

## Flammable Surgical Preps Require Vigilance

by Charles E. Cowles, Jr., MD, MBA, and Jen Li Chang, CRNA, MS

### Basis

The “fire triangle,” or “fire triad,” is taught throughout general fire safety education and is used as a point of emphasis for surgical fire prevention. Fire is the result of the combination of a fuel source, an oxidizing substance, and heat. In the operating room, alcohol-based preps and draping materials are the most common sources of fuel. Alcohol-based surgical prep solutions are

excellent antiseptic agents but are also extremely flammable. In most operating rooms, the prepping and draping of the surgical patient is a role of the operating room nurse. Anesthesia providers use these same prep solutions for central line preparation and for regional anesthesia procedures. As surgical team members, our role should include increased vigilance whenever an alcohol-based prep solution is used in the operating room (OR).

### Communication

One of the pillars of surgical fire prevention is communication among surgical team members. Often the team member most engaged in the work at a given time can suffer from tunnel vision. Human factors related to production pressure and interruptions in workflow may result in overlooking critical elements such as allowing

See “Surgical Preps,” Page 27

### ASA/PSF

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

## Competence and Teamwork Are Not Enough: The Value of Cognitive Aids



David M. Gaba, MD

Annual Meeting of the  
American Society of Anesthesiologists  
Saturday, October 11, 2014  
New Orleans Morial Convention Center  
Great Hall B (1 PM – 2 PM)

## Medicolegal Data Implicate Oxygen as Common Factor in OR Fires

by Steve R. Sanford, JD, Brian J. Thomas, JD, Lorri A. Lee, MD

Many concerns for patient safety prompt anesthesia professionals to increase the FiO<sub>2</sub> level above 30% during surgery. These concerns include adequate oxygenation and prevention of anoxic end organ injuries, increased duration for rescue from an event that decreases oxygenation, and possible prevention of surgical site infections in certain procedures. Most anesthesia providers generally consider oxygen to be strictly beneficial without toxicity except in specific situations such as neonates and post-bleomycin treatment. An increasing number of reports in both the medical literature and the lay press regarding on-patient surgical fires associated with delivery of oxygen and large payment judgments to the plaintiff

remind us that oxygen is like any other drug in that its administration should be carefully considered to avoid patient harm.

According to Brian Thomas, Director of Risk Management for Preferred Physicians Medical, an anesthesia-only malpractice insurance company, injuries from intraoperative fires continue despite ongoing efforts by the company to educate anesthesia providers. Mr. Thomas notes that Preferred Physicians Medical has handled 42 cases of intraoperative fire since 1990 and paid indemnity losses in excess of \$4 million with additional legal expenses totaling more than \$1 million. According to Preferred Physicians Medical’s data, approximately 5,000 anesthesia providers (anesthesiologists and CRNAs) insured by the company during a report year, are expected to generate 1 to 5 cases of intraoperative fire per year. Of the 42 cases of intraoperative fire, procedures involving the face (16), neck (10) and head (5) were the most common, and according to Mr. Thomas, almost every case involved the administration of oxygen along with either



See samples on the effect of oxygen in the Fire Safety Video on the APSF.org website.

See “Oxygen,” Page 29

TABLE OF CONTENTS

Articles:

Flammable Surgical Preps Require Vigilance..... Cover  
 Medicolegal Data Implicate Oxygen as Common Factor in OR Fires..... Cover  
 Q&A: What is the Incidence and Common Cause of Anesthetic Death in 2014?.....Page 30  
 Refractory Airway Hemorrhage in a Patient on Apixaban .....Page 31  
 AAMI Salutes Eight Professionals For Contributions to Health Care Technology .....Page 34

Letters to the Editor:

USP-797 Guidelines Raise Concerns.....Page 32  
 Pediatric Transfusion and Hyperkalemia .....Page 33  
 Sub-Hood Gas Evacuation: A Burning Issue .....Page 34  
 Education Improves Patient Satisfaction and Patient Safety .....Page 35  
 Neuromonitoring Needlestick .....Page 36  
 Intrahospital Transport of Critically Ill Patient Highlights Hazards .....Page 39

APSF Announcements:

ASA/APSF-Ellison C. Pierce, Jr., MD, Patient Safety Memorial Lecture ..... Cover  
 Board of Directors Workshop .....Page 28  
 Prevention and Management of Operating Room Fires .....Page 29  
 APSF Announces Availability of Recently Released Educational DVDs .....Page 30  
 Covidien Acknowledgment.....Page 39



NEWSLETTER

The Official Journal of the Anesthesia Patient Safety Foundation

The **Anesthesia Patient Safety Foundation Newsletter** is the official publication of the nonprofit Anesthesia Patient Safety Foundation and is published three times per year in Wilmington, Delaware. Individual subscription—\$100, Corporate—\$500. Contributions to the Foundation are tax deductible. ©Copyright, Anesthesia Patient Safety Foundation, 2014.

The opinions expressed in this *Newsletter* are not necessarily those of the Anesthesia Patient Safety Foundation. The APSF neither writes nor promulgates standards, and the opinions expressed herein should not be construed to constitute practice standards or practice parameters. Validity of opinions presented, drug dosages, accuracy, and completeness of content are not guaranteed by the APSF.

**APSF Executive Committee:**

Robert K. Stoelting, MD, President; Jeffrey B. Cooper, PhD, Executive Vice President; George A. Schapiro, Executive Vice President; Robert J. White, Vice President; Matthew B. Weinger, MD, Secretary; Casey D. Blitt, MD, Treasurer; Sorin J. Brull, MD; Robert A. Caplan, MD; David M. Gaba, MD; Steven K. Howard, MD; Lorri A. Lee, MD; Robert C. Morell, MD; A. William Paulsen, PhD; Richard C. Prielipp, MD; Steven R. Sanford, JD; Maria A. van Pelt, CRNA; Mark A. Warner, MD. Consultants to the Executive Committee: John H. Eichhorn, MD; Bruce P. Hallbert, PhD.

**Newsletter Editorial Board:**

Robert C. Morell, MD, Co-Editor; Lorri A. Lee, MD, Co-Editor; Sorin J. Brull, MD; Joan Christie, MD; Jan Ehrenwerth, MD; John H. Eichhorn, MD; Steven B. Greenberg, MD; Glenn S. Murphy, MD; John O'Donnell, DrPH, CRNA; Wilson Somerville, PhD; Jeffery Vender, MD.

Address all general, contributor, and subscription correspondence to:

Administrator, Deanna Walker  
 Anesthesia Patient Safety Foundation  
 Building One, Suite Two  
 8007 South Meridian Street  
 Indianapolis, IN 46217-2922  
 e-mail address: walker@apsf.org  
 FAX: (317) 888-1482

Address Newsletter editorial comments, questions, letters, and suggestions to:

Robert C. Morell, MD  
 Senior Co-Editor, APSF Newsletter  
 c/o Addie Larimore, Editorial Assistant  
 Department of Anesthesiology  
 Wake Forest University School of Medicine  
 9th Floor CSB  
 Medical Center Boulevard  
 Winston-Salem, NC 27157-1009  
 e-mail: apsfeditor@yahoo.com

Send contributions to:

Anesthesia Patient Safety Foundation  
 Building One, Suite Two  
 8007 South Meridian Street  
 Indianapolis, IN 46217-2922

Or please donate online at [www.apsf.org](http://www.apsf.org).

APSF Newsletter  
*guide for authors*



The *APSF Newsletter* is the official journal of the Anesthesia Patient Safety Foundation. It is published 3 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 Morell@apsf.org and/or Lee@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 1500 words. Special invited articles, regarding patient safety issues and newsworthy articles, are often solicited by the editors. These articles should be limited to 2000 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.

If accepted for publication, copyright for the accepted article is transferred to the Anesthesia Patient Safety Foundation. Except for copyright, all other rights such as for patents, procedures, or processes are retained by the author. Permission to reproduce articles, figures, tables, or content from the *APSF Newsletter* must be obtained from the APSF.

All submissions should include author affiliations including institution, city, and state, and a statement regarding disclosure of financial interests, particularly in relation to the content of the article.

# Alcohol-based Preps Have FDA Package Inserts

“Surgical Preps,” From Page 25

adequate drying times and assessing for alcohol pooling near the surgical field. In emergency cases where alcohol prep is used, adequate drying time is still required. The anesthesia provider should remain observant and speak up if alcohol excess or pooling is noted.

## Prep Solutions

Table 1 lists commonly used surgical prep solutions along with the isopropyl alcohol (IPA) content and the added antimicrobial agent. Prep solutions should be dispensed in unit dose applicators, swabs, or similar applicators for cases where an ignition source is being used or contemplated.

Povidone iodine such as Betadine® and chlorhexidine solutions such as Hibiclens® are not flammable prep solutions and do not need a set drying time to prevent ignition.

## Reading the Fine Print

Alcohol-based skin preps are required to have US Food and Drug Administration (FDA) approved package inserts. These inserts are quite informative and contain directions and warnings specific to the individual product and the size of applicators. For instance, labeling reminds users that 26 mL applicators are not to be used for head and neck cases. Personnel using solutions are expected to be familiar with the content of the package insert prior to use on a patient.

## Alcohol-Based Hand Rubs

The following table lists commonly used alcohol-based hand rubs (ABHR) along with the ethyl alcohol (EA) content.

Brand Name	Manufacturer	% Ethyl Alcohol
Purell®	GOJO®	70%
Purell Foam®	GOJO®	70%
Purell Scrub®	GOJO®	70%
Avagard™	3M™	61%
Surgicept®	CareFusion	70%
Triceptin®	CareFusion	70%

## Other Surgical Scrub Solutions and Handwashes

Many products in the current market are for use by health care professionals as a hand scrub prior to donning surgical gowns and gloves. These products are to be used with water and usually consist of an antimicrobial or bacteriostatic base agent such as iodine, chlorhexidine gluconate, or parachlorometaxyleneol mixed with buffering agents and a small amount of ethyl or isopropyl alcohol. The alcohol content of these solutions is

Table 1. Common Prep Solutions and Their Alcohol Content

Brand Name	Manufacturer	% Isopropyl Alcohol	Antimicrobial Agent
Bactoshield® CHG 2%	Steris	<5%	CHG
ChloraPrep®	CareFusion	70%	CHG
DuraPrep™	3M™	74%	Iodine povacrylex
Hibiclens®	Mölnlycke Health Care	4%	Chlorhexidine gluconate
Prevail-FX®	CareFusion	72.5%	Iodine
Betadine®	Purdue Products L.P.	–	Povidone-iodine

usually under 5% and, considering the other components of the detergents are non-flammable, these solutions are rated as non-flammable. Users should always review product inserts or the material date safety sheet (MSDS) for the specific product used. With today’s technology this information is readily found online.

## Hard Surface Cleaners and Wipes

To provide proper disinfection and for proper infection control, many facilities use disposable wipes containing alcohol and a germicidal such as benzalkonium chloride. Considering the product packaging recommends use only between cases, these wipes should not contribute to surgical fires related to ignition sources used during a procedure. It is of note that these wipes are considerably oculo-toxic and contact with the eyes can result in temporary or permanent eye damage.

## Storage Concerns

The National Fire Protection Agency (NFPA) Codes offer guidance to governmental agencies such as the Centers for Medicare and Medicaid Services (CMS) and also to accrediting agencies such as The Joint Commission and others. The

NFPA Code determines the safe amount of alcohol that can be stored within a smoke compartment, setting a limit of 10 gallons of alcohol-containing solutions, which includes ABHRs, that can be in use in a single smoke compartment (outside of an approved storage cabinet), plus an additional 5 gallons per smoke compartment that can be stored. As with any standard, the NFPA codes and CMS requirements are revised frequently; users should refer to the most current NFPA and CMS references as a source of information.

## Selection

Selection of an appropriate prep solution based upon antimicrobial and germicidal properties is beyond the scope of this article, but other factors in addition to infection control issues should be considered for the safe care for our patients. For alcohol-based prep solutions, the selection of properly sized pre-filled applicators is a key step in fire prevention. Applicators too large for a given prep area or anatomical segment may result in an increased fire hazard due to the amount of excess prep requiring disposal and removal, or if all of the prep is used, the excess can

See “Surgical Preps,” Next Page

## Sources for Updated information

- National Fire Protection Agency (NFPA) ..... [www.nfpa.org](http://www.nfpa.org)
- The Joint Commission (TJC) ..... [www.jointcommission.org](http://www.jointcommission.org)
- Centers for Medicare and Medicaid Services (CMS) ..... [www.cms.gov/Regulations-and-Guidance/Regulations-and-Guidance.html](http://www.cms.gov/Regulations-and-Guidance/Regulations-and-Guidance.html)
- American Society for Healthcare Engineering (ASHE) ..... [www.ashe.org](http://www.ashe.org)

## References

- CareFusion Products. .... [www.carefusion.com](http://www.carefusion.com)
- 3M Products ..... [www.3m.com](http://www.3m.com)
- GOJO Products ..... [www.gojo.com](http://www.gojo.com)
- Purdue Products ..... [www.betadine.com](http://www.betadine.com)
- Mölnlycke Products ..... [www.hibiclens.com](http://www.hibiclens.com)
- NFPA 99 Health Care Facilities Code (2012 ed.) ..... 15.13.3 Germicides and Antiseptics
- NFPA 101 Life Safety Code (2012 ed.) ..... 19.3.2.6 Alcohol-Based Hand-Rub Dispensers

# Drying Times Vary by Body Site with Alcohol-based Surgical Preps

## “Surgical Preps,” From Preceding Page

accumulate in pools on or around the patient. Every effort should be made to match proper applicator size to the area needing coverage.

### Drying Times

Most commercially available surgical preps that are alcohol based have a recommended drying time of at least 3 minutes. The “fine print” in most package inserts warns users that when applied to hairy areas or in body folds or creases a greater drying time of up to 1 hour may be required. Providers need to be aware of specific instructions for the product used. If at all possible, alcohol-containing solutions should be kept out of the patient’s hair. Adequate drying times should take place prior to the application of drapes or surgical barriers. Drying times are specifically addressed in some institutional surgical safety checklists to encourage communication between surgical team members.

### Disposal

According to NFPA Code, any excess or remaining flammable prep solution, along with

any other solution-soaked materials, must be removed from the operating room prior to the use of any ignition source.

### Regulatory Matters

Although the NFPA and CMS regulations define the minimal best practice, the authority having jurisdiction (AHJ) for your facility takes precedent. Practitioners and facilities should refer to their AHJ for specific regulations and fire codes. CMS usually adopts NFPA codes as their regulatory standard. Following NFPA revisions, CMS usually adopts these within 8-12 months. Joint Commission standards usually conform to NFPA and CMS revisions.

*Dr. Cowles is Assistant Professor, Department of Anesthesiology, and Perioperative Medicine and Clinical Medical Director, Department of Anesthesiology and Perioperative Medicine, Division of Anesthesiology and Critical Care, and serves as the Perioperative Safety Officer, at the University of Texas MD Anderson Cancer Center, Houston, TX.*

*Jen Li Chang, CRNA, MS is a nurse anesthetist at the MD Anderson Cancer Center in Houston, TX.*

**The APSF  
continues to accept  
and appreciate  
contributions.**

*Please make checks  
payable to the APSF and  
mail donations to*

**Anesthesia Patient  
Safety Foundation (APSF)**

1061 American Lane  
Schaumburg, IL 60167-4973

**or donate online at  
[www.apsf.org](http://www.apsf.org)**



## Board of Directors Workshop

**Competence and Team Work are  
Not Enough: Implementing Emergency  
Manuals and Checklists**

**Saturday, October 11, 2014**

*New Orleans Morial Convention Center  
Great Hall Ball (2 PM – 4 PM)*



# Jury Awards \$18 Million in Washington State Case

"Oxygen," From Page 25

electrocautery (39) or laser (3). Procedures involving the chest (3), airway (3), and shoulder (2) were also included in the data along with three (3) cases of intraoperative fire unrelated to the administration of anesthesia. Preferred Physician Medical's data are consistent with loss data reported by the ASA's Closed Claims Project.<sup>1</sup>

Mr. Thomas indicates the severity of loss varies widely, but severity measured in terms of indemnity reserves and amounts paid are significant including a recent case in Washington State in which a jury awarded \$18 million for an intraoperative airway fire.

That case, widely reported in the media, involved a 53-year-old female patient with a history of hoarseness following a prolonged intubation from a previous surgery who presented for laser excision of a vocal cord polyp. The patient was intubated with a cuffed Medtronic laser endotracheal tube filled with saline and methylene blue dye. The anesthesiologist testified she was administering 100% oxygen and had turned away from the surgical field to perform some documentation when the surgeon began the laser procedure. Shortly thereafter an audible "pop" was heard and the surgeon yelled "fire!" The surgeon poured saline into the airway, the anesthesiologist turned off the oxygen and the surgeon pulled the laser tube. The patient experienced thermal burns and significant damage to her trachea, vocal cords and esophagus. Post-operatively the patient required a permanent tracheostomy, feeding tube, and was admitted to a long-term care facility.

The patient sued the surgeon and his practice group, the anesthesiologist and her practice group, the hospital and the laser endotracheal tube manufacturer, Medtronic. The hospital settled with plaintiff for \$12 million prior to trial while the remaining parties were unable to reach settlement and proceeded to trial.

Following a 6-week trial, the jury returned a verdict of \$18 million allocating 5% of liability to the settling hospital, 52.5% to the anesthesiologist and her practice, and 42.5% to the surgeon and his practice. No award was entered against Medtronic. Following post verdict motions and appeal, the healthcare providers reached a settlement with the plaintiff.

Many nationally renowned institutions as well as smaller hospitals are using cognitive aides such as a question during the timeout procedure, posters in the OR, or smart anesthesia messages (SAM) via the computer as reminders to the OR staff, surgeons,

and anesthesia professionals that specific precautions should be used in cases at high risk for fire. It doesn't require utilization of enormous resources or the latest advanced technology to institute some of these cognitive aides. Smaller institutions can sometimes enact these changes and facilitate awareness of this complication more quickly than larger health care facilities. The APSF in conjunction with other experts has developed an algorithm for preventing on-patient OR fires that is free to download (<http://www.apsf.org/newsletters/html/Handouts/FirePreventionAlgorithm-20X16.pdf>).

Oxygen-air blenders can also help minimize the use of oxygen.<sup>2</sup> Commercial blenders are available for purchase, or one can modify the anesthesia circuit for this purpose as described in the Spring-Summer 2012 issue of the *APSF Newsletter*.<sup>3</sup>

Minimizing the elements of the triad necessary for on-patient OR fires—oxidizer, fuel, and ignition source—requires participation of every care provider in the OR including nurses, scrub technicians, surgeons, and anesthesia professionals.

*Mr. Steven R. Sanford, JD, is President and CEO of Preferred Physicians Medical.*

*Mr. Brian J. Thomas, JD, is Senior Claims Attorney and Director of Risk Management for Preferred Physicians Medical.*

*Dr. Lorri A. Lee is Co-Editor of the APSF Newsletter, Member of the APSF Executive Committee, and Professor of Anesthesiology and Neurological Surgery at Vanderbilt University in Nashville, TN.*

### References:

1. Mehta SP, Bhananker SM, Posner, KL, Domino KB. Operating Room Fires: A Closed Claims Analysis. *Anesthesiology* 2013 May;118(5):1133-1139.
2. Ahmed OI, Sanchez G, McAllister K, Girshin M. Fire Safety in the Operating Room. *APSF Newsletter* Spring-Summer 2013; 28(1):17.
3. Rooke GA. Converting an Anesthesia Circuit to Deliver and Titrate Supplemental Oxygen. *APSF Newsletter* Spring-Summer 2012; 27(1):16.

*The Anesthesia Patient Safety Foundation (APSF) announces the availability of the 18-minute educational video:*

**Prevention and Management of Operating Room Fires**

View the DVD on the APSF website ([www.apsf.org](http://www.apsf.org))

Request a complimentary copy of the DVD on the APSF website ([www.apsf.org](http://www.apsf.org))

## ANESTHESIA PATIENT SAFETY FOUNDATION

### CORPORATE ADVISORY COUNCIL

- George A. Schapiro, Chair  
*APSF Executive Vice President*
- Gerald Eichhorn.....*AbbVie*
- Brian E. Tufts.....*Baxter Healthcare*
- Michael S. Garrison.....*Becton Dickinson*
- Timothy W. Vanderveen, PharmD.....*CareFusion*
- Michael Grabel.....*Codonics*
- Dan J. Sirota.....*Cook Medical*
- Patty Reilly, CRNA.....*Covidien*
- David Karchner.....*Dräger Medical*
- Peter Clayton.....*Edwards Lifesciences*
- Matti E. Lehtonen.....*GE Healthcare*
- Chris Dax.....*Masimo*
- Rachel A. Hollingshead, RN.....*Merck*
- Scot C. Carriker.....*Mindray*
- Kathy Hart.....*Nihon Kohden America*
- Daniel R. Mueller.....*Pall Corporation*
- Mark Wagner.....*PharMEDium Services*
- Heidi Hughes, RN.....*Philips Healthcare*
- Steven R. Sanford, JD.....*Preferred Physicians Medical Risk Retention Group*
- Clara Gombar.....*Sheridan Healthcare*
- Tom Ulseth.....*Smiths Medical*
- Andrew Levi.....*Spacelabs*
- Cary G. Vance.....*Teleflex*
- Julie M. Brightwell, RN.....*The Doctors Company*
- Abe Abramovich
- Casey D. Blitt, MD
- Robert K. Stoelting, MD

## Q&amp;A

# What is the Incidence and Common Cause of Anesthetic Death in 2014?

## Q Dear Q&A,

What is the incidence and common cause of anesthetic death in 2014?

Brian Hall, MD  
Department of Anesthesiology  
Mayo Clinic  
Rochester, MN

## A Dear Dr. Hall,

Thank you for the inquiry. There are various possible answers to this question, depending on what you mean by "anesthetic death" and when you are attempting to find it. Here are some general answers:

Mortality prior to hospital discharge in patients admitted for surgery (inpatient operations) is about 3-4% in western medicine in several recent large studies. Most deaths are due to underlying illness and frailty.

Mortality in the OR or PACU is about 3/10,000 (.03%), and is again mostly due to underlying disease, such as severe trauma or overwhelming

sepsis. Death is 1000x more likely in an ASA 5 than an ASA 1 patient.

Attribution of mortality (i.e. "preventable mortality") is often difficult. If a patient dies from an MI on POD 1 whose fault was it? The anesthesiologist who was managing vital signs, the surgeon who was inflicting stress and managed the patient overnight, or the nurse who forgot to give the beta blockers? Or was it primarily related to the patient's underlying disease processes?

Unexpected perioperative mortality, which would be deemed "definitely preventable," from the anesthesia perspective, occurs a handful of times per million cases. Airway management is a major contributor, but used to be much more common than it is now. My estimate is that it ranks at about the same level as unrecognized hemorrhage and over-sedation now, with failure to recognize anaphylaxis, malignant hyperthermia, local anesthetic systemic toxicity (LAST), and others trailing a little behind.

The good news is that these things happen so rarely that getting a handle on them statistically is

impossible. I prefer to regard them all as sentinel events, each worthy of their own detailed review.

Richard Dutton, MD, MBA  
Executive Director  
Anesthesia Quality Institute  
Chief Quality Officer  
American Society of Anesthesiologists

## General References

Pearse RM, et al; Mortality after surgery in Europe: a 7 day cohort study. European Surgical Outcomes Study (EuSOS) group for the Trials groups of the European Society of Intensive Care Medicine and the European Society of Anaesthesiology. *Lancet*. 2012;380:1059-65.

Dimick JB, et al. Reliability adjustment for reporting hospital outcomes with surgery. *Ann Surg*. 2012;255:703-7.

Velanovich V, et al. Accumulating deficits model of frailty and postoperative mortality and morbidity: its application to a national database. *J Surg Res*. 2013;183:104-10.

Anderson JE, et al. An efficient risk adjustment model to predict inpatient adverse events after surgery. *World J Surg*. 2014;38:1954-60.

*The APSF sometimes receives questions that are not suitable for the Dear SIRS column. This Q and A column allows the APSF to forward these questions to knowledgeable committee member or designated consultants. The information provided is for safety-related educational purposes only, and does not constitute medical or legal advice. Individual or group responses are only commentary, provided for purposes of education or discussion, and are neither statements of advice nor the opinions of the APSF. It is not the intention of the APSF to provide specific medical or legal advice or to endorse any specific views or recommendations in response to the inquiries posted. In no event shall the APSF be responsible or liable, directly or indirectly, for any damage or loss caused or alleged to be caused by or in connection with the reliance on any such information.*



## APSF Announces Availability of Recently Released Educational DVDs

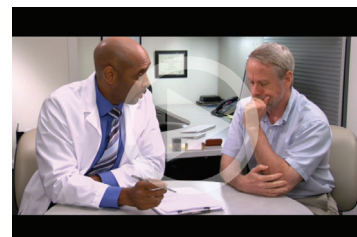
Visit the APSF website ([www.apsf.org](http://www.apsf.org)) to view the following DVDs and request a complimentary copy



- Opioid-Induced Ventilatory Impairment (OIVI): Time for a Change in the Monitoring Strategy for Postoperative PCA Patients (7 minutes)



- 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 Ischemic Optic Neuropathy (18 minutes)

# Refractory Airway Hemorrhage in a Patient on Apixaban

by Luis Llamas, MD, Asif Khan, MSIII, Amanda Myres, MD

The advent of novel oral anticoagulants is shifting the management of bleeding care in the operating room. As more patients transition to these new anticoagulants, which lack specific antidotes, it is important that we consider how we will manage and assess these patients. Our case report presents a patient on the anticoagulant apixaban (trade name Eliquis) and how we managed an uncontrollable spontaneous bleed during his elective surgery.

## Case Report

A 69-yr-old male (ASA III; 84 kg) presented for ENT evaluation after an MRI for cervical spine issues revealed a cricoid lesion. The submucosal mass of the cricoid cartilage extended onto the right posterolateral aspect, and was obstructing approximately half of the airway. With a high suspicion for chondrosarcoma, it was decided that biopsy and excision of the incidentally-found lesion would be appropriate management. With a significant past medical history of atrial fibrillation, the patient was asked to consult cardiology for recommendations on how to manage his anticoagulation. Based upon their recommendation, the patient's apixaban was held 24 hr prior to operation.

In the operating room, the patient was induced with propofol and then intubated with a 4.0 MLT. Sevoflurane was used as the maintenance anesthetic. After biopsies of the lesion were obtained using up-cup forceps with microscopic visualization, a Coblator was used to debulk the lesion further. With no direct vessel

visualized to be arterial or requiring ligation, a consistent ooze began from the cricoid lesion.

To make the wound bed hemostatic, attempts were made using epinephrine-soaked pledgets and direct pressure with the up-cup forceps. Failure of these methods to resolve the bleeding led to the use of laryngeal cautery, which was also unsuccessful. Given the concern for continued hemorrhage, or rapid re-bleed if the wound was made hemostatic, and the inability to protect the airway, a tracheostomy was indicated. After performing a tracheostomy, the patient's airway was reassessed. The oral cavity and nose both had a copious amount of blood and clot present (Fig. 1). An estimated 500 ml of clot was noted in the oral cavity, oropharynx, and nasopharynx. Without an identifiable source and continued bleeding, reversal of the anticoagulant, Apixaban, was indicated (Fig. 2).

Consultation with OR pharmacy revealed there is no known antidote for apixaban, although they recommended administering FEIBA, an anti-inhibitor coagulant complex, in an off-label manner to control the hemorrhaging (Fig. 3). Over an infusion of 20 min, the patient received 2116 units of FEIBA (25 units/kg). During this time, continued efforts to control the bleeding were made with additional cautery, pressure with an 8.5 endotracheal tube with a 20 cc air inflated cuff over the lesion, and thrombin soaked gelfoam. After completion of the FEIBA infusion, hemostasis was achieved with an estimated blood loss of 800 cc.

The patient was transferred post-op to PACU where cardiology was consulted regarding restarting anticoagulation and risk of clot development. Repeat laryngoscopy was performed to confirm no postoperative bleeding and hemostatic stability. With no postoperative bleeding and continued stability, the patient was discharged a few days later with tracheostomy in place with plans to decannulate at a later date with follow-up.

## Discussion

The last few years has seen the introduction of 2 classes of novel oral anticoagulants, direct thrombin inhibitors (dabigatran) and factor Xa inhibitors (rivaroxaban, apixaban). These new agents have rapidly gained popularity due to their significant advantages over the traditional vitamin K antagonists, which include more rapid onset, shorter half-lives, fewer drug interactions, and the lack of need for routine monitoring.<sup>1</sup> The only obstacle to these agents being widely adopted is the absence of a reversal agent for their anticoagulant effects. Our case report tackles the issue of managing spontaneous surgical bleeding in a patient on apixaban anticoagulation therapy.

Apixaban is an oral, reversible, direct active-site inhibitor of free and clot bound factor Xa. As an effector in the final common pathway of the coagulation cascade, factor Xa mediates the activation of prothrombin to thrombin. With its predictable pharmacokinetics and pharmacodynamics, apixaban reaches peak plasma level 3 hr after administration and has a half-life of 10-14 hr with partial renal excretion (25%).<sup>2</sup> For patients with normal renal function, as determined by a creatinine clearance greater than 30 mL/min, the expert opinion is to cease anticoagulation 24 hr prior to low-risk surgery and 48 hr prior to high-risk surgery.<sup>3</sup> These

See "Apixaban," Next Page



Figure 1. The site of the surgical bleed.

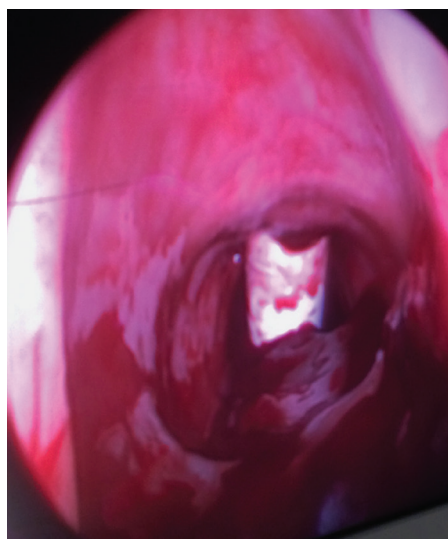


Figure 2. Placement of tracheostomy with presence of clot.

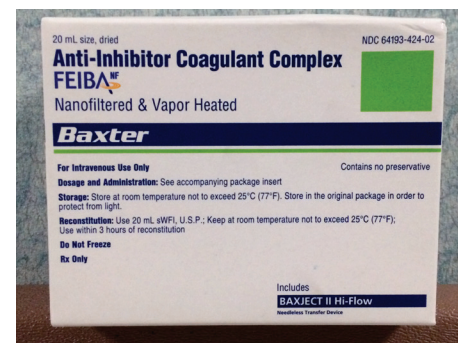


Figure 3. FEIBA administered.

## Perioperative Oral Anticoagulants Present Monitoring and Assessment Challenges

### “Apixaban,” From Preceding Page

times are doubled for patients with impaired renal function (creatinine clearance <30 mL/min).<sup>3</sup>

With our case report we encountered the obstacle of attempting to reverse apixaban despite it being held 24 hr prior to surgery as directed by the patient's cardiologist. All attempts to control the bleeding surgically failed since the source was non-visible. It was not until the patient was administered activated prothrombin complex concentrate (FEIBA) that the bleeding yielded. FEIBA (Factor Eight Inhibitor Bypassing Activity) is a prothrombin complex concentrate (Activated PCC) that was developed as a pro-hemostatic for hemophiliacs.<sup>4</sup> It includes factors II, VII, IX, and X that are activated during the manufacturing process. Not surprisingly, its usage has been associated with increased thrombotic events, but primarily in patients with pre-existing thrombotic risk factors.<sup>1</sup> When used in an off-label manner, as we did, FEIBA can act as adjuvant therapy when attempting to attenuate a spontaneous surgical bleed in a patient on apixaban since it provides activated factor X. The immediate favorable coagulative response achieved with our patient after a 20-min infusion presents FEIBA as a possibly efficacious therapy for apixaban anticoagulant reversal.

Prevention is always the best therapy. And it is for that reason we would like to discuss a few ways this situation could have been avoided. Firstly, it is important to recognize that a majority of the new oral anticoagulants are dependent on renal excretion.<sup>1</sup> Thus, elderly patients and those with decreased renal function should be cautiously managed.<sup>5</sup> Extending the duration during which the anticoagulant is discontinued from 24 to 48 hr in this case might have been indicated considering the patient's age. In addition, a creatinine clearance on the patient could have further necessitated the need for a 48 hr discontinuation.

Although apixaban does not require routine coagulation monitoring, patients with decreased clearance of the anticoagulation should be monitored prior to surgery to ensure stable coagulation. Since apixaban increases the INR, it would seem that the PT test would be the ideal study. Unfortunately, the PT assay lacks the sensitivity of the dilute PT assay (modified PT), which would be a better option.<sup>6</sup> An alternative is the HepTest, a commercially available clot-based anti-Factor Xa which is more sensitive than the PT assay, but equally sensitive as the dilute PT to apixaban.<sup>6</sup> These

assays are possible means for determining the anticoagulation status of at risk patients taking apixaban prior to surgery. Performing these assays on our patient could have revealed him to be still anticoagulated, and thus might have changed our approach to his elective surgery. Monitoring these new oral anticoagulants should be considered in patients undergoing elective surgery that have any predictors of bleeding.

As more patients transition to anticoagulant therapy on these new oral agents, it is important that the anesthesia community be aware of their challenges and understand the interventional options available. Despite following cardiology's recommendations to hold our patient's apixaban 24 hr prior to his ENT surgery, we still faced an uncontrollable, diffuse surgical bleed. We acknowledge the lack of clinical data to guide the use of FEIBA for the reversal of apixaban anticoagulation therapy, and therefore cannot recommend its routine use because of the associated thrombosis risks. It is our suggestion that FEIBA should not be used in lieu of careful preoperative preparation or procedural/surgical hemostatic intervention.

*Dr. Llamas, Mr. Khan and Dr. Myres are from the Department of Anesthesiology, University of Texas Health Science Center at San Antonio School of Medicine, San Antonio, TX.*

### References

1. Siegal DM, Crowther MA. Acute management of bleeding in patients on novel oral anticoagulants. *Eur Heart J* 2013;34:489-498b.
2. Raghavan N, Frost CE, Yu Z, et al. Apixaban metabolism and pharmacokinetics after oral administration to humans. *Drug Metab Dispos* 2009;37:74-81.
3. Fawole A, Daw HA, Crowther MA. Practical management of bleeding due to the anticoagulants dabigatran, rivaroxaban, and apixaban. *Cleve Clin J Med* 2013;80:443-51.
4. Key NS, Negrier C. Coagulation factor concentrates: past, present, and future. *Lancet* 2007;370:439-48.
5. Schulman S, Beyth RJ, Kearon C, Levine MN. Hemorrhagic complications of anticoagulant and thrombolytic treatment: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th ed). *Chest* 2008;133:257S-298S.
6. Samama MM, Guinet C. Laboratory assessment of new anticoagulants. *Clin Chem Lab Med* 2011;49:761-72.

### Letter to the Editor:

## USP-797 Guidelines Raise Concerns

### To the Editors:

As a member of the anesthesia community I want to make sure that the APSF is aware of the following matter that could affect timely care of acutely injured patients and could potentially increase medical waste and cost.

CMS appears to be supporting USP guidelines regarding the compounding of sterile medications (USP 797) that was written in 2007, raising concerns that setting up an IV bag or pressure line or cardiopulmonary bypass machine more than an hour in advance of a procedure increases infectious risk. Agreeing with an "hour rule" would be like saying that OR instruments used in a case are no longer sterile after an hour of surgery or that any IV bag connected to a patient for more than an hour poses an added infectious risk. Clinical, pharmaceutical, and perfusion data on cardiopulmonary machine priming indicate that this practice does not increase infectious risk, even up to 7 days. The Joint Commission has no problem with up to 96 hours as long as medication drip stability is not compromised. Infectious disease specialists have no issue with it so long as federal regulations are not violated (based on a recent meeting I attended).

Some centers keep operating rooms ready to go for trauma, cardiac, and obstetric emergency cases. A room that is immediately ready includes intravenous fluids and pressure transducers that are spiked and flushed. In addition, basic vasoactive drips are generally prepared, spiked, and ready to go, loaded onto tested infusion pumps, as well a cell saver machine. All of these should be dated and timed. I believe that there is enough medical and perfusion-related evidence to categorically state that an IV or drip prepared under sterile conditions remains sterile for up to 7 days. In addition, the evidence also points out that if a bag is contaminated, then it is contaminated even after a minute of being prepared. Most of the solutions that we prepare for a trauma case, such as normal saline or lactated ringers, do not support bacterial growth unlike a propofol or TPN drip. Would 24, 48 or 96 hours be OK as evidence indicates it would? Those of us who work in large centers know often enough of critically injured patients, cath lab complications, unstable aortic dissection cases, or acutely bleeding patients who arrive in the OR with little or no prior notice. To have to begin setting up a room for such a case detracts and delays critical patient care. These issues are even more evident later in the day or at night when faced with limited personnel who may already be involved in other cases.

All these comments are my personal beliefs and in no way represent the institution in which I work and practice.

*Enrique Pantin, MD  
Newark, NJ*



## Letters to the Editor:

# Pediatric Transfusion and Hyperkalemia

## Reader Asks About Potassium Filters

### To the Editors:

I was reading the article "Preventing Pediatric Transfusion-Associated Incidents of Hyperkalemic Cardiac Arrest". I personally was involved with an intraoperative hyperkalemic arrest due to massive transfusion in liver transplant case. Following the case, I've researched and found that potassium reducing filters are developed in Japan that seem to be effective and relatively low budget technique to reduce potassium load during transfusion with some limitations to the number of units. I noted that the authors of the above article did not mention this relatively simple method. I have no commercial interest in the any company involved in production or development of those filters.

Stefan Hariskov, MD  
Tufts University School of Medicine  
Boston, MA.

### Dear Dr. Hariskov:

Thank you for your letter. We did not mention potassium-reducing filters because such devices are not currently approved for use in the United States. However, in our review article<sup>1</sup> published in *Transfusion* in January 2014, we did consider such filters as possible future options. Dr. Heitmiller<sup>2</sup> was involved in the *in vivo* study that you referenced in your letter. The study showed that while the potassium absorption filters worked optimally for RBC units with a hematocrit of 55 to 65%, which is in the range of Additive Solution 3 (AS-3) preserved units used in the study, it was not the case for citrate-phosphate-dextrose-adenine (CPDA-1) preserved units which have a higher hematocrit of less than 80%. Blood Bank policies vary institution by institution but generally CPDA-1 units are reserved for neonatal transfusion. Certainly, a growing awareness and demand for such devices in the anesthesiology and transfusion medicine community will hopefully encourage filter manufacturers to develop and obtain approval for clinical use in the United States.

## Factors Affecting Post-transfusion Potassium Level and Efficacy of Washing PRBCs

### To the Editors:

I read with interest the June 2014 *APSF Newsletter* article by Drs. Lee and Heitmiller<sup>3</sup> regarding transfusion-associated hyperkalemic cardiac arrest in pediatric patients. Although a study performed over a decade ago focused upon pediatric patients receiving transfusions during cardiopulmonary bypass (CPB) rather than massive transfusion, per-

haps our results will be of interest to some of your readers, as we observed that storage time of packed red blood cells (PRBCs) was a general but not reliable predictor of the degree of increase in serum potassium (K+) post-Tx.

Our pediatric cardiac surgery team observed cases of severe hyperkalemia post-Tx of PRBCs during CPB associated with decreased cardiac function or ventricular fibrillation, leading to increased CPB times. While washing PRBCs prior to Tx is an effective alternative to avoid this problem, washed units are more costly, contain fewer PRBCs, and have only a 24-hr shelf life.

Dr. Pearl Toy, then the director of the blood bank at the University of California San Francisco Medical Center, and I undertook a prospective unblinded observational study to help determine when washed PRBCs were indicated. We measured the effect of transfusion during CPB of one unit of banked RBCs on serum K+ following 103 transfusions to 99 patients weighing <15kg. (The median patient weight was 5.6 Kg, ranging from 1.5-14.9 Kg.) Electrolyte concentrations were measured <15 min. prior to and 5-15 min. post-Tx, nearly always toward the end of CPB in preparation for separation from bypass. We did not alter usual practices during CPB including the addition of calcium and sodium bicarbonate.

For the unwashed units (n=75), the mean increase in K+ was 1.05 ± SD 0.92. While we observed a trend correlating the absolute increase in post-transfusion K+ with increased days of storage and previous irradiation, a storage time of only 2-5 days did not prevent individual cases of extreme hyperkalemia. Among the 26 transfusions following only 2-5 days PRBC storage we observed one increase in K+ of 2.6 mEq/L resulting in a post-transfusion K+ of 7.5. Individual increases in serum K+ of >2.4 mEq/L occurred in each of 4 storage-time categories (2-5, 6-10, 11-20, and 21-30 days). The strongest observed predictor of both the absolute post-Tx K+ level and the increase was the pre-Tx K+ value. Other predictors were patient age < 1 year, increased days of blood storage, and irradiation of the unit.

As expected, no significant increase in serum K+ following Tx of washed units (n=28) was observed. The mean increase was 0.07 mEq/L ± SD 0.59. (Mann-Whitney P < 0.0001 compared with unwashed units.)

Our conclusions were that transfusion during CPB of washed PRBCs was indicated for patients <1 yr of age when normal cardiac rhythm was essential. These data were presented at the American Society of Hematology meeting in San Francisco in 2000.<sup>4</sup>

Lydia Cassorla, MD, MBA, Professor Emeritus,  
Department of Anesthesia and Perioperative Care,  
University of California, San Francisco, CA.

### Dear Dr. Cassorla,

Thank you for sharing your study with us. Your findings that the strongest predictor of post-transfusion potassium rise and absolute level was the pretransfusion potassium level, and that individual increases in serum potassium levels of greater than 2.4 mEq/L occurred in each of the 4 storage time categories (2-5, 6-10, 11-20 and 21-30 days) are particularly interesting. They reinforce the point that transfusion associated hyperkalemia has multiple contributing factors outside of the storage age of the transfused blood. I would like to also point out to our readers a related article by Swindell et al.<sup>5</sup> where washing irradiated RBCs significantly reduced potassium levels in cardiopulmonary bypass prime in infants undergoing complex congenital heart surgery.

## Clarification of Dextrose Dose for Infants

### To the Editors:

Shouldn't the dextrose dose be 1-2 ml/kg vs 1-2 Gm/kg? I would not want to give a 3 kg infant 60 ml of D10W? D10W is 100 mg dextrose/ml.

Tammy Dukatz, CRNA, Beaumont Health System,  
Royal Oak, MI

### Dear Ms. Dukatz:

Thank you for your letter. It gives us an opportunity to clarify. The dextrose dose for treating hyperkalemia is correctly written in the article in g/kg rather than mL/kg, but the 1-2 g/kg is a bit high and more appropriate for the emergency treatment of hypoglycemia rather than in conjunction with insulin for hyperkalemia treatment. We were attempting to streamline the dosages cited by different sources. Coté et al.'s *A Practice of Anesthesia for Infants and Children*<sup>6</sup> prescribes the following: dextrose 0.5-1 g/kg and insulin 0.1 units/kg to be given over 30-60 minutes. The 1-2 mL/kg dose applies if D50W is used because 1 mL of D50W contains 500mg (0.5g) of dextrose. The maximum dose is the adult dose of 25-50 g dextrose and 5-10 units of regular insulin.<sup>7</sup>

### References:

1. Lee AC, Reduque LL, Luban NLC, Ness PM, Anton B, Heitmiller ES. Transfusion-associated hyperkalemic cardiac arrest in pediatric patients receiving massive transfusion. *Transfusion* 2014; 54: 244-54.
2. Yamada C., Heitmiller ES, Ness PM, King KE. Reduction in potassium concentration of stored blood cell units using a resin filter. *Transfusion* 2010; 50: 1926-33.

See "Pediatric Concerns," Next Page

## Pediatric Concerns

### "Pediatric Concerns," From Preceding Page

3. Lee AC, Heitmiller ES. Preventing pediatric transfusion-associated incidents of hyperkalemic cardiac arrest. A wake up safe quality improvement initiative. *APSF Newsletter* 2014;29:1,6
4. Cassorla L, Ho RJ, Watson JJ, Toy PTCY. Increase in serum potassium after red blood cell transfusion during cardiopulmonary bypass in pediatric patients. *Blood* 2000;96:452a.
5. Swindell CG, Barker TA, McGuirk SP, Jones TJ, Barron DJ, Brawn WJ, Horsburgh A, Willetts RG. Washing of irradiated red blood cells prevents hyperkalaemia during cardiopulmonary bypass in neonates and infants undergoing surgery for complex congenital heart disease. *Eur J Cardiothorac Surg* 2007;31:659-64.
6. Charles Coté M, Jerrold Lerman M, Brian Anderson M. Coté And Lerman's A Practice Of Anesthesia For Infants And Children [e-book]. Elsevier Health Sciences; 2013. Available from: R2 Digital Library, Ipswich, MA. Accessed September 5, 2014.
7. Ronald Miller M. Miller's Anesthesia, 2 Vol Set [e-book]. Elsevier Health Sciences; 2010. Available from: R2 Digital Library, Ipswich, MA. Accessed September 6, 2014.

## Letter to the Editor:

### Sub-Hood Gas Evacuation: A Burning Issue

#### To the Editors:

Operating room fires are of great concern to the practicing anesthesiologist. The ECRI Institute estimates that approximately 550 to 600 surgical fires occur each year. The 3 components needed for a fire to occur include 1) an oxidizer, 2) fuel source, and 3) ignition. Some practitioners believe that placing a suction line underneath the drapes may reduce the oxygen content available for sustaining a fire. Is this practice effective/not effective? This could be called sub-hood gas evacuation (SHGE). Theoretically, there may be less oxygen by providing this suction, but this technique does nothing to address the oxygen supply being delivered underneath the drapes. Furthermore, when suction injuries such as these occur on the skin (or when the suction catheter is occluded for any reason), it certainly results in ineffective O<sub>2</sub> evacuation. In this case, there was a mild patient injury related to the usage of suction in this manner (shown in Figure 1). We suggest to APSF readers that if SHGE is applied, then the suction tip should remain visible in order to prevent injuries (most

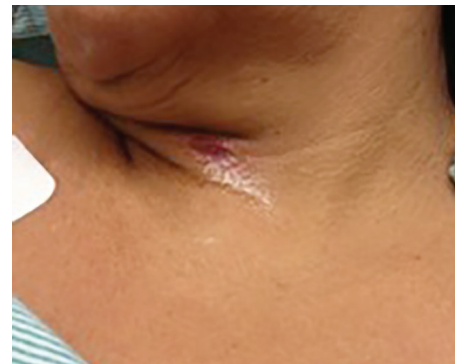


Figure 1. Skin injury resulting from suction catheter underneath the surgical drapes.

specifically to the skin) related to this technique and maximize potential efficacy.

Dr. George William, MD, FCCP

Dr. Bilal Rana, MD

Dr. Sabeen Mujtaba, MD

University of Texas Medical School  
Houston, TX.

# AAMI Salutes Eight Professionals For Contributions to Health Care Technology

Each year, AAMI honors leaders, visionaries, and innovators who have made a positive difference in health care technology. The AAMI Awards Committee sifted through scores of nominations to consider who is most deserving of the honors, which are formally handed out at the Annual Conference. This year's recipients have diverse interests and areas of expertise, but share one common value: a commitment to excellence.

## Matthew B. Weinger, MD A Fidelity to Science

### AAMI Foundation's Laufman-Greatbatch Award

An overwhelming number of tributes poured in for Matthew Weinger, MD, a professor and vice chair at Vanderbilt University in Nashville, TN, praising him for his tireless work in human factors to enhance the safety of medical technology. His work includes co-chairing AAMI's Human Factors Engineering Committee and making presentations on the topic at various events.



Matthew B. Weinger

"Dr. Weinger has made significant, singular, and global impacts on the advancement of patient safety and care through his work on human factors; medical device design and interoperability; international standards; use of simulation for training; leadership in national professional organizations; and clinical research and publications," said Tim Vanderveen, vice president of the Center for Safety and Clinical Excellence with CareFusion.



For more information, please read the full article: [http://www.aami.org/publications/AAMINews/Jun2014/2014\\_Award\\_Winners.html](http://www.aami.org/publications/AAMINews/Jun2014/2014_Award_Winners.html)

Hospital Quality Institute president and chief executive Julie Morath, who formerly worked with Weinger at Vanderbilt, hailed him for "his fidelity to science, commitment to patient safety systems design, and research, and his passion for teaching."

Weinger has participated in a range of AAMI activities, including presenting at the October 2012 AAMI/FDA Interoperability Summit. He also sits on the AAMI Board of Directors.

## Letter to the Editor:

# Education Improves Patient Satisfaction and Patient Safety

### To the Editors:

Anesthesiologists and members of the anesthesia care team have always been critical members of surgical teams, but largely worked “behind the drapes” and out of the surgeon’s and patient’s view. Now, as a result of health care reform and a new focus on patient satisfaction, anesthesiologists are playing a more visible role since their work can make the difference in how patients feel during the perioperative process.

Still, most patients don’t know much about their anesthesia care or anesthesia care team. It is one of the more nerve-racking elements of a surgical procedure for many patients, in large part because it isn’t well understood. There is a need to better educate patients about the role of anesthesia and the different options available; and the effort is certainly worthwhile since it impacts patient satisfaction and, most importantly, patient safety.

### Anesthesia Care Team Role in Patient Education

It is often difficult to determine specifically who is responsible for patient education when care is provided by surgical teams; but the general lack of understanding around anesthesiology places anesthesiologists and members of the anesthesia care team in a pivotal role in terms of education, and ultimately satisfaction. Informed patients, who know what to expect throughout their surgery and recovery, and who understand exactly what will go on while they are “under,” feel more in control and at ease. When patients feel like they know and trust their anesthesiologist and members of their anesthesia care team, and see them as a resource for their questions and concerns, anxiety levels diminish. Education is a simple way that an anesthesiologist and anesthesia care team members can make surgery a less stressful and scary prospect for a patient. Lower stress and anxiety positively affects a patient’s perception of the quality of care he or she received. Outlining a patient’s options for anesthesia and how each might affect his or her pain and recovery helps ensure the patient’s expectations are met.

Additionally, anesthesiologists’ role as perioperative physicians places them in the unique position to better educate patients about the complete process—from booking to discharge. Anesthesia professionals are visible throughout the entire lifecycle of a surgery, so they have more touch points with the patients and more opportunities to educate them on their procedures. They, therefore, have the opportunity to become the “face” of a patient’s surgery, so the more a patient sees that face as a resource for questions, concerns and feedback, the better.



### Informed Patients Are Safer Patients

Most importantly, better patient education leads to better patient safety. When a preoperative consultation is a true dialogue—with patients and anesthesia care team members asking and answering questions—we learn even more about the patients and, as a result, can further tailor their care in the most effective way.

With the rise of consumerism in health care, patients are increasingly more involved in their medical decisions. They are demanding transparency, and want to better understand their options and the reasons behind physicians’ decisions. And they should—patients should feel that they have a voice in their care. Arming patients with knowledge and giving them greater control over their care leads to better outcomes.

For instance, certain medical errors can be avoided through the input patients give and the questions they ask. Laterality specification is of the utmost importance in a surgery. If a patient is educated on the preoperative site marking and draping procedures to expect, and the types and sites of the anesthesia they will receive (e.g., an extremity block), they provide an extra set of eyes and ears to ensure the surgery is performed on the correct part of their body.

And before patients even enter the operating room, in the planning stages of a surgery, patient education regarding their medical history is critical. Patients who have a deeper understanding of their past procedures, drug reactions, and allergies can provide crucial information to their surgical team. For example, when planning a surgery, an anesthesiologist might enter an order for a penicillin-derived medication. If the patient is documented as having a past allergic reaction to a penicillin, the EHR will likely

display a warning and encourage the doctor to select an alternative. However, if the patient understands the details of their past reaction, and can share that the drug reaction was a known side effect as opposed to a true allergic reaction, the anesthesiologist can prescribe the best medication for the patient instead of a second or third line option. We should encourage patients to learn about their medical history in the planning phase of a surgery, and can guide them with the appropriate questions to ask.

Seeing an anesthesiologist and anesthesia care team members as a resource for information is critical. They should make it clear that they are available to answer questions and address patients’ concerns. Providing resource material, like the anesthesia Patient Education Portal developed by Sheridan Healthcare, can be hugely helpful for patients preparing for surgery. Sheridan’s portal provides definitions of the different types of anesthesia, including general, regional, and MAC. It outlines the roles of anesthesiologists, nurse anesthetists, and anesthesiologist assistants. It also provides a clear overview of what to expect. The site helps educate patients before they even meet with their anesthesiologist and care team, to help guide the conversation and provide patients with the questions they may want to ask before surgery.

### Key Topics to Address

To ensure that your patients are well-informed about their anesthesia care and surgery in general, here is a checklist of key topics anesthesia care team members should aim to address:

- **Anesthesia Options** – If patients have options for their anesthesia, be sure that they know what their options are and how each will affect their surgery and recovery experience.

See “Patient Education,” Next Page

# Enabling Patients to Improve Their Safety

## "Patient Education," From Preceding Page

- **Surgical Team** – Detail which caregivers will be part of the patient's surgery and the roles that each play.
- **Pre-Op Testing** – Define a clear preoperative plan for your patients. Make sure they consult with their primary care provider or any other necessary specialist, and that they receive all necessary tests while avoiding unnecessary preop testing. False positives from unnecessary preop testing is one of the most common causes for day-of cancellations, losing money for the hospital and, most importantly, creating a very frustrating situation for the patient and surgeon.
- **NPO Guidelines** – Make sure your patient understands when he or she must begin fasting from food and liquids.
- **Vital Signs** – Educate the patient on the physical effects of anesthesia and the vital signs doctors will be monitoring throughout the surgery.

- **Immediate Side Effects** – Postop nausea and vomiting is one of the biggest patient dissatisfiers. Explain that nausea is a likely side effect, and work together to address and avoid it.
- **Recovery** – Set real expectations for the time it will take for full recovery and explain how the patient's pain will be managed. Let your patient know when he or she can expect to go home and when he or she will be able to start physical therapy, if necessary. Be sure to communicate these expectations to the patient's family or other caregivers, as well. Lastly, provide a contact that the patient can call with any questions after the procedure.

## The Future of OR Communication

In the last 10 years, efforts to improve OR teamwork and communication have been on the rise. These efforts have optimized surgical workflows, preventing errors and improving patient safety.

Educating patients and involving them in surgical communication is a natural extension of the current practices, especially now with the Affordable Care Act's increased focus on patient satisfaction. Many hospitals and surgical centers have devoted significant resources to OR communication and procedural training. But while progress has been tremendous, our work is not yet done. We believe patient safety can further improve with more effective training, as well as better processes for patient communication. Structuring and standardizing communication throughout the perioperative process will provide a roadmap and encourage increased dialogue that will insure critical information is shared and confirmed, ultimately making surgical procedures safer for patients.

*Dr. Adam Blomberg is the National Education Director for the Anesthesiology Division at Sheridan Healthcare.*

## Letter to the Editor:

# Neuromonitoring Needles Present Sticky Issue

## To the Editors:

I am a CRNA at Denver Health Medical Center and had a needlestick from a positive Hep C patient this year. I was positioning a patient for an interbody fusion, from a lateral approach, of L1-L5 when the incident occurred. I have been a CRNA for 12 years now and have done many spine cases in my career, so am quite comfortable with "working around" the neuromonitoring electrodes. This spine case was unique in that it was a lateral approach, for which the patient was positioned lateral decubitus. I was checking the patient's ear to ensure it was not folded over and was free from pressure, when I felt a pinch on my right index finger. When I removed my hand from under the patient's head, I had an electrode lodged into my fingertip. I immediately pulled it out and exsanguinated my finger and initiated the OUCH protocol for my facility.

That evening I began wondering if there were any protocols for neuromonitoring technicians to follow to communicate with the anesthesia team as to the locations of their probes. Are you aware

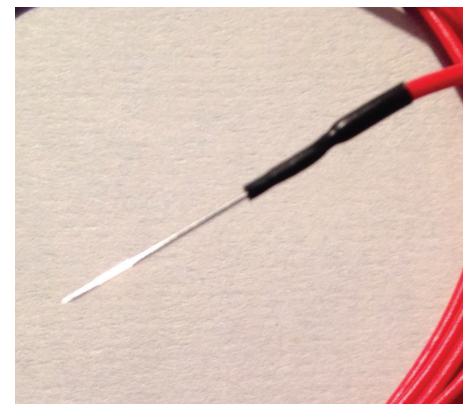
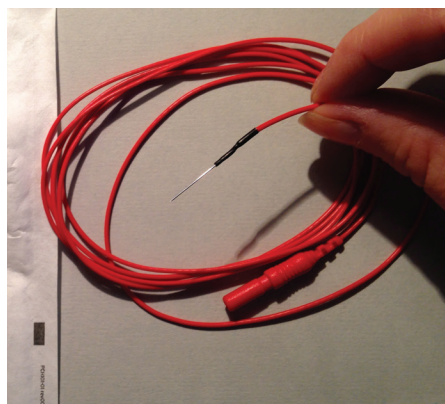


Figure 1. Neuromonitoring needle that resulted in a needle stick injury.

of any such protocols or formal handouts that have been used? I realize that my chance of a conversion are very low with these 0.4 mm diameter probes, but thought it might be a fine idea to improve our knowledge and communication about the location of the probes.

I have attached 2 photos of a neuromonitoring probe.

*Jennifer L. Harenberg, CRNA  
Denver Health Medical Center  
Golden, CO*

# Anesthesia Patient Safety Foundation

## CORPORATE SUPPORTER PAGE

APSF is pleased to recognize the following corporate supporters for their exceptional level of support of APSF



**COVIDIEN**

Covidien is committed to creating innovative medical solutions for better patient outcomes and delivering value through clinical leadership and excellence in everything we do. [www.covidien.com](http://www.covidien.com)



Preferred Physicians Medical providing malpractice protection exclusively to anesthesiologists nationwide, PPM is anesthesiologist founded, owned and governed. PPM is a leader in anesthesia specific risk management and patient safety initiatives. [www.ppmrrg.com](http://www.ppmrrg.com)

**abbvie**

Supported by a charitable donation from AbbVie. [www.abbvie.com](http://www.abbvie.com)



**GE Healthcare**

GE Healthcare  
([gemedical.com](http://gemedical.com))



Foundation for Ethics, Innovation, and Competition in Health Care

Masimo is dedicated to helping anesthesiologists provide optimal anesthesia care with immediate access to detailed clinical intelligence and physiological data that helps to improve anesthesia, blood, and fluid management decisions. [www.masimofoundation.org](http://www.masimofoundation.org)



**THE DOCTORS COMPANY FOUNDATION**

The Doctors Company Foundation was created in 2008 by The Doctors Company, the nation's largest insurer of medical liability for health professionals. The purpose is to support patient safety research, forums, pilots programs, patient safety education and medical liability research. [www.tdcfoundation.com](http://www.tdcfoundation.com)

**Baxter**

Baxter's Global Anesthesia and Critical Care Business is a leading manufacturer in anesthesia and preoperative medicine, providing all three of the modern inhaled anesthetics for general anesthesia, as well products for PONV and hemodynamic control. [www.baxter.com](http://www.baxter.com)

# Anesthesia Patient Safety Foundation

Online donations accepted at [www.apsf.org](http://www.apsf.org)

## Corporate Donors

**Founding Patron**  
American Society of Anesthesiologists (asahq.org)

American Society of Anesthesiologists 

### Sustaining Professional Organization (\$125,000 and higher)

American Association of Nurse Anesthetists (aana.com)



### Grand Patron (\$100,000 and higher)



Covidien (covidien.com)

### Sponsoring Patron (\$30,000 to \$49,999)



Preferred Physicians Medical Risk Retention Group (ppmrmg.com)

### Benefactor Patron (\$20,000 to \$29,999)



AbbVie (abbvie.com)



Baxter Anesthesia and Critical Care (baxter.com)



CareFusion (carefusion.com)



GE Healthcare (gemedical.com)



Masimo Foundation (masimo.com)



The Doctors Company Foundation (tdcfoundation.com)

### Patron (\$10,000 to \$19,999)

Cook Medical (cookgroup.com)  
Dräger Medical (draeger.com)  
Edwards Lifesciences (edwards.com)  
Merck and Company (merck.com)  
PharMEDium Services (pharmedium.com)  
Philips Healthcare (medical.philips.com)  
Spacelabs Medical (spacelabs.com)  
Teleflex Incorporated (teleflex.com)

Codonics (codonics.com)  
Mindray North America (mindray.com)  
Nihon Kohden America, Inc. (nihonkohden.com)  
Pall Corporation (pall.com)  
Respiratory Motion (respiratorymotion.com)  
Sheridan Healthcorp, Inc. (shcr.com)  
Smiths Medical (smiths-medical.com)

Anesthesia Check (anesthesia check.com)  
Belmont Instrument Corporation (belmontinstrument.com)  
B. Braun Medical Inc. (bbraun.com)  
Hospira, Inc.  
iMDsoft (imd-soft.com)  
Intersurgical, Inc. (intersurgical.com)  
Micropore, Inc. (microporeinc.com)  
SenTec AG (sentec.ch)  
TRIFID Medical Group LLC (trifidmedical.com)  
W.R. Grace (wrgrace.com)

### Corporate Level Donor (\$500 to \$999)

NeuroWave Systems (neurowave.com)  
Paragon Service (paragonservice.com)  
ProMed Strategies  
Wolters Kluwer (lww.com)

### Subscribing Societies

American Society of Anesthesia Technologists and Technicians (asatt.org)  
American Society of Dentist Anesthesiologists

### Sustaining Donor (\$5,000 to \$9,999)

Becton Dickinson (bd.com)

### Sponsoring Donor (\$1,000 to \$4,999)

AMBU, Inc (ambu.com)  
Anesthesia Business Consultants (anesthesiallc.com)

## Community Donors (includes Individuals, Anesthesia Groups, Specialty Organizations, and State Societies)

### Grand Sponsor (\$15,000 and higher)

US Anesthesia Partners (GHA-Houston, JLR-Orlando, Pinnacle-Dallas)

### Benefactor Sponsor (\$5,000 to \$14,999)

Alabama State Society of Anesthesiologists  
American Academy of Anesthesiologist Assistants  
Anaesthesia Associates of Massachusetts Anonymous  
CareFusion Foundation  
Connecticut State Society of Anesthesiologists  
Indiana Society of Anesthesiologists  
Minnesota Society of Anesthesiologists  
Frank B. Moya, MD, Continuing Education Programs  
North American Partners in Anesthesia  
Phymed Management, LLC  
Robert K. Stoelling, MD  
Tennessee Society of Anesthesiologists  
Valley Anesthesiology Foundation  
Thomas F. Walker, MD

### Sustaining Sponsor (\$2,000 to \$4,999)

Anesthesia Consultants Medical Group  
Anesthesia Resources Management  
Arizona Society of Anesthesiologists  
Madison Anesthesiology Consultants  
Massachusetts Society of Anesthesiologists  
Michiana Anesthesia Care  
Michigan Society of Anesthesiologists  
Michael D. Miller, MD  
North Carolina Society of Anesthesiologists  
Old Pueblo Anesthesia Group  
Pennsylvania Society of Anesthesiologists  
Raizman Frischman Maatzus & Rizza  
Society of Academic Anesthesiology Associations  
Society of Cardiovascular Anesthesiologists  
Springfield Anesthesia Service at Baystate Medical Center

### Contributing Sponsor (\$750 to \$1,999)

Affiliated Anesthesiologists of Oklahoma City, OK  
Alaska Association of Nurse Anesthetists  
Alaska Society of Anesthesiologists  
American Association of Oral and Maxillofacial Surgeons  
American Society of PeriAnesthesia Nurses  
Anesthesia Services of Birmingham  
Associated Anesthesiologists of St. Paul, MN  
Casey D. Blitt, MD  
Dr. and Mrs. Robert A. Caplan  
Frederick W. Cheney, MD  
California Society of Anesthesiologists  
Jeffrey B. Cooper, PhD  
Dr. and Mrs. Robert Cordes  
David S. Currier, MD  
District of Columbia Society of Anesthesiologists  
John H. Eichhorn, MD  
Gerald Feldman  
Foundation for Anesthesia Education and Research  
Georgia Society of Anesthesiologists  
Mark P. Fritz, MD  
Goldilocks Anesthesia Foundation  
Illinois Society of Anesthesiologists  
Iowa Society of Anesthesiologists  
Kansas City Society of Anesthesiologists  
Kentucky Society of Anesthesiologists  
Lorri A. Lee, MD  
Anne Marie Lynn, MD  
Maryland Society of Anesthesiologists  
Joseph L. Meltzer, MD  
Patricia A. Meyer, PharmD  
Missouri Society of Anesthesiologists  
Nevada State Society of Anesthesiologists  
Northwest Anesthesia Physicians  
Nurse Anesthesia of Maine  
Ohio Academy of Anesthesiologist Assistants  
Ohio Society of Anesthesiologists  
Oklahoma Society of Anesthesiologists  
Oregon Society of Anesthesiologists  
Frank J. Overdyk, MSEE, MD  
Pamela P. Palmer, MD  
A. William Paulsen, PhD, AA-C  
James M. Pepple, MD

Physician Anesthesia Service  
Rhode Island Society of Anesthesiologists  
Laura M. Roland, MD  
Carol E. Rose, MD  
Drs. Ximena and Daniel Sessler  
Society for Airway Management  
Society for Ambulatory Anesthesia  
Society for Obstetric Anesthesia and Perinatology  
Society for Pediatric Anesthesia Patient Safety and Education Fund  
South Dakota Society of Anesthesiologists  
South Denver Anesthesiologists  
Spectrum Medical Group  
Stockham-Hill Foundation  
Tejas Anesthesia  
Texas Association of Nurse Anesthetists  
Texas Society of Anesthesiologists  
The Saint Paul Foundation  
Mary Ellen and Mark A. Warner  
Washington State Society of Anesthesiologists  
Wisconsin Society of Anesthesiologists

### Sponsor (\$200 to \$749)

AllCare Clinical Associates, Asheville, NC  
Anesthesia Associates of Columbus, GA  
Anesthesia Associates of Kansas City  
Anesthesia Associates of Northwest Dayton, Inc  
Donald E. Arnold, MD  
Balboa Anesthesia Group  
Robert L. Barth, MD  
William C. Berger, MD  
Vincent C. Bogan, CRNA  
Amanda Burden, MD  
Lillian K. Chen, MD  
Joan M. Christie, MD  
Marlene V. Chua, MD  
Daniel J. Cole, MD  
Melvin A. Cohen, MD  
Colorado Society of Anesthesiologists  
Glenn E. DeBoer, MD  
Andrew E. Dick, MD  
Rajiv Doshi, MD  
Richard P. Dutton, MD, MBA  
Stephen B. Edelstein, MD  
Jan Ehrenwerth, MD  
Michael R. England, MD  
Georgia Association of Nurse Anesthetists  
Ian J. Gilmour, MD  
Richard Gnaedinger, MD  
James D. Grant, MD  
Joel G. Greenspan, MD  
Allen N. Gustin, MD  
Robert J. Hahn, MD  
John A. Hamel, MD  
Gary R. Haynes, MD  
Daniel E. Headrick, MD  
John F. Heath, MD  
Simon C. Hillier, MD  
Glen E. Holley, MD  
Paul M. Jaklitsch, MD  
Robert E. Johnstone, MD  
Kansas Society of Anesthesiologists  
Marshal B. Kaplan, MD  
Michael G. Kral, MD  
James Lamberg, DO  
Hans Larsen, CRNA (in honor of Dr. Timothy Dowd)  
Rodney C. Lester, PhD, CRNA  
Kevin P. Lodge, MD  
Michael J. Loushin, MD  
Maine Society of Anesthesiologists  
Edwin Mathews, MD  
Gregory B. McComas, MD  
E. Kay McDivitt, MD  
Mississippi Society of Anesthesiologists  
Roger A. Moore, MD  
Robert C. Morell, MD  
Soe Myint, MD  
Joseph J. Naples, MD  
John B. Neeld, MD  
New Jersey State Society of Anesthesiologists  
New Mexico Society of Anesthesiologists  
Mark C. Norris, MD  
Ducu Onisei, MD  
Michael A. Olympio, MD  
Mukesh K. Patel, MD  
Pennsylvania Association of Nurse Anesthetists  
Lee S. Perrin, MD  
Drs. Beverly and James Philip  
Tian Hoe Poh, MD  
Matthew W. Ragland, MD  
Neela Ramaswamy, MD (in honor of Dr. Bhattacharya)  
Maunak E Rana, MD  
Yashesh R. Savani, MD  
Howard Schapiro and Jan Carroll  
Sanford H. Schaps, MD

David Solosko and Sandra Kneiss  
South Carolina Society of Anesthesiologists  
Shepard B. Stone, PA  
Kenneth R. Stone, MD  
Dr. and Mrs. Stephen J. Thomas  
University of Maryland Anesthesiology Associates  
Susan A. Vassallo, MD (in honor of Neelakantan Sunder, MD)  
J. Clark Venable, MD  
Vermont Society of Anesthesiologists  
Virginia Society of Anesthesiologists  
Denham S. Ward, MD, PhD  
Thomas L. Warren, MD  
Mark and Heidi Weber  
Matthew B. Weinger, MD  
Andrew Weisinger, MD  
West Florida Anesthesia Consultants  
West Virginia State Society of Anesthesiologists  
Wichita Anesthesiology, Chartered  
Mark D. Zajkowski, MD, DDS

### In Memoriam

In memory of Stanley E. Borum, MD (Texas Society of Anesthesiologists)  
In memory of Hank Davis, MD (Sharon Rose Johnson, MD)  
In memory of Mark G. Ewell, MD (Texas Society of Anesthesiologists)  
In memory of Margie Frola, CRNA (Sharon Rose Johnson, MD)  
In memory of Andrew Glickman, MD (Sharon Rose Johnson, MD)  
In memory of Enoch C. McReynolds, MD (Texas Society of Anesthesiologists)  
In memory of Russell Morrison, CRNA, MS (Jeanne M. Kachnij, CRNA, MS)  
In memory of E. S. Siker, MD (Drs. Susan E. and Jerry A. Dorsch)  
In memory of E. S. Siker, MD (Donal Lucas Pelligrini, MD)  
In memory of E. S. Siker, MD (Christopher Troianos, MD)

Note: Donations are always welcome. Donate online ([http://www.apsf.org/donate\\_form.php](http://www.apsf.org/donate_form.php)) or mail to APSF, 1061 American Lane, Schaumburg, IL 60167-4973. (Donor list current through September 1, 2014.)

Letter to the Editor:**Intrahospital Transport of Critically Ill Patient Highlights Hazards****To the Editors:**

We recently cared for a morbidly obese patient who was admitted to our ICU following a traumatic injury. The patient was difficult to ventilate due to elevated airway pressures and ventilator dyssynchrony, resulting in significant hypoxemia. The consulting surgeons requested further imaging for operative planning. Shortly after, the patient was transported to the Radiology Department on a transport ventilator with an ICU nurse, a critical care transport nurse, and a respiratory therapist. During the imaging study the patient suffered a cardiopulmonary arrest, became progressively difficult to ventilate, and underwent multiple attempts at CPR. In reviewing the case, reading the available literature, and discussing with colleagues, it became clear that the intrahospital transport of critically ill patients is a topic both with a relative paucity of literature and a low level of awareness among clinicians of multiple specialties. We believe this aspect of patient care has the potential for preventable adverse events.

There have been a number of negative outcomes reported to be associated with the intrahospital transport of critically ill patients, including death.<sup>1-9</sup> While the percentage varies widely depending on the type of adverse event described, the incidence of such events occurring during transport or within the first 24 hours after transport may approach 68%.<sup>1-9</sup> Furthermore, the incidence of adverse events requiring therapeutic intervention during transport has been reported to range from approximately 4-9%.<sup>1,2</sup> The variability in incidence is likely related to the definition of "adverse event," the patient's severity of illness, and variable institutional practices. A recent observational study of mechanically ventilated patients reported a 50% incidence of complications during transport.<sup>3</sup> The authors of this study postulated that many of these adverse events could have been prevented by proper planning, preparation, and standardized equipment checks.

Expert opinion from professional societies has guided the recommendations for intrahospital transport, most recently published by the American College of Critical Care Medicine and the Society of Critical Care Medicine.<sup>10</sup> As outlined in these practice guidelines, the decision to transport a critically ill patient should be based on an assessment of the potential benefits of transport weighed against the potential risks of adverse events inherent to both the transport process itself and the intervention or diagnostic study being pursued. They suggest that the implementation of formal, written policies and procedures specifically addressing the principles of communication, per-

sonnel, equipment, and monitoring may help mitigate risks and improve safety, ultimately resulting in improved patient outcomes.<sup>10</sup> There are few data to support these recommendations and still fewer instituted guidelines.

We believe that despite the recent focus on establishing safer transport practices for critically ill patients, the question of how to manage this high-risk population remains largely unresolved. The implementation of a system-wide practice of prophylactic anticipatory guidance, formal pre-transport timeout procedures, individualized patient plans of care, and specialized transport teams may represent the next step in further minimizing adverse events for this particularly vulnerable patient population. As such we would advocate for prospective studies in this area to help further guide our clinical practice and mitigate the potential for harm to our patients.

Bryan Romito, MD  
Anahat Dhillon, MD  
Joseph Meltzer, MD

The David Geffen School of Medicine at UCLA, Los Angeles, CA

**References**

1. Fanara B, Manzon C, Barbot O, et al. Recommendations for the intra-hospital transport of critically ill patients. *Crit Care* 2010;14:R87.
2. Papon JP, Russell KL, Taylor DM. Unexpected events during the intrahospital transport of critically ill patients. *Acad Emerg Med* 2007;14:574-7.
3. Parmentier-Decrucq E, Poissy J, Favory R, et al. Adverse events during intrahospital transport of critically ill patients: incidence and risk factors. *Ann Intensive Care* 2013;3:10.
4. Voigt LP, Pastores SM, Raouf ND, et al. Review of a large clinical series: intrahospital transport of critically ill patients: outcomes, timing, and patterns. *J Intensive Care Med* 2009;24:108-15.
5. Beckmann U, Gillies DM, Berenholtz SM, et al. Incidents relating to the intra-hospital transfer of critically ill patients. An analysis of the reports submitted to the Australian Incident Monitoring Study in Intensive Care. *Intensive Care Med* 2004;30:1579-85.
6. Picetti E, Antonini MV, Lucchetti MC, et al. Intrahospital transport of brain-injured patients: a prospective, observational study. *Neurocrit Care* 2013;18:298-304.
7. Waydhas C, Schneck G, Duswald KH. Deterioration of respiratory function after intra-hospital transport of critically ill surgical patients. *Intensive Care Med* 1995;21:784-9.
8. Gillman L, Leslie G, Williams T, et al. Adverse events experienced while transferring the critically ill patient from the emergency department to the intensive care unit. *Emerg Med J* 2006;23:858-61.
9. Lahner D, Nikolic A, Marhofer P, et al. Incidence of complications in intrahospital transport of critically ill patients—experience in an Austrian university hospital. *Wien Klin Wochenschr* 2007;119:412-6.
10. Warren J, Fromm RE Jr, Orr RA, et al. Guidelines for the inter- and intrahospital transport of critically ill patients. *Crit Care Med* 2004;32:256-62.

**APSF gratefully acknowledges  
an educational grant from**



**COVIDIEN**

**in full sponsorship of the  
October 2014 APSF Newsletter**

**www.covidien.com**

Anesthesia Patient Safety Foundation  
Building One, Suite Two  
8007 South Meridian Street  
Indianapolis, IN 46217-2922

NONPROFIT ORG.  
U.S. POSTAGE  
**PAID**  
WILMINGTON, DE  
PERMIT NO. 1858

APSF NEWSLETTER October 2014



## Board of Directors Workshop

Competence and Team Work are  
Not Enough: Implementing Emergency  
Manuals and Checklists

Saturday, October 11, 2014

*New Orleans Morial Convention Center  
Great Hall Ball (2 PM – 4 PM)*

### *In This Issue:*

**Flammable Surgical Preps  
Require Vigilance**

-----

**Medicolegal Data Implicate  
Oxygen as Common Factor in  
OR Fires**

-----

**Refractory Airway  
Hemorrhage in a Patient on  
Apixaban**

-----

**Utilizing Patient Education to  
Improve Patient Safety**

*The APSF gratefully acknowledges an educational grant from Covidien in full sponsorship of this October 2014 Issue of the APSF Newsletter.*