Porteous, MD, Department of Anesthesiology, Virginia Mason Medical Center, Seattle, WA.

Dr. Porteous has no financial conflicts of interest to disclose.

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# 2017 APSF Grant Recipients

by Steven K. Howard, MD

We are pleased to report on this year's grant recipients in this edition of the *Newsletter*. The APSF's mission statement explicitly includes the goal to continually improve the safety of patients during anesthesia care by encouraging and conducting safety research and education. Since 1987, the APSF has funded safety projects totaling over 10 million dollars.

In 2016, the APSF investigator-initiated grant program had 46 letters of intent (LOIs). Members of the APSF Scientific Evaluation Committee reviewed and invited the top eight scoring LOIs to submit full proposals—seven full proposals were submitted for final review and discussion on October 22, 2016, at the ASA Annual Meeting in Chicago, IL. Three proposals were recommended to the APSF Executive Committee for funding and all received unanimous support. This year's grant recipients were Seth Herway, MD, MS, from the Department of Anesthesiology at the University of California San Diego; Michael Mazzeffi, MD, MPH, from the Department of Anesthesiology at the University of Maryland; and Janet van Vlymen, MD, FRCPC, from the Department of Anesthesiology and Perioperative Medicine at Queen's University in Kingston, Ontario, Canada.

The principal investigators of this year's APSF grant provided the following description of their proposed work.



## Seth Herway, MD, MS

Assistant Professor of Anesthesiology  
Department of Anesthesiology  
University of California San Diego

Dr. Herway's grant is titled "*An insidious cause of postoperative weakness: peripheral stores of neuromuscular blocking agents caused by unrecognized extravasation when injected distal to a NIBP cuff.*"

**Background:** There are a number of situations where an anesthesia professional may elect to

place a noninvasive blood pressure (NIBP) cuff on the same extremity and proximal to an intravenous (IV) catheter including contralateral upper extremity injuries, dialysis fistulas, previous lymph node dissection, or inability to find alternate sites for IV placement. The common assumption is that, as long as the IV catheter remains completely within the intact vein and large volumes of medication are not injected against complete and prolonged veno-occlusion (as is intentionally done for an IV regional anesthetic), the medications administered through the IV catheter will remain intravenous as well. Recent case reports, however, suggest that medications administered through an IV catheter distal to transient veno-occlusion, as seen in an inflating or inflated NIBP cuff, may be at risk for extravasation and subsequent redistribution resulting in extended release of medication. For most medications, extended release of small amounts of the drug would result in little to no physiologic implications for the patient. However, in the case of nondepolarizing neuromuscular blocking agents (NDNMBAs), extended release of even very small amounts could result in complications, compromising the perioperative safety of potentially all postoperative patients and certainly groups with impaired muscular strength or respiratory physiology.

**Aims:** This project will detect extravascular accumulation of an NDNMBA surrogate fluorescent molecule, indocyanine green (ICG), when injected against transient veno-occlusion in healthy volunteers using a novel real-time, noninvasive, *in vivo* fluorescent imaging technique. This surrogate will be administered through an IV distal to an inflated blood pressure cuff in healthy volunteers. A Fluobeam® Clinical System device (Fluoptics, Grenoble, France), a noninvasive, FDA-approved device that can detect, in real-time, fluorescence emitted from tracer molecules such as ICG, will be used to determine the extent of ICG extravasation that occurs when injected distal to a transiently inflated NIBP cuff and the time course of redistribution of extravasated medication. This study will demonstrate conditions under which extravasation occurs, the relative proportion of injected medication that extravasates, and the time period required for redistribution of the extravasated medication.

**Implications:** Regardless of the outcome, the information from the study will be useful to the anesthesia community and improve perioperative safety. If this study finds that extravasation does not readily occur or redistribution is rapid, then anesthesia providers will have the first rigorously documented evidence that they can be confident

in continuing to administer medications ipsilateral to an NIBP cuff without risk of unintended consequences. However, if this study finds that extravasation occurs readily and redistribution is prolonged, then the publication of this information could alter practice habits for all providers and improve safety for all patients. NDNMBAs are unique drugs that can directly compromise patient safety when their effects are not completely terminated at the conclusion of the anesthetic. It is essential to recognize and address any potential causes of residual neuromuscular blockade in the postoperative period.

**Funding:** \$149,976 (January 1, 2017—December 31, 2017). This grant was designated as the APSF/American Society of Anesthesiologists (ASA) President's Research Award.



## Michael Mazzeffi, MD, MPH

Assistant Professor of Anesthesiology  
Department of Anesthesiology  
University of Maryland

Dr. Mazzeffi's grant is titled "*High-flow nasal cannula oxygen in patients having anesthesia for endoscopy.*"

**Background:** High-flow nasal cannula oxygen provides several advantages over traditional nasal cannula oxygen including reduced work of breathing, reduced anatomic dead space, and continuous positive airway pressure, which improves oxygenation. Traditional nasal cannula oxygen is limited by the fact that it can only increase the inspired oxygen concentration to around 35%. Alternatively, high-flow nasal cannula can deliver inspired oxygen concentrations as high as 91%. High-flow nasal cannula oxygen has also been shown to increase the distending pressure in the upper airway, which may decrease upper airway obstruction in anesthetized patients and improve ventilation. At the present time, high-flow nasal

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## 2017 APSF Grant Recipients Focus on a Wide Variety of Safety Topics

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cannula has been used primarily in critical care, but it may also be useful in patients receiving deep sedation or general anesthesia without a controlled airway. One group of patients that commonly receives general anesthesia without a controlled airway is patients undergoing gastrointestinal (GI) endoscopy. Each year, millions of endoscopies are performed in the United States and a substantial number of patients experience hypoxemia while under anesthesia. High-flow nasal cannula oxygen offers an opportunity to potentially decrease hypoxemia and improve patient safety.

**Aims:** The specific aims of this single center randomized controlled trial are to determine whether high-flow nasal cannula oxygen delivery can reduce hypoxemia, hypercarbia, and hypotension in patients having anesthesia for GI endoscopy. Patients who participate in the study will be randomly assigned to receive the current standard of care (regular-flow nasal cannula oxygen) or to have high-flow nasal cannula oxygen delivery. Patients will have their blood carbon dioxide levels measured during their procedure using a noninvasive monitor. They will also have standard anesthetic monitoring during the procedure and study outcomes will be compared between the two groups.

**Implications:** Although serious complications from hypoxemia or hypercarbia are rare during anesthesia for GI endoscopy, near-miss events may be frequent. A review of our own center’s data over the last year demonstrated that as many as 18% of patients may experience hypoxemia during these procedures. If high-flow nasal cannula is found to reduce hypoxemia and hypercarbia, this could prevent many “near-miss” events per year in the United States and substantially improve patient safety. Also, a large multicenter trial would be merited as many patients could be impacted by the study’s findings.

**Funding:** \$150,000 (January 1, 2017—December 31, 2018). This grant was designated as the APSF/American Society of Anesthesiologists (ASA) Endowed Research Award.



### Janet van Vlymen, MD, FRCPC

*Associate Professor of Anesthesiology  
Department of Anesthesiology & Perioperative Medicine  
Queen’s University, Kingston, Ontario, Canada*

Dr. van Vlymen’s grant is titled *“Can health-care-associated hepatitis C virus outbreaks occur when intravenous medication vials are accessed with clean needles and syringes for use in multiple patients?”*

**Background:** Healthcare-associated hepatitis C virus (HCV) outbreaks with patient-to-patient transmission continue to occur across North America despite the widespread implementation of infection control guidelines. In some circumstances, contaminated medications, administered by the anesthesia provider, have been found to be the most likely source of transmission. Although it is often assumed that contamination occurred from reusing needles or syringes, investigations often find no evidence for this and the practitioners involved have adamantly denied the practice.

While it is clearly unacceptable to reuse needles or syringes, it remains a recognized practice to share multi dose medication vials between patients, provided sterile needles and syringes are used with aseptic technique for each access. Published medication safety guidelines recommend that vials should be single-use whenever possible. The guidelines indicate that if multi-dose vials are used on more than one patient, they should be stored outside of the immediate patient care area and the diaphragm cleaned with 70% alcohol with friction and drying. Although some institutions may be able to ensure strict compliance to these standards, unfortunately, this has not been universal practice.

It has been widely demonstrated that anesthesia professionals often inadvertently contaminate their workspace, including medication preparation areas, during routine clinical practice. It is possible that the rubber diaphragm of medication vials could become unknowingly contaminated with bodily fluids containing a significant viral load if the anesthesia professional was caring for an HCV-infected patient. If the anesthesia professional then accessed that vial with a sterile needle and syringe, they might unintentionally contaminate the medication, which could be administered to subsequent patients. Not only has HCV been shown to remain viable on inanimate surfaces for up to 6 weeks, studies have also shown that HCV remains stable in commonly used anesthetic medications for days to weeks.

**Aims:** Using the most current and appropriate virology methods available for HCV research, we will test the hypothesis that HCV can be transferred from the outer diaphragm of a medication vial into the medication itself when penetrated with a sterile needle and syringe. We will also examine the stability of HCV within a number of commonly used anesthetics and determine what cleansing practices are required to eliminate this transmission risk.

**Implications:** Anesthesia professionals are leaders in patient safety, but are often reluctant to follow guidelines blindly without evidence to justify the recommendations. However, when presented with scientific proof, we are quick to adopt change and become advocates educating other health care practitioners. Without awareness of the true dangers of medication practices that are intended to reduce waste and expense, adherence to safe medication practices will never be achieved. With proof that this mode of transmission occurs and with appropriate knowledge translation strategies, changes in clinical practice surrounding the re-use of medication vials for multiple patients will be achievable.

**Funding:** \$148,235 (January 1, 2017—December 31, 2018). This grant was designated as the APSF/Medtronic Research Award. Dr. van Vlymen is also the recipient of the Ellison C. “Jeep” Pierce, Jr., MD Merit Award, which provides an additional, unrestricted amount of \$5,000.

*Dr. Howard is Professor of Anesthesiology, Perioperative and Pain Medicine at Stanford University School of Medicine and Chair of the APSF Committee on Scientific Evaluation.*

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In memory of Ellison C. Pierce, Jr., MD (Alexander A. Hannenberg, MD)  
In memory of William Roady, MD (James S. Hicks)  
In memory of Jack D. Stringham, MD (Gregory Peterson, MD)

# 2017 EC Pierce Lecture: Safety Beyond Our Borders

by Steven Greenberg, MD, FCCP, FCCM

Alexander A Hannenberg, MD, presented the Ellison C. Pierce Jr., MD, ASA/APSF Patient Safety Memorial Lecture at the 2016 ASA Annual Meeting in Chicago, IL, entitled "Safety Beyond Our Borders: Different but the Same." Dr. Hannenberg is clinical professor of Anesthesiology at Tufts University School of Medicine in Boston, MA, and associate chair of Anesthesiology at Newton-Wellesley Hospital in Newton, MA, and a past president of ASA (2010). He provided some staggering statistics surrounding inadequate surgical care in developing nations with approximately 5 billion people lacking any access to surgical care, and an additional 7 million who are seriously injured or die from surgical-related complications.<sup>1</sup> He noted that the impressive increase in global surgical care between 2004 to 2012 has made surgery a more frequent event worldwide than childbirth, but experts are concerned that this rapid increase will create more victims of unsafe surgery. Dr. Hannenberg commented that those who live in inadequate health care systems may be exposed to a 100 to 1,000 fold greater risk of preventable death with surgery than those in industrialized nations.<sup>1,2</sup> He acknowledged that unsafe anesthesia practices significantly contribute to this unintended harm. He believes the key contributory factors for this heightened risk are poor teamwork and commu-



Alexander A. Hannenberg, MD

nication, insufficient provider training, and lack of basic resources.<sup>2</sup>

Dr. Hannenberg highlighted some measures to reduce the potential for unsafe surgery and anesthesia. He noted that the World Health Organization's surgical safety checklist has been demonstrated to significantly improve surgical

outcomes by facilitating teamwork and communication among the surgical team providers. He also suggested that equipment that is donated from other countries should have the same quality and meet the same standards as in those developed nations that are using them. Dr. Hannenberg finished his poignant lecture by articulating the importance of ensuring patient safety as surgical access increases in developing nations.<sup>2</sup>

Steven Greenberg currently serves as Co-Editor of the APSF Newsletter and Vice Chairperson, Education in the Department of Anesthesiology at NorthShore University HealthSystem, Evanston, IL. He is Clinical Associate Professor in the Department of Anesthesiology/Critical Care at the University of Chicago, Chicago, IL.

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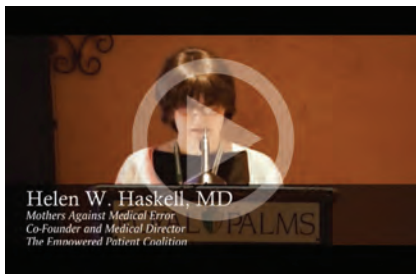
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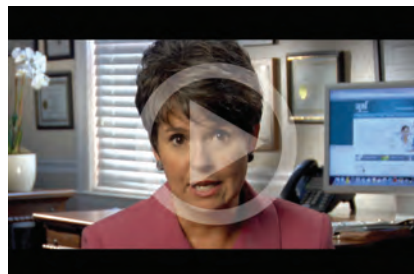
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- Perioperative Visual Loss (POVL): Risk Factors and Evolving Management Strategies (10 minutes)



- APSF Presents Simulated Informed Consent Scenarios for Patients at Risk for Perioperative Visual Loss from Ischemic Optic Neuropathy (18 minutes)

## Letter to the Editor:

# Don't Forget the Routine Endotracheal Tube Cuff Check!

by Christina Brown, MD, and Laura Cavallone, MD

### To the Editor:

We are writing to call attention to the often under-appreciated importance of checking the endotracheal tube (ETT) prior to the start of the procedure. Routine checks of the ETT integrity and functionality before insertion used to be the standard of care, but the practice is becoming less common, although it is still recommended in current ASA guidelines.<sup>1</sup>

After induction of anesthesia, a 71-year-old female patient undergoing a parotidectomy was nasally intubated with a TaperGuard 6.5 Nasal RAE tube using a C-MAC® KARL STORZ GmbH & Co. KG Mittelstraße 8, 78532 Tuttlingen, Germany, video-laryngoscope. Intubation was atraumatic and the cuff was inflated with 10 ml of air. After cuff inflation, a persistent significant air leak was noted (> 1 L/min in volume controlled ventilation modality). The integrity of the entire breathing circuit and correct positioning of the ETT between the vocal cords with direct laryngoscopy

were confirmed. Although the ETT pilot balloon was noted to be appropriately tense to the touch, a small amount of air was added to the cuff. However, a major air leak persisted. At this point the anesthesiology team decided to proceed with exchanging the ETT, which was successful. The air leak resolved with the new ETT in place and the cuff inflated. Upon closer inspection of the ETT that had been removed from the airway, there appeared to be a defect in which the air injected into the pilot balloon did not reach the cuff (see Figures 1 and 2).

Air leaks are a common yet critical problem that require quick diagnosis. A systematic approach to evaluation of air leaks is recommended to ensure rapid evaluation and identification of underlying issues. One such approach entails beginning at the patient and following the circuit to the machine. In this case, an air leak was audible from the patient's oropharynx, which led the team to identify the problem quickly. However, the presence of contradictory findings (tense

cuff bulb, holding appropriate inflating pressure in the presence of a major air leak) confounded the diagnostic process, while a preoperative check of the ETT would have unequivocally detected the defect in the cuff tube.

As newer manufacturing techniques have decreased the occurrence of ETT defects, routine assessments of the ETT cuff integrity prior to use have become increasingly less common among providers. The ASA recommends checking all ETT cuffs prior to their use.<sup>1</sup> While rare, endotracheal tube cuff defects are a known cause of endotracheal tube leaks which often necessitate endotracheal tube exchange. ETT exchange could pose significant risk to patients especially in the case of the patient with a difficult airway. In our case, had the endotracheal tube been checked prior to the start of the case, the defect could have been easily identified which would have obviated the need for tube exchange.

*Christina M. Brown, MD, Resident, Department of Anesthesiology, Washington University in St. Louis, MO.*

*Laura F. Cavallone, MD, Associate Professor, Department of Anesthesiology, Washington University in St. Louis, MO.*

*None of the authors have conflicts of interest relating to the publication of this paper.*

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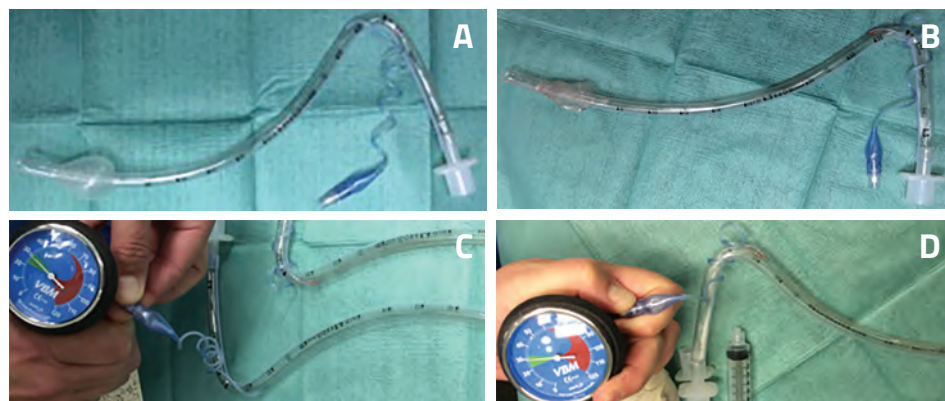


Figure 1. Comparison of normal and defective endotracheal tubes. A) Normal endotracheal tube with 10 ml of air instilled into cuff. B) Defective cuff with 10 ml air instilled into cuff. C) Pressure gauge attached to pilot balloon of normal cuff reading 30 mmHg with cuff inflated. D) Pressure gauge attached to pilot balloon of defective cuff with reading of 30 mmHg with cuff not appropriately inflated.

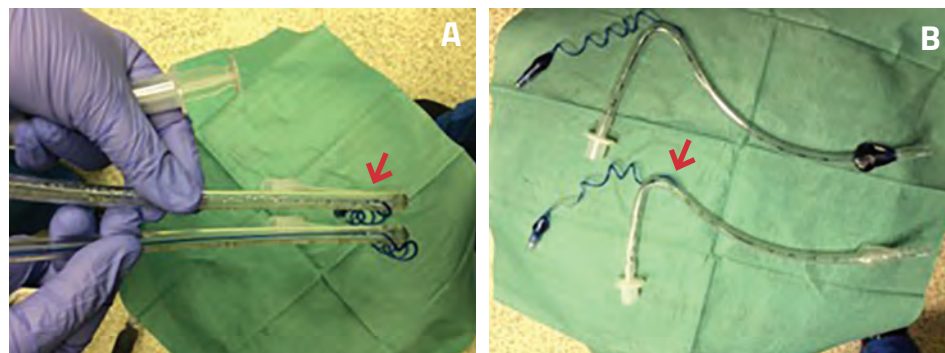


Figure 2. Comparison of distance traveled by dye instilled into cuff. A) Dye instilled into the normal endotracheal tube travels all the way to the cuff. B) Dye instilled into the defective endotracheal tube stops at the entrance of the pilot balloon tubing into the main tubing (arrow in Figure 2A and 2B).

### APSF Executive Committee Invites Collaboration

From time to time the Anesthesia Patient Safety Foundation reconfirms its commitment of working with all who devote their energies to making anesthesia as safe as humanly possible. Thus, the Foundation invites collaboration from all who administer anesthesia, and all who provide the settings in which anesthesia is practiced, all individuals and all organizations who, through their work, affect the safety of patients receiving anesthesia. All will find us eager to listen to their suggestions and to work with them toward the common goal of safe anesthesia for all patients.

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## Letter to the Editor:

# Error in Inhaled Nitric Oxide Setup Results in “No Delivery of iNO”

by Nicole Giglio, MS, CRNA, Jeffery Lyvers, MD, and Bhawana Dave, MD

Right ventricular (RV) dysfunction is a common complication after left ventricular assist device (LVAD) insertion, occurring in approximately 20-50% of patients.<sup>1</sup> Multiple pathophysiologic factors are implicated, including pre-existing RV contractile dysfunction as well as abnormal geometric changes in the interventricular septum due to LV decompression, RV distention and ischemia as a result of augmented venous return, and increased pulmonary vascular resistance (PVR) secondary to increased RV afterload.<sup>2-4</sup> The mechanisms described have been observed in patients with pulsatile as well as continuous flow devices; however, these unfortunate sequela are more often manifested in the former. Inhaled nitric oxide (iNO) is a selective pulmonary vasodilator that diffuses into pulmonary vascular smooth muscle resulting in vasodilation via stimulation of guanylate cyclase and production of cyclic guanosine monophosphate. This vasodilation allows for marked improvement in acute RV dysfunction after LVAD placement through its ability to reduce PVR, decrease RV distension, and minimize wall tension and myocardial oxygen consumption.<sup>3</sup>

We report a potential safety risk in the assembly and delivery of iNO in the OR through a Dräger Apollo anesthesia machine. Immediately prior to weaning a patient from cardiopulmonary bypass after implantation of an LVAD, a respiratory therapist (RT) was called to the operating room (OR) for the connection of 20 ppm of iNO through the breathing circuit of the anesthesia machine. Per protocol, fresh gas flow (FGF) was increased to 8 L/min on the anesthesia machine in an effort to keep FGF higher than minute venti-

lation.<sup>2</sup> The RT connected the iNO to the anesthesia circuit and set the concentration for 20 ppm, with confirmation of delivery as seen on the iNO machine console. Within a few minutes of connection, a reading of “0 ppm” was suddenly seen on the iNO machine console and an alarm sounded.

As an immediate attempt to troubleshoot this sudden cessation of iNO administration, the flows on the anesthesia machine were decreased, with an observed subsequent rise in detected iNO concentration to 20 ppm. At this time, another anesthesiologist entered the room and began to assist in further investigation. Within minutes, the cause of delivery failure was determined; the iNO system was found attached to the expiratory limb of the anesthesia machine and not the inspiratory limb. We also identified a critical fault in exterior labeling on the anesthesia machine itself. Stickers labeled “Expiratory” and “Inspiratory” had been placed incorrectly over the back of each limb, out of sight in the front of the machine, and only visible from the back of the limbs where the RT would pass the iNO circuit through to be attached to the anesthesia machine. Coincidentally, this ventilator had just been serviced, and although the limbs were correctly labeled within the housing of the ventilator, visualization of the manufacturer labeling could not be made without pulling the ventilator drawer out. This issue was detected and promptly corrected (see Figure 1).

*Because of the potential for delayed treatment and/or incorrect delivery of iNO in the OR, we propose that a protocol for iNO in the OR should include the direct participation of the anesthesia provider in properly*

*introducing the iNO module to the anesthesia machine as well as a checklist to confirm all steps have been taken to successfully and safely introduce iNO into the anesthesia circuit (see Table 1).*

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*None of the authors have any conflicts of interest to disclose.*

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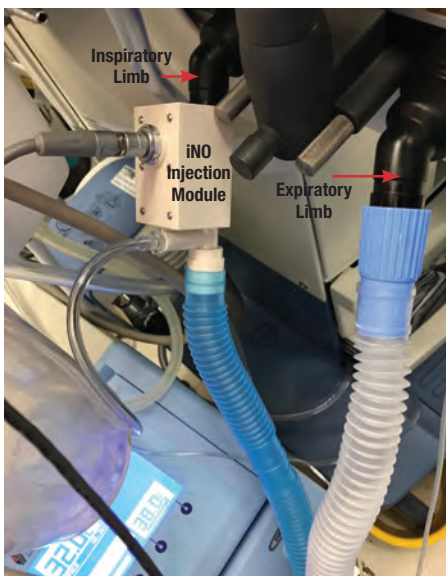


Figure 1. iNO module correctly connected to the inspiratory limb of a Dräger Apollo anesthesia machine.

## A Protocol for Initiation of iNO in the Cardiac Operating Room Through the Anesthesia Machine

1. For cardiac cases with a known iNO need (i.e. LVAD, transplantation), RT will be notified by anesthesia prior to the start of the case. For all other iNO needs, RT will be notified ASAP after the decision has been made to incorporate iNO therapy.
2. RT will bring iNO machine into the outer core and leave machine plugged in directly outside of OR door that will be utilizing it. Anesthesia team should confirm this process through visual inspection.
3. RT will then be paged to the OR prior to weaning from cardiopulmonary bypass (CPB).
4. RT will then bring iNO into the OR, run through appropriate set-up checklist, and then set desired parts per million (PPM) to begin therapy.
5. The anesthesia team will set fresh gas flow (FGF) on the anesthesia machine to a minimum of 8L/min.
6. Identification of the inspiratory limb of the anesthesia machine and connection of the iNO system will be done in collaboration with RT by the anesthesia team.
7. Once connected and iNO delivery is confirmed, the system will be monitored continuously by RT throughout the process of weaning from CPB.
8. Once the patient has been successfully weaned from CPB, the RT may leave the OR and will then be paged to return once the anesthesia team is ready for patient transport to the cardiothoracic intensive care unit (CTU).

## Letter to the Editor:

# Air Leak in a Pediatric Case—Don't Forget to Check the Mask!

by Elvera L. Baron, MD, PhD, and Barbara M. Dilos, DO

Scrupulous anesthesia equipment check is part of a routine pre-operative checklist for all pediatric cases. We describe a case of a defective face mask, the integrity of which was not assessed prior to use. This had the potential to result in the adverse outcome of a pediatric patient if not promptly detected.

An otherwise healthy 3-week old infant presented for pyloromyotomy under general anesthesia. Despite pre-oxygenation and normal vital signs, efforts to bag-mask ventilate the infant via face mask during a rapid sequence induction where the first attempt at intubation was not successful proved to be inadequate and unsuccessful. An appropriately sized oral airway was placed. The anesthesia providers detected a sound suggesting a leak. The appropriately sized bubble gum flavored latex-free face mask was firmly re-applied to the patient's face, with concurrent chin lift-jaw thrust maneuver in order to maximize ventilation, yet no chest rise or end tidal CO<sub>2</sub> were noted. Again, a leak in the circuit was suspected, and both the machine and the circuit were quickly re-examined. A loud leak around the face mask was heard despite adequate seal between face mask and patient's face, with precipitant hypoxemia. Leak in the mask itself was presumed. After the defective mask was replaced by another one of the same size, ventilation efforts became markedly improved, leading to stabilization of the patient's vital signs. The patient then underwent intubation, maintenance, and emergence from anesthesia uneventfully, and fully recovered in the post-anesthesia care unit without any additional concerns.



Figure 1. Note the apparent small gap (see red circular outline) in the pediatric mask on the left side of the figure.

After conclusion of the surgery, closer examination revealed two small defects at the brim of the face mask, accounting for resultant air leak during attempted hand ventilation. Though the mask was examined pre-operatively for its ability to hold air in the inflatable cushion of the mask, this did not preclude the leak from occurring since the defect responsible for the leak was found at the brim of the mask (see Figure 1). The anesthesiol-

ogy team examined several additional masks from the same batch of the same size, and did not discover similar defects.

The supplier of the mask was contacted. Visual inspection confirmed that the glue used to seal the air cuff of the face mask had multiple gaps in it between the crown and the bladder of the mask, while no leak was detected in the cushion itself. Since samples were re-inflated and compressed by hand, potential root causes for this failure mode included operator error setting up adhesive dispense quantity. Several improvements were reportedly made since the production of this lot with controls in place to mitigate this failure mode.

The risk of cardiac arrest in pediatric anesthetic cases is approximately 1.4 in 10,000.<sup>1</sup> Infants accounted for 55% of all anesthesia-related arrests, with those younger than 1 month of age having the greatest risk. Eighty-two percent of cardiac arrests occurred during induction of anesthesia; bradycardia, hypotension, and a low SpO<sub>2</sub> frequently preceded these arrests. Respiratory mechanisms leading to cardiovascular collapse included laryngospasm, airway obstruction, and difficult intubation, in decreasing order. In most cases, the laryngospasm occurred during induction. Infants have a reduced margin for error. Since hypoxia from inadequate ventilation is exacerbated by neonatal and pediatric respiratory physiology, it remains a common cause of perioperative morbidity and mortality. Pulse oximetry and capnography assume an even more important role in infants as compared to older children or adults. Specifically contoured face masks are designed to minimize dead space and to aid in adequate ventilation efforts.<sup>2</sup> It is crucial to select equipment appropriate for age and size as the infant

airway easily becomes obstructed. Oral airways may help forwardly displace an oversized tongue.

Compression of submandibular soft tissues should be avoided during mask ventilation to prevent further upper airway obstruction.

Based on our experience, if an air leak is heard or suspected during attempted bag-mask ventilation, we recommend to examine the source of such air leak systematically, rapidly, and thoroughly. Once the machine and circuit are found to function properly, the leak source is then narrowed to the face mask itself. We advise adding inspection of the face mask and assessment of its integrity as part of the routine pre-operative checklist for all cases.

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*Neither author has any financial conflicts of interest to disclose.*

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# The Anesthesia Professional's Role in Patient Safety During TAVR (Transcatheter Aortic Valve Replacement)

by Todd E. Novak, MD and Suraj Parulkar, MD

*"By failing to prepare, you are preparing to fail."*

Benjamin Franklin

Transcatheter Aortic Valve Replacement (TAVR) is quickly becoming an everyday procedure seen in operating rooms and cardiac catheterization suites throughout the country. With aortic stenosis being one of the most common valvular heart conditions in a continually aging population, these numbers are only expected to increase. To date, it is estimated over 200,000 TAVR procedures have been performed worldwide.<sup>1</sup> It is imperative that anesthesia professionals have an understanding of this transformative procedure and the unique anesthetic challenges these patients present in order to provide the safest level of care.

## History of TAVR

TAVR was first performed as a proof-of-concept procedure by Cribier et al. in Paris, France, on April 16, 2002, on a patient with severe aortic stenosis and cardiogenic shock as a treatment of last resort.<sup>2</sup> The patient experienced a dramatic improvement in his heart failure symptoms post-operatively, thus, demonstrating the feasibility of this remarkable new procedure. Since that moment 16 years ago, TAVR has seen a rapid evolution, and after being validated through several rigorous clinical trials,<sup>3-6</sup> has now become a common, everyday procedure. TAVR has revolutionized the treatment of severe aortic stenosis since patients that were considered non-operable for traditional surgical aortic valve replacement (SAVR) due to significant comorbidities are now given this treatment option. Many of these patients go on to experience sustained quality of life with improved functional status for many years,<sup>3</sup> whereas medically managed patients have a 1-year mortality of 51% and an average survival of only 1.8 years.<sup>6</sup> TAVR has been accepted by the American Heart Association/American College of Cardiology (AHA/ACC) as a Class I indication and is considered the standard of care in these non-operable\* patients and as a Class IIa indication in patients who are operative candidates but at high-risk† for mortality and complications after SAVR.<sup>7</sup> Now, with data from the PARTNER-2A randomized clinical trial that have demonstrated

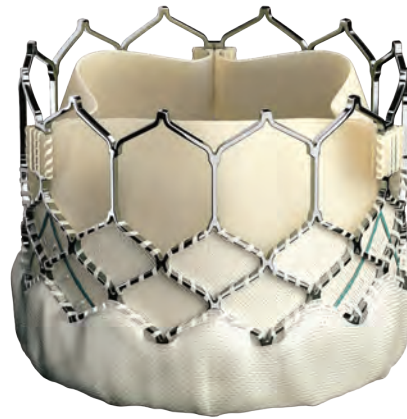


Figure 1. SAPIEN 3 Transcatheter valve. Courtesy of Edwards Lifesciences LLC, Irvine, CA. Edwards, Edwards Lifesciences, and SAPIEN 3 are trademarks of Edwards Lifesciences Corporation.



Figure 2. The Medtronic CoreValve® Evolut R Transcatheter Valve. Courtesy of Medtronic, Inc., Minneapolis, MN.

lower stroke and mortality rates for TAVR,<sup>8</sup> the Federal Drug Administration has recently approved TAVR for intermediate-risk‡ patients.<sup>9</sup> There is also an interest in advancing efforts to include the recommended use of TAVR as an alternative to SAVR for even low-risk§ patients, with two large randomized trials underway in the US.<sup>10</sup>

## Overview of the Procedure

There are several commercially available TAVR systems approved for use in Europe and two in the United States. The two newest generation valve systems approved for use in the United States are the Sapien 3 (Edwards Lifescience, Irvine, CA, Figure 1) and the CoreValve Evolut-R (Medtronic, Minneapolis, MN, Figure 2). Both the Sapien and CoreValve systems are most commonly inserted via a retrograde transfemoral approach. For patients with ilio-femoral arterial access not amenable to this percutaneous technique due to severe peripheral vascular disease, tortuosity, or aortic disease, other options may include subclavian/axillary, transaortic, transapical, transcaval, and even a transcarotid approach. While both systems provide patients with similar outstanding outcomes,<sup>11,12</sup> it is important to note that these two device systems differ in their deployment techniques that, in turn, have implications for the development of hemodynamic insta-

bility. The Sapien valve is a *balloon-expandable* device that requires rapid ventricular pacing (rate 160-220 beats/minute) at the time of deployment in order to minimize arterial pulse pressure and transaortic flow helping to reduce the risk of migration or ejection of the valve into the aorta. Conversely, the CoreValve is *self-expanding* and does not require pacing since it is gradually released into position. The CoreValve is a longer profile device that can also be partially recaptured in the sheath and repositioned if necessary. Balloon aortic valvuloplasty is occasionally performed to facilitate placement of either prosthetic valve. Rapid ventricular pacing is routinely employed during this step as well. While the vast majority of patients spontaneously recover from these brief pacing episodes, management of continued hemodynamic instability must be prompt. Patients with severe aortic stenosis and concomitant left ventricular hypertrophy do not tolerate hypotension for an extended period of time due to lack of coronary flow reserve and perfusion mismatch, even in the absence of coronary disease. Interventions can range from bolus vasopressor administration for transient hypotension to defibrillation for induced ventricular fibrillation and initiation of cardiopulmonary bypass for sustained hypotension, coronary occlusion, or annular rupture. Patients with pre-existing first-degree atrioventricular block, left anterior hemiblock, right bundle branch block, and those receiving a CoreValve are at higher risk of requiring pacing immediately after valve

\* non-operable definition is challenging but agreed to be >50% mortality at 30 days or irreversible morbidity<sup>1</sup>

† Society of Thoracic Surgeons (STS) predicted risk of operative mortality score ≥10% or at a ≥15% risk of mortality at 30 days<sup>3</sup>

‡ STS predicted risk of operative mortality score ≥4% and ≤8%<sup>8</sup>

§ STS predicted risk of operative mortality score <2%<sup>10</sup>

## Aortic Valve Replacement Procedure Revolutionized with Percutaneous Approach

### “Aortic Valve,” From Preceding Page

deployment as well as postoperatively.<sup>13</sup> Since the CoreValve structure extends more deeply into the left ventricular outflow tract where the atrioventricular conduction system passes superficially, these patients are particularly at risk. A reliable mechanism for immediate pacing is required for all TAVR patients but a heightened sense of awareness is needed for patients with these preoperative electrocardiogram abnormalities and those receiving the CoreValve.

### General versus Monitored Anesthesia Care (MAC):

Although the first TAVR was performed with local anesthesia and minimal sedation in a moribund patient, the early stage of TAVR development saw almost uniform use of general anesthesia. It is still the most common type of anesthesia used today in the United States.<sup>14</sup> General anesthesia allows for more control of the procedural environment with a secure airway and completely immobile patient. Since ventilation is controlled, a period of apnea can be provided that may help avoid unnecessary movement of the heart during deployment of the valve. It also gives the cardiologist as much time as needed to perform the procedure. In addition, general anesthesia allows for the use of transesophageal echocardiography (TEE), in particular 3D TEE, to assist with positioning of the valve, the assessment of any paravalvular regurgitation, and immediate diagnosis of cardiac perforation if hypotension is persistent. TEE is also valuable in assessing under-filling of the left ventricle as an etiology of rapid or unfavorable hemodynamic changes. In the earlier stages of TAVR development, general anesthesia was warranted when there was a higher complication rate and the duration of the procedure was longer. Presently, with recent technological advancements in the newer generation TAVR systems, along with better operator experience and implementing standardized protocols, there has been a much lower complication rate and a trend toward using MAC anesthesia. Some of the TAVR innovations that have permitted this transition to MAC anesthesia include significantly lower profile delivery systems, less paravalvular regurgitation from improved valve design, and enhanced device delivery systems.<sup>1</sup> Although MAC anesthesia is now being used in many uncomplicated cases, general anesthesia is still required for most non-transfemoral approaches, in some high-risk patients, and when TEE guidance is used, such as in patients with chronic kidney disease to help minimize the use of x-ray contrast for procedure guidance.

Many high-volume centers now use almost exclusively MAC anesthesia as part of a stream-

lined process known as “*minimalist*” TAVR.<sup>15,16</sup> When the vasculature of the patient is amenable to a percutaneous transfemoral approach, this method streamlines the entire perioperative process by using MAC anesthesia, intraoperative transthoracic echocardiography (TTE), reduction or elimination of pre-implantation balloon valvuloplasty, and well-defined postoperative care plans.<sup>1</sup> The possible benefits of MAC over general anesthesia include less hemodynamic instability from anesthetic drugs, the avoidance of intubation and mechanical ventilation, faster postoperative recovery, and the ability to monitor for central nervous system embolic events. Since TTE, and not TEE, is used to evaluate the prosthetic valve after deployment, the ability to diagnose paravalvular regurgitation may be limited; however, with newer valve design modifications and more precise valve-sizing algorithms, the rate of paravalvular regurgitation has decreased significantly.<sup>1</sup> In cases where aortography shows no paravalvular leak, patent coronary arteries, and good prosthetic position, there is no need for immediate post implant echo imaging. This latter point helps reduce procedure time and decreases the demands on the echocardiography staff and physicians.

Another potential benefit to a minimalist technique is reducing the incidence of postoperative delirium (PD). These patients are at unique risk for developing PD given their advanced age, frailty, and significant comorbidities. Abawi and colleagues recently published a retrospective observational study demonstrating PD was more frequent in nontransfemoral approaches (50% vs 10%,  $p < 0.001$ ) and in those that received general anesthesia (50% vs. 15%,  $p < 0.001$ ).<sup>17</sup> Since all nontransfemoral procedures were performed under general anesthesia, it could not be determined whether there was an independent effect from the type of anesthesia (general vs. MAC). A more important factor in PD may be that patients with severe vascular disease, relegated to a nontransfemoral approach, are at higher risk for cerebral emboli and ischemia during the procedure. Moreover, non-transfemoral procedures involve a longer intensive care unit stay, more pain and opioid use, and more postoperative inflammation, which all may lead to PD. Further studies investigating whether the anesthetic type can lead to decreased postoperative delirium are forthcoming.

Although previous small studies did not reveal a difference in short or intermediate-term survival between general and MAC anesthesia,<sup>18-20</sup> recent data are emerging that MAC anesthesia may be associated with improved outcomes. The largest observational TAVR study to date compared outcomes in patients who received general anesthesia or MAC anesthesia in all 10,997 patients who underwent TAVR in the United States from April 2014 through June 2015.<sup>14</sup> The success of the procedure was comparable between the two techniques;

however, MAC patients had significantly lower 30-day mortality (2.9% vs. 4.1%,  $p = 0.029$ ), a lower composite mortality and/or stroke rate (4.8% vs. 6.4%,  $p = 0.019$ ), and a shorter hospital length of stay (6 d vs. 6.7 d,  $p < 0.0001$ ). Even though these advantages remained after a propensity matched analysis, as a retrospective observational study, selection bias could have unintentionally been introduced into the data since non-transfemoral patients generally have more co-morbid conditions. For instance, outcomes may be better using MAC anesthesia solely because it is a much more common technique at high-volume centers than at emerging programs that employ general anesthesia and where operators encounter a steep learning curve. Although it is unknown whether anesthesia type is directly associated with improved outcomes without a prospective, randomized study, these data clearly signify a trend towards an increasing number of programs performing TAVR without general anesthesia. From April 2014 until June 2015, the percentage of programs employing moderate sedation or MAC increased from 10% to almost 30%.<sup>14</sup> This transition from general to MAC anesthesia has largely already occurred internationally, where TAVR has been in general use for several more years than in the US.

There still are risks associated with TAVR performed under MAC anesthesia. The anesthesia provider must always be prepared for any contingency plan and be able to convert to a general anesthetic promptly. The rate of conversion to general anesthesia in most recent experience is under 2%, but has been reported as high as 5-6%.<sup>14</sup> The most dramatic cases are when annular rupture or cardiac perforation occur. Embolization of the TAVR valve into the left ventricle may require rapid conversion to open surgery. In smaller patients, the delivery system can obstruct the arterial supply to a lower extremity causing ischemia and pain, let alone arterial dissection. Furthermore, many of these elderly patients also suffer from spinal stenosis and remaining motionless in the supine position after a period of time can be nearly impossible, necessitating conversion to a general anesthetic. Therefore, it may be prudent to have airway equipment (laryngoscopes, endotracheal tubes, laryngeal mask airway), vasopressors, and blood checked and ready for any critical life threatening situation that may arise. Moreover, open communication between all operating room team members, both before and during the procedure, is particularly important to avoid preventable complications. This “heart team” collaborative model has a Class I indication from the AHA/ACC as it seeks to optimize patient safety and clinical outcomes.<sup>7</sup>

See “Aortic Valve,” Next Page

# TAVR is Becoming More Commonplace in US

## “Aortic Valve,” From Preceding Page

### Summary

TAVR has revolutionized the care of patients with severe aortic stenosis, proving in randomized comparisons with standard surgery to be a superior treatment alternative to SAVR in patients that are at prohibitive, high, and intermediate surgical risk. Recent data demonstrate MAC anesthesia provides a similar rate of procedural success when compared to general anesthesia; however, whether MAC anesthesia actually leads to improved patient safety and better outcomes in these patients remains to be elucidated. While technological advances and a low complication rate allowed for the introduction of the minimalist TAVR approach under MAC anesthesia, the anesthesia provider must always be prepared to address problems that may arise. A well-designed and thoughtful anesthetic plan should always be accompanied by an understanding of the sequence of steps involved in the TAVR procedure so that hemodynamic perturbations and procedural complications can be anticipated and addressed appropriately. As TAVR moves toward use in low risk patients, the importance of readiness to manage catastrophic complications becomes even more important. There should be contingency plans for anything from major hemodynamic changes and catastrophic complications to intolerance to MAC anesthesia.

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***APSF President Robert K. Stoelting, MD:  
A Tribute to 19 Years of Steadfast Leadership***



***2016 President's Annual Report***

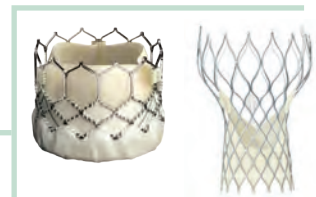
***2016 APSF BOD Workshop Report: Conflict in the OR***



***Large Anesthesia Groups/Practice Management Companies Discuss the Impact of  
Production Pressures on Patient Safety with APSF Leaders***

***Distractions in the Workplace***

***Safety Issues in Transcatheter Aortic Valve Replacements***



***2016 National Geriatric Surgical Initiatives***

***2017 Grant Recipients***

