

## The Challenges of Technological Intensification

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The practice of anesthesia continues to become increasingly complex with the expected standard of care increasingly defined by the skilled use of emerging technologies by appropriately-trained practitioners. This complexity arises from inherent sources such as the variable pathophysiology of patients, the necessary temporal and spatial coordination of practitioners from several disciplines during surgical procedures, and the rapid development of technology through a process we call technological intensification.

We do not oppose innovation and technology. In the hands of skilled healers, technology has the capacity to greatly increase the effectiveness and safety of medical procedures. However, potential risk is often also increased. In this paper we consider the highly topical issue of patient safety in the context of technological intensification.

### Sources of Complexity

In recent years much has been made of the analogy between anesthesiology and aviation.<sup>1,2</sup> While the adoption of a better safety culture is clearly constructive, it is also important to recognize the limitations of the aviation analogy.<sup>3</sup> Like aviation, anesthesiology is increasingly dependent on the skilled use of advanced technology, but the system comprised of an anesthetized

patient and the associated technology and people, is typically considerably more complex and more variable than that of an aircraft and typically presents greater challenges to maintaining high levels of safety.<sup>4</sup>

Systems expert, Charles Perrow, has described the function of any technological or human system along 2 dimensions; interaction and coupling.<sup>5</sup> The

interaction between the elements of a process or device is considered *complex* if there are many alternative sub-tasks at any point in its completion, or *linear* if it is comprised of a set of fixed steps carried out in rigid sequence. The coupling dimension describes the extent to which an action is related to its consequences. A system is said to be *tightly* coupled if

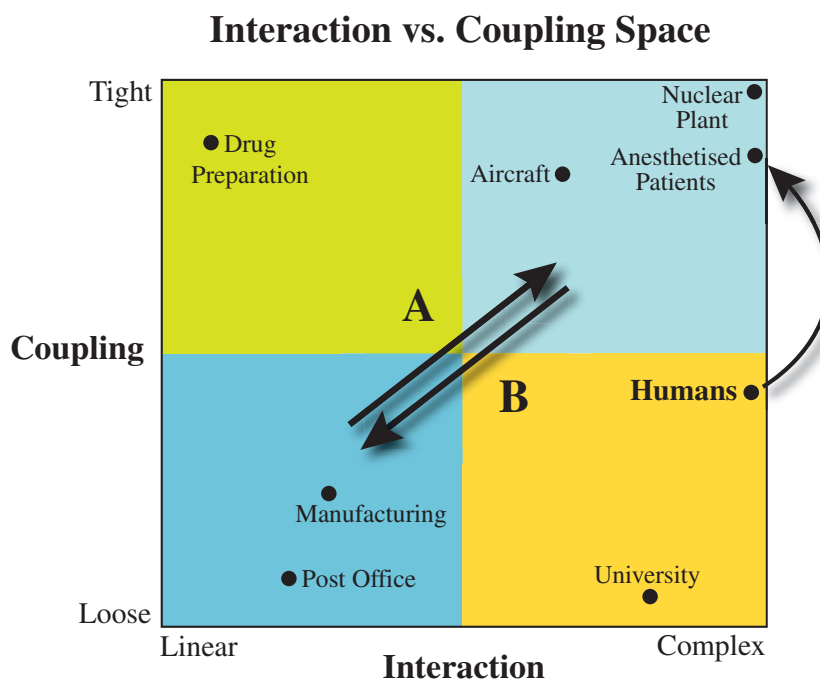


Figure 1. The interaction/coupling space (adapted from Perrow<sup>5</sup>). Note that anesthetized patients fall in the most potentially dangerous, upper right-hand quadrant, in which organizations and activities are both tightly coupled and have complex interactions. The lines A and B indicate the directions of intensification and de-intensification respectively.

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## NEWSLETTER

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# Anesthesia and Nuclear Power Plants Share Complexity

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consequences are closely linked to actions. It follows that in tightly coupled systems minor slips can quickly become accidents. In a *loosely* coupled system, the link between an action and its consequences is less clear, and such systems therefore tend to be more forgiving of error. Together, these 2 dimensions form Perrow's interaction/coupling space with which technologies can be classified (Figure 1).<sup>5</sup>

The post office is a relatively safe organization because it is both loosely coupled and has linear interaction between sub-systems (bottom-left quadrant, Figure 1). Hence there are many opportunities to correct any mistakes before a letter is finally delivered to the correct address. A nuclear power plant by comparison is the antithesis of a post-office-like system, being potentially very dangerous because it has both complex interaction and tight coupling between sub-systems (top-right quadrant, Figure 1). As a result, errors in the operation of a nuclear power plant may quickly lead to dangerous outcomes.<sup>6,7</sup> Thus, an increase in both the complexity of interaction and tightness of coupling yields more intensified systems; hence, the direction of greater intensification is toward the top-right quadrant of the Perrow space (indicated by A in Figure 1).

Humans are highly complex and contain a variety of loosely and tightly coupled physiological sub-systems, many of which are robustly homeostatic. Therefore on balance humans fall on the “loose” side of the midline of the coupling dimension. However, a patient undergoing anesthesia is a decidedly more tightly-coupled system than an awake individual.<sup>1</sup> This is because an anesthetized patient has had the control of a number of normally self-regulating sub-systems suspended, altered, or taken over by the technology of the anesthetic. Even our best technology is less reliable and requires much greater oversight than the subsystems of healthy bodies, and so when a healthy patient is anesthetized, the system of which he or she becomes a part, is significantly more tightly coupled for this reason alone. Pathology can greatly diminish the reliability with which the human body responds to the challenges of surgery and anesthesia, and it is the variability of the human condition that leads to the increased complexity that most separates anesthesia from aviation. Some aspects of anesthesia are loosely coupled, but in others (such as the adequate delivery of oxygen to the tissues) the coupling is very tight indeed. Figure 1 shows the migration within the Perrow space, in the direction of greater intensification, when a patient undergoes an anesthetic. In addition, surgery will further increase the complexity of the system and often the tightness of coupling as well by potentially reducing homeostatic reserves through challenges such as blood loss, sympathetic stimulation, and fluid shifts. Timelines for treatment during anesthesia are short, action and reaction are immediate, and several health care disciplines (typically anesthesiology, surgery, and nursing at a minimum, and in cardiac surgery perfusion, as well) must

work closely together within a small physical space while simultaneously and independently engaged in the treatment of the same patient. In the cockpit, the pilot and the copilot have similar skill sets and capabilities, and the hierarchy is clear and static. However, in the operating room each of the disciplines has a unique skill set, each set of professionals is entirely dependent on the others for their contribution to the process, and the hierarchy is fluid. The days are gone when a surgeon could reasonably intervene in the provision of anesthesia, and few anesthetists would wish to take over the scalpel if the surgeon appeared to be struggling. Leadership varies dynamically, according to the stage of the procedure and the most pressing issue at any particular time; for example, during an anaphylactic reaction the anesthesiologist is likely to take overall responsibility, whereas the decision to abandon an off pump coronary artery graft procedure and go onto bypass will likely rest with the surgeon. There is, therefore, a lack of redundancy in the system, and greater challenges in communication and coordination. While it is widely recognized that a nuclear power plant is complex and tightly coupled, it is much less well appreciated that an anesthetized patient has similar system characteristics (reflected in the closer proximity of an anesthetized patient to a nuclear plant than to an aircraft in Figure 1).<sup>7</sup>

## Technological Intensification

A further important source of complexity in anesthesia comes from the rapid development of the technology seen in recent years. Well designed technology can promote de-intensification (movement in direction B, Figure 1), but technological innovation more typically occurs through a process of intensification (movement in direction A, Figure 1), in which desired aspects of a technology are successfully increased or intensified over time. Each new model of a device tends to be more complex, and have more features, capacity, speed, or power than the last. However, the process of adopting iteratively more potent versions of what has gone before can have disadvantages. Increasingly intensified technologies can lead to increased hazards with the potential for unintended outcomes that detract from, or negate, the intended benefits of the innovation itself (“revenge effects”).<sup>8</sup> In addition, with successful technology, the number of indications for its use tends to increase, thus exposing more individuals to any risk involved.

Transesophageal echocardiography (TEE) has provided new, rapidly available information and improved management in adult cardiac surgical patients. Indications for intraoperative TEE have increased over the past decade along with improved image resolution. However, TEE has been associated with complications to the gastroesophageal system including esophageal perforation, bleeding and thermal injury, and poor decision making on the basis of misinterpretation of the information obtained.<sup>9,10</sup> Distraction from the primary task of vigilant monitoring of the patient may also occur. In a similar way, a generation ago, the Swan-Ganz catheter

was widely adopted into cardiac surgical care, before becoming associated with a number of side effects.<sup>11</sup> In both cases, increased expertise is required, but the adoption of these technologies has not necessarily been accompanied by appropriate and formalized training.<sup>12-15</sup>

## Technological Deintensification

Rational use of a technology with known complications is the most obvious and probably the simplest approach to increasing patient safety.<sup>16</sup> In terms of the Perrow space such an approach de-intensifies the system by effectively pushing the system of the anesthetized patient in the direction of the arrow marked B in Figure 1. However, even this simple approach requires good quality data on which to base estimates of risk. Incident reporting provides an important method of identifying hazards; in anesthesiology and medicine generally, it tends to be poorly used in comparison with other high-technology industries, and often only accidents are reported, and near misses neglected.<sup>17,18</sup> For example, the threshold for the reporting of incidents in the nuclear power industry is much lower than in anesthesiology—an accident precursor is reported if it has an estimated probability of as little as 1 in 1 million of causing damage to the reactor.<sup>19</sup> Better reporting of near misses in anesthesiology would allow more risks to the patient to be identified before harm occurs.

Incident reports can also be used to identify poorly designed and error-prone aspects of technology, allowing redesign to de-intensify the system. In anesthesiology convincing evidence exists to suggest that systematic approaches to improve the labeling of drugs, color-coding, automated identity checking, and drug layout and organization, can significantly reduce error.<sup>1,20-22</sup> These approaches de-intensify the system of drug administration by reducing complexity, improving organization and layout, and through better checking—which provides more opportunities to intercept an incorrect action before an error occurs.

Anesthesiology is an inherently intensified discipline because its activities and technology are both highly complex and tightly coupled. Redesign to de-intensify critical aspects of systems and equipment has underpinned the widely acknowledged gains in patient safety that followed engineering and monitoring solutions to the problem of failing to administer oxygen to patients.<sup>23,24</sup> The need for ongoing surveillance through incident reporting is as important today as it ever has been, to address the legacy of poor design which still characterizes some aspects of anesthesia practice (notably IV drug administration<sup>17</sup>), and to counter the effects of the technological intensification which has tended to characterize progress in this discipline.

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## Q&amp;A

# Reducing the Risk of Defibrillation Fires

## Q Dear Q&A,

Recently, we conducted a simulation in which a patient in the surgical ICU, who was on a ventilator at the time, needed to be defibrillated. When the students involved in the simulation defibrillated their patient, the instructor told them, "You just blew yourselves up," ostensibly because they left the patient connected to the ventilator. I have participated in numerous code situations in the ICUs over the years, and I never witnessed anyone being "blown up," despite being on a ventilator while they were being defibrillated. Is this instructor giving the students incorrect information?

Lenny Wade  
Chicago, IL

## A Dear Mr. Wade,

We agree that it is highly unlikely that the students or the patient would have been blown up or have been the victim of an explosion. However, it is possible for a number of factors to work together and produce a fast, large fire. In the small, crowded space of an ICU room or ambulance this can be a frightening and potentially harmful event to the patient and staff.

The ECRI Institute has learned from its 30 years of investigations that fires during defibrillation can occur when a source of high oxygen concentration (above 50% oxygen) is near the defibrillation site (within 30 cm) during defibrillation, **AND** when defibrillation produces an electric arc. Leaving the patient connected to a ventilator during defibrillation can be done safely if exhaled gases and other sources of oxygen are vented away

from the patient. However, there is a small risk of a sudden, acute increase in peak airway pressure and possibly barotrauma if the ventilator should cycle during the shock, but the risk of barotrauma should be mitigated by the high pressure limit features of the ventilator. If the patient is left connected, the ventilator should likely be paused. In the event that the ventilator is paused, a person should be assigned to only operate the ventilator and restart ventilation after defibrillation. Hypoxia following lack of ventilation resulting from not remembering to turn the ventilator back on is a dangerous possibility and must be averted.

The ECRI Institute has noted cases in which the breathing circuit containing a high oxygen concentration was disconnected and laid near the patient, flooding the chest area with oxygen. Clearly this can lead to a fire if an electric arc is produced between the paddle or pad and the patient. The arc in the presence of a high concentration of oxygen with nearby combustible material such as hair and fabric fibers will cause a fire that will burn the patient.

For example (*Health Devices* Jan 2003; 32[1]: 12 with permission):

*A patient went into cardiac arrest while on a ventilator and was defibrillated. Just before defibrillation, one of the responding staff disconnected the breathing system from the patient and left the open end flowing O<sub>2</sub> onto the bed near the patient's upper chest. The defibrillation discharge resulted in a visible arc, possibly because the patient was thin and had prominent ribs and the paddles were not applied with enough force to make a large low resistance contact area with the patient's skin. This arc caused a fire to flash*

*across the patient, who had copious chest hair, and across the bed to the O<sub>2</sub> source. The breathing system caught fire and was not extinguished until the ventilator was shut off. The patient was only slightly burned, but subsequently died of cardiac arrest.*

The ECRI has published numerous accounts of defibrillator fires during the past 4 decades.<sup>1,2</sup> In many cases, defibrillation was accomplished successfully in the presence of high oxygen concentrations because the pads or paddles made good electrical contact with the skin and there was no arcing. When the pad or paddle was placed improperly, such as the pad not fully in contact with the skin, or the paddle placed on a bony prominence, an electric arc can occur during the discharge. In room air, this is not a problem. However, if the local oxygen concentration is greater than room air, then body hair and fabric fibers can be ignited by the arc and spread into a large fire. There is a little known phenomenon in which the fine body hair (vellus) or fabric fibers burn and rapidly spread the fire, which becomes established along folds, edges, and corners of the fabric. The fire then flashes back to the source of oxygen usually setting it on fire as well.

One way to potentially improve patient contact with gel pads, used by some Emergency Department physicians, is to place a pad then rip it off. This will remove the body hair and allow a second gel pad to be placed in good contact with the skin. Gel pad directions typically say shave the area in which the pad will be placed, but that might not be a timely option.

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Numerous questions to the Committee on Technology are individually and quickly answered each quarter by knowledgeable committee members. Many of those responses would be of value to the general readership, but are not suitable for the Dear SIRS column. Therefore, we have created this simple column to address the needs of our readership.

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## Q&amp;A

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In summary, we agree with the American Heart Association 2005 Guidelines for CPR and ECC, which conclude that, "Severe fires have been reported when ventilator tubing is disconnected from the tracheal tube and then left adjacent to the patient's head, blowing oxygen across the chest during attempted defibrillation," and that rescuers "should . . . try to ensure that defibrillation is not attempted in an oxygen-enriched atmosphere." Disconnecting the patient from the ventilator may be more hazardous than leaving the patient connected if the breathing circuit creates an increased oxygen concentration at the sites where the defibrillator contacts the patient. Gel pads are preferable to paddles<sup>3</sup> due to the likelihood of better lower resistance connection with the skin, but in any case the rescuer should always ensure that paddles or pads make good contact with the patient's skin.

*The Committee on Technology  
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**Letter to the Editor:****Label Similarity Masks the Presence of Preservative****To the Editor:**

We would like to report 2 look-alike medications. The purpose is to decrease the likelihood that accidental epidural injection by similarly packaged medications. The medications were local anesthetic vials of lidocaine HCl 2% with epinephrine 1:200,000 for "infiltration and nerve block including epidural and caudal"; and lidocaine HCl 2% with epinephrine 1:100,000 for "infiltration and nerve block" (NOT FOR EPIDURAL OR CAUDAL USE).

These 2 look-alike medications were found in the labor and delivery suite of our institution where they are used typically for cesarean sections. The primary difference in the medications was the "multiple dose" indication for the lidocaine 2% with epinephrine in the 1:100,000 concentration. The preservative in this vial was methylparaben 1 mg.

Although the manufacturer lists the medications as separate for indications, it is interesting to note that methylparaben as a preservative has not been suggested to be non-toxic when given spinally in small doses.<sup>1,2</sup>

A concern over accidental epidural use of the "multiple dose" vial with the methylparaben preservative for epidural analgesia is what initiated this letter. Our hope is that other anesthesiologists and providers will be made aware of these differences.

*Sincerely,*

*David Kim MD*

*Ihab Kamel MD*

*Temple University School of Medicine  
Philadelphia, PA 19140*

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*Read the fine print! Vial on left is preservative free local anesthetic approved for neuraxial anesthesia; look-alike vial on right is the same local anesthetic with methylparaben preservative.*



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### In Memoriam

In memory of E. H. Boyle, MD

(Philip F. Boyle, MD)

In memory of Hank Davis, MD

(Sharon Rose Johnson, MD)

In memory of Steve Edstrom, MD

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## Letter to the Editor

# Anesthesiologists Should Not Shoulder the Burden Alone

### To the Editor:

The image of the Titan Atlas holding planet earth on his shoulders comes to mind when thinking about the issue I wish to discuss here: is postoperative visual loss (POVL) after surgery and specifically after spine surgery an anesthetic issue? Is POVL an anesthetic complication *per se*?<sup>1,2</sup> Tremendous effort and resources have been placed to attempt to elucidate and therefore control some of the factors associated with this complication in an effort to decrease this devastating consequence of spine surgery, but there are still more questions than answers.<sup>3</sup> Medico-legally this has tremendous implications, and although I am glad and proud that anesthesiology as a specialty has taken a leading role in trying to prevent and treat this condition, I am not so content that it seems that we are like Atlas, "holding the planet on our shoulders." Our contribution to the prevention and treatment of the pathophysiological effects of the prone position is very important but limited.<sup>4</sup> We have no control over

some of the variables that seem to be of importance: size and weight of the patients, coexistent diseases like diabetes and peripheral vascular disease, and last and not least surgical factors: are we responsible for factors like extent of bleeding and/or duration of surgery? How often do we have to discuss (dare I say argue) with our surgical colleagues about the need to transfuse patients during spine procedures? What about issues of induced hypotension? When we are asked to lower the BP for surgical reasons, are there any real anesthetic advantages of doing this or do we do it because of surgical issues? Are most surgeons really open minded to even discuss staged procedures? I could go on and on. The bottom line is that I believe surgical and surgeon factors should be heavily scrutinized and the issue of POVL should be viewed as a shared responsibility between surgeons and anesthesiologists. We should continue to study and lead the research in this field to attempt to establish and treat the etiological factors associated with

this dreadful complication, but we should not be in this alone and surgeons should be not just interested as I am sure they are, but should play an active role in this topic that obviously impacts their patients and them as well.

Felipe Urdaneta  
Gainesville, Florida

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## ANNOUNCEMENT: REQUEST FOR PROPOSAL

The Anesthesia Patient Safety Foundation (APSF) is announcing its intent to publish a Request for Proposals (RFP) to be due February 1, 2010, to undertake research to understand the nature and potential etiological factors of unexpected neurocognitive deficits in patients undergoing general anesthesia during surgery in non-supine positions. There have been increasing reports of severe neurological injury in previously healthy patients having surgery in head-above-heart positions (e.g., shoulder surgery in the beach chair position) but the incidence and mechanisms are unknown. APSF believes this is a major patient safety issue that warrants rigorous study.

- APSF intends to provide up to \$200,000 for a period not to exceed 2 years.
- The proposed study should be a prospective observational clinical trial with a matched and/or parallel control group (i.e., similar patients having similar surgery in the supine position). The use of validated preoperative and postoperative neurocognitive tests will be required. Additional intraoperative and postoperative testing (e.g., neurological function monitoring, biomarkers) may be required or encouraged.
- The proposals will be evaluated by a scientific review committee selected by APSF. Proposals will be assessed for merit based primarily on their likelihood of meeting the contractual objectives outlined in the RFP as well as the proposed study's scientific rigor, innovation, and cost-effectiveness.
- The principal investigator must be an experienced scientist from a North American institution.
- A contract mechanism will be used and funds will be awarded to a single institution.
- Funding will be contingent on acceptable modifications to the proposal based on feedback from the APSF review committee as well as appropriate IRB and institutional approvals.

Please contact Robert K. Stoelting, MD, President of APSF, at [Stoelting@apsf.org](mailto:Stoelting@apsf.org) for the official RFP  
(anticipated availability date November 15, 2009)



Letter to the Editor:

# Opiates May Influence Cancer Outcome

**To the Editor:**

I read with great interest the article by Professor Marcel Durieux on the implications of anesthetic management and cancer recurrence,<sup>1</sup> a concept that is becoming increasingly important, and I concur with his conclusions that the intriguing epidemiologic evidence presented in the *Newsletter* merits further intensive study.

Professor Durieux focuses on either the direct (i.e., mediated through local anesthetics) or indirect (i.e., mediated by their effect on reduction of stress hormones) effects of epidural or regional anesthesia as an explanation for the differences in cancer recurrence observed in 2 retrospective studies. An alternative explanation relies on the proangiogenic effects of opioids. He briefly refers to the possibility that mu opioids could have an effect on angiogenesis as proposed by Dr. Gupta and her study in breast cancer tumor growth.<sup>2</sup> Our group has investigated the effects of opioids on models of angiogenesis and demonstrated that mu agonists in clinical concentrations trans-activate the VEGF receptors, and that opioid-induced angiogenesis is blocked by naloxone and the peripheral opioid antagonist methylnaltrexone.<sup>3</sup>

One randomized trial of patients receiving either intrathecal or comprehensive, i.e., systemic opiate cancer care, showed a dramatic difference in survival in those patients receiving intrathecal opiates.<sup>4</sup> If there is an effect of opioids on tumor growth or recurrence, it may be particularly manifest in the perioperative period as there is no compelling clinical evidence that either opiates or opiate antagonists affect the development of new tumors. We examined this hypothesis in a study of new tumors from patients receiving methadone maintenance or chronic implanted

naltrexone. Although the study was retrospective and small, some 4,000 patient years in all, we did not see a signal suggesting an effect of methadone or naltrexone on the development of new tumors.<sup>5</sup> That an effect on tumor growth or recurrence is manifest in the perioperative period is further suggested by a very recent article demonstrating perioperative stimuli that activate disseminated tumor cells.<sup>6</sup>

One possible explanation for a selective effect during tumor surgery may reside in the effect of opioids on endothelial cell barrier integrity.<sup>7</sup> We have recently demonstrated that mu opiates, in doses which can be used clinically, can alter the integrity of the endothelial barrier *in vitro*. Thus, when cells may be shed into the circulation during surgery, the endothelial barrier integrity may not be intact.<sup>7</sup> A recent clinical report suggests such an effect of opiates on endothelial barrier function.<sup>8</sup> Such an explanation would explain the disparate findings that were observed in the epidemiologic studies during surgery and the observation that chronic opiate use does not increase the risk of cancer.

We would concur with Professor Durieux that this is an area which needs more complete investigation. The ability to vary the anesthetic regimen, or potentially to incorporate peripheral opiate antagonists to attenuate the proangiogenic effects of endogenous or exogenous opioids during surgery, represents an exciting new area for anesthesia.

Jonathan Moss, MD, PhD  
Professor and Vice Chairman for Research  
Anesthesia and Critical Care  
Professor of the College  
University of Chicago  
Chicago, IL

Dr. Jonathan Moss serves as a paid consultant to Progenics Pharmaceuticals, has a financial interest in MNTX as a patent holder through the University of Chicago, and receives stock options from Progenics.

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## APSF Highlights Past and Future Initiatives in Patient Safety at the August 2009 AANA meeting in San Diego, CA



Left to right: Current AANA President James Walker, CRNA, DNP; Maria Magro, CRNA, MS, MSN; Ken Plitt, CRNA, MS, MBA; immediate past AANA President Jackie Rowles, CRNA, MBA, MA, FAAPM; Rodney Lester, CRNA, PhD; Casey Blitt, MD; John O'Donnell, CRNA, DrPH; Kevin Cardinal, CRNA, MS.



Letter to the Editor:

# Readers Explore Relationship of Anesthesia to Cancer Outcomes—Authors Offer Reply

**To the Editor:**

In the winter 2009 *APSF Newsletter*, Dr. Durieux indicates in the lead article that based on the literature, general anesthetic agents depress immune function, and are implicated in increased cancer morbidity and mortality.

How long would general anesthetics depress immune function after an anesthetic is concluded?

Is this immune depression as brief as the anesthetic or a short time after that? If so, why would that brief duration of immune depression have significant *ongoing* impact on immune function, such that tumor growth would be enhanced and cancer morbidity and mortality increased?

Are the patients receiving general anesthesia for cancer surgery generally a more ill patient population to start with?

If so, could it be perhaps that such patients have a poorer preoperative prognosis anyway, such that the relationship between increased cancer related morbidity and mortality is *associated with, but not caused by* the general anesthetic?

I would appreciate Dr. Durieux answering these questions since they would aid in my and perhaps others' understanding of the mechanisms involved in increased cancer-related morbidity and mortality after general anesthetics.

Lee A. Balaklaw, MD  
Louisia, KY

**To the Editor:**

We read with interest the article by Dr. Durieux in the Winter 2008-2009 *APSF Newsletter*. We are anesthesiologists at the UT MD Anderson Cancer Center in Houston and have recently published the results of our investigation of whether aprotinin decreased blood loss when employed for the operation of extrapleural pneumonectomy. This prospective, randomized and blinded study not only found that aprotinin, despite its current disfavor in cardiac surgery, decreased blood loss; it also significantly improved the survival of these mesothelioma patients. All

investigators felt that publication in the cancer literature was preferable to the anesthesia literature due to the implications for treatment of cancer patients. Incidentally, this study also suggests that surgical and oncologic studies that do not control for anesthesia type may be incorrect in their results and interpretation. We are all members of UTMDACC's Thoracic Anesthesia group and are cross-appointed to Thoracic and Cardiovascular Surgery.

Peter H Norman, MD, FRCPC  
Dilip R. Thakar, MD  
Ronaldo V. Purugganan, MD  
Houston, TX

**In reply:**

We thank Drs. Balaklaw, Norman, Thakar, Purugganan, and Moss for their insightful comments on our article. As to the question regarding the duration of the immune suppression by anesthetics: their effect is likely to be brief (i.e., not exceeding by much the duration of administration). Effects of surgery on the immune response may last from hours to days, depending on the invasiveness of the procedure. However, it should be realized that even brief suppression may have long-term consequences. If transient inhibition of NK cell function allows a cancer cell, released during surgery, to find a foothold, or if several hours of decreased immune surveillance allows a micrometastasis to escape from control, this can have devastating eventual consequences. As emphasized by Dr. Moss, the effects of opiates on angiogenesis may be particularly damaging, and these drugs are commonly administered for days.

As to the issue of causality vs. association: in the largest retrospective studies demonstrating benefit of regional anesthesia, patients received regional anesthesia in addition to—not instead of—general anesthesia. But still, the question as to causality cannot be conclusively answered with the current data, since all of it is retrospective. Multivariate analysis of the retrospective studies attempts to compensate for possible confounders (such as the patients in one group being more sick than those in the other), but it cannot provide the same degree of confidence as a prospective, randomized, controlled trial can do. Several of such trials are in progress, but given the nature of the question, it will be years before we will have a definitive answer.

Antje Gottschalk, MD  
Marcel Durieux, MD PhD  
Mohamed Tiouririne, MD

## PLEASE NOTE

**Effective with the Spring 2010 issue, the *APSF Newsletter* will become an **all-electronic publication**.**

**Routine hard copy publication will cease as of the Winter 2009-2010 issue. Please be sure your affiliated organization (ASA, AANA, AAAA, ASATT, etc.) has your accurate email to ensure your continued receipt of the *Newsletter*.**

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Check out the Reader's Poll  
on the APSF Website at**www.apsf.org***Give your opinion on timely issues.*Paulsen to Assume Interim Chair  
of the Committee on Technology

A. William Paulsen, MMSc, PhD, CCE, AAC, the current vice chairman of the Committee on Technology of the APSF, will assume the role of Interim Chair on October 17 during the meeting of the Committee. Dr. Paulsen will serve under the mentorship of the current chairman, Dr. Michael A. Olympio, who will retire from the Committee on Technology and the APSF at the February 6, 2010, meeting of the Executive Committee. Paulsen is a Certified Anesthesiologist Assistant, physiologist, engineer, and biophysicist and was recently named Dean of the School of Health Professions of South University in Savannah, Georgia. He has been chairman of the Department of Anesthesia Sciences there for many years. He also holds an appointment as clinical professor of anesthesiology with Mercer University School of Medicine and has an impressive background in medical technology issues. Dr.

Paulsen's work with APSF began in 2005, and he quickly rose to vice chairman in September 2007. His primary responsibilities have included the popular Q&A column, where he serves as editor, several technology safety initiatives, and co-direction of several meetings of the Committee on Technology. Recently, Paulsen led the anesthesia machine safety checkout station at the joint SEA-APSF meeting in Seattle. A native of Georgia, Dr. Paulsen was educated at Emory University and the Georgia Institute of Technology, and he received his Doctorate in physiology and biophysics under the famed Arthur Guyton at the University of Mississippi. Along with his formal education and degree in clinical engineering, Dr. Paulsen is well suited to serve as interim chair. His impressive accomplishments and CV may be viewed on the APSF web site at [www.apsf.org](http://www.apsf.org).

With Dr. Olympio's planned retirement from the APSF, he and the Executive Committee (EC) have developed an aggressive campaign to recruit the finest and brightest new leadership of the Committee, beginning with Dr. Paulsen's transitional leadership. Existing and newly recruited members of the Committee, including Dr. Paulsen, will learn more about the specific leadership responsibilities from Dr. Olympio during the October 17 meeting, will continue to receive mentorship, and will have the opportunity of consideration for the chairmanship by the EC during 2010. The new chair position is expected to be named by October 2010.



# "Wake up Safe"—Wrong Sided Cases Reported to Registry

by Donald C. Tyler, MD, MBA

Wake up Safe, a component organization of the Society for Pediatric Anesthesia (SPA), is a newly formed Patient Safety Organization (PSO), listed by the Agency for Healthcare Research and Quality (AHRQ), and partially supported by the Anesthesia Patient Safety Foundation (APSF). The goal of Wake up Safe is to create a registry of significant adverse events that occur during pediatric anesthesia, to learn from the events, and to disseminate suggestions for improvement.

Five cases of wrong side procedure were recently submitted to the registry. These events all occurred during the year 2008. There were 2 wrong side regional blocks and 3 wrong side surgical procedures. Although the registry was not yet fully functional in 2008, the approximate yearly case total was 145,000 for the institutions reporting; thus, the incidence of wrong side procedures among the reporting institutions was 1/29,000 anesthetics. Although the incidence seems high, there is also a high incidence of wrong side surgery and blocks reported in Pennsylvania,<sup>1</sup> and also in the United Kingdom.<sup>2,3</sup>

The reports indicate that for the wrong side blocks there was no formal "time out" prior to the block. For the surgical procedures, although the universal protocol was in place, it was not strictly followed. Several protocol violations were noted, including the side of the procedure not indicated on the consent, the site

marking not visible after the patient was prepped and draped, and failure to display appropriate images.

After review of these cases the following points can be made:

1. Wrong side procedures can and do occur in leading pediatric hospitals.
2. A formal "time out" is necessary prior to regional anesthesia procedures.
3. Having a universal protocol for procedures is not enough. The protocol must be followed. Failure to follow protocol is a common problem in the Pennsylvania reports.<sup>4</sup>
4. Teamwork among nurses, anesthesiologists, and surgeons is an important component in preventing wrong side procedures.

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Dr. Tyler is an associate Professor of Anesthesiology and Critical Care at the Hospital of the University of Pennsylvania and the Children's Hospital of Philadelphia and chair of the Quality and Safety Committee of the Society for Pediatric Anesthesia.

## 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.

# References Provide Background For Technology Concerns

## "Technology," From Page 35

Dr. Stabile is an Adjunct Clinical Professor, Vanderbilt University School of Medicine, Nashville, TN, and St. Louis University School of Medicine, St. Louis, MO.

Dr. Merry is Professor and Head, Department of Anaesthesiology, School of Medicine, University of Auckland, Auckland, New Zealand; and specialist anesthesiologist, Auckland City Hospital, Auckland New Zealand.

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