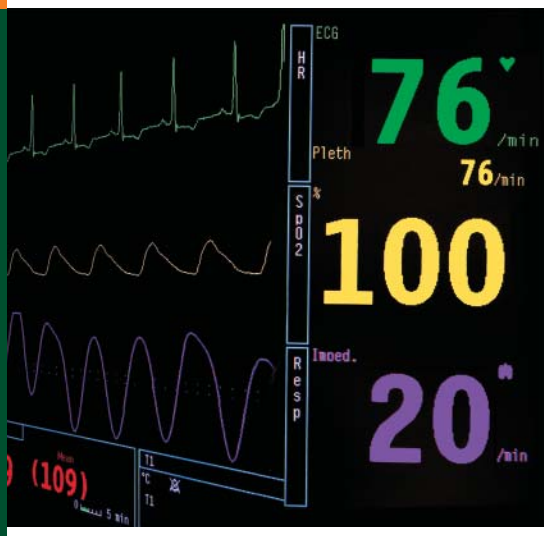
Program and Abstracts of the
5th Annual

Perioperative Medicine Summit 2010

Using Evidence to Improve Quality, Safety and Patient Outcomes

March 4–6, 2010
The Eden Roc Hotel
Miami Beach, Florida



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SUMMIT CO-DIRECTORS:
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This publication is available online as an electronic supplement to the *Cleveland Clinic Journal of Medicine*:
www.ccjm.org/content/77/Electronic_Suppl_1

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Society for Perioperative Assessment and Quality Improvement (SPAQI)

Welcome from the Summit Director

Along with my summit co-directors, David Hepner and Frank Michota, I welcome you to Miami for the 5th Annual Perioperative Medicine Summit. The summit is a collaborative effort between the University of Miami, Cleveland Clinic, and the Society for Perioperative Assessment and Quality Improvement (SPAQI). I urge each of you to join the society at **www.spaqi.org** if you are not already a member.

As resources shrink during these tough economic times and as health care reform looms, I believe that practicing safe, quality, and evidence-based perioperative medicine becomes more important than ever. In addition, the principles of good perioperative medicine may help us identify some long-standing practices with limited benefit that can be eliminated from our current practice. I believe you will leave this summit armed with a wealth of cutting-edge, evidence-based knowledge in perioperative medicine that you can start implementing in your practice right away.

As you can see from the agenda and faculty listings in this booklet, we are fortunate to have many renowned leaders from Miami, the broader United States, and all over the world speaking at the summit. In addition to our speakers, attendees will present 36 abstracts (included in this booklet) as posters and oral presentations. Be sure to visit the poster session and welcome reception at the hotel from 5:30 to 7:00 PM on Thursday as well as the SPAQI Open House from 4:00 to 5:00 PM on Friday. Please make it a point to join us for both.

I also remind you to visit our Web site, **www.periopmedicine.org**, and to register at our Twitter site, **http://twitter.com/PeriopSummit**, for important updates.

We want to make each subsequent summit better than the one before, and we take your feedback seriously, so be sure to fill out the evaluation forms.

Finally, I trust you will love the weather, culture, food, and activities that Miami and its environs have to offer, so have fun while you are here with us at the summit.

Bienvenido!

Amir K. Jaffer, MD
Summit Director

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Electronic Supplement 1 to Volume 77, March 2010

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Amir K. Jaffer, MD

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Summit Program

WEDNESDAY, MARCH 3, 2010

5:00–8:00 PM	Registration

THURSDAY, MARCH 4, 2010

6:30–7:45 AM	Registration and Continental Breakfast
7:30–7:45 AM	**Welcome**—*Amir K. Jaffer, MD, FHM; Franklin A. Michota, Jr., MD; and David L. Hepner, MD*
7:45–8:15 AM	**Perioperative Medicine: The Epicenter for Improving Patient Safety, Quality and Outcomes**—*Geno Merli, MD*
8:15–8:30 AM	Questions and Answers
8:30–9:00 AM	**Preoperative Cardiac Risk Assessment: The Evidence, Guidelines and What is Emerging**—*Lee A. Fleisher, MD*
9:00–9:15 AM	Questions and Answers
9:15–9:45 AM	**Perioperative Risk Reduction: Where Are We with Statins and Beta-Blockers?**—*Don Poldermans, MD, PhD*
9:45–10:00 AM	Questions and Answers
10:00–10:30 AM	Break/Visit Exhibits
10:30–11:00 AM	**Preoperative Evaluation and Cost-Effective Lab Testing**—*David L. Hepner, MD*
11:00–11:15 AM	Questions and Answers
11:15–11:45 AM	**Critical Care Management of the Surgical Patient**—*Monty Mythen, MD*
11:45–12:00 PM	Questions and Answers
12:00–1:00 PM	Lunch
1:00–1:30 PM	**Anesthesia for the Medical Consultant**—*David A. Lubarsky, MD*
1:30–1:45 PM	Questions and Answers
1:45–2:15 PM	**Perioperative Management of Warfarin and Antiplatelet Therapy for Noncardiac Surgery**—*Amir K. Jaffer, MD, FHM*

2:15–2:30 PM Questions and Answers

2:30–3:00 PM Break/Visit Exhibits

3:00–3:30 PM **Prevention of Venous Thromboembolism after Surgery**—*Franklin A. Michota, Jr., MD*

3:30–3:45 PM Questions and Answers

3:45–4:15 PM **Body Temperature and Postoperative Outcomes**—*Daniel Sessler, MD*

4:15–4:30 PM Questions and Answers

4:30–5:15 PM **Simultaneous Breakout Sessions**

Documentation and Billing for Perioperative Medical Consultation—*Seema Chandra, MD, and Jessica Zuleta, MD*

Perioperative Management of the Cancer Patient—*Sunil K. Sahai, MD*

Problem-Based Pain Management—*Darin J. Correll, MD*

Quality Improvement in Perioperative Medicine—*Jason Stein, MD*

5:15–5:30 PM Questions and Answers

5:30–7:00 PM Welcome Reception and Poster Session

FRIDAY, MARCH 5, 2010

6:30–7:45 AM Continental Breakfast

7:00–7:45 AM **Simultaneous Breakout Sessions**

Various Models of Delivering Preoperative Care: Which Makes Sense?—*Angela M. Bader, MD, MPH; Daniel Fleisher, BS; Amir K. Jaffer, MD, FHM; Ajay Kumar, MD; and Bobbie Sweitzer, MD*

Medication Management—*Christopher Whinney, MD*

Co-Management of the Neurosurgery Patient—*Kamal Ajam, MD, and Rachel Thompson, MD, FHM*

Getting Your QI Work Published with a Focus on the Squire Guidelines—*Susan R. Kirsh, MD*

7:45–8:00 AM Questions and Answers

8:00–8:15 AM	**Welcome**—*Amir K. Jaffer, MD, FHM; Franklin A. Michota, Jr., MD; and David L. Hepner, MD*
8:15–8:45 AM	**Perioperative Management of Diabetes: Translating Evidence into Practice**—*Luigi F. Meneghini, MD, MBA*
8:45–9:00 AM	Questions and Answers
9:00–9:30 AM	**Pulmonary Risk Stratification and Risk-Reduction Therapy for Noncardiac Surgery**—*Gerald Smetana, MD*
9:30–9:45 AM	Questions and Answers
9:45–10:15 AM	**Perioperative Management of Stroke**—*Jose Romano, MD*
10:15–10:30 AM	Questions and Answers
10:30–11:00 AM	Break/Visit Exhibits
11:00–11:30 AM	**Clinical Applications of Pharmacogenomics to Perioperative Medicine**—*Keith A. Candiotti, MD*
11:30–11:45 AM	Questions and Answers
11:45–12:45 PM	**Simultaneous Lunch Breakout Sessions** *Bring questions and meet the experts* **Anticoagulation**—*Franklin A. Michota, Jr., MD, and Amir K. Jaffer, MD, FHM* **Cardiac Risk Assessment**—*Brian Harte, MD, and Steven L. Cohn, MD* **Anesthesiologists**—*R. Lebron Cooper, MD, and Keith A. Candiotti, MD* **Hospitalists and Co-Management**—*Efren Manjarrez, MD; Joshua D. Lenchus, DO, RPh; Andres F. Soto, MD; and Alex Rico, MD*
1:00–1:45 PM	**Best Research Abstracts (3 Abstracts)—Presided by the Chair of the Research Abstract Review Committee—** *David L. Hepner, MD*
1:45–2:00 PM	Questions and Answers
2:00–2:30 PM	**Prevention of Delirium in the Elderly**—*Robert M. Palmer, MD*
2:30–2:45 PM	Questions and Answers
2:45–3:15 PM	Break/Visit Exhibits

3:15–3:45 PM	**Perioperative Management of the Patient with Heart Failure and Valvular Heart Disease**—*Mauro Moscucci, MD, MBA*
3:45–4:00 PM	Questions and Answers
4:00 PM	Adjourn
4:00–5:00 PM	**Society for Perioperative Assessment and Quality Improvement (SPAQI) Open House**

SATURDAY, MARCH 6, 2010

6:45–7:15 AM	Continental Breakfast
7:15–7:30 AM	**Welcome**—*Amir K. Jaffer, MD, FHM; Franklin A. Michota, Jr., MD; and David L. Hepner, MD*
7:30–8:00 AM	**Perioperative Management of Patients with Sleep Apnea and Pulmonary Hypertension**—*Shirin Shafazand, MD*
8:00–8:15 AM	Questions and Answers
8:15–8:45 AM	**Preparing Rheumatologic Patients for Noncardiac Surgery**—*Brian Mandell, MD, PhD*
8:45–9:00 AM	Questions and Answers
9:00–9:45 AM	**Panel Discussion: Co-Management of the Cardiac Surgery Patient—From Admission to Discharge**—*Syeda Uzma Abbas, MD; Donald B. Williams, MD; and Fahim A. Habib, MD*
9:45–10:00 AM	Questions and Answers
10:00–10:30 AM	Break/Visit Exhibits
10:30–11:00 AM	**Challenging Perioperative Cases**—*Steven L. Cohn, MD*
11:00–11:15 AM	Questions and Answers
11:15–11:45 AM	**Medicolegal Issues in Perioperative Medicine: Lessons from Some Real Cases**—*Franklin A. Michota, Jr., MD, and Matthew J. Donnelly, Esq.*
11:45–12:00 PM	Questions and Answers
12:00–12:30 PM	**Perioperative Anemia**—*Ajay Kumar, MD*
12:30–12:45 PM	Questions and Answers
12:45–1:00 PM	Concluding Remarks and Adjourn

Abstract 1

Venous Thromboembolism after Total Hip and Knee Replacement in Older Adults with Single and Co-Occurring Comorbidities

Alok Kapoor, MD, MSc[1]; A. Labonte[1]; M. Winter[1]; J.B. Segal[2]; R.A. Silliman[1]; J.N. Katz[3]; E. Losina[3]; and D.R. Berlowitz[1]

[1]Boston University, Boston, MA; [2]Johns Hopkins University, Baltimore, MD; [3]Harvard Medical School, Boston, MA

Background: The presence of comorbidities in older adults has been associated with poor quality of life, disability, and high healthcare utilization. Eighty percent of older adults have one or more comorbidities, and 50% have two or more. Despite this, most clinical practice guidelines do not modify or discuss the applicability of their recommendations to individuals with single comorbidities and co-occurring comorbidities.

Venous thromboembolism (VTE) is a common, fatal, and costly injury which complicates major surgery in older adults. The American College of Chest Physicians recommends high-potency prophylaxis regimens such as fondaparinux and low-molecular-weight heparin at twice-daily dosing for all individuals undergoing total hip or knee replacement (THR or TKR). Surgeons are reluctant to prescribe them, however, due to fear of excess bleeding. Identifying high-risk patients, such as older adults with specific comorbidities and co-occurring comorbidities, would optimize provision of high-potency prophylaxis. Coronary artery disease, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and cerebrovascular disease are postulated to increase VTE through venous stasis, immobility, and hypercoagulability mechanisms, but epidemiologic studies have not confirmed these effects. The combined effect of comorbidities, ie, co-occurring comorbidities, has been incompletely evaluated but could potentially cause a synergistic increase in VTE.

Methods: Using the Nationwide Inpatient Sample, we identified older adults who underwent THR or TKR in the U.S. between 2003 and 2006. Our outcome was VTE, including pulmonary embolus or deep vein thrombosis. We performed multivariate logistic regression analyses to assess the effects of comorbidities on VTE. Exposures analyzed included the above comorbidities and prevalent combinations.

Results: Older adults underwent 93,071 THR and 223,600 TKR surgeries in our sample. VTE occurred 0.8% and 1.2% of the time during the hospitalization period for the respective surgery types. CHF increased the odds of VTE in both the THR (OR = 3.08; 95% CI, 2.05–4.65) and TKR cohorts (OR = 2.47; 95% CI, 1.95–3.14). COPD increased the odds in the TKR cohort only (OR = 1.49; 95% CI, 1.31–1.70). The data did not support a synergistic effect of co-occurring comorbidities with respect to VTE occurrence.

Conclusions: Older adults with CHF undergoing THR or TKR, and those with COPD undergoing TKR, are at increased risk of VTE. If these findings are confirmed in other data sets, these older adults may benefit from higher-potency prophylaxis.

Abstract 2

Are There Consequences of Discontinuing Angiotensin System Inhibitors Preoperatively in Ambulatory and Same-Day Admission Patients?

Vasudha Goel, MBBS; David Rahmani, BS; Roy Braid, BS; Dmitry Rozin, BS; and Rebecca Twersky, MD, MPH

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ACE inhibitors (ACEIs) and angiotension receptor blockers (ARBs) are commonly used treatments for hypertension (HTN). Studies describe adverse effects after induction of anesthesia in groups of inpatients who continued medications preoperatively.[1] However, studies have not specifically addressed whether discontinuation predisposes patients to preoperative HTN.[2] We undertook this study to evaluate the impact of discontinuing ACEIs/ARBs in the preoperative period in ambulatory and same-day patients.

Methods: Randomized, single-blind, controlled trial (IRB approved). Inclusion criteria: age > 18 years, ASA 2–3, ACEI/ARB use > 6 months, all types of surgery and anesthesia. Patients on diuretics, beta-blockers, and calcium channel blockers (CCBs) were included. Exclusion criteria: uncontrolled HTN > 180/110 in presurgical testing, unstable ASA 3 or more, pregnancy, BMI > 45. Patients were randomized into two groups: group 1 was instructed not to take ACEIs/ARBs on day of surgery; group 2 was instructed to take ACEIs/ARBs 2 hours before surgery. Other anti-HTN medications were continued. Time last medication taken was recorded. Analysis stratified as taken medication ≥ 10 hours before surgery. Preoperative BP was recorded in holding area. *Primary outcome:* prevalence of preoperative hypertension by Joint National Committee 7 definitions.[3] *Secondary outcome:* cancellations due to unstable BP or other perioperative sequelae. A post hoc analysis of maximum and minimum intraoperative and postoperative BP was obtained from available anesthesia records. Categorical data were analyzed by Kruskal-Wallis test. P value < 0.05 considered significant.

Results: 428 patients were enrolled. 94 were excluded (38 surgery cancelled, 14 patient withdrawals, 22 met exclusion criteria, 20 lost to follow-up), leaving 334 in the analysis. Demographics were similar between the groups, and there were no differences between groups in preoperative BP or degree of preoperative HTN **(Table, below)**. Hispanics had more severe HTN than whites and blacks (P = 0.03). In post hoc analysis of 95 patients, there was no difference in mean maximum and minimum intraoperative and postoperative BP. No cancellations were reported due to unstable preoperative BP.

Conclusion: Discontinuing ACEIs/ARBs ≥ 10 hours preoperatively does not increase the incidence of pre- or perioperative hypertension or cancellation of surgery compared with continuing ACEIs/ARBs. Patients may safely discontinue these medications if perioperative hypotension is of concern.

1. Comfere T, Sprung J, Kumar MM, et al. Angiotensin system inhibitors in a general surgical

population. Anesth Analg 2005; 100:636–644.

2. *Rosenman DJ, McDonald FS, Ebbert JO, Erwin PJ, LaBella M, Montori VM. Clinical consequences of withholding versus administering renin-angiotensin-aldosterone system antagonists in the preoperative period. J Hosp Med 2008; 3:319–325.*
3. *Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003; 42:1206–1252.*

TABLE
Demographics, antihypertensive therapies, and comorbidities

	Time since last ACEI/ARB dose	
	< 10 h (n = 161)	**≥ 10 h (n = 173)**
Median age, yr (range)	61 (27–90)	61 (38–82)
Female, n (%)	109 (67.7)	114 (65.49)
African American, n (%)	98 (60.9)	94 (55)
ASA 3, n (%)	44 (27.3)	57 (32.9)
ACEI, n (%)	82 (50.9)	88 (51.2)
ARB, n (%)	79 (50.3)	85 (49.4)
Beta-blockers, n (%)	48 (30.4)	55 (32.7)
CCB, n (%)	35 (21.7)	34 (19.8)
Diabetes, n (%)	57 (35.4)	65 (37.6)
Coronary artery disease, n (%)	16 (9.9)	24 (13.9)
Preoperative blood pressure < 140/90, n (%)	98 (62)	103 (61)
Preoperative moderate HTN stage I (≥ 140/90), n (%)	45 (28.5)	50 (29.6)
Preoperative severe HTN stage II (≥ 160/100), n (%)	15 (9.5)	16 (9.5)

Abstract 3

Residents' Knowledge of ACC/AHA Guidelines for Preoperative Cardiac Evaluation Is Limited

BobbieJean Sweitzer, MD[1]; Michael Vigoda, MD, MBA[2]; Nikola Milokjic[3]; Ben Boedeker, DVM, MD, PhD, MBA[3]; Kip D. Robinson, MD, FACP[4]; Michael A. Pilla, MD[5]; Robert Gaiser, MD[6]; Angela F. Edwards, MD[7]; Ronald P. Olson, MD[8]; Matthew D. Caldwell, MD[9]; Shawn T. Beaman, MD[10]; Jeffrey A. Green, MD[11]; Jesse M. Ehrenfeld, MD, MPH[12]; Marsha L. Wakefield, MD[13]; Praveen Kalra, MD[14]; David M. Feinstein, MD[15]; Deborah C. Richman, MBChB, FFA(SA)[16]; Gail Van Norman[17]; Gary E. Loyd, MD, MMM[18]; Paul W. Kranner, MD[19]; Stevin Dubin, MD[20]; Sunil Eappen, MD[21]; Sergio D. Bergese, MD[22]; Suzanne Karan, MD[23]; James R. Rowbottom, MD, FCCP[24]; and Keith Candiotti, MD[2]

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Background: To determine if duration of clinical training is associated with knowledge and application of the 2007 American College of Cardiology/American Heart Association (ACC/AHA) Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery.

Methods: We designed and implemented a Web-based assessment tool based on the cardiac evaluation and care algorithm as described in the 2007 ACC/AHA guidelines. Twenty-four academic training programs (548 residents) participated. All residents were presented with 6 scenarios describing patients with one of the following: (1) active cardiac condition; (2) low-risk surgery without active cardiac conditions; (3) good functional capacity and 1 clinical risk factor and intermediate-risk surgery; (4) 1 or 2 risk factors and vascular surgery; (5) 2 clinical risk factors and poor/unknown functional capacity and intermediate-risk surgery; or (6) no clinical risk factors and intermediate-risk surgery. Scenarios and possible recommendations were presented in a randomized order. For each scenario, we created 3 "equivalent" descriptions, to lessen the chance that two residents would see the same clinical scenario.

Results: Resident participation by site ranged from 18% to 91%. The 548 trainees included 45 PGY-1s, 159 CA-1s, 154 CA-2s and 167 CA-3s. Residents' recommendations for scenario #1 (active cardiac condition) were consistent with

the guidelines approximately 80% of the time. For the remaining 5 scenarios, recommendations were consistent with the guidelines < 47% of the time. CA-3s answered questions correctly more often than the other two groups. However, the differences among CA-1s, CA-2s, and CA-3s were small. The largest difference between any two groups was 13%. In only two scenarios was the difference > 10% (the "low-risk surgery" scenario and the "2 clinical risk factors and poor/unknown functional capacity and intermediate-risk surgery" scenario).

In general, residents recommended more aggressive evaluation and conservative management than suggested by the guidelines. For the low-risk surgery scenario, 42% of residents required an ECG, although the guidelines suggest to "proceed to surgery." For patients with no clinical risk factors scheduled for intermediate-risk surgery, 36% of residents required an ECG, in contrast with the guidelines. Sixty-one percent of residents recommended that patients with good functional capacity should be at least 3 months out from a myocardial infarction, contrary to the guidelines' 7- to 30-day recommendation.

Conclusions: Residents' knowledge and application of the 2007 ACC/AHA guidelines is limited. Recommendations are minimally influenced by the duration of clinical training. In general, residents requested more aggressive preoperative evaluation and conservative management than is suggested by the guidelines.

Abstract 4

Descriptive Perioperative BNP and CRP in Vascular Surgery Patients

Thomas Barrett, MD, MCR[1]; and Rebecca Duby, BS[2]

[1]Portland Veterans Affairs Medical Center and Oregon Health & Science University, Portland, OR; [2]Oregon Health & Science University, Oregon Clinical & Translational Research Institute, Portland, OR

Background: Vascular surgery is the most morbid of noncardiac surgeries, with a 30-day mortality of 3% to 10% and a 6-month mortality of 10% to 30%. Clinical prediction indices such as the Revised Cardiac Risk Index (RCRI) have a receiver operating characteristic curve of 0.80 and perform as well for vascular surgery as do subjective methods such as the American Society of Anesthesiologists score. Biomarkers may increase our ability to predict adverse postoperative outcomes. There has been preliminary work suggesting that baseline B-type natriuretic peptide (BNP) and C-reactive protein (CRP) may be associated with adverse postoperative events in vascular surgery, but no data have been published on postoperative BNP and CRP in noncardiac surgery.

Methods: 25 vascular surgery patients presenting between May 2008 and October 2009 for open abdominal aortic aneurysm repair or lower extremity bypass surgery were enrolled. Preoperative data included demographics, past medical history, medication use, and RCRI scores, as well as NT-proBNP, CRP, and troponin T levels. Postoperative data included blood samples drawn at postoperative days 1, 2, and 3. The primary outcome was myocardial ischemia, myocardial infarction, heart failure, new arrhythmia, coronary revascularization, stroke, or death at 30 days and 6 months.

Results: 48% of the patients were low risk, 44% were intermediate risk, and 8% were high risk. 4 of 25 patients (16%) had a primary outcome (3 positive troponins, 1 of which was recognized as a clinical NSTEMI, and 1 postoperative atrial fibrillation). Follow-up at 30 days was complete, and at 6 months was 17 of 25 patients (68%).

There was a statistically significant difference for peak postoperative BNP and delta postoperative BNP (difference between baseline and peak BNP) for risk level of RCRI ($P = 0.013$ and 0.006, respectively). CRP had no statistically significant association with RCRI. Baseline values for BNP and CRP were also not statistically significant. One patient had a detectable baseline troponin T of 0.01 ng/mL and subsequently had atrial flutter with nonfatal MI at 6 months.

Conclusions: This descriptive pilot study was not statistically powered to clarify perioperative risk stratification for vascular surgery. However, peak postoperative BNP and delta postoperative BNP were associated with RCRI risk level. Interestingly, a detectable preoperative troponin T predicted a clinical outcome. Further research is needed to clarify the potential role of biomarkers in perioperative risk stratification and optimization.

Abstract 5

Selective Serotonin Reuptake Inhibitors and Risk of Intraoperative Bleeding

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Background: As of 2005, antidepressants surpassed antihypertensive agents to become the most commonly prescribed medications in the outpatient setting, with a prescription rate of 10.12% in the general population. A case-control study of more than 64,000 patients showed that exposure to antidepressants with intermediate or high inhibition of serotonin reuptake was associated with increased risk of bleeding. This is possibly due to platelet dysfunction as a consequence of serotonin-uptake blockade. Most evidence associates use of selective serotonin reuptake inhibitors (SSRIs) with upper gastrointestinal bleeding, especially in the setting of aspirin or warfarin use. At this time, there are no evidence-based guidelines for the perioperative management of SSRIs.

Methods: We performed a systematic PubMed and MEDLINE review of all literature discussing the effect of SSRIs on surgical bleeding published between September 2002 and December 2009. The amount of surgical bleeding and the need for allogeneic blood transfusion was compared between patients taking SSRIs and patients not on antidepressants.

Results: We identified 6 publications (3 studies and 3 case reports) assessing the association of SSRIs with surgical and postprocedural bleeding. 1,229 patients on SSRIs were identified undergoing several surgical procedures (CABG, orthopedic surgery, ENT procedures, and pancreatoduodenectomy). There was minimal difference in transfusion requirement during CABG (73% in SSRI users versus 61% in nonusers). A second study in patients undergoing CABG indicated that SSRIs did not increase intra- and postprocedural bleeding events (6.5% in SSRI users versus 7.2% in nonusers; OR = 0.93). However, significant differences in blood loss and transfusion requirements were noted during orthopedic procedures (23% in SSRI users versus 14% in nonusers).

Conclusions: There is a paucity of published data regarding the provision and safety of SSRIs in the perioperative period. However, the interactions and effects mentioned indicate that patients who use SSRIs and require surgery might have an enhanced perioperative risk. Further studies are required to clarify whether stopping SSRIs is warranted prior to certain or all surgical procedures.

Abstract 6

Incidence and Nature of Postoperative Complications in Patients with Obstructive Sleep Apnea Undergoing Noncardiac Surgery

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Purpose: To study the nature and frequency of postoperative complications after noncardiac surgery (NCS) among patients with obstructive sleep apnea (OSA).

Methods: The Internal Medicine Preoperative Assessment, Consultation and Treatment (IMPACT) Center and polysomnography (PSG) databases were crossmatched to identify patients who underwent both NCS and PSG at our major tertiary care center. OSA (apnea-hypopnea index [AHI] > 5) was presumed to be present at the time of surgery, even if established by PSG within 3 years after NCS. Among patients who underwent multiple procedures, those with higher surgical risk class and the most recent PSG prior to the chosen NCS were selected. The impact of OSA on postoperative outcomes was analyzed with a multivariate logistic model that was adjusted for age, gender, race, type of anesthesia, BMI, ASA class, and medical comorbidities.

Results: A total of 471 patients underwent both NCS and PSG between February 2002 and June 2006. A total of 262 patients (56%) had OSA, and a majority of NCS (80%) were intermediate risk. Continuous positive airway pressure (CPAP) was recommended to 152 patients with OSA (58%) after diagnosis but was not consistently resumed postoperatively. The presence of OSA was associated with higher risk of unplanned ICU transfer (OR = 4.1, $P = 0.047$), higher overall complications (OR = 6.4, $P = 0.0005$), and longer hospital stay (OR = 1.7, $P = 0.04$). Postoperative respiratory failure was the most frequent complication among OSA cases (6% vs 2%), but the difference was not statistically significant ($P = 0.18$). Severity of OSA, defined by higher AHI, was not associated with postoperative complications ($P = 0.21$) or hospital length of stay (LOS) ($P = 0.35$). 70% of OSA patients for whom home CPAP was recommended were compliant as reported at their preoperative assessment. Among OSA patients, use of CPAP at home prior to NCS did not lower the risk of postoperative complications ($P = 0.80$) or hospital LOS ($P = 0.19$).

Conclusion: Higher risk of postoperative complications is noted after NCS in patients with OSA, resulting in unplanned ICU admissions and longer hospital stay. Further studies are needed to understand the impact of OSA severity and perioperative CPAP use on postoperative outcomes.

Clinical Implications: Patients with OSA should be closely monitored postoperatively. Resuming CPAP immediately postoperatively may help reduce the risk of postoperative complications.

Abstract 7

HMG-CoA Reductase Inhibitor Therapy and the Risk of Venous Thromboembolism in Joint Replacement Surgery

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Background: Venous thromboembolism (VTE), comprising deep vein thrombosis (DVT) and pulmonary embolism (PE), is a relatively common postoperative complication. Patients undergoing joint replacement surgery are at particularly high risk of developing VTE. HMG-CoA reductase inhibitors (statins) are widely prescribed medications, but their effect on the development of VTE is controversial.

Aim: The aims of this study are to investigate the difference in the incidence of statin use between patients who did and did not develop VTE following joint replacement surgery and investigate the association between statin use and the incidence of VTE following joint replacement surgery.

Methods: We performed a retrospective analysis of the incidence of symptomatic VTE in all patients who underwent joint replacement surgery by the orthopedic surgical unit at our tertiary referral center in Victoria, Australia, between July 1, 2008, and June 30, 2009. Patients' histories, medication charts, and radiological investigation results were reviewed. All medications (statins and therapeutic anticoagulants) were recorded, along with whether or not VTE (radiologically proven DVT/PE) occurred within 4 weeks of joint replacement surgery.

Results:

	Statin therapy		
	No	**Yes**	**Total**
No VTE	367	201	568
VTE	7	12	19
Total	374	213	587

Pearson's chi-square value = 6.133 (P = 0.013)
Fisher's exact test (two-sided), P = 0.026
Incidence of statin use in patients with VTE = 63.2%
Incidence of statin use in patients with no VTE = 35.4%
Incidence of VTE in patients not on statins = 1.9%
Incidence of VTE in patients on statins = 5.6%

Conclusions: There is a significantly increased incidence of statin use in patients who developed symptomatic VTE compared with those who did not. Moreover, statin use is associated with a significantly increased risk of VTE in joint replacement surgery.

Abstract 8

Risk Prediction Models for Cardiac Morbidity and Mortality in Noncardiac Surgery: A Systematic Review of the Literature

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Background: Risk models for the prediction of cardiac morbidity and mortality are recommended as part of the stepwise preoperative assessment of patients undergoing noncardiac surgery in the American College of Cardiology/American Heart Association 2007 guidelines. However, no systematic comparison of the different risk prediction models has previously been published. We have conducted a systematic review of the discriminative precision of models used to predict cardiac morbidity and mortality in patients undergoing noncardiac surgery.

Methods: Inclusion criteria included all papers validating models for the prediction of perioperative cardiac adverse events, as well as those which validated known cardiac risk prediction models for other outcomes, such as long-term survival. A search of MEDLINE and EMBASE from 1980 until July 2009 led to 126,567 articles being screened; 34 papers describing 13 models were included in the final analysis. We assessed both the predictive precision of the models and the quality of the included studies.

Results and Discussion: The Lee Revised Cardiac Risk Index (Lee RCRI) performed best in direct comparison with other scores such as the Goldman and Detsky indexes. However, the area under the receiver operating characteristic curve (AUROC) for the Lee RCRI in most studies since its original validation was between 0.6 and 0.7, indicating only moderate predictive precision; yet when novel modifications of the Lee RCRI included more information relating to the type of surgery, discrimination improved. Newer models, such as that developed and validated from the National Surgical Quality Improvement Program (NSQIP) database, demonstrated superior discrimination but have not been validated in more than one study. Of note, the NSQIP model included variables which are not traditionally thought to be associated with cardiac outcomes, and did not include others, such as a history of ischemic heart disease, which are elements of most other cardiac risk prediction models. The quality of validation studies varied widely, with only half the studies being conducted in multiple centers, half using prospective data collection, and nine studies using small (< 100 patient) cohorts. There was also considerable variation in the outcome measures used, making direct comparison between different studies difficult.

Conclusions: It is likely that modifications of the Lee RCRI using more detailed information on the proposed surgical procedure would result in improved precision. We recommend that future work should focus on refining the Lee RCRI, and also use logistic regression analysis in multicenter cohorts to identify risk factors which may not be traditionally associated with adverse cardiac outcomes and which, if included in risk models, may improve their predictive precision.

Abstract 9

Economic Aspects of Preoperative Testing

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Aims and Purpose: Laboratory assessment and technical diagnostic tests are common tools for preoperative evaluation. These tools are employed with the aim of preventing complications and to allow for risk stratification. The practice of recommending routine tests should be abandoned in favor of selective ordering. Tests are often carried out in an unstructured manner. This study was conducted to calculate the possible economic impact of the Web-based preoperative diagnostic guideline (PROP) prior to its implementation in the state of Salzburg.

Methods: This prospective observational cohort study was carried out in a secondary care hospital in Salzburg (Hospital of Schwarzach). Data were collected from 1,363 consecutive patients scheduled for elective surgery from September 1, 2007, to November 30, 2007 (demographic data; medical history; classification of surgical procedure; number, specification, and findings of preoperative tests; and extra- or intra-hospital setting of tests). The incidence of double examinations (DEs) was calculated. DEs were further divided into two groups: essential controls of pathological findings and unnecessary tests. In the following step, the collected data were entered into the PROP software and the recommended diagnostic procedures were compared to the actually performed procedures.

Results: A total of 5,879 preoperative tests were documented and analyzed (1,582 extra-hospital [EH] and 4,297 intra-hospital [IH]). 226 DEs (14.3% of all EH tests) were performed, of which 208 (92%) were classified as nonessential due to normal findings in the foregoing test. In 633 patients (46.4%), guideline-based evaluation would only have indicated basic requirements such as physical examinations and medical interview, though 2,269 diagnostic procedures (38.6% of total) were carried out on these patients. Estimations of possible savings were about €1,076.3 per 1,000 patients by avoiding duplicate testing and €21,332.4 per 1,000 patients by avoiding nonrecommended testing.

Conclusion: These data indicate a considerable potential for improvement in process quality and reduction of costs through the use of structured preoperative assessment via implementation of a guideline.

Abstract 10

Postoperative Myocardial Infarction and In-Hospital Mortality Predictors in Patients Undergoing Elective Noncardiac Surgery

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Introduction: Postoperative myocardial infarction (MI) is a well-known complication of surgery. However, predictors of postoperative MI and in-hospital mortality after noncardiac surgery (NCS) have not been well established.

Methods: Patients aged > 18 years undergoing elective NCS in 2005–2007 who required at least an overnight stay were identified. Demographics, diagnoses, labs, medications, and primary outcomes, including postoperative MI and in-hospital death, were obtained from the electronic medical record and the Social Security Death Index. All MI and in-hospital mortality events were validated by individual chart analysis. Missing values in the predictor variables were multiply imputed by chained equations in order to effectively utilize the sample size. A stepwise selection method identified the important predictive variables in the multivariable logistic regression. Concordance indices were calculated for the selected final models to assess the predictive accuracy.

Results: Of the 34,793 patients identified, 130 (0.4%) developed postoperative MI, with in-hospital death occurring in 19 of these MI patients (15%). 139 patients (0.4%) had in-hospital death due to any cause.

Multivariable analyses identified increased age, hematocrit and sodium values, vascular surgery, prior history of heart failure, prior history of MI, and prior history of coronary artery disease to be independent predictors of postoperative MI **(Table 1, below)**. Age, history of chronic kidney disease (Cr > 2), vascular surgery, increased bleeding risk, and BUN, sodium, creatinine, and hematocrit values were found to be independent predictors of in-hospital mortality **(Table 2, below)**. The reduced model achieved concordance indices of 0.869 and 0.78 for postoperative MI and in-hospital mortality, respectively, after internal cross-validation.

Conclusions: Predictive models of risk for postoperative MI and in-hospital mortality were generated. Components of the model contain easily determined factors that can be entered into risk stratification tools that may be used in preoperative assessments for NCS.

TABLE 1
Postoperative MI predictor variables included in the final logistic regression model

Predictor variables	*P* value	Odds ratio
Bleeding risk: 4 vs 3	0.083	1.19 (0.98, 1.46)
Patient age: 69 vs 47*	< 0.001	8.30 (3.60, 19.13)
Patient sex: male vs female	0.081	1.41 (0.96, 2.09)
Hypertension: yes vs no	0.076	0.65 (0.41, 1.05)
Myocardial infarction: yes vs no	< 0.001	3.45 (1.78, 6.67)
Heart failure: yes vs no	0.010	2.25 (1.21, 4.16)
Coronary artery disease: yes vs no	< 0.001	4.11 (2.49, 6.79)
Atrial fibrillation: yes vs no	0.092	0.48 (0.20, 1.13)
Hyperlipidemia: yes vs no	0.068	0.62 (0.37, 1.04)
Glucose: 114 vs 85*	0.107	1.32 (0.97, 1.78)
Hematocrit: 38 vs 32*	0.001	0.95 (0.67, 1.33)
Sodium: 145 vs 135*	0.018	0.82 (0.51, 1.31)
Statin use: yes vs no	0.110	0.71 (0.46, 1.08)
Insulin-dependent diabetes: yes vs no	0.084	1.88 (0.92, 3.85)
Vascular surgery: yes vs no	< 0.001	2.68 (1.77, 4.04)

* Restricted cubic splines were applied to numeric predictor variables to relax linearity assumption. Odds ratio for numeric predictors was measured for the amount of the third quartile compared with the first quartile.

TABLE 2
In-hospital mortality predictor variables included in the final logistic regression model

Predictor variables	*P* value	Odds ratio
Bleeding risk: 4 vs 3	< 0.001	1.52 (1.25, 1.85)
Patient age: 69 vs 47*	< 0.001	2.63 (1.71, 4.03)
Chronic kidney disease: yes vs no	0.030	0.19 (0.06, 0.67)
BUN: 26 vs 13*	0.005	1.93 (1.22, 3.04)
Creatinine: 1.6 vs 1.2*	0.032	1.06 (1.00, 1.13)
Glucose: 114 vs 85*	0.045	1.37 (1.02, 1.84)
Hemoglobin: 15 vs 10*	0.025	0.08 (0.01, 0.61)
Sodium: 145 vs 135*	< 0.001	0.55 (0.37, 0.82)
Statin before surgery flag: yes vs no	0.122	0.71 (0.46, 1.10)
Vascular surgery: yes vs no	< 0.001	2.42 (1.60, 3.65)

* Restricted cubic splines were applied to numeric predictor variables to relax linearity assumption. Odds ratio for numeric predictors was measured for the amount of the third quartile compared with the first quartile.

Abstract 11

Incidence and Predictors of Postoperative Heart Failure in Patients Undergoing Elective Noncardiac Surgery

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Introduction: Heart failure (HF) is a major concern after surgery. However, predictors of postoperative HF after noncardiac surgery (NCS) have not been well studied.

Methods: Patients aged > 18 years undergoing elective NCS in 2005–2007 who required at least an overnight stay were identified. Demographics, diagnoses, labs, medications, and primary outcomes, including postoperative HF, were obtained from the electronic medical record. All HF events were validated by individual chart analysis. Missing values in the predictor variables were multiply imputed by chained equations in order to effectively utilize the sample size. A stepwise selection method identified the important predictive variables in the multivariable logistic regression. Concordance indices were calculated for the selected final models to assess predictive accuracy.

Results: Of the 34,793 patients identified, 579 (1.7%) developed postoperative HF; 150 of these 579 patients carried a prior diagnosis of HF. Increased age, vascular surgery, platelet count, hematocrit, glucose, calcium, and prior history of hypertension, hyperlipidemia, insulin-dependent diabetes, myocardial infarction, HF, atrial fibrillation, and sleep apnea were found to be independent predictors of postoperative HF **(Table, below)**. The reduced model achieved a concordance index of 0.842 after internal cross-validation.

Conclusions: A predictive model of risk for postoperative HF was generated. Components of the model contain easily determined factors that can be entered into risk stratification tools that may be used in preoperative assessments for NCS.

TABLE
Postoperative HF predictor variables included in the final logistic regression model

Predictor variables	*P* value	Odds ratio
Patient age: 69 vs 47*	< 0.001	3.63 (2.84, 4.63)
Hypertension: yes vs no	0.014	0.75 (0.60, 0.94)
Myocardial infarction: yes vs no	0.002	2.06 (1.31, 3.26)
Heart failure: yes vs no	< 0.001	10.80 (8.36, 13.96)
Atrial fibrillation: yes vs no	< 0.001	1.84 (1.37, 2.47)
Transient ischemic attack: yes vs no	0.056	0.24 (0.05, 1.03)
Sleep apnea: yes vs no	0.003	1.88 (1.24, 2.85)
Chronic obstructive pulmonary disease: yes vs no	0.136	1.43 (0.89, 2.28)
End-stage renal disease: yes vs no	0.051	1.81 (1.00, 3.27)
Hyperlipidemia: yes vs no	0.005	0.70 (0.55, 0.90)
BUN: 21 vs 13*	0.062	1.17 (0.99, 1.39)
Calcium: 12 vs 10*	< 0.001	0.76 (0.67, 0.86)
Glucose: 114 vs 85*	< 0.001	0.92 (0.81, 1.06)
Hematocrit: 38 vs 32*	< 0.001	3.24 (1.80, 5.84)
Platelet count: 316 vs 210*	0.004	0.86 (0.76, 0.97)
WBC: 8.92 vs 5.77*	0.090	1.18(1.02, 1.37)
Insulin-dependent diabetes: yes vs no	0.006	1.63 (1.15, 2.32)
Vascular surgery: yes vs no	< 0.001	2.09 (1.67, 2.60)

* Restricted cubic splines were applied to numeric predictor variables to relax linearity assumption. Odds ratio for numeric predictors was measured for the amount of the third quartile compared with the first quartile.

Abstract 12

Predictors of Length of Stay in Patients Undergoing Total Knee Replacement Surgery

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Background and Purpose: Very few studies have focused on patient characteristics that influence length of stay (LOS) after total knee arthroplasty (TKR). The primary goal of this retrospective study was to identify patient characteristics associated with LOS. A secondary goal was to look at the incidence of acute kidney injury (AKI) and to identify patient characteristics associated with AKI after TKR, which was defined as an abrupt (within 48 hours) absolute increase in the serum creatinine concentration of ≥ 0.3 mg/dL (26.4 micromol/L) from baseline, a percentage increase in the serum creatinine concentration of ≥ 50%, or oliguria of less than 0.5 mL/kg/hr for more than 6 hours.

Methods: Between January 2009 and December 2009, 359 patients (247 female) with a mean age of 67 (39–88) years underwent knee replacement surgery at Mercy Hospital's Knee and Hip Institute. Retrospective chart review was done to identify patient characteristics associated with LOS and AKI after TKR. Chi-square analyses were performed to identify significant parameters influencing LOS, postoperative blood loss, and AKI. The significance level was set at $P < 0.05$.

Results: Mean LOS after TKR was 3.2 days. Age greater than 75 and male sex were the only predictors associated with longer LOS. Premorbid conditions like coronary artery disease, hypertension, and diabetes were not associated with longer LOS. Mean postoperative hemoglobin loss was 2.6%. Age greater than 65 was associated with more postoperative blood loss. Fifty-seven patients developed AKI. AKI was not associated with longer LOS. Diabetics were more likely to develop AKI. Preoperative ACE inhibitor use was not associated with AKI.

Conclusion: Among different patient characteristics, advanced age tends to be associated with greater LOS and more postoperative blood loss. Diabetics tend to develop more AKI. Hence during preoperative evaluations of diabetic patients, a careful evaluation should be done to prevent postoperative AKI, which may include holding diuretics, holding NSAIDs, and careful evaluation of hydration status.

Abstract 13

Analysis of Surgeon Utilization of the Preoperative Assessment Communication Education (PACE) Center in the Pediatric Population

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Objective: To evaluate surgeon attitudes and utilization of preoperative services in the pediatric population.

Aim: To improve the pediatric perisurgical services offered by our institution.

Background: Perioperative assessment is vital to overall surgical patient outcomes.[1] In addition to risk stratification, it provides additional opportunities for patients and their families to receive education on the surgical process.[2] Pediatric patients are at greater risk than adults for anesthesia-related complications and benefit from specialized presurgical care. Currently, our institution does not provide specialized care in its presurgical facility.

Methods: Surgical and preoperative center appointment lists will be cross-referenced to determine the percentage of pediatric patients evaluated prior to surgery. An online provider survey will be used to gauge physician attitudes toward presurgical evaluation.

Results: We found that 16% of outpatient surgical pediatric patients received preoperative assessment at our center. Despite underutilization, 42% of survey respondents believed healthy patients benefit from presurgical services and 88% believed patients with comorbidities benefit. Additionally, 79% agreed that pediatric patients would benefit from specialized care.

Conclusion: Although our facility is underutilized among the pediatric population, the physicians surveyed viewed our services as valuable. Our facility must take steps to further understand why surgeons who did not respond to the survey do no utilize our services. Subsequently, we can address these issues and educate surgeons on the benefits of pediatric preoperative assessment and the services our center provides. In doing so, we must also improve our services to meet the pediatric preoperative care standards set forth by the current literature.

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Abstract 14

Use of the BATHE Method to Increase Satisfaction Amongst Patients Undergoing Cardiac and Major Vascular Operations

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Introduction: The role of anesthesiologists as perioperative physicians implies that patient satisfaction goes beyond control of postoperative pain and nausea and vomiting. Patients undergoing cardiac and major vascular operations (CVOs) have numerous comorbidities and are often seen in dedicated preoperative clinics where anesthesiologists may positively affect patients' outlook on their care. The use of key questions and responses by healthcare providers has been shown to improve patient satisfaction in family medicine populations. The BATHE method, in particular, has been extensively researched. This technique uses questions that touch on the condition for which a patient seeks medical care (ie, background) and asks how this is affecting the patient, what is most troubling about their condition, and how the patient is handling this. Finally, empathy is expressed to the patient. We sought to determine if the BATHE technique improves patient satisfaction amongst patients scheduled for CVOs.

Methods: We enrolled 80 patients scheduled to undergo a CVO and seen 3 to 7 days prior to their operation in Mount Sinai Hospital's CVO preoperative clinic. One attending anesthesiologist saw all participants. The first 10 participants were interviewed in the standard fashion for this anesthesiologist, with none of the BATHE items deliberately incorporated. The next 10 patients were interviewed with BATHE questions inserted. The remaining patients were "BATHE'd" or not "BATHE'd" according to a randomization scheme. After their interview, patients completed an anonymous satisfaction questionnaire with 10 Likert scale items and a 5-question survey on whether or not specific BATHE components were used by the anesthesiologist.

Results: Patients in the BATHE group rated overall satisfaction with their preanesthetic care better than did those in the non-BATHE group. Specific items such as whether their physician showed concern for their worries, whether they felt included in decisions about their care, and whether or not they felt well informed were significantly higher for the BATHE group. Reported use of the specific BATHE components was also significantly higher in the BATHE group for all 5 items. No significant differences were found in the length of interview between the two groups.

Discussion: In this preliminary study we were able to show that inserting a few simple items from the BATHE method into the preoperative interview could improve patient satisfaction without significantly changing the length of the preoperative assessment. It is not yet clear what other effects improving satisfaction may have on patient outcomes or the incidence of litigation in the postoperative period.

Abstract 15

Indication for Surgery Predicts Long-Term But Not In-Hospital Mortality in Patients Undergoing Lower Extremity Bypass Vascular Surgery

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Introduction: Vascular surgery patients are at risk for perioperative cardiovascular morbidity and mortality. We wanted to consider whether the indication for surgery provided independent information for long-term mortality in contrast to in-hospital mortality. Indications for this surgery include chronic limb ischemia (claudication, ischemic rest pain, and tissue loss) and acute indications such as aneurysm repair and graft thrombosis.

Methods: The Mount Sinai Hospital institutional review board approved the study and a waiver of informed consent was obtained. A retrospective review was performed of all patients who underwent femoral-distal lower extremity arterial bypass procedures between January 2002 and January 2008. 603 patients were studied. The Rutherford grade classification was used to categorize symptoms of chronic limb ischemia. Patients who presented with acute limb ischemia were categorized as acute. Multiple logistic regression analysis was performed to determine independent risk factors for in-hospital and 1-year mortality.

Results: Overall in-hospital and 1-year mortality were 4.64% and 18.9%, respectively. In multivariate analysis, independent risk factors for in-hospital mortality were ASA physical status (PS) classification, Revised Cardiac Risk Index (RCRI) score, age, and emergency surgery. Independent risk factors for 1-year mortality included ASA PS classification, RCRI score, age, emergency surgery, gender, and indication for surgery. The 1-year mortality rate was 2.9% for patients who presented with claudication, 7% for patients who presented with rest pain, 22% for patients who presented with tissue loss, and 20% for patients who presented with acute indications such as aneurysm repair.

Discussion: Guidelines from the American College of Cardiology/American Heart Association suggest that clinicians should focus on the long-term management of patients undergoing vascular surgery.[1] Consideration of the indication for surgery may prompt the clinician to identify high-risk vascular surgery patients and ensure adequate medical follow-up outside of the immediate perioperative period.[2] While these guidelines discuss magnitude of surgery and surgery type as important variables for immediate perioperative outcomes, perhaps indication for surgery should be considered in the analysis of long-term outcomes.

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Abstract 16

Research and Outcomes on Analgesia and Nociception During Surgery

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Six studies are reviewed leading to an outcomes-based research question. The key theoretical question is: If in the presence of equianalgesic recovery from anesthesia (PACU pain scores of 0), does intraoperative facial micro grimacing (FACE R2 > 20) predict later postoperative pain, catabolism, and exhaustion in proportion to the magnitude and duration of facial micro grimacing during demonstrated unconsciousness with general anesthesia (MAC > 0.7)?

The latest clinical study found large individual differences in facial micro grimacing to a standard stimulus (incision) and opioid doses. End-tidal gas concentration plus opioid dose did not predict high or no grimace response to incision. Grimacing was independent of end-tidal desflurane ($P = .06$) and fentanyl dose prior to incision.

A definitive clinical test of using facial grimacing as a signal of adequate analgesia will require (1) monitoring of somatic pain stimulation (eg, orthopedic surgery) and (2) monitoring of visceral pain stimulation (eg, colectomy).

Interventions will be based on remifentanil bolus versus inhalation gas increase.

Outcomes will be: (1) effectiveness of gas versus remifentanil IV bolus in ameliorating nociception activations, (2) immediate and delayed postoperative pain behaviors, (3) analgesic consumption, (4) catabolic processes (eg, infection), and (5) long-term exhaustion.

Theoretical issues to be addressed include whether central pain registration in subcortical structures during the unconsciousness of general anesthesia does or does not have consequences.

Jordan C, Vaughan DJA, Newton DEF, eds. Memory and Awareness in Anaesthesia IV. London, UK: Imperial College Press; 2000.

Bennett HL, Liu J, Mercado M, Johnson S, Lesser J. Towards validation of inadequate analgesia by facial grimace responses to surgical stimulation during general anesthesia. Anesth Analg 2009; 108(suppl):S-163.

Abstract 17

A Snapshot Survey of Fluid Prescribing

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In March 2008 a consensus guideline was published in the United Kingdom to advise on intravenous fluid prescribing in adult surgical patients (GIFTASUP).[1] From this document a series of prescribing rules were developed for our institution. We performed a "snapshot" survey of all surgical inpatients to determine whether these rules were being followed.

The prescribing rules generated by the GIFTASUP document were as follows:

1) Use CSL, not 0.9% NaCl, for crystalloid resuscitation or replacement.
2) Do not use 0.5% dextrose or dextrose/saline for resuscitation or replacement of deficit.
3) Use fluid balance chart and regular (daily) weights to ensure that maintenance requirements are met.
4) Treat hypochloremia with 0.9% NaCl.
5) Use CSL to match other bowel losses volume for volume.
6) Ensure clear documentation of a fluid plan/regimen.

The case notes, fluid prescription charts, and patient observation charts were examined for the preceding 24 hours. Along with adherence to the prescribing rules, we also recorded volume and type of fluid administered and a score for the quality of documentation.

101 patients were studied with roughly a 3:1 emergency:elective split. Intravenous fluids had been given in 53 patients.

Use of 0.9% saline, 5% dextrose, and dextrose/saline solutions was reassuringly low, but the almost complete absence of documentation regarding the indication for IV fluids made analysis difficult. In the patients with documented gastrointestinal tract losses, less than half were given CSL and there was no correlation between gastrointestinal tract loss and volume of fluid administered. Admission weights had been recorded for most elective patients but for only 5% of emergency patients, and no patients had any other weight documented.

It would appear from this survey that the prescribing advice from the British consensus group is not being followed. We are currently in the process of developing an "intravenous fluid team" similar to those managing parenteral nutrition or epidural catheters to take over the fluid management of these patients.

1. *Powell-Tuck J, Gosling P, Lobo DN, et al. British consensus guidelines on intravenous fluid therapy for adult surgical patients (2008). Available at: http://www.bapen.org.uk/pdfs/bapen_pubs/giftasup.pdf.*

Abstract 18

Predictors of Difficult Intubation with the Video Laryngoscope

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Introduction: Anesthesiologists choose which airway device to use for difficult intubation, taking into account each patient's specific features. The video laryngoscope (VL) allows equal or superior glottic visualization compared with direct laryngoscopy (DL), but predictive features for intubation difficulty using the VL have not been identified.[1] We therefore undertook a prospective observational study to identify which patient characteristics are likely to predict intubation difficulty with the VL. Principal outcomes were time to intubation and number of attempts.

Methods: Following approval from the IRB and each participant, patients were prospectively enrolled before surgeries requiring endotracheal intubation. Demographic and morphometric factors known to be associated with difficult DL, or believed to influence the use of the VL, were recorded preoperatively. After induction of anesthesia and adequate muscle relaxation, regular DL was performed in all patients to assess the Cormack and Lehane (C&L) grade of glottic visualization. Then intubation using the VL was accomplished. The number of attempts and time needed for intubation were recorded. For statistical analysis, correlation coefficients (Pearson or Spearman) between patients' characteristics and time needed to intubate or number of attempts were calculated. Significantly correlated variables were then introduced in multiple regression models. A P value < 0.05 was considered statistically significant.

Results: Four hundred patients were studied. Intubation required 1/2/3 attempts in 342/48/9 patients, respectively; 1 patient could not be intubated with the VL. Mean intubation time was 211.4 seconds. In the univariate correlation analysis, the following characteristics were significantly correlated with time to intubate: age, male sex, snoring, Mallampati class, mouth opening, sternothyroid distance, manubriomental distance in extension, neck circumference, and C&L grade as noted during DL. The need for multiple attempts was correlated with snoring, Mallampati class, sternothyroid distance, manubriomental distance in extension, and C&L grade as noted during DL. However, after introducing these variables in multiple regression models, only higher C&L grade at DL (P < 0.0001) and shorter sternothyroid distance (P = 0.007) were associated with longer intubation times, while only higher C&L grade predicted multiple attempts (P = 0.0006).

1. *Jungbauer A, Schumann M, Brunkhorst V, Borgers A, Groeben H. Expected difficult tracheal intubation: a prospective comparison of direct laryngoscopy and video laryngoscopy in 200 patients. Br J Anaesth 2009; 102:546–550.*

Abstract 19

Use of Technology to Improve Operational Efficiency

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The expectation is for patients to be in the operating room (OR) within 5 minutes of scheduled time. Delays in the OR schedule cause decreased patient and surgeon satisfaction and result in overtime at the end of the schedule. This negatively impacts finances as well, and leads to decreased volume due to wasted time. In January 2008 it was noted that the "first case on time" percentage was 34.88% within 5 minutes and 75.25% within 15 minutes. As of November 2009, our percentage improved to 69.85% on time within 5 minutes and 88.44% on time within 15 minutes. We have used many different computer applications to track, display, and tell our story. Our 2010 goal is to have 100% in 15 minutes and increase the 5- and 10-minute compliance.

Abstract 20

The ASA Physical Status Score for the Nonanesthesiologist

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Background: In many hospitals nonanesthesia healthcare providers are permitted to provide intravenous sedation for patients who are American Society of Anesthesiologists (ASA) physical status (PS) class I or II; an anesthesia provider is needed for patients classified as ASA PS III or higher.

SAGES (Society of American Gastrointestinal and Endoscopic Surgeons) guidelines state that "all patients scheduled for endoscopic procedures should be assigned an anesthesia risk score, using the ASA score." ASA IV patients should not undergo endoscopy in the office setting. ASA III patients may be acceptable candidates if deemed so by a qualified physician.

Since the introduction of the ASA PS score in 1941, studies have highlighted disagreements and inconsistency of ratings, even among qualified specialists.

Purpose: To design a skeleton template for nonanesthesiology providers for deriving the ASA PS score.

Description: We propose an assessment of patients' underlying conditions by scoring each system as follows:

Cardiac III: uncontrolled HTN, stable CAD or asymptomatic after revascularization, compensated CHF/valvular disease, supraventricular tachycardias, pacemaker; ***Cardiac IV:*** symptomatic CAD, decompensated CHF/valvular disease, malignant arrhythmias, AICD, s/p MI within 6 months

Pulmonary III: moderate asthma/COPD, OSA, pulmonary fibrosis/sarcoid/tumor or metastasis not requiring home O_2; ***Pulmonary IV:*** severe active asthma/COPD, home O_2 requirement

Gastrointestinal III: compensated liver cirrhosis /failure/chronic hepatitis; ***Gastrointestinal IV:*** decompensated liver cirrhosis/failure

Renal III: compensated CKD/nonuremic ARF; ***Renal IV:*** CKD requiring dialysis/uremic ARF

Hematology/oncology III: severe anemia/thrombocytopenia, compensated hematologic malignancies, nonmetastatic solid tumor; ***Hematology/oncology IV:*** metastatic malignancies

Endocrine/metabolic III: poorly controlled DM, controlled thyroid disease; ***Endocrine/metabolic IV:*** DKA, HHNK, thyroid storm, symptomatic pheochromocytoma

Neurology III: frequent seizures, prior CVA, compensated neurologic disease; ***Neurology IV:*** status epilepticus, increased ICP, acute stroke or current TIAs, decompensated neurologic disease.

1. An ASA score of IV would be assigned if any of the systems above were assessed as ASA IV or more than 3 systems were assigned an ASA III.

2. An ASA score of IV also would be assigned if the patient were assessed as ASA III but had impaired functional capacity (less than 4 METs).
3. Otherwise, the patient would be assigned the highest ASA based on the system score.

Conclusion: This proposed model can reduce the variability of ASA scoring, even among anesthesia providers, which is one of the criticisms of the current ASA PS score. More importantly, it would be a useful tool for the nonanesthesia provider, assisting in a better assessment of patients' physical status and optimal triage, therefore promoting patient safety.

Abstract 21

Development of a Shared Multidisciplinary Electronic Preanesthetic Record

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Background: A shared multidisciplinary electronic preanesthetic record allows for patient history and physical examination data to be entered by preoperative nurses, perioperative internal medicine hospitalists, same-day surgery nurses, and/or anesthesiologists and be continually carried forward, verified, corrected, and updated throughout the perioperative period.

Purpose: To create a multidisciplinary tool that accomplishes necessary documentation for nursing, perioperative hospitalists, anesthesiologists, and surgeons sharing patient care by charting important patient data that remains in a centralized location accessible throughout a patient's hospitalization. A shared process allows for the most correct and thorough patient health information to be included in the preoperative H&P and postoperative admitting note for the surgical or hospitalist team assisting with postoperative care.

Description: Advantages of electronic medical records include legibility and central data storage to provide access from multiple locations by multiple providers simultaneously. The anesthesiology and information technology departments at Northwestern Memorial Hospital worked in conjuction in 2007–2008 to develop the original electronic version of the preanesthetic record that generated an anesthesia preoperative H&P note in the hospital inpatient Cerner Powerchart system. In 2008 this was expanded to include a Pre-op Assessment Signout "tear-off sheet" report that extracted patient information from the anesthesia H&P (systems assessment, physical exam, anesthetic plan) and central areas (allergies, medication list, problem list, etc.) and created this tool that looks more like a traditional paper anesthesia preop record, allowing for quick access to key patient data in the operating room. In 2009, variations of the note were created to serve the needs of preoperative medical risk evaluations done by the perioperative medicine hospitalist physicians in clinic and the preoperative nurses completing patient phone screens and same-day surgery nurses doing patient intake.

Results: A shared multidisciplinary electronic preanesthetic record allowed any provider to copy a record forward, regardless of its original author, and update its information to reflect their individual documentation needs and exam findings without losing any of the information already documented by another provider. It seems logical that this throughput of information can reduce transcription errors and build a stronger database of patient information, particularly regarding medications and past medical history.

Conclusions: It is possible to create a shared multidisciplinary electronic preanesthetic record that satisfies the documentation needs of perioperative physicians and nursing staff.

Abstract 22

Development of a Patient Selection Protocol Prior to Robotic Radical Prostatectomy (RRP) in the Preoperative Assessment Unit (PAU)

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Background: The first clinical cases of extraperitoneal laparoscopic radical prostatectomy using the da Vinci robotic system were reported by Gettman et al in 2003.[1] Our institution began performing this procedure in 2008. In the largest published review to date (1,500 cases), Danic et al opine: "…any patient who is a suitable candidate for conventional retropubic (open) radical prostatectomy is a candidate for RRP."[2] However, their experience (mean operative time of 177 minutes, mean blood loss of 109 mL, mean BMI of 27 kg/m^2) is likely very different from that of other centers in the United States that have recently started performing the technique. Given the clinical consequences and known potential complications of the steep Trendelenburg position and pneumoperitoneum during prolonged surgery, we sought a more selective approach.

Purpose: To develop a RRP patient selection protocol to be used in the PAU by physician assistants and resident anesthesiologists. To our knowledge, none is previously reported in the literature.

Description: Development of the patient selection protocol was based on local expert opinion derived from personal experience with RRP surgery, experience with other surgeries in which pneumoperitoneum and steep Trendelenburg positioning were used, personal communications with experts at national meetings, and literature review.[3–5]

Results: Exclusion criteria for RRP, based on our protocol, include the following neurologic, musculoskeletal, or cardiopulmonary conditions: severe glaucoma, increased intracranial pressure, history of cerebral aneurysm, hip disease that precludes lithotomy positioning, class II–IV angina, class II–IV congestive heart failure, left ventricular ejection fraction less than 40%, CHF or COPD exacerbation in the past 3 months, severe asthma or COPD, severe restrictive lung disease, any condition requiring supplemental oxygen, blebs on chest radiography, obesity with BMI greater than 40 kg/m^2, pulmonary hypertension with RVSP greater than 40 mm Hg, and moderate or severe stenotic valvular heart disease or severe regurgitant valvular heart disease.

Conclusions: Patient selection for RRP can be protocol-based in order to facilitate consistent decision making that reflects institution-specific risk. As surgeons gain experience with the technique and operative times decrease, patient selection protocols should be reassessed. Although our current protocol is based on local expert opinion, a more evidence-based approach is anticipated as we collect and analyze data from continued experience.

1. Gettman MT, Hoznek A, Salomon L, et al. Laparoscopic radical prostatectomy: description

of the extraperitoneal approach using the da Vinci robotic system. J Urol 2003; 170:416–419.

2. *Danic MJ, Chow M, Alexander G, et al. Anesthesia considerations for robotic-assisted laparoscopic prostatectomy: a review of 1,500 cases. J Robotic Surg 2007; 1:119–123.*
3. *Phong SV, Koh LK. Anaesthesia for robotic-assisted radical prostatectomy: considerations for laparoscopy in the Trendelenburg position. Anaesth Intensive Care 2007; 35:281–285.*
4. *Falabella A, Moore-Jeffries E, Sullivan MJ, et al. Cardiac function during steep Trendelenburg position and CO2 pneumoperitoneum for robotic-assisted prostatectomy: a transoesophageal Doppler probe study. Int J Med Robot 2007; 3:312–315.*
5. *Awad H, Santilli S, Ohr M, et al. The effects of steep Trendelenburg positioning on intraocular pressure during robotic radical prostatectomy. Anesth Analg 2009; 109:473–478.*

Abstract 23

Protocol-Driven Preoperative Testing in the Preoperative Assessment Unit (PAU): Which Patients Should Receive a Resting Transthoracic Echocardiogram (TTE) Prior to Elective Noncardiac Surgery?

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Background: In 2002 the American Society of Anesthesiologists (ASA) published a practice advisory for preanesthesia evaluation which stated, "no studies were found which examined outcomes from routine cardiac evaluations of...echocardiography."[1] It did not include recommendations for preoperative TTE testing. In 2007 the American College of Cardiology (ACC) and American Heart Association (AHA) published guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery which listed two Class 2a indications for preoperative assessment of left ventricular function: "patients with dyspnea of unknown origin" and "patients with current or prior heart failure with worsening dyspnea or other changes in clinical status."[2] In 2006 the ACC/AHA published guidelines for the management of patients with valvular heart disease,[3] although the document is not specific to the preoperative period. Used together, these documents can form the framework for a rational approach to preoperative TTE testing. However, unified recommendations applicable to all preoperative patients do not exist.

Purpose: To develop a protocol to determine which patients should receive a resting TTE prior to elective noncardiac surgery based on evidence when it exists and regional expert opinion when it does not.

Description: Guidelines and advisories published by the ASA and ACC/AHA were reviewed and incorporated into the protocol, as were recommendations from authors of peer-reviewed journal articles. Opinions of regional experts in internal medicine, cardiology, and cardiac anesthesiology were included for disease states not addressed by these documents.

Results: The protocol included 17 indications for preoperative testing; 11 originated from published advisories and/or guidelines, 1 was supported by published expert opinion, and 5 were developed by local expert opinion.

Conclusions: Protocol-driven preoperative TTE testing based on medical society recommendations and local expert opinion was integrated into practice in our PAU. Further study will include whether the use of this protocol has decreased surgical delays and cancellations at our institution.

1. *American Society of Anesthesiologists Task Force on Preanesthesia Evaluation. Practice advisory for preanesthesia evaluation. Anesthesiology 2002; 96:485–496.*
2. *Fleisher LA, Beckman JA, Brown KA, et al. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery. Circulation 2007; 116:e418–e499.*
3. *ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation 2006; 114:e84–e231.*

Abstract 24

High-Risk Preoperative Assessment for Elective Orthopedic Surgery Patients

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Background: Preoperative assessment prior to surgery is an important clinical care component, especially in patients with high surgical risk characteristics. Interdisciplinary preoperative evaluations help assess medical problems that affect surgical timing, surgical cancellation, or procedural risk.

Purpose: The Minneapolis Veterans Administration implemented a multidisciplinary high-risk orthopedic surgery pilot project with internal medicine, anesthesia, and orthopedic physicians meeting together to discuss optimal management of high-risk orthopedic surgical patients. This quality improvement project focuses on patients considered for elective orthopedic surgery procedures who have clinical characteristics which may place them at high risk for surgical intervention and aims to improve surgical risk stratification, facilitate intraprovider communication, and enhance the delivery of optimal clinical care.

Description: A prescreening process identifies patients with procedural characteristics and clinical comorbidities that may contribute to adverse surgical outcomes. The orthopedic surgical procedures assessed included major joint replacement and spine surgeries. High-risk patient characteristics include cardiopulmonary disease, wound healing, rehabilitation risk factors, and other clinical comorbidities. Once identified, the patients receive "high-risk orthopedics" preoperative medical evaluations with the results then discussed by a multidisciplinary provider panel. The panel provides recommendations including offering the patient surgery, delaying surgery for further evaluation, not offering surgery based on clinical risk, or proceeding to surgery with patient-specific surgical planning. The recommendations are subsequently communicated to patients for surgical or conservative management.

Results: The quality improvement pilot included 19 patients over a 3-month period who received full panel review. Of the 19 patients reviewed, 6 patients were offered surgery, 10 were not offered surgery, and 3 are currently pending. Of the 6 patients offered surgery, 2 patients chose to defer/cancel their surgical plans after receiving preoperative and high-risk panel findings and recommendations. A survey of providers on the process yielded a response rate of 64.7%, with 4 providers finding it to be "useful" and 7 "extremely useful."

Conclusions: The high-risk orthopedic surgery clinical review process pilot project has provided a comprehensive review for 19 patients. A significant number of the patients were not offered surgery or subsequently chose to defer/cancel surgery after getting advance information on their surgical risk. Providers have found the process to be a useful addition to usual clinical care.

Abstract 25

A Novel Use of Web-Based Software to Efficiently Triage Presurgical Patients Based on Perioperative Risk: A Pilot

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Approximately 40 million surgical procedures are performed annually in the United States. To ensure the safety of patients undergoing these procedures, it is imperative to identify and mitigate perioperative risk. Unfortunately, the process used by most hospitals and surgical centers to evaluate presurgical patients falls short on two fronts. One is a failure to identify risk factors in a timely fashion, as most preoperative evaluations occur the day before or day of surgery. The second is a failure to properly identify risk factors due to incomplete or inaccurate preoperative evaluations. These shortcomings increase morbidity and mortality, increase healthcare costs, and lower patient satisfaction. Therefore, a standardized preoperative assessment delivered in a timely fashion is needed.

To address this need, we have developed Web-based software that utilizes a patent-pending algorithm to generate a customized patient survey based on the patient's medication profile and successive responses to the survey. The survey output takes the form of a comprehensive medical history, triages patients based on health status, and provides the patient-specific information required by healthcare providers to identify and mitigate perioperative risk.

To test the feasibility of using our Web-based patient survey software to accurately assess a patient's perioperative risk, we administered the survey to a representative group of 100 patients scheduled for surgery at a 250-bed community hospital. We evaluated three primary end points:

(1) Ability of patients to complete the Web-based survey

(2) Accuracy and completeness of the output generated by the Web-based survey

(3) Patient satisfaction.

Results from our pilot were overwhelmingly positive. 95% of patients were very satisfied/satisfied with the survey; 92% rated the survey very easy/easy to use; the median time to complete the survey was 14 minutes; and the mean percent agreement between the survey output and the "gold standard" (in-person interview) was greater than 90%.

Abstract 26

Value of a Specialized Clinic for Day Admission Surgery for Cardiac and Major Vascular Operations

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The preoperative evaluation has a critical role in the perioperative care of day admission surgery (DAS) patients for cardiac and major vascular operations (CVO). Due to increased volume of patients, who are older, need reoperations, and have multiple comorbidities, we opened a specialized preoperative clinic (SPC) only for CVO.

Methods: After a survey of 76 institutions, we opened in April 2006 a separate SPC designed for CVO. The clinic is located near the cardiac catheterization suite to allow for evaluation of those needing urgent surgery and also near the CICU. The team was assembled: cardiac anesthesiologist, CICU nurse, and nurse practitioner.

Patients are seen 3 to 7 days prior to DAS. Before the appointment all previous medical reports are collected. Evaluation in the SPC involves a detailed history and physical examination, acquisition of the additional necessary tests, performance of medical reconciliation, and discussing with patients and their families all information about hospitalization, surgery, CICU stay, and pain management. Collected data are sent to the cluster of operating room for review by the anesthesiology team. OR staff are given all pertinent information for review and for determining needed interventions to be ordered in advance (eg, motor evoked potential, nitric oxide). On the day of surgery the patient is admitted to the SPC, an immediate assessment is performed, and IV antibiotic prophylaxis is started.

Results: Our computerized data from January 2007 to September 2009 included 2,504 patients (average age 62.1 years, 44.5% female). 1,004 were undergoing mitral valve surgery. Ninety-two patients (3.7%) were seen in the cardiac catheterization suite for urgent surgery. There were 36 cancellations (1.4%) for medical and logistical reasons, and 52 patients were evaluated twice.

Discussion: Our data show that a SPC for CVO patients scheduled for DAS is feasible and provides numerous safety and cost-containment benefits. We believe that a complete preoperative evaluation of these complicated patients benefits not only patients and their families but all medical personnel as well, as it creates efficiency and harmony during the entire hospitalization.

Flynn BC, de Perio M, Hughes E, Silvay G. The need for specialized preanesthesia clinics for day admission cardiac and major vascular surgery patients. Semin Cardiothorac Vasc Anesth 2009; 13:241–248.

Abstract 27

Preoperative Evaluation for Parathyroidectomy—Rule Out Pheochromocytoma

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Case Presentation: A 71-year-old woman presented for preoperative evaluation for parathyroidectomy. Her past medical history was significant for hypertension, diabetes mellitus, osteoporosis, and paroxysmal SVT. Labs had shown hypercalcemia and hyperparathyroidism, and ultrasonography revealed a 0.98 × 0.64 × 0.46 cm lesion typical of left lower parathyroid adenoma. Further questioning revealed that she had flash pulmonary edema and severe hypertension during her previous surgery. Her blood pressure (BP) control was suboptimal on multiple medications. Her BP was 182/110 with normal exam. Due to a history of intraoperative severe hypertension, pheochromocytoma was considered in the differential. Labs revealed elevated free plasma metanephrines and elevated epinephrine and norepinephrine levels of 3,934 and 1,824, respectively. CT of the abdomen revealed a 9.4 × 11.4 × 11.3 cm necrotic left adrenal mass. Since the patient had findings consistent with hyperparathyroidism and pheochromocytoma, multiple endocrine neoplasia syndrome type 2A (MEN-2A) was considered a possibility; however, there was no evidence of medullary thyroid carcinoma. She was started on phenoxybenzamine and scheduled for the pheochromocytoma surgery before the parathyroidectomy.

Case Discussion: Pheochromocytoma occurs in ~50% of patients with MEN-2A and hyperparathyroidism in 15% to 20%. About half of the pheochromocytomas are bilateral, and > 50% of patients who have had unilateral adrenalectomy develop a pheochromocytoma in the contralateral gland within a decade. Most clinicians recommend removing only the affected gland during primary surgery. If both adrenal glands are removed, glucocorticoid and mineralocorticoid replacement is mandatory.

From the internist's perspective, preoperative patient preparation is essential for safe surgery. Alpha-adrenergic blockers (phenoxybenzamine) should be initiated at low doses and titrated up. Because patients are volume-constricted, liberal salt intake and hydration are necessary to avoid orthostasis. Adequate alpha blockade generally requires 10 to 14 days, with a typical final dose of 20 to 30 mg phenoxybenzamine three times daily. Before surgery, the BP should be consistently below 160/90 with moderate orthostasis. Beta-blockers can be added after starting alpha-blockers. BP can be labile during surgery, particularly at the onset of intubation or when the tumor is manipulated. Nitroprusside infusion is useful for intraoperative hypertensive crises, and hypotension responds to volume infusion. Atraumatic endoscopic surgery has now become the method of choice. It may be possible to preserve the normal adrenal cortex, particularly in patients with hereditary disorders, in whom bilateral pheochromocytomas are more likely.

Conclusion: Physicians should evaluate for pheochromocytoma in patients undergoing parathyroidectomy, especially if patients have severe hypertension, as there is a well-known association between the two. These patients need initiation of alpha-blockers and surgery for pheochromocytoma before parathyroidectomy.

Abstract 28

Should We Stop the Oral Selective Estrogen Receptor Modulator Raloxifene Prior to Surgery?

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Case Presentation: A 69-year-old Caucasian female with a past medical history of hypertension, hyperlipidemia, osteoarthritis, and severe osteoporosis takes the oral selective estrogen receptor modulator raloxifene. Her other medications include hydrochlorothiazide and atorvastatin. The patient takes ibuprofen and the combination of oxycodone and acetaminophen as needed for knee pain.

She is seen by an internal medicine physician for preoperative evaluation 3 weeks prior to surgery for total knee replacement for osteoarthritis of the right knee. Physical examination reveals decreased range of motion of the right knee but is otherwise normal. The electrocardiogram recorder in her primary care physician's office shows normal sinus rhythm.

The patient and her primary care physician want to know whether she should stop taking raloxifene prior to surgery.

Discussion: Indications for use of selective estrogen receptor modulators (SERMs) such as tamoxifen and raloxifene have expanded beyond breast cancer treatment to prevention and treatment of osteoporosis. Both tamoxifen and raloxifene increase the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism).

Most experts in perioperative medicine recommend that tamoxifen and raloxifene be discontinued for 4 weeks before surgeries associated with a moderate or high risk of venous thromboembolism. If a patient takes these medications for breast cancer treatment, a consultation with an oncologist is recommended.

Abstract 29

Should Mesalamine Be Stopped Prior to Noncardiac Surgery to Avoid Bleeding Complications?

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Case Presentation: A 53-year-old Caucasian male with a past medical history of Crohn's disease, hypertension, hypercholesterolemia, osteoarthritis, and atrial fibrillation takes mesalamine (Asacol) to control diarrhea. His other medications include atenolol, warfarin, and simvastatin. He also takes oxycodone and acetaminophen as needed for hip pain. The physical examination is normal apart from irregularly irregular cardiac rhythm. The electrocardiogram shows atrial fibrillation with heart rate of 67 beats per minute. His exercise tolerance corresponds to 6 METs.

The patient is seen by an internal medicine physician for preoperative evaluation 1 week prior to surgery for total knee replacement for osteoarthritis of the left hip.

The patient inquires whether he should stop mesalamine to avoid bleeding complications during surgery. His primary care physician told him that nonsteroidal anti-inflammatory drugs (NSAIDs) may increase the bleeding risk.

Discussion: Mesalamine (5-aminosalicylic acid) does not interfere with platelet aggregation as aspirin and other NSAIDs do. According to Winther et al,[1] there was no effect on platelet aggregation during normal treatment with 5-aminosalicylic acid when given at a dose of 1.5 g per day with a slow-release formulation, nor after an intravenous dose of 250 mg. All in vivo and in vitro tests were negative for inhibition of platelet aggregation, in contrast to the inhibition seen with aspirin (acetylsalicylic acid). Treatment with mesalamine does not constitute a hazard to patients with inflammatory bowel disease in regard to prolonged bleeding time caused by an influence on platelet aggregation or fibrinolytic activity.

1. *Winther K, Bondesen S, Hansen SH, Hvidberg EF. Lack of effect of 5-aminosalicylic acid on platelet aggregation and fibrinolytic activity in vivo and in vitro. Eur J Clin Pharmacol 1987; 33:419–422.*

Abstract 30

Thyroidectomy: Perioperative Management of Acute Thyroid Storm

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Patients with hyperthyroidism in need of surgical intervention present challenges to medical consultants charged with making recommendations perioperatively. Furthermore, those who enter thyroid storm are at risk for complications prior to, during, and after surgery. Increased awareness, early intervention, and delay of thyroidectomy will result in improved outcomes.

We report a 58-year-old female with Graves' disease, coronary artery disease, diabetes mellitus, and right-sided vocal cord paralysis who presented with ventilator-dependent respiratory failure after aspiration. The patient had a long history of dysphagia and required a PEG tube for nutrition. She had documented normal thyroid function 2 weeks prior to admission. She then developed nausea, increased neck size, and double vision. She reportedly had been compliant with methimazole and propranolol.

The patient was intubated secondary to respiratory failure after aspiration. With ventilatory support, she was found to have blood pressure of 125/52, heart rates of 115 to 156, pulse oximetry of 100%, and to be afebrile. Other positives on physical exam were diplopia, exophthalmos, and neck goiter. She had 2/6 systolic ejection murmur heard over the left second intercostal space. She exhibited 3+ reflexes and bilateral lower extremity wasting.

Initial diagnostics measured TSH < 0.03, free T4 of 7.6, and a T3 > 20. Chest CT was negative for pulmonary embolism and demonstrated enlarged heterogeneous thyroid.

Subsequently, the patient passed spontaneous breathing trials but was unable to produce cuff leak. However, she self-extubated and remained stable enough to be transferred to a regular medical floor. For management of thyrotoxicosis, she was placed on an esmolol drip initially and then given oral propranolol. Her methimazole was increased and corticosteroids were started. Her symptoms gradually improved, and her T4 decreased to 1.4. The patient was discharged in stable condition and instructed to follow up with a general surgeon regarding thyroidectomy in 1 week.

Preoperative thyroid storm is a life-threatening condition that requires medical intervention prior to surgery. Most patients are boarded to undergo thyroidectomy for persistent thyrotoxicosis, usually secondary to Graves' disease. In most cases, they have contraindications to or have failed medical therapy. The method of treatment usually depends on the time available for preoperative measures and the severity of thyrotoxicosis. Beta-blockers are typically employed unless contraindicated because they improve thyroid storm symptoms, especially those of the cardiovascular system. Other agents, including iodine and steroids, are used if severe thyrotoxicosis is present. The ultimate goal of therapy is to make the patient as close to euthyroid and hemodynamically stable as possible before surgery.

Abstract 31

Core Competencies: Not Just for the ACGME—But for Successful and Ethical Perioperative Management of a Young Respiratory Cripple

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Case Description: A 48-year-old respiratory cripple with multiple sclerosis (MS) presents for percutaneous nephrolithotripsy after another bout of urosepsis. She has suffered from MS for 20 years and in the last year has lost use of her right arm, leaving her quadriplegic. She is completely dependent but has no other comorbidities. Her most recent surgery was for pain pump insertion and took place 3 years back when she still had some useful muscle power in her arms. Recovery from this procedure with local anesthesia and sedation was uneventful. She has no bulbar dysfunction and is fed a regular diet.

On examination she is wheelchair-bound but has a positive affect. She visibly uses the sternocleidomastoids as muscles of respiration and is short of breath after a few sentences. She has no effective cough.

The anesthetic plan and the possibility of permanent postoperative ventilation were discussed with the patient, and she emphatically stated that intubation and ventilation were not acceptable. She would lose her only means of communication, and that would be untenable.

Conclusion: In this patient with an unmeasurable FEV1, a 75-minute superficial procedure becomes a life-threatening event. We discuss how we made our management decisions using all six ACGME core competencies. We were guided by the patient's wishes and needs and successfully discharged her home breathing on her own.

Abstract 32

'If I Have to be Transfused I Only Want My Own Blood, or Blood from Family Members'—What Is Best-Practice Advice to Be Given in the Preoperative Clinic?

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Case Description: A 62-year-old female with painful scoliosis presents to the preoperative clinic for anesthetic consultation prior to surgical repair of her spine. The planned operation, a two-stage multilevel surgery, is anticipated to involve significant blood loss requiring transfusion therapy. The patient states her wish to avoid anonymously donated blood. She wants to auto-donate, and her physician husband is encouraging the family to be directed donors. "What do you think, doc?"

Modern blood transfusion in the United States has never been safer. However, many patients express concerns over receiving transfusions "from strangers," and alternatives to anonymous-donor blood transfusion exist. There is also recent literature which brings persuasive evidence as to the dangers of "old" blood. It is the responsibility of the physician to offer best-practice advice to patients who may require perioperative transfusion.

The different options are:

- Autologous donation
- Acute normovolemic hemodilution
- Intraoperative blood salvage
- Directed donation
- Conventional anonymous-donor blood.

Conclusion: This is an often forgotten challenge—what to advise patients on optimal preoperative preparation for blood loss and which blood is best for transfusion. Using our case we discuss current thinking on transfusion options, the economics of directed donation, and what we should be informing our patients in 2010.

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Abstract 33

Prolonged QTc and Hypokalemia: A Bad Combination Before Surgery

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A 34-year-old female with a past medical history of asthma presented to our perioperative medical center for medical clearance for carpal tunnel release surgery. The patient is a schoolteacher and reported frequent episodes of palpitations and syncope for a few years alternating with painful, tetanic muscle spasms followed by flaccid paralysis. Her syncopal episodes were short and she usually regained consciousness in a few minutes. The patient's mother never witnessed seizure activity during any of her episodes. She had been seeing a neurologist and a cardiologist in her hometown, but they had not been able to figure out the cause of these symptoms. Her physical examination was completely normal and her vitals stable. Her blood work showed hypokalemia of 3.1 mEq/L. Electrocardiogram showed prolonged QT/QTc.

Because of her syncope and prolonged QTc, the patient was referred to cardiology for further work-up. Exercise stress testing was done and she developed ventricular arrhythmias that terminated the test. She was at risk for sudden cardiac death, so an AICD was inserted. Repeated blood work in subsequent visits continued to show low potassium and magnesium. The patient was referred to neurology, which raised the suspicion for hypokalemic periodic paralysis. She was started on an oral potassium supplement, and her paralysis attacks became less frequent and shorter in duration. The combination of periodic paralysis and long QT made the diagnosis of Andersen-Tawil syndrome more likely, and genetic testing for mutation in the *KCNJ2* gene was positive.

Andersen-Tawil syndrome is a hereditary syndrome that consists of a triad of periodic paralysis, prolonged QT, and characteristic physical features (low-set ears and small mandible, among others). About two-thirds of patients with Andersen-Tawil syndrome have mutations in the *KCNJ2* gene, which codes for potassium channels.

A few weeks later the patient returned to our preoperative clinic for her carpal tunnel surgery. The recommendation from the neurologist and cardiologist was to maintain her potassium level in the high-normal rage (> 5 mEq/L), as this would shorten the QTc, lessening the chances of a malignant arrhythmia, as well as help control her muscle symptoms. Furthermore, it is necessary to regularly check the serum potassium level when patients like this are hospitalized and acutely ill; if the patient starts to have painful muscle spasms, potassium has to be checked and replaced if necessary, and benzodiazepines work better than other options in controlling pain.

Our patient underwent her surgery with no complications.

Abstract 34

Perioperative Management of a Parturient with Neuromyelitis Optica

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Devic's disease, or neuromyelitis optica (NMO), is a severe inflammatory demyelinating disorder of the central nervous system that involves recurrent episodes of transverse myelitis and optic neuritis. NMO has traditionally been considered a variant of multiple sclerosis (MS), and management of the two diseases was similar. More recently, a specific IgG antibody against the astrocytic water channel aquaporin-4 (AQP4) has been implicated in the pathogenesis of NMO, and it is considered an entity distinct from MS. We present a case involving the perioperative anesthetic management for cesarean delivery in a patient with NMO.

There is a paucity of literature on the anesthetic management of patients with NMO. To our knowledge, only two case reports describe the obstetric anesthetic management of patients with NMO: the use of an epidural for labor analgesia converted to anesthesia for urgent cesarean delivery (Gunaydin, 2001) and the development of NMO after administration of a spinal anesthetic (Facco, 2009). In a third case, a 53-year-old female who underwent spinal anesthesia for an orthopedic procedure also developed NMO following the procedure.

We report the anesthetic management of a parturient with active Devic's disease who underwent general endotracheal anesthesia for elective cesarean delivery. Our patient initially presented with NMO after a previous delivery with an epidural, and the association of the neuraxial technique with her disease process was uncertain. General anesthesia was chosen to avoid potential exacerbation of her NMO, particularly in light of its timing of onset after a previous neuraxial technique. General anesthesia was provided successfully for cesarean delivery. The patient did exhibit heightened sensitivity to neuromuscular paralysis, requiring a higher dose of cholinesterase inhibitor for blockade reversal and short-term bimodal positive airway pressure assistance upon extubation. She did not exhibit any of the hemodynamic instability that has previously been postulated. Postoperative pain management was approached aggressively because the patient had been taking chronic opioid analgesia for her disease. Close postoperative follow-up was uneventful from an anesthesiology standpoint. The patient had no short-term postoperative exacerbation of NMO; self-limited constipation was evaluated by a neurologist and thought to be consistent with postoperative opioid use and unrelated to NMO. This case highlights the potential challenges of anesthetic management in patients with rare neurological disease.

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Abstract 35

'High'-Pertension

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Case Presentation: A 75-year-old male presented for preoperative evaluation prior to laparoscopic radiofrequency ablation of solitary liver metastasis from colorectal cancer. His exercise tolerance was greater than 4 METs. He had had intestinal surgery 6 months earlier without complications. His past medical history was significant for myocardial infarction in 2000 and 2004, hypertension (HTN), peripheral vascular disease, untreated sleep apnea, and tobacco use. He took carvedilol twice daily and had experienced side effects with several antihypertensives. Examination was unremarkable except for manual right arm blood pressure (BP) of 212/110 and a 2–3/6 blowing systolic apical murmur. Labs were normal except for a creatinine of 1.36. Electrocardiogram showed sinus bradycardia at 59 bpm, left ventricular hypertrophy, and inferior q waves. Persantine Cardiolite stress testing 1.5 years earlier demonstrated an ejection fraction of 51%, fixed inferior defect with some reversible ischemia, and minor septal wall motion abnormalities.

The patient was agitated. His BP had been 235/94 during surgical evaluation 2 weeks earlier, and he did not understand our concern. He refused new prescriptions, tests, or further physician evaluation. His surgeon and PCP were notified. On the morning of surgery, his sBP was in the 200s and was reduced to the 170s with parenteral medication. He tolerated surgery well but developed ventricular tachycardia/fibrillation 2 hours after surgery and died.

Discussion: Preoperative HTN is an important cardiovascular risk factor. Uncontrolled HTN can lead to labile intraoperative blood pressures, myocardial ischemia, arrhythmias, systolic dysfunction, renal insufficiency and neurological complications. Per ACC/AHA guidelines, uncontrolled HTN is only a "minor" risk factor. However, risks seem higher in patients with dBP > 110 and sBP > 180 and with end-organ damage such as congestive heart failure and renal insufficiency. Chronically elevated BP should be controlled for several weeks before elective surgery. Parenteral antihypertensives may be used prior to urgent surgeries.

This case underscores the need for communication between all teams involved in perioperative care. Our patient required further optimization but unfortunately refused any intervention and insisted on proceeding with surgery despite the risks. The importance given to his BP by the medical team was not reinforced by his PCP or the surgical or anesthesia teams. The lack of a unified message may have contributed to inadequate patient understanding of perioperative risks, and such poor communication adds to medicolegal liability. This situation was further complicated by the patient's diagnosis of metastatic cancer, which made it difficult to significantly delay his surgery.

Conclusion: Effective communication between various teams is extremely important to ensure optimal postsurgical outcomes.

Abstract 36

Perioperative Care in Neuromuscular Scoliosis

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A 25-year-old male with Becker muscular dystrophy is referred from the neurosurgery clinic for preoperative evaluation for spinal stabilization. He has been hospitalized once for acute decompensated heart failure and has been treated for two episodes of pneumonia in the past 6 months. The patient and his family are concerned about the risk of heart failure and pulmonary complications.

Muscular dystrophy is a group of hereditary progressive diseases associated with cardiomyopathy, progressive decline in pulmonary function, and scoliosis, which are the major cause of morbidity and mortality. Muscle weakness, contractures, and progressive scoliosis impair pulmonary function, leading to hypoventilation and ineffective cough. Pulmonary function tests including arterial blood gas are essential to the evaluation of pulmonary reserve and degree of hypoventilation. Vital capacity of less than 35% predicted suggests that postoperative complications are likely and postoperative ventilatory support will be necessary. Preoperative physical therapy and breathing exercises may be beneficial in improving pulmonary reserve. Patients with hypoventilation may benefit from nocturnal ventilation started in the preoperative phase in consultation with a pulmonologist.

In a recent retrospective chart review, prior seizure history, unplanned blood loss, and unplanned staged surgery were factors statistically significantly associated with perioperative complications. Patients taking anticonvulsant drugs had significantly greater blood loss during anterior procedures. Cardiac evaluation per current guidelines and two-degree echocardiography is essential to quantify left ventricular ejection fraction. Succinylcholine administration is associated with life-threatening hyperkalemia and should be avoided in patients with muscular dystrophy. In the postoperative period, duration of intubation and the presence of atelectasis is a stronger predictor of infective complications. Prolonged prone positioning and hypotension can predispose to compartment syndrome, necessitating fasciotomy. The incidence of postoperative myocardial infarction is not well documented in this patient subgroup. Frank discussion with patients and their families regarding long-term use of artificial ventilation may be helpful to document patients' wishes. A thorough cardiac, pulmonary, and hematologic evaluation, along with awareness of specific adverse drug effects, will help guide care in the postoperative period. More studies need to be done to further evaluate the cardiac adverse events and protocols to better risk-quantify the same.

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