MESSAGE FROM THE CHAIR  
-SCOTT REEVES, MD, MBA

In May, I had the honor along with Brenda Dorman of taking two of our residents, Drs. Caroline McKillop and Jerrell Brown to the ASA Legislative Conference in Washington D.C. Along with others from the South Carolina delegation, we had the opportunity to speak with many of our congressmen and their healthcare legislative assistants. Healthcare reform is on everyone’s minds this year and a priority for both the Administration and Congress. Several issues were key to our visit:

1. Creating a balanced universal access system with appropriate payment reforms.
2. As part of the expected payment reform, we stressed the absolute requirement to revise the Medicare SGR formula and its effects on anesthesiology.
3. As is already occurring in South Carolina and at MUSC via the Lewis Blackman law, we stressed Truth and Transparency legislation to insure appropriate patient knowledge about their healthcare providers training.
4. Improve pain care for all Americans through increased research funding and training.

It is my expectation that this will be the first of a long series of return visits to Capitol Hill. Our group invited our legislators to visit us on campus. Hopefully many will take us up on our offer.

Finally, this issue of Sleepy Times will concentrate on the department’s patient safety initiatives including OR fire safety, beta blocker usage, and antibiotic regimen. Please review this important information.

JOANNE CONROY, MD CHIEF HEALTH CARE OFFICER

I often ask myself, “What do you do after being a department chairman?” For Dr. Joanne Conroy, MUSC departmental chair from 1996-2001, the answer is to become the Chief Health Care Officer for the Association of American Medical Colleges (AAMC). In this crucial role, she will have the opportunity to influence healthcare policy at the medical school and university level. It is great having a MUSC alumni and anesthesiologist in such a prominent national position. A few of us had the opportunity to have dinner with her and pick her brain on issues facing residency training. Look for her to address the department this year as part of our Grand Rounds Lecture series.
SLEEPY TIMES

SCA FOUNDATION FOCUS UPDATE

It took a while but all of the 5 initial sites have been visited and observed. The data gathered from survey instruments distributed prior to site visitation, extensive interviews with the entire operating room team and on-site observations are currently being analyzed. Amazingly, it takes the Johns Hopkins team 3-5 days to input the observations from one case into the qualitative data analysis software – much longer than I ever thought. The John’s Hopkins team, lead by Dr Peter Pronovost, tells us that “the data are very rich, and full of possibilities for interventions to improve patient safety – ones that can be done relatively easily and soon, and some that will take more earnest work.” From conversations with them and the little bit of data presented at the SCA, we can surmise there is a great deal of low hanging fruit, lots of room to improve. How do I interpret this? As great news. We all see ourselves as practicing safe medicine, and, in fact, based upon overall morbidity and mortality, we do. But, I suspect that FOCUS will teach us that we can do much better – and relatively easily!

While we await the results from our early work, we are planning the next steps. Clearly 5 carefully chosen sites could not represent the entirety of cardiac anesthesia and surgery. More sites (5-20 more) will be chosen and studied using the same LENS methodology used at MUSC. At the same time more sites are studied, a self-study program will be initiated. The self-study program will utilize the information gathered from our site visit, combined with the others, to develop a scientific, data driven medical and sociological method of evaluating and improving the safety of cardiac anesthesia and surgery. It is my hope that MUSC can participate in this next phase. In the next 12 months we should expect to see recommendations from the FOCUS project on best practice in cardiac surgery.

As the project gains momentum it also is gaining international and national recognition that we should all be proud of. For the most recent press release go here, http://www.scahqgive.org/news_details.asp?id=22. Additionally, key partnerships are being forge with the Society of Thoracic Surgeons, American Association for Thoracic Surgery, American Society of Extracorporeal Technology, and the Association of Operating Room Nurses. Improving safety is a team effort and it will take us all to be successful. The FOCUS initiative is still young and MUSC has been and continues to be at the forefront of this initiative.

Jake Abernathy, MD

INTRAVENOUS INSULIN PROTOCOL IN DIABETES AND RENAL TRANSPLANTATION

The purpose of the study is to evaluate the effect of intensive glycemic control using an intravenous insulin protocol in the peri-operative, immediate post-operative, and outpatient period of renal transplantation.

It is a single site pilot study being conducted at MUSC with a total of 90 participants. The ADA Grant research team is investigating to see if intensive glycemic control pre – operative, peri-operative, immediate post-operative and outpatient time periods will improve the outcomes, such as graft survival, in these renal transplant patients.

Patients are enrolled upon admission to MUSC for a kidney transplant and randomized by computer to the INTENSIVE or the CONTROL group arm of the study. The ADA insulin protocol begins for either group participant at the time anesthesia is induced.

In the OR, the INTENSIVE group study participant receives insulin via IV drip utilizing the Intravenous Insulin Infusion Calculator (IVIIC) when blood glucose levels are > 110mg/dL until 0700 POD # 3. Blood glucose levels are checked and recorded every 30 minutes in the OR and every hour in the PACU. These blood glucose checks and recordings are to be conducted even if blood glucose levels do not rise above 110 mg/dL. The blood glucose target for this group is 70 -110 mg/dL.

In the OR, the CONTROL group study participant receives insulin subcutaneous (SC) when blood glucose levels are > 140mg/dL. Blood glucose levels are checked and recorded every hour in the OR and every 4 hours in the PACU. These blood glucose levels checks and recordings are to be conducted even if blood glucose levels do not rise above 140 mg/dL. The blood glucose target for this group is 70 – 180 mg/dL.

The study will significantly and positively effect kidney transplantation and diabetes outcomes. Presumably, good blood sugar control at the time of kidney transplantation will improve overall survival of the new kidney, and these results may reshape patient care in this setting.

This is a multi-collaborative study involving Endocrinology, Anesthesia, Transplant Surgery, Nephrology, Pharmacy, Nursing and Biostatistics.

Kathie Hermayer, MD, MS, FACE, is the Primary Investigator who is conducting a Clinical Research Award Foundation Grant from the American Diabetes Association with funding for 3 years (7/01/07 – 6/30/10). The study coordinator is Shari Biggins, BSN, RN.

Kathie Hermayer, MD, MS
GOLDEN GRADS

The Medical University of South Carolina honored a distinguished group of alumni who graduated 50 years or more years ago at the 180th commencement on May 15, 2009. Pictured to the left is former anesthesiology resident and medical school class of 1959 graduate Eloise Adcock Bradham along with Dr. Reeves.

MEET THE NEW PRE OP NURSE PRACTITIONERS

Anne Brennan has been a nurse practitioner for over 30 years with experience in pediatrics and adolescent care, women’s health, trauma and sexual assault. For the past 8 years she has been the Medical Manager of the Trauma Recovery/Rape Treatment Program for the City of San Francisco overseeing the care of sexual assault clients including medical evaluation and treatment, forensic evidence collection, and expert medical testimony. She was the Co-Chair of the Adult Sexual Assault Task and the San Francisco Sexual Assault Response Team (SART). She was also the founder and Chair of Bay Area SART, coordinating sexual assault response, continuing education and peer review across 6 counties in the Bay area.

Anne moved to the Charleston area in May with her husband. She has a son who is a senior at New York University studying International Politics and a daughter who is a junior at Tulane in pre-med. She enjoys running, white water canoeing and sailing.

Heather Halford has been a Family Nurse Practitioner for 9 years. After graduating from the Duke University FNP program with a Master's in Nursing, she worked in Heart Transplant and then in Family Practice. She moved to Charleston five years ago with her husband who took an attending position in Neurology here at MUSC. For the past few years she has worked part-time and been home with her two children, Benjamin (5) and Charlotte Grace (3). Her family enjoys sitting on the beach, reading together and traveling. She feels very fortunate to be back at work in a University hospital setting and is excited to learn about anesthesia and the patient population we serve.

MESSAGE FROM THE PAIN CLINIC

I recently read an article by an oncology nurse struggling with a patient diagnosed with aggressive lymphoma. The article, “Doctors and Nurses, Still Learning” states at times crucial information, which can make a difference in patient care, falls through the cracks. In the ambulatory setting crucial information must be shared doctor to doctor; doctor to nurse, and nurse to doctor. The article continues stating: to achieve effective outcomes nurses and doctors learn from each other and states doctors who are willing to educate makes a difference. The nurses have witnessed on a daily basis the commitment of the Senior Residents to educate.

We would like to acknowledge our Senior Resident Physicians for their daily commitment to excellence. Everyday you made a difference!!

Dr. Stoll  Dr. Gardner
Dr. Theruvath  Dr. Pourmand
Dr. Chaplin  Dr. Sarti
Dr. Clay  Dr. Tobin
Dr. Dick

Cynthia Fitzgerald, RN
ASA Legislative Update

On May 4th-6th, Caroline McKillop and I had the privilege of attending the American Society of Anesthesiologists (ASA) annual Legislative conference with Dr. Scott Reeves and Brenda Dorman. The ASA Legislative Conference is our specialty’s largest meeting focusing on state and federal legislative, regulatory and political issues impacting ASA and anesthesiology. The conference was an eye opening experience for me. In just three days we heard from several outstanding speakers (including the Honorable Frank Pallone Jr. Chairman of Subcommittee of Health for the US House of Representatives). We also discussed several key issues impacting our specialty including health care reform and Medicare payment reform.

The first day of the conference included a newcomer’s session, which allowed first-timers to become acclimated to "The D.C. Political Environment" and understand the role of the ASA Political Action Committee (PAC). During this session we learned about several key issues affecting the ASA, our specialty (and its reimbursement), its lobbying organization, and the changing face of our health care reform. A significant amount of time on the second day of the conference was spent briefing attendees on ASA priority issues, teaching attendees how to speak with lawmakers and their staff about our specific concerns, and providing the appropriate literature supporting our concerns to our respective congressman. The third day of the conference was when we put everything we learned the first two days together. On the morning of the third day, we ended the informative portion of the conference and “set out” to meet our South Carolina Senators and Representatives from the US House to discuss the key legislative issues of our specialty.

During our Hill meetings, our legislators were very receptive to our specific specialty’s concerns and always greeted us with a warm welcome. In particular, Congressman Brown made a special effort to meet with MUSC staff, take pictures, and hear our concerns. The “Hill” meetings were eye-opening and gave me a greater appreciation for the ASA lobbyist and how politics work in Washington. It definitely made me more aware of the politics of medicine and how they will shape the way I practice once I complete residency training. I encourage everyone to learn more about healthcare reform, our respective lobbying organizations, and the politics of medicine. In the next couple of years, our specialty will change, the only question is whether we will help shape the change or stand by and accept it. - Jerrell Brown, MD, MPH
SUDAC Visiting Professor Program

At the recent Southeastern University Department of Anesthesiology Chairs (SUDAC) meeting held in Miami, a junior faculty visiting professor exchange program was initiated. MUSC was well represented in this initiative created by Drs. Jane Fitch, University of Oklahoma and Scott Reeves, MUSC. Dr. Livia Marica was the first faculty chosen to participate and she lectured at the University of Oklahoma in April. Her visit and lectures were very well received. The complete list of available MUSC faculty and topics include:

Jake Abernathy, MD  
Epicardial Echocardiography: From Adjunct to Mainstream

Tommy Burch, MD  
Strategy for Prevention and Diagnosis/Management of Pulmonary Embolisms

Rebecca Cain, MD  
Anticoagulation Guidelines and Complications for the Cardiothoracic Anesthesiologist

Larry Field, MD  
Sedation, Pain, and Delirium Management in the ICU  
Perioperative and ICU Stress Dose Steroids  
Advanced Ventilation Modes

Cory Furse, MD  
Emergence Delirium in Pediatrics

George Guldan, MD  
Cardiopulmonary Bypass: Past, Present and Future

Livia Marica, MD  
Opioids: Past, Present and Future  
Heart Transplantation

Matt McEvoy, MD  
Metabolic Syndrome and Morbid Obesity  
Perioperative Management of the Bariatric Surgical Patient  
ACLS and other Perioperative Events

Rick Smith, MD  
Chronic Regional Pain Syndrome

Tamas Szabo, MD, PhD  
Neuromuscular blockade: from curare to sugammadex

APPLAUSES

Dr. Matt McEvoy - appointed as Assistant Dean for Patient Safety and Simulation in the College of Medicine

Textbook Published: Atlas of Cardiothoracic Anesthesia, JG Reves, Scott T Reeves, James H Abernathy III editors

Chapter Contributors:

Cardiovascular Physiology: David Warters
Ischemic Heart Disease: Jaime Torres
Cardiac Valvular Disease: Kim Payne, Rebecca Cain, Scott Reeves
Electrocardiography and Invasive Monitoring of the Cardiothoracic Patient: Larry Field
Transesophageal Echocardiography Monitoring: James Abernathy
Cardiopulmonary Bypass: Jerry Reves
History, Practice Management, and Education: Jerry Reves, Jake Abernathy

Congratulations to Ellen McClellan for 35 years of service to the Department of Anesthesia. Her efforts have made a significant contribution to the quality of this department and we honor her for her dedication and service.
GUIDELINES FOR BETA BLOCKER USE IN THE PERI-OPERATIVE PERIOD

Purpose:

• To prevent adverse cardiac events due to beta blocker withdrawal
• To meet CMS – Surgical Care Improvement Project (SCIP) benchmarks

Procedure:

1. For patients that are on beta blockers prior to admission
   a. There must be documentation stating whether or not patients are on these medications (medication history)

2. For patients taking beta blockers as home or current medications, beta blocker use should be documented in the peri-operative period
   a. Peri-operative period is defined as the **24 hours prior to** surgical incision through discharge from the post anesthesia care/recovery area (PACU)
   b. the date and time the patient last took the beta blocker should be recorded in the chart

3. For patients who have not taken their beta blocker
   a. Consider administering at least 5 mg of IV metoprolol, unless a contraindication exists
   b. May repeat every 15 minutes for a total of 4 doses if necessary
   c. If contraindication exists, please document reason in patient’s chart

4. Contraindications may include:
   a. heart rate < 50 bpm
   b. SBP < 100 mmHg
   c. second or third degree heart block without pace maker
   d. sick sinus syndrome
   e. severe or decompensated heart failure
   f. cardiogenic shock
   g. symptomatic hypotension
   h. severe asthma
   i. severe peripheral arterial disease
   j. pregnancy (2nd and 3rd trimesters)
   k. hypersensitivity

IT’S A BOY!

Congratulations to Mari and Joe Whiteley
Jason Richard Whiteley
May 20, 2009
8 lbs. 1 oz.; 21 in.
**Antibiotic Regimen**

**INTRAOPERATIVE: Anesthesiology/Surgery Initiatives**

- Appropriate Prophylactic antibiotic received within one hour prior to surgical incision (within 2 hours for vancomycin or quinolone)
- If necessary, parameters established for antibiotic redosing and plan communicate to OR team.
- Appropriate hair removal (clippers), including documentation
- If on pre-op beta-blocker, received a beta-blocker during the perioperative period, including documentation

**Normothermia (>36.0°C) protocol (all IVFs warmed; warm touch)**

- Patient disposition post-operatively (PACU, PACU overnight, ICU, etc…)

**Prophylactic Antibiotic Regimen Selection for Surgery**

<table>
<thead>
<tr>
<th>Surgical Procedure</th>
<th>Approved Antibiotics</th>
<th>Hip/Knee Arthroplasty</th>
<th>Hysterectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG, Other Cardiac or Vascular</td>
<td><strong>Cefazolin, Cefuroxime or Vancomycin</strong>&lt;br&gt;or Clindamycin*&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong>&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong>&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong>&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong></td>
<td>Cefazolin or Cefuroxime or Vancomycin**&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong>&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong>&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong>&lt;br&gt;<strong>If β-lactam allergy: Vancomycin or Clindamycin</strong></td>
<td><strong>Cefotetan, Cefazolin, Cefoxitin, Cefuroxime, or Ampicillin/ Sulbactam</strong>&lt;br&gt;<strong>If β-lactam allergy:</strong>&lt;br&gt;<strong>Clindamycin + Aminoglycoside, or</strong>&lt;br&gt;<strong>Clindamycin + Quinolone or</strong>&lt;br&gt;<strong>Clindamycin + Aztreonam</strong>&lt;br&gt;<strong>OR</strong>&lt;br&gt;<strong>Metronidazole + Aminoglycoside, or</strong>&lt;br&gt;<strong>Metronidazole + Quinolone</strong>&lt;br&gt;<strong>OR</strong>&lt;br&gt;<strong>Clindamycin monotherapy</strong></td>
</tr>
<tr>
<td>Colon</td>
<td><strong>Cefotetan, Cefoxitin, Ampicillin/ Sulbactam, or Ertapenem†</strong>&lt;br&gt;<strong>OR</strong>&lt;br&gt;<strong>Cefazolin or Cefuroxime + Metronidazole</strong>&lt;br&gt;<strong>If β-lactam allergy:</strong>&lt;br&gt;<strong>Clindamycin + Aminoglycoside, or</strong>&lt;br&gt;<strong>Clindamycin + Quinolone, or</strong>&lt;br&gt;<strong>Clindamycin + Aztreonam</strong>&lt;br&gt;<strong>OR</strong>&lt;br&gt;<strong>Metronidazole with Aminoglycoside, or</strong>&lt;br&gt;<strong>Metronidazole + Quinolone</strong></td>
<td>Hysterectomy</td>
<td>Cefotetan, Cefazolin, Cefoxitin, Cefuroxime, or Ampicillin/ Sulbactam</td>
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</table>

**Special Considerations**

- *For cardiac, orthopedic, and vascular surgery, if the patient is allergic to β-lactam antibiotics, Vancomycin or Clindamycin are acceptable substitutes.*
- **Vancomycin is acceptable with a physician/APN/PA documented justification for its use (see data element Vancomycin)**
- † A single dose of Ertapenem is recommended for colon procedures.*
On March 23rd, a sixty year old female was having a bilateral temporal artery biopsy with local anesthesia and monitored anesthesia care. Oxygen was administered using nasal cannula at four liters per minute. Upon use of the electrocautery, there was a spark and a subsequent flame under the surgical drapes. The drapes were patted down by the surgeon, the fire was extinguished and the nasal cannula was removed. The patient had evidence of second degree burns to the right cheek.

It is ironic that this occurred about a month after an article appeared in the Wall Street Journal titled "In Just a Flash, Simple Surgery Can Turn Deadly". The article pointed out that there are estimated to be 650 surgical fires in hospitals annually in the U.S.

An analysis of closed malpractice claims by the American Society of Anesthesiologists shows that of 145 claims for burn injuries, 31% were from the use of electrocautery.

Fire requires the presence of three components: (1) an oxidizer, (2) an ignition source, and (3) fuel.

Oxidizers used in the OR are oxygen and nitrous oxide. An oxidizer-enriched atmosphere increases the likelihood and intensity of combustion. An oxidizer-enriched atmosphere commonly exists within closed or semiclosed breathing systems, including the patient’s airway. It can also be created locally when the configuration of the drapes and open oxygen sources such as masks or nasal cannula promote the trapping or pooling of oxygen or a mixture of oxygen and nitrous oxide.

Ignition sources are electrocautery devices, lasers, heated probes, drills and burrs, argon beam coagulators, fiberoptic light cables, and defibrillator paddles or pads.

Fuel sources include tracheal tubes; sponges; drapes; gauze; alcohol-containing solutions (e.g., certain prepping solutions); solutions containing other volatile compounds, such as ether or acetone; oxygen masks; nasal cannulae; the patient’s hair; dressings; ointments; gowns; gastrointestinal tract gases; blankets; suction catheters; flexible endoscopes; fiberoptic cable coverings; gloves; and packaging materials.

The modern operating room certainly is an environment that has all three elements in abundance. In 2008, the ASA published a practice advisory on preventing and managing OR fires. It is available on line at:

http://journals.lww.com/anesthesiology/Fulltext/2008/05000/Practice_Advisory_for_the_Prevention_and.6.aspx

Ideally practice advisories would be based on evidence from controlled studies. Unfortunately much of what we do has no solid evidence supporting it and there are some issues that will never be studied. As an example there will never be a study of patient outcome NOT using pulse oximetry. As a result many of the recommendations in a practice advisory are based on experts’ opinions and much of the verbiage in the practice advisories are descriptions of the process and legalese. Even though the practice advisory is sixteen pages long, it contains some real pearls.

One is the concept of a high-risk procedure which is defined as one in which an ignition source (usually electrocautery) may come in proximity to an oxidizer-enriched atmosphere thereby increasing the risk of fire. Examples of high-risk procedures include tonsillectomy, tracheostomy, removal of laryngeal papillomas, cataract or other eye surgery, burr hole surgery, or removal of lesions on the head, neck, or face.

The second pearl is the one page Operating Room Fires Algorithm. It sums up in one page pretty much all you need to know.

The third is an appendix that is a very comprehensive summary of fire prevention and management. Both the algorithm and appendix are included with this article.

So what should you do?

First is that we all should be vigilant about fire related issues in our environment. We should report doors that don’t positively latch, fire extinguishers that are obstructed, and other hazards. Know where the smoke zones are and where you will evacuate your patient to if necessary.

The entire OR team should periodically participate in OR fire drills during dedicated educational time. Rutledge Tower has already had a very realistic and well planned drill.
More importantly, fire prevention and management should be part of our anesthetic planning. Every time we begin an anesthetic we develop a mental list of the likely problems we are going to face and develop a management plan. The list will be different for different situations. Laryngospasm will be high on the list for a pediatric tonsillectomy and low on the list for a CAB. How we will manage our patient in the event of a general or patient OR fire needs to be on the list for every case.

For every case, we should participate with the entire OR team during the surgical time out in determining whether a high-risk situation exists. For all procedures:

- Surgical drapes should be configured to minimize the accumulation of oxidizers (oxygen and nitrous oxide) under the drapes and from flowing into the surgical site.
- Flammable skin prepping solutions should be dry before draping.
- Gauze and sponges should be moistened before use in proximity to an ignition source.

If a high-risk situation exists, all team members should take a joint and active role in agreeing on how a fire will be prevented and managed and the following steps should be taken to prevent a fire:

- The surgeon should be notified of the presence of an oxidizer enriched atmosphere.
- Use cuffed endotracheal tubes for surgery in the airway and laser resistant tubes if appropriate.
- Consider the use of an endotracheal tube or laryngeal mask airway for moderate or deep sedation or in oxygen dependent patients for surgery on the head neck or face.
- Before an ignition source is activated:
  - Announce the intent to use an ignition source
  - Reduce the oxygenation concentration to the minimum required to avoid hypoxia
  - Discontinue nitrous oxide

Also before a high risk procedure each OR team member should be assigned a specific fire management task to perform in the event of a fire (e.g., removing the tracheal tube, stopping the flow of airway gases). Each team member should understand that his or her preassigned task should be performed immediately if a fire occurs, without waiting for another team member to take action. When a team member has completed a preassigned task, he or she should help other team members perform tasks that are not yet complete.

My interest in OR fires began a couple of months ago when ART was to have a DHEC fire inspection. I was expected to accompany the inspector and viewed it as another bureaucratic chore.

I was surprised to find that it was a very interesting experience. The inspector was a pleasant young man who had a lot of interest in what went on in the ORs. He was very particular in what he was looking for and explained the reasons to me. He obviously wanted to see the fire extinguishers and to make sure that they were readily available. There was one that was blocked by some equipment and that was a no brainer. He checked to see that all the doors with automatic closing devices actually latched. The reason for this is to stop the pressure from a fire from blowing open a door and allowing the fire to spread more quickly.

An interesting sidelight of all this for me was when one of the operating room nurses pointed out that the fire extinguishers in the ART ORs were water based and not suitable for electrical fires. Fire extinguishers for the operating rooms are kind of tricky because chemicals cannot be used that will contaminate an open wound. Even though the practice advisory refers to carbon dioxide fire extinguishers, others say that carbon dioxide should not be used on a patient because it is too cold. Halon type extinguishers cannot be used because they displace oxygen. The ART OR fire extinguishers were replaced with ones that produce fine mist deionized water and are safe for patients. The extremely fine mist produced takes the heat out of a fire rapidly and the deionized water coupled with the fine droplets is non conducting and may not damage sensitive equipment not already damaged by fire.

Fires can and do happen. We play a key role in protecting the patients and need to take fire prevention very seriously.
OR FIRES CONTINUED

Appendix 1: Primary Findings of the Advisory Task Force

I. Education

- All anesthesiologists should have fire safety education, specifically for OR fires, with emphasis on the risk created by an oxidizer-enriched atmosphere.

II. OR Fire Drills

- Anesthesiologists should periodically participate in OR fire drills, with the entire OR team. This formal rehearsal should take place during dedicated educational time, not during patient care.

III. Preparation

- For every case, the anesthesiologist should participate with the entire OR team (e.g., during the surgical pause) in assessing and determining whether a high-risk situation exists.

- If a high-risk situation exists, all team members—including the anesthesiologist—should take a joint and active role in agreeing on how a fire will be prevented and managed.

- Each team member should be assigned a specific fire management task to perform in the event of a fire (e.g., removing the tracheal tube, turning off the airway gases).

- Each team member should understand that his or her preassigned task should be performed immediately if a fire occurs, without waiting for another team member to take action.

- When a team member has completed a preassigned task, he or she should help other team members perform tasks that are not yet complete.

- In every OR and procedure area where a fire triad can exist (i.e., an oxidizer-enriched atmosphere, an ignition source, and fuel), an easily visible protocol for the prevention and management of fires should be displayed.

- Equipment for managing a fire should be readily available in every procedural location where a fire triad may exist. IV. Prevention

- The anesthesiologist should collaborate with all members of the procedure team throughout the procedure to minimize the presence of an oxidizer-enriched atmosphere in proximity to an ignition source.

IV. Prevention

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For all procedures:

- Surgical drapes should be configured to minimize the accumulation of oxidizers (oxygen and nitrous oxide) under the drapes and from flowing into the surgical site.

- Flammable skin prepping solutions should be dry before draping.

- Gauze and sponges should be moistened before use in proximity to an ignition source.

For high-risk procedures:

- The anesthesiologist should notify the surgeon whenever there is a potential for an ignition source to be in proximity to an oxidizer enriched atmosphere or when there is an increase in oxidizer concentration at the surgical site.

- Any reduction in supplied oxygen to the patient should be assessed by monitoring (1) pulse oximetry and, if feasible, (2) inspired, exhaled, and/or delivered oxygen concentration.
OR FIRES CONTINUED

For laser procedures:

- A laser-resistant tracheal tube should be used.
  - The laser-resistant tracheal tube used should be chosen to be resistant to the laser used for the procedure (e.g., CO2, Nd:YAG, Ar, Er:YAG, KTP).
- The tracheal cuff of the laser tube should be filled with saline and colored with an indicator dye such as methylene blue.
- Before activating a laser:
  - The surgeon should give the anesthesiologist adequate notice that the laser is about to be activated.
  - The anesthesiologist should:
    - Reduce the delivered oxygen concentration to the minimum required to avoid hypoxia.
    - Stop the use of nitrous oxide.
    - Wait a few minutes after reducing the oxidizer-enriched atmosphere before approving activation of the laser.

For cases involving an ignition source and surgery inside the airway:

- Cuffed tracheal tubes should be used when clinically appropriate.
- The anesthesiologist should advise the surgeon against entering the trachea with an ignition source (e.g., electrosurgery unit).
- Before activating an ignition source inside the airway:
  - The surgeon should give the anesthesiologist adequate notice that the ignition source is about to be activated.
  - The anesthesiologist should:
    - Reduce the delivered oxygen concentration to the minimum required to avoid hypoxia.
    - Stop the use of nitrous oxide.
    - Wait a few minutes after reducing the oxidizer-enriched atmosphere before approving the activation of the ignition source.
- In some cases (e.g., surgery in the oropharynx), scavenging with suction may be used to reduce oxidizer enrichment in the operative field.

For cases involving moderate or deep sedation, an ignition source, and surgery around the face, head, or neck:

- The anesthesiologist and surgeon should develop a plan that accounts for the level of sedation and the patient's need for supplemental oxygen.
  - If moderate or deep sedation is required or used, or if the patient exhibits oxygen dependence, the anesthesiologist and surgeon should consider a sealed gas delivery device (e.g., cuffed tracheal tube or laryngeal mask).
  - If moderate or deep sedation is not required, and the patient does not exhibit oxygen dependence, an open gas delivery device (e.g., face-mask or nasal cannula) may be considered.
- Before activating an ignition source around the face, head, or neck:
  - The surgeon should give the anesthesiologist adequate notice that the ignition source is about to be activated.
  - The anesthesiologist should:
    - Stop the delivery of supplemental oxygen or reduce the delivered oxygen concentration to the minimum required to avoid hypoxia.
    - Wait a few minutes after reducing the oxidizer-enriched atmosphere before approving the activation of the ignition source.
OR FIRES CONTINUED

V. Management of OR Fires

• When an early warning sign is noted, halt the procedure and call for an evaluation of fire.
• When a fire is definitely present, immediately announce the fire, halt the procedure, and initiate fire management tasks.
• Team members should perform their preassigned fire management tasks as quickly as possible.
  - Before the procedure, the team may identify a predetermined order for performing the tasks.
  - If a team member cannot rapidly perform his or her task in the predetermined order, other team members should perform their tasks without waiting.
  - When a team member has completed a preassigned task, he or she should help other members perform tasks that are not yet complete.
• For a fire in the airway or breathing circuit, as fast as possible:
  - Remove the tracheal tube.
  - Stop the flow of all airway gases.
  - Remove all flammable and burning materials from the airway.
  - Pour saline or water into the patient’s airway.
• For a fire elsewhere on or in the patient, as fast as possible:
  - Stop the flow of all airway gases.
  - Remove all drapes, flammable, and burning materials from the patient.
  - Extinguish all burning materials in, on, and around the patient (e.g., with saline, water, or smothering).
• If the airway or breathing circuit fire is extinguished:
  - Reestablish ventilation by mask, avoiding supplemental oxygen and nitrous oxide, if possible.
  - Extinguish and examine the tracheal tube to assess whether fragments were left in the airway.
• Consider bronchoscopy (preferably rigid) to look for tracheal tube fragments, assess injury, and remove residual debris.
  - Assess the patient’s status and devise a plan for ongoing care.
• If the fire elsewhere on or in the patient is extinguished:
  - Assess the patient’s status and devise a plan for ongoing care of the patient.
  - Assess for smoke inhalation injury if the patient was not intubated.
• If the fire is not extinguished after the first attempt (e.g., after performing the preassigned tasks):
  - Use a CO2 fire extinguisher in, on, or around the patient.
  - If the fire persists after use of the CO2 fire extinguisher:
    - Activate the fire alarm.
    - Evacuate the patient if feasible, following institutional protocols.
    - Close the door to the room to contain the fire and do not reopen it or attempt to reenter the room.
    - Turn off the medical gas supply to the room.
• Follow local regulatory reporting requirements (e.g., report fires to your local fire department and state department of health).
• Treat every fire as an adverse event, following your institutional protocol.
OR FIRES CONTINUED

OPERATING ROOM FIRES ALGORITHM

Fire Prevention:
- Avoid using ignition sources in proximity to an oxidizer-enriched atmosphere.
- Configure surgical drapes to minimize the accumulation of oxidizers.
- Allow sufficient drying time for flammable skin prepping solutions.
- Moisten sponges and gauze when used in proximity to ignition sources.

Is this a High-Risk Procedure?
- An ignition source will be used in proximity to an oxidizer-enriched atmosphere.

- Agree upon a team plan and team roles for preventing and managing a fire.
- Notify the surgeon of the presence of, or an increase in, an oxidizer-enriched atmosphere.
- Use cuffed tracheal tubes for surgery in the airway; appropriately prepare laser-resistant tracheal tubes.
- Consider a tracheal tube or laryngeal mask for monitored anesthesia care (MAC) with moderate to deep sedation and/or oxygen-dependent patients who undergo surgery of the head, neck, or face.
- Before an ignition source is activated:
  - Announce the intent to use an ignition source.
  - Reduce the oxygen concentration to the minimum required to avoid hypoxia.
  - Stop the use of nitrous oxide.

Fire Management:
- Early Warning Signs of Fire

Fire is not present; Continue procedure
- HALT PROCEDURE
  - Call for Evaluation

FIRE IS PRESENT

AIRWAY Fire:
- IMMEDIATELY, without waiting
  - Remove tracheal tube
  - Stop the flow of all airway gases
  - Remove sponges and any other flammable material from airway
  - Pour saline into airway

NON-AIRWAY Fire:
- IMMEDIATELY, without waiting
  - Stop the flow of all airway gases
  - Remove drapes and all burning and flammable materials
  - Extinguish burning materials by pouring saline or other means

If Fire is Not Extinguished on First Attempt
- Use a CO₂ fire extinguisher.
- If fire persists: activate fire alarm, evacuate patient, close OR door, and turn off gas supply to room

- Re-establish ventilation
- Avoid oxidizer-enriched atmosphere if clinically appropriate
- Examine tracheal tube to see if fragments may be left behind in airway
- Consider bronchoscopy

Assess patient status and devise plan for management

- Maintain ventilation
- Assess for inhalation injury if the patient is not intubated

1 Ignition sources include but are not limited to electrosurgery or electrocautery units and lasers.
2 An oxidizer-enriched atmosphere occurs when there is any increase in oxygen concentration above room air level, and/or the presence of any concentration of nitrous oxide.
3 After minimizing delivered oxygen, wait a period of time (e.g., 1-3 min) before using an ignition source. For oxygen dependent patients, reduce supplemental oxygen delivery to the minimum required to avoid hypoxia. Monitor oxygenation with pulse oximetry, and if feasible, inspired, exhaled, and/or delivered oxygen concentration.
4 After stopping the delivery of nitrous oxide, wait a period of time (e.g., 1-3 min) before using an ignition source.
5 Unexpected flash, flame, smoke or heat, unusual sounds (e.g., a “pop,” “snip” or “frooof”) or odors, unexpected movement of drapes or dislodgment of drapes or breathing circuit, unexpected patient movement or complaint.
6 In this algorithm, airway fire refers to a fire in the airway or breathing circuit.
7 A CO₂ fire extinguisher may be used on the patient if necessary.

Fig. 1. Operating room fires algorithm. CO₂ = carbon dioxide; OR = operating room.
Future Events
6/2- Gastric Bypass (Grand Rounds), Dr. Baker
6/3- ART Teaching Conference: TEE Review, Dr. Abernathy
6/9- Raising the Dead: Management of Post-Arrest Patient (Grand Rounds), Dr. Fahy
6/10- ART Teaching Conference: TEE Review, Dr. Abernathy
6/16- M&M, Dr. Harvey
6/17- ART Teaching Conference: TEE Review, Dr. Abernathy
6/23- M&M, Dr. Harvey
6/30- Simulation Training Impact on Resuscitation (Grand Rounds), Dr. Schaefer

SAVE THE DATE: Department holiday party will be 12/12/09 at the Old Exchange Building.