



Program and Abstracts of the
4th Annual
**Perioperative Medicine
Summit 2009**

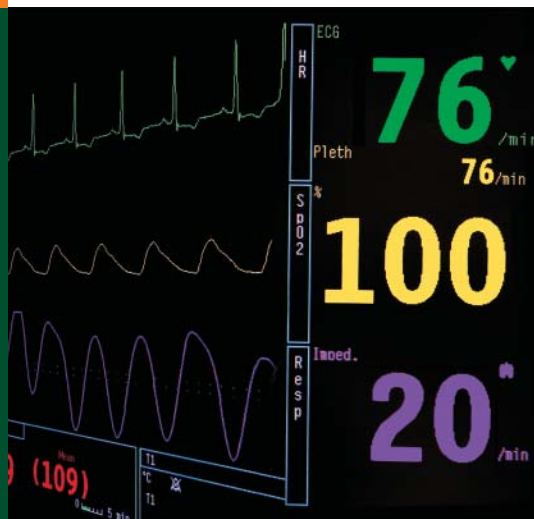
Using Evidence to Improve Quality,
Safety and Patient Outcomes

February 5–7, 2009

Eden Roc Resort
Miami Beach, Florida

SUMMIT DIRECTOR:
Amir K. Jaffer, MD

SUMMIT CO-DIRECTORS:
David L. Hepner, MD
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Welcome from the Summit Director



Along with my summit co-directors, David Hepner and Frank Michota, I welcome you to Miami, the new home for the Perioperative Medicine Summit. This is our fourth meeting, and it 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 grow more limited during these tough economic times in the United States and around the world, I believe that practicing safe, quality, and evidence-based perioperative medicine becomes more important than ever. I trust you will leave this summit armed with a wealth of cutting-edge knowledge in perioperative medicine that you can readily implement in your practice or at your home institution.

As you can see from the agenda and faculty listings in this booklet, we are fortunate to have numerous 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 approximately 40 abstracts (included in this booklet) as posters and oral presentations. Don't forget to join us for the poster session and the welcome reception at the hotel at 5:00 PM Thursday, February 5.

I remind you to visit our Web site, www.periopmedicine.org, and to register at our Twitter site, <http://twitter.com/PeriopSummit>, for important updates. In collaboration with the *Cleveland Clinic Journal of Medicine* (www.ccjm.org), we plan to publish a proceedings supplement in a few months that will include review articles based on presentations made at the summit.

We want to make each subsequent summit better than the one before, and we take your feedback seriously, so don't forget to fill out the evaluation forms. Finally, I trust that you will love the weather, culture, food, and activities that Miami and the surrounding areas have to offer, so have fun while you are here with us at the summit.

Bienvenido!

A handwritten signature in black ink, appearing to read 'Amir K. Jaffer'.

Amir K. Jaffer, MD
Summit Director

Program and Abstracts of the 4th Annual Perioperative Medicine Summit 2009

Electronic Supplement 1 to Volume 76, February 2009

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Summit Program

THURSDAY, FEBRUARY 5, 2009

7:00–7:30 AM	Breakfast/Registration
7:30–7:45 AM	Welcome — <i>Amir K. Jaffer, MD, David L. Hepner, MD, and Franklin A. Michota, Jr., MD</i>
7:45–8:15 AM	Improving Quality and Safety in Perioperative Medicine — <i>Peter Lindenauer, MD</i>
8:15–8:30 AM	Questions and Answers
8:30–9:00 AM	Cardiac Risk Stratification for Noncardiac Surgery: Update from the 2007 ACC/AHA Guidelines — <i>Lee A. Fleisher, MD</i>
9:00–9:15 AM	Questions and Answers
9:15–9:45 AM	Perioperative Care of the Elderly — <i>Robert M. Palmer, MD</i>
9:45–10:00 AM	Questions and Answers
10:00–10:30 AM	Break/Visit Exhibits
10:30–10:50 AM	Enhancing Patient Safety Through Communication — <i>David J. Birnbach, MD</i>
10:50–11:00 AM	Questions and Answers
11:00–11:20 AM	Preoperative Evaluation and Cost-Effective Lab Testing — <i>David L. Hepner, MD</i>
11:20–11:30 AM	Questions and Answers
11:30–11:50 AM	Perioperative Fluid Management — <i>Mark Hamilton, BSc, MRCP, FRCA</i>
11:50–12:00 PM	Questions and Answers
12:00–1:15 PM	Lunch
1:15–1:45 PM	Anesthesia for the Medical Consultant — <i>David A. Lubarsky, MD</i>
1:45–2:00 PM	Questions and Answers

2:00–2:30 PM	Perioperative Management of Warfarin and Antiplatelet Therapy for Noncardiac Surgery— <i>Amir K. Jaffer, MD</i>
2:30–2:45 PM	Questions and Answers
2:45–3:15 PM	Break/Visit Exhibits
3:15–3:45 PM	Prevention of Venous Thromboembolism after Surgery— <i>Franklin A. Michota, Jr., MD</i>
3:45–4:00 PM	Questions and Answers
4:00–5:00 PM	Simultaneous Breakout Sessions
	Maximizing Revenue from Perioperative Consultation— <i>Gail Pfeiffer, RHIA, CCS-P</i>
	Perioperative Management of Devices— <i>Vivek Reddy, MD</i>
	Problem-Based Postoperative Pain Management— <i>Darin J. Correll, MD</i>
	Quality Improvement 101: QI Skills, Tools, and Their Application— <i>Susan R. Kirsh, MD, Peter Lindenauer, MD, and Michael Vigoda, MD, MBA</i>
5:00–7:00 PM	Poster Session and Welcome Reception

FRIDAY, FEBRUARY 6, 2009

7:00–7:30 AM	Breakfast
7:30–7:45 AM	Welcome— <i>Amir K. Jaffer, MD, David L. Hepner, MD, and Franklin A. Michota, Jr., MD</i>
7:45–8:15 AM	Perioperative Management of Diabetes: Translating Evidence into Practice— <i>Luigi F. Meneghini, MD, MBA</i>
8:15–8:30 AM	Questions and Answers
8:30–9:00 AM	Pulmonary Risk Stratification and Risk-Reduction Therapy for Noncardiac Surgery— <i>Gerald Smetana, MD</i>
9:00–9:15 AM	Questions and Answers
9:15–9:45 AM	Perioperative Gastrointestinal Dysfunction— <i>Michael (Monty) Mythen, MD</i>
9:45–10:00 AM	Questions and Answers

10:00–10:30 AM	Break/Visit Exhibits
10:30–11:15 AM	Challenging Perioperative Cases —Steven L. Cohn, MD, and Bobbie Jean Sweitzer, MD
11:15–11:30 AM	Questions and Answers
11:30–11:50 AM	Statins and Noncardiac Surgery —Don Poldermans, MD, PhD
11:50–12:00 PM	Questions and Answers
12:00–1:00 PM	Lunch—Simultaneous Breakouts <i>Bring your questions and meet the experts</i>
	Anticoagulation — Amir K. Jaffer, MD, and Franklin A. Michota, Jr., MD
	Quality Improvement 201: Making your QI Work Publishable — Andrew Friedrich, MD, and Peter Lindenauer, MD
	Anesthesiologists —Sunil Eappen, MD, and Steven Gayer, MD
	Hospitalists —Efren Manjarrez, MD, Jessica Zuleta, MD, Joshua Lenchus, DO, RPh, and Alex Rico, MD
	Cardiac Risk Assessment and Reduction — Steven L. Cohn, MD, and Brian Harte, MD
1:00–1:45 PM	Best Research Abstracts <i>Moderator: David L. Hepner, MD</i>
1:45–2:15 PM	Debate: Perioperative Beta-Blocker Therapy for Noncardiac Surgery: Yes or No? —Don Poldermans, MD, PhD, vs Philip Devereaux, MD
2:15–2:30 PM	Questions and Answers
2:30–3:00 PM	Break/Visit Exhibits
3:00–3:30 PM	Perioperative Management of Valvular Heart Disease — William O'Neill, MD
3:30–3:45 PM	Questions and Answers
3:45–4:45 PM	Simultaneous Breakout Sessions
	Maximizing Revenue from Perioperative Consultation — Gail Pfeiffer, RHIA, CCS-P

- 3:45–4:45 PM **Simultaneous Breakout Sessions (continued)**
- Perioperative Management of Devices**—*Vivek Reddy, MD*
- Problem-Based Postoperative Pain Management**—*Darin J. Correll, MD*
- Hands-On Quality Improvement**—*Peter Lindenauer, MD, Susan R. Kirsh, MD, and Michael Vigoda, MD, MBA*

SATURDAY, FEBRUARY 7, 2009

- 6:45–7:15 AM **Breakfast**
- 7:15–7:30 AM **Welcome**—*Amir K. Jaffer, MD, David L. Hepner, MD, and Franklin A. Michota, Jr., MD*
- 7:30–8:00 AM **Perioperative Management of Patients with Liver Disease**—*Paul Martin, MD*
- 8:00–8:15 AM **Questions and Answers**
- 8:15–8:45 AM **Perioperative Management of Sleep Apnea: Ready for Prime Time?**—*Shirin Shafazand, MD*
- 8:45–9:00 AM **Questions and Answers**
- 9:00–9:45 AM **Panel Discussion: Preoperative Clinics: Nuts and Bolts**—*Angela M. Bader, MD, MPH, Bobbie Jean Sweitzer, MD, and Ajay Kumar, MD*
- 9:45–10:00 AM **Questions and Answers**
- 10:00–10:30 AM **Break/Visit Exhibits**
- 10:30–10:50 AM **Perioperative Management of Anemia**—*Ajay Kumar, MD*
- 10:50–11:00 AM **Questions and Answers**
- 11:00–11:45 AM **Medicolegal Issues in Perioperative Medicine: Lessons from Some Real Cases**—*Victoria Vance, Esq., and Franklin A. Michota, Jr., MD*
- 11:45–12:00 PM **Questions and Answers**
- 12:00–12:30 PM **Medication Management**—*Christopher Whinney, MD*
- 12:30–12:45 PM **Questions and Answers**
- 12:45–1:00 PM **Concluding Remarks and Adjourn**

Abstract 1

Pulmonary Hypertension Is an Important Predictor of Perioperative Outcomes in Patients Undergoing Noncardiac Surgery

Roop Kaw, MD; Esteban Walker, PhD; Vinay Pasupuleti, MD, PhD;
Abhishek Deshpande, MD, PhD; Tarek Hamieh, MD; and Omar A. Minai, MD
Cleveland Clinic, Cleveland, OH

Rationale: Pulmonary hypertension (PH), although considered high risk, is not currently recognized as an independent risk factor for perioperative outcomes after noncardiac surgery (NCS).

Objectives: We report perioperative complications and their associated risk factors from a large cohort of patients with angiographically proven PH.

Methods: Patients undergoing NCS between January 2002 and December 2006 were cross-matched with a pulmonary artery catheterization (PAC) database for the same period. Patients were excluded if they were < 18 years old or if they underwent cardiac surgery prior to NCS or minor procedures using local anesthesia/sedation. A comparable number of controls with mean pulmonary arterial pressure (MPAP) < 25 mm Hg who underwent similar surgeries were used for analysis. Multivariate logistic regression was used to identify clinical, echocardiographic, and angiographic characteristics associated with perioperative morbidity and mortality (**Table, next page**).

Results: Out of a total of 5,445 patients who underwent PAC, 526 underwent NCS during the specified period. Of these, 96 patients had PH. MPAP ($P = .001$), American Society of Anesthesiologists (ASA) class ($P = .02$), and chronic renal insufficiency ($P = .03$) were determined as independent risk factors for postoperative morbidity. Of the 27 patients with significant perioperative complications, which included 1 death, 25 (92.6%) had underlying PH. Patients with PH were more likely to develop congestive heart failure ($P < .001$; OR: 11.9), hemodynamic instability ($P < .002$), sepsis ($P < .0005$), and respiratory failure ($P < .004$). Patients with PH needed longer ventilatory support ($P < .002$), stayed longer in the ICU ($P < .04$), and were more frequently readmitted to the hospital within 30 days ($P < .008$; OR: 2.4).

Conclusions: Underlying PH can have a significant impact on perioperative outcomes after NCS. Patients with pulmonary arterial hypertension and “mixed PH” had a higher likelihood of such complications when compared to patients with pure pulmonary venous hypertension.

TABLE
Multiple logistic regression for morbidity/mortality for all patients

Characteristic	Odds ratio*	P value
Cardiac risk index (with vs without)	3.9	.01
ASA class (> 2 vs ≤ 2)	3.2	.04
Surgical risk class	7.5 (3 vs 1) 1.5 (2 vs 1)	.03
MPAP	5.9	.02
Pulmonary vascular resistance	—	.06

*Area under the receiver operator characteristic curve: .81

Abstract 2

Analysis of Administrative Practices and Residency Training Curricula in Academic Anesthesiology Programs

David Hepner, A.R. Bader, D. Correll, L.C. Tsen, B.S. Segal, and A.M. Bader

Brigham and Women's Hospital, Boston, MA

Introduction: A survey of academic anesthesiology programs was undertaken to analyze administrative and educational practice patterns. Information regarding current and planned changes to residency curricula in preoperative assessment was obtained to assess program plans to meet the increasing requirements mandated by the Accreditation Council for Graduate Medical Education (ACGME).

Methods: A detailed questionnaire was devised using input from a group of academic anesthesiologists with specific expertise in preoperative assessment. The questionnaire was sent via e-mail to anesthesiology program directors in the United States. Data were collected and descriptive analysis was performed.

Results: Responses were submitted from 75 of 130 academic anesthesiology programs (58% response rate). Responses to administrative questions revealed that 81.3% have a preoperative clinic, of which 63% are run by an anesthesiologist, 31% by a nurse manager, and 4% by a hospitalist. Only 40% of clinics had anesthesia attendings physically on site in the clinic. Of those that do have attendings in the clinic, 88% utilize only specific attendings. However, 33% of institutions report that virtually all of their attendings have expertise in preoperative evaluation. Although residents currently perform about 44% of preoperative evaluations at responding institutions, 31% of institutions do not currently have residents rotating through the preoperative clinic. Of the institutions that do rotate residents through the clinic, 66.7% do this with a block rotation and 64% have a formal curriculum in preoperative evaluation. Eighty-seven percent of responding institutions plan on making changes to meet the new ACGME requirements. These changes include hiring new attendings (9.2%), establishing new curricula (33.8%), enlarging current curricula (24.6%), adding new rotations (13.8%), changing to block rotations (20%), and increasing rotation length (53.8%). Sixty-nine percent of institutions believe that these changes will meet the new ACGME requirements in education.

Conclusions: Concern about current adequacy of training in preprocedure assessment may be reflected in the increased mandates proposed by the ACGME. Results of our survey underline these concerns, particularly in the significant number of clinics that do not have attendings on site or residents on scheduled clinic rotations. The responding institutions report a number of ways in which education will hopefully be greatly improved in this area. Educational improvements in training programs will be essential to validate the significant role of the anesthesiologist during the perioperative period.

Abstract 3

Is Percent Body Fat a Better Predictor of Surgical Site Infection Risk than Body Mass Index?

Emily Waisbren, BS; Angela M. Bader, MD, MPH; Heather Rosen, MD, MPH;
Selwyn O. Rogers, Jr., MD, MPH; and Elof Eriksson, MD, PhD

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Purpose: Body mass index (BMI) is commonly used to define obesity, and studies suggest that obesity is an independent predictor of surgical site infection (SSI). We hypothesized that percent body fat (%BF) provides a better definition of obesity and is a better predictor of SSI risk than BMI. Its incorporation into preoperative patient assessment may improve clinical outcome.

Methods: Elective surgical patients at the Brigham and Women's Hospital were evaluated in a prospective cohort study. Excluded were immunosuppressed, pregnant, transplant, trauma, or burn patients, for a cohort of 194 patients. BMI was measured using the standard formula (weight [kg] divided by height [m²]), and %BF was measured using bioelectrical impedance analysis. Preoperative, operative, and 30-day postoperative outcome variables were obtained using interviews, questionnaires, and medical record analyses. The primary outcome variable was SSI.

Results: Mean age was 48.9 ± 10.2 years. Mean %BF and BMI were 33.8 ± 10.6 and 29.5 ± 7.5 , respectively. Using body fat measurements, 130 (67%) patients were obese (males > 25% BF, females > 31% BF). Using BMI criteria, only 74 (38%) were obese (BMI > 30 kg/m²). The overall incidence of SSI was 13.9% (n = 27). Using BMI criteria, 14.2% of nonobese and 13.5% of obese patients developed SSI ($P = .898$). Using %BF criteria, 4.7% of nonobese and 18.5% of obese patients developed SSI ($P = .008$). Obesity, defined by %BF, captured 24 of the 27 patients (88.9%) with SSI, but only 10 (37%) patients were captured using BMI criteria. Patients with SSI had significantly higher %BF than those without SSI (38.5 vs 33.1, $P = .01$). However, BMI was not statistically significantly different between the groups ($P = .1$). %BF ($P = .01$), pedal edema ($P = .05$), recent surgery ($P = .05$), National Nosocomial Infection Surveillance (NNIS) score ($P = .048$), and wounds with class 2 (clean-contaminated) or higher ($P = .038$) were univariate predictors of SSI.

Conclusions: %BF defines obesity better than BMI, and is a better predictor of SSI risk than BMI.

Abstract 4

A Nomogram for Prediction of Survival for Patients Undergoing Elective Major Noncardiac Surgery

Y. Olivia Xu-Cai, MD; and Michael W. Kattan, PhD

Cleveland Clinic, Cleveland, OH

Background: An accurate predictive model for perioperative outcomes of patients who have been clinically optimized prior to elective noncardiac surgery has not been well studied. We sought to develop a nomogram that can help physician and patient to accurately estimate the likelihood of postoperative survival.

Methods: We studied consecutive patients who were systematically evaluated and treated by hospitalists in a preoperative clinic between 2003 and 2006. Thirty-four routinely available preoperative clinical baseline variables were analyzed to design the predictive model.

Results: There were 11,255 eligible patients for analysis (mean age 69 ± 12 years) who were followed for a median of 1.9 years postoperatively. The nomogram (**Figure, next page**) was formulated based on a Cox proportional hazards regression model. The model had a bootstrap-corrected concordance index of 0.739 and good calibration.

Conclusions: A nomogram was constructed, based on preoperative variables, that can predict 30-day, 1-year, and 3-year survival probability in patients undergoing elective major noncardiac surgery. This nomogram should be helpful for patient counseling and trial design.

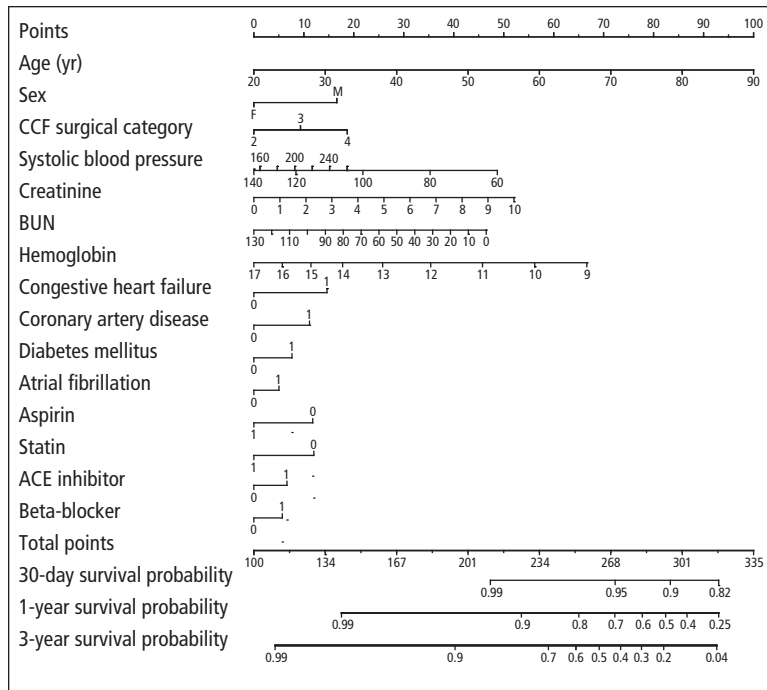


FIGURE. *Instructions for Physician:* Locate the patient's age on the **Age** axis. Draw a line straight upwards to the **Points** axis to determine how many points towards death the patient receives for his or her sex. Repeat this process for the other axes, each time drawing straight upward to the **Points** axis. For medical comorbidities and medications, 1 represents current use of medication or presence of the medical condition and 0 represents no current use of the medication or absence of the medical condition. Cleveland Clinic Foundation (CCF) surgical category: 2 = mild risk, 3 = moderate, and 4 = high risk procedure. Sum the points achieved for each predictor and locate this sum on the **Total points** axis. Draw a line straight down to the **30-day**, **1-year**, and **3-year survival probability** axes to find the patient's probability of surviving for 30 days, 1 year, or 3 years.

Abstract 5

Sustainability of an Osteoporosis Pathway

Catherine Gibb, MBBS, FRACP¹; Christopher Butcher, FRACS²; Lesley Thomas, BNsg²; and Jennifer Pink, BPharm²

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In 2003 The Queen Elizabeth Hospital (TQEH) implemented a champion-driven pathway for the initiation of triple therapy for osteoporosis in patients presenting with a minimal-trauma fracture over the age of 50.

Preliminary data from 2003 suggested none of these patients were being discharged on therapy.

After a 10-month period an audit was performed which confirmed that 88% of eligible patients in this group were discharged on triple therapy.

A further recent review at a 5-year period shows that prescription rates of therapy for osteoporosis in this patient group are now at 95%.

The champion-driven pathway concept at TQEH has sustained prescription rates for orthopedic patients presenting with an osteoporotic fracture over a sustained period of time.

Abstract 6

Length of Hospital Stay Is Predicted by Comorbidities

Catherine Gibb, MBBS, FRACP; and Professor Villis Marshall, FRACS

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Australia's demographics are of an aging population. This is putting an increasing strain on hospital resources.

One potential for building capacity in the hospital system is to reduce the length of stay (LOS). This would allow greater patient turnover.

The challenge has been to identify areas where potential improvements could occur.

An audit of LOS cross-correlated with comorbidities at the Royal Adelaide Hospital (RAH) showed that an increased number of common comorbidities correlated well with increased LOS, and particularly LOS of greater than 14 days.

This finding has confirmed the potential for early identification of patients likely to have a prolonged LOS. It raised the possibility of interventions prior to admission, at least in elective surgical patients, that may reduce LOS.

A high-risk preoperative medical clinic has been established in conjunction with the existing preanesthetic clinic. The aim of the clinic is to optimize pre-existing medical problems and establish a plan for possible complications to facilitate early recognition and treatment.

Early data suggest LOS in patients seen through the high-risk clinic is reduced compared with case controls, with the relative stay index in patients seen through the clinic being 1.103, compared with 1.235 in case controls.

Abstract 7

Generalization of the POISE and Mangano Studies on Beta-Blocker Use in the Perioperative Period

Matthieu Touchette, MD; Odile Paquette, MD; Catherine St-Georges, MD; and Luc Lanthier, MD, MSc

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Objective: To revise the indications and contraindications related to the prescription of beta-blockers for the perioperative period at a preoperative clinic, according to POISE (PeriOperative ISchemic study Evaluation) and Mangano's criteria.

Methods: This retrospective cohort study included all patients evaluated at an internal medicine preoperative clinic between November 2005 and November 2006 who were undergoing an elective surgery necessitating hospitalization of more than 1 day. We recorded general characteristics of the patients and the surgeries, and all the data about the inclusion and exclusion criteria from the POISE and the Mangano studies. The data were analyzed with the chi-square test. We considered a P value of $< .05$ as statistically significant.

Results: A total of 949 patients were reviewed and 504 met inclusion criteria. According to Mangano's criteria, 396 (78.6%) patients had an indication but 187 (47.2%) of these had a contraindication to the prescription of a beta-blocker, for a total of 209 patients (41.5%) who should have received beta-blocker therapy according to these criteria. As for POISE criteria, 208 patients (41.3%) presented an indication, whereas 160 of them (76.6%) had a contraindication for the prescription of a beta-blocker or another exclusion criterion. Thus, according to POISE criteria, 48 (9.5%) were eligible for the administration of beta-blockers. A significant difference was shown in the number of subjects who could receive a beta-blocker according to Mangano's and POISE criteria (41.5% vs 9.5%; $P < .0001$).

Conclusion: The use of the POISE study criteria restricts the prescription of beta-blockers to a more restrained group of patients compared with Mangano's study criteria. The generalization of these 2 studies on the use of beta-blockers in the perioperative period is thus very different.

Abstract 8

Impact of Antihypertensive Medication on Perioperative Period

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Introduction: There are only sparse data on antihypertensive medication management during the perioperative period. The literature is not clear concerning their hemodynamic effects and their optimal use during this particular time.

Objective: To evaluate the impact of antihypertensive medication on blood pressure (BP) and vasopressor use during the perioperative period.

Methods: This retrospective cohort study included all patients using antihypertensive therapy seen at the internal medicine preoperative clinic between November 2005 and November 2006 who were undergoing elective surgery that needed hospitalization for more than 1 day. We recorded patients' characteristics, medication used at home and during the perioperative period, surgery and anesthesia types, all hemodynamic data before and during surgery, and vasopressor use. Patients with incomplete files were excluded from final analysis. Results were analyzed with the chi-square test and the t-test. We considered a *P* value of $< .05$ as statistically significant.

Results: Of the 949 patients that we reviewed, 371 met inclusion criteria. Patients were then divided into 2 groups. The first group included hypertensive patients who did not take their antihypertensive therapy on the morning of the surgery ($n = 91$), and the second group was composed of hypertensive subjects who took their antihypertensive medication before surgery ($n = 280$). Analysis showed that there was no significant difference between group 1 and group 2 for the incidence of perioperative hypotension (defined as systolic BP < 90 mm Hg) (58.2% vs 46.4%, $P = .07$) or for vasopressor medication use (71% vs 79%, $P = .12$). The combined end point of perioperative hypotension or vasopressor perfusion was not different between groups (65% vs 59%, $P = .29$). In addition, we could not show a difference in perioperative BP depending on the class of antihypertensive medication taken the morning of surgery.

Conclusion: The administration of antihypertensive therapy on the morning of surgery did not cause significant variations in perioperative BP and did not increase the utilization of vasopressor therapy during the perioperative period.

Abstract 9

An Analysis of Preoperative Testing Protocols in Academic Anesthesiology Programs

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Introduction: Preoperative testing remains a controversial area, especially since there are no formal guidelines in the literature. A survey of academic anesthesiology programs was therefore undertaken to analyze practice patterns.

Methods: A detailed questionnaire on preoperative test ordering, preoperative test billing, and impact on cancellation rate was devised using input from a group of academic anesthesiologists with specific expertise in preoperative assessment. The questionnaire was sent via e-mail to anesthesiology program directors in the United States. Data were collected and descriptive analysis was performed.

Results: Responses were submitted from 75 of 130 academic anesthesiology programs (58% response rate). Although 94.7% of institutions require no testing unless indicated based on patient history, age, or type of surgery, 70.8% of institutions have age requirements for electrocardiograms. 78.6% consider them outdated if done more than a year prior to surgery and 64% base their protocols on the literature. 68.6% have no requirements for preoperative chest x-ray and 43.9% base ordering on surgery type. Even though 20% of institutions have no specific guidelines for preoperative pregnancy testing, 56.5% that do have guidelines require testing in all menstruating females. 66.2% utilize urine pregnancy testing. While 72.5% of institutions have no specific requirements for preoperative coagulation studies, 40% of those institutions with guidelines require them for joint replacement surgery. The majority of institutions have no specific requirements for electrolytes based on age (77.9%), type of surgery (72.1%), or American Society of Anesthesiologists status (86.4%). 71.6% of institutions report that their testing guidelines have not changed within the past year. In 31.3% of the institutions, 1% to 5% of all surgeries are canceled for inadequate preoperative workup; 16.4% of the institutions report greater than 5% cancellation rate based on inadequate evaluations, and 16.4% have no idea what percentage of canceled surgeries is the result of inadequate preoperative workup. 52.2% of institutions do not understand how they are reimbursed for preoperative testing and 27.7% bill separately. 30.8% have no idea if they bill for this service. 81.5% of institutions would not let knowledge regarding payment influence ordering of preoperative tests.

Conclusions: Analysis of our data demonstrates that although there is no generalized consensus on preoperative testing, surgery cancellation rates continue to depend on inadequate preoperative evaluations. An understanding of the reasons behind preoperative protocols is likely to impact efficient operating room resource use.

Abstract 10

Preoperative Biomarkers of Inflammation, Ischemia, and Heart Failure and Outcomes of Vascular Surgery

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Background: Vascular surgery patients are at risk for perioperative myocardial infarction (MI), heart failure, and death. Patients are screened before vascular surgery for coronary artery disease and heart failure; however, current clinical risk assessment strategies have poor accuracy for identifying patients who will suffer adverse perioperative events. Improved methods of accurately assessing risk may lead to improvements in safety.

Biomarkers are blood tests that are highly informative of a diagnosis or prognosis for a particular disease. B-type natriuretic peptide (BNP), a biomarker of heart failure; troponin I (TropI), a biomarker of cardiac ischemia; and C-reactive protein (CRP), a biomarker of inflammation, are promising candidates for preoperative screening of vascular surgery patients.

In blood donors, BNP differs significantly by gender. It is not known whether gender influences biomarker levels in subjects with surgical vascular disease. However, if present, gender effects on biomarker levels should be incorporated into recommended cut-off levels for preoperative risk assessment and risk reduction goals.

Methods: Fifty-seven patients scheduled for major vascular surgery (interventions on the aorta or lower extremity revascularization) were recruited between March 2007 and July 2008. Inpatients and emergency surgery patients were excluded.

Preoperative data include demographics, medical history, and levels of BNP, TropI, and CRP. Primary cardiac outcomes within 30 days of surgery comprise MI, pulmonary edema, ventricular fibrillation, primary cardiac arrest, complete heart block, and death.

Results: Five of 57 (9%) patients suffered a primary outcome (1 death, 1 MI, 3 cases of pulmonary edema). Two of 2 patients with preoperative TropI elevation had an MI, with 1 associated death. No relationship was found between preoperative BNP and adverse outcome. BNP levels, on average, were higher for males than for females, in contradistinction to prior reports.

Conclusion: Our pilot study did not show that a panel of 3 biomarkers relevant to cardiovascular pathophysiology contributed to preoperative risk stratification before high-risk vascular surgery. Given the low incidence of primary outcomes, it may have been underpowered. Preoperative TropI elevation appears to be an ominous sign, although low overall numbers limit statistical inferences. Curiously, BNP levels were higher in males than females, in opposition to reports in other populations. Further research is needed to clarify the potential role of biomarkers in preoperative risk stratification and optimization.

Abstract 11

Alcohol-Related Predictors of Postoperative Delirium in Major Head and Neck Cancer Surgery

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Background: Despite the potential adverse impact of heavy alcohol consumption on postoperative outcome, screening for alcohol consumption prior to surgery is often haphazard. The objective of this study was to determine which alcohol-use-related findings on preoperative laboratory testing and medical history were most predictive of postoperative delirium.

Methods: The study population was an inception cohort of 805 patients undergoing medical evaluation from 1994 through 2004 prior to major surgery to resect squamous cell carcinoma of the head and neck. Fifteen patient variables were analyzed for correlation with postoperative delirium. This included 5 medical variables, 2 surgical variables, and 8 preoperative alcohol-use questions. The alcohol-use questions consisted of modified versions of the 4 CAGE questions and 4 additional questions about recent alcohol use, abstinences from alcohol in the prior year, alcohol withdrawal symptoms, and memory loss episodes ("blackouts" associated with heavy drinking). Logistic regression with stepwise selection was used to analyze the data.

Results: Ninety-two (11.4%) of the 805 surgeries were complicated by postoperative delirium. After multivariable logistic regression, 7 variables remained significantly correlated with postoperative delirium: age (OR: 1.05/yr, $P < .01$), pre-existing cognitive impairment (OR: 2.65, $P = .02$), poor functional status (OR: 2.23, $P = .02$), mean corpuscular volume greater than 95 fL (OR: 2.20, $P < .01$), duration of surgery (OR: 1.003/min, $P < .01$), patient report of not going without alcohol for at least 1 week in the prior year (OR: 2.32, $P = .01$), and having ever been advised by others to cut back on alcohol consumption (OR: 2.28, $P < .01$).

Conclusions: In a population at risk for heavy alcohol consumption, specific findings associated with heavy alcohol consumption may help to identify patients at risk for postoperative delirium. These findings include an elevated mean red blood cell volume, patient report of uninterrupted daily alcohol intake, and patient report of having ever been advised to reduce alcohol consumption.

Abstract 12

Intraoperative Coagulopathy: A Low-Volume Treatment Protocol that Completely Replaces Fresh Frozen Plasma

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Background: Fresh frozen plasma (FFP) is commonly used to correct intraoperative coagulopathies (believed to be secondary to clotting factor depletion, platelet consumption, and/or volume replacement strategies), but is associated with significant fluid volume if multiple units are given. Similar to other institutions, volume overload and a high number of ventilator days were major issues in high-risk spine surgeries (HRSS) at our institution.

Methods: As part of a quality improvement (QI) initiative addressing the entire perioperative period, we evaluated use of a low-volume approach to treat coagulopathies—sequential use of cryoprecipitate, DDAVP, and activated factor VII (fVIIa) instead of FFP. Our goals were to reduce blood loss, reduce overall intraoperative fluid volume, and reduce postoperative ventilator days. Following implementation of the intervention, we retrospectively reviewed the charts of 16 consecutive patients who underwent HRSS (defined as greater than 5 levels of fusion or lasting at least 360 minutes) and 16 patients who underwent HRSS after protocol intervention. The protocol was implemented in January 2007. Sixteen consecutive patients were chosen in a blind fashion between October and November 2005 (preprotocol) and May and June 2007 (postprotocol implementation).

Results: The protocol patients as a group had an 18% (20-unit) reduction in packed red blood cell (pRBC) units ($P = .52$), a 15% (17.1 L) reduction in crystalloid ($P = .35$), and a 24% (5.3 L) increase in colloid usage ($P = .65$). The preprotocol patients used 88 units (22 L) of FFP as opposed to none in the protocol patients. Per patient, the protocol cohort received 2.7 L less volume, had a 2.3-day (14%) reduction in length of stay (LOS) ($P = .52$), and had a 1.1-day (9%) reduction in ventilator days ($P = .91$). The surgeries using the protocol lasted on average 19 minutes less, had more women (75% vs 56%), more 2-stage surgeries (6 vs 3), more revisions (9 vs 4), and more osteotomies (38 vs 25). The preprotocol cohort had more lumbar levels (71 vs 64), but the protocol cohort had more cervicothoracic levels (78 vs 61).

Of note, the deep vein thrombosis (DVT) rate doubled from 12.5% to 25% after the protocol was implemented. Also, fVIIa was given to only 1 patient during the study and this patient did not acquire a DVT.

Conclusion: Using an innovative low-volume coagulopathy treatment protocol, we successfully reduced intraoperative blood product usage and overall resuscitative volume, ventilator days, and LOS in 16 patients undergoing HRSS. However, the rate of DVT development doubled. Prior to implementing this low-volume coagulopathy treatment protocol, the impact of the increased risk of postoperative DVT needs to be assessed.

Abstract 13

Is the Berlin Questionnaire an Effective Screening Tool for Obstructive Sleep Apnea in the Preoperative Total Joint Replacement Population?

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¹Northwestern University, Chicago, IL; ²Northwestern Memorial Hospital, Chicago, IL

Background: Obstructive sleep apnea (OSA) has become a recognizable disorder among medical specialists but remains a relatively unexplored topic for surgeons, anesthesiologists, and their patients in the perioperative period. Recent studies have begun to describe the negative impact of untreated OSA in the perioperative patient population, specifically in orthopedics. Guidelines from the American Society of Anesthesiologists in 2006 address the screening and care of patients with OSA, although they admit that supportive studies do not exist for many of their recommendations.

Methods: In this study, 80 consecutive total joint replacement patients presenting to the preoperative clinic at our institution were screened using the Berlin Questionnaire, a validated tool used to screen medical outpatients for OSA. Patients who tested as high risk using the scoring system were offered a sleep study to be completed preoperatively.

Results: Of the 80 questionnaires performed, 21 (26%) were screened as high risk. Of these 21 positive patients, 12 agreed to a sleep study. All 12 sleep studies showed OSA, and of these, 7 (58%) were found to be severe. The average body mass index (BMI) for all patients was 30.9 kg/m². As the BMI increased from > 30 to > 35 to > 40, the percentage of positive Berlins increased from 42% to 59% to 75%, with only 1 person requiring the BMI to qualify as a positive Berlin. Only 5 of 42 patients (12%) with a BMI below 30 had a positive Berlin and none of these patients agreed to a sleep study. The Berlin Questionnaire has been found to have a positive predictive value of 89% in prior studies. With a positive Berlin Questionnaire incidence of 26% in our study, it could be estimated that the incidence of sleep apnea in this population of orthopedic patients undergoing a total joint replacement is 23%, which is consistent with estimates for the general population.

Conclusion: This study demonstrates a relatively simple and effective tool for screening patients for sleep apnea in the preoperative setting and highlights the extent of undiagnosed OSA. Clinicians can use the questionnaire results to prompt precautionary measures in the care of these patients or to prompt the expedition of a sleep study. Future studies could investigate the safety of a focused screening effort on those patients with a BMI over 30, as the incidence of clinically important OSA is likely much higher in this population.

Abstract 14

The Impact of Preoperative Medical Optimization on Head and Neck Cancer Surgery

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Royal Adelaide Hospital, Adelaide, Australia

Head and neck cancer and many cardiopulmonary diseases share similar risk factors of smoking, excess alcohol use, and lower socioeconomic status. This affects the rate of complications and length of stay after surgical intervention.

Outcomes were studied from a group 1 year before and a group 1 year after initiation of a medical preoperative optimization clinic at the Royal Adelaide Hospital.

This clinic contributed to decision-making in difficult patients and had a positive impact on the patient journey.

Abstract 15

Reconceptualizing the Preoperative Process

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In the last 10 to 15 years in Australian hospitals, the generally accepted “model of care” for elective surgical patients has changed, so that centralized preoperative assessment services led by anesthetists have become widespread.

While clinical practice has changed, the conceptual model for the preoperative process remains unclear.

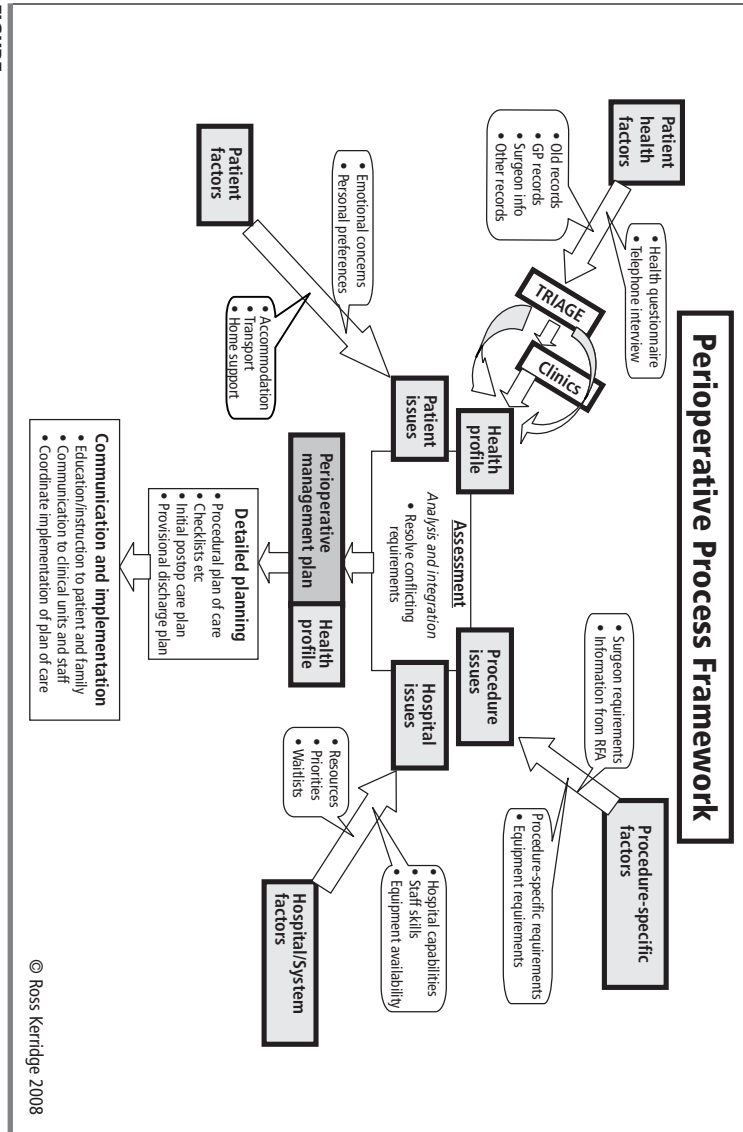
The traditional model is based on a single channel of information flow and decision-making, starting at the surgeon’s decision to operate. Subsequent stakeholders (including the anesthetist and hospital-based services) are seen as reactive to this process. Thus they function as “gatekeepers” or “checks and barriers,” interrupting or diverting the patient care process when necessary. This model may no longer be an appropriate way of conceptualizing the preoperative process.

The increased complexity of medical comorbidities in surgical patients, the greater attention to the patient’s personal needs and preferences, and the more proactive involvement of the hospital in planning surgical care processes make a different “model” of the preoperative process necessary. A new model (**Figure, next page**) was developed in 2007 and has been accepted by the State (New South Wales) Department of Health.

This model conceptualizes the preoperative assessment process as including 4 distinct groups of process factors (the surgical/procedural requirements, the patient’s medical comorbidities, the patient’s personal preferences, and the hospital requirements). The preoperative process acts to resolve these different factors into a perioperative management plan, which is then communicated to all those involved in patient care during the surgical episode.

This new model has proved useful to support the redesign of clinical and information management processes, to improve system efficiency, and to allow staff to develop a more appropriate understanding of their role in the perioperative process.

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FIGURE

Abstract 16

Development of an Electronic Medical Record Smart Set Form to Increase Standardization, Consistency, and Compliance with ACC/AHA Perioperative Guidelines

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Background: Our Internal Medicine Preoperative Assessment Consultation and Treatment Center sees a volume of 14,500 patients per year. The preoperative assessment is done by a group of 35 physicians who rotate through our center using an electronic medical record (EMR) for documentation, which has generally only permitted free text entry. This may result in inconsistencies with preoperative risk assessment and discordance with the current American College of Cardiology (ACC)/American Heart Association (AHA) guidelines.

Purpose: We aimed to devise a smart form for standardization of our perioperative risk assessment and to improve compliance with the current ACC/AHA guidelines.

Description: A task force was established, which included our information technology personnel, to develop a smart set form to create simple drop-down reminders in our assessment and plan portion. This drop-down menu included a separate cardiac portion which reminded the physician of all 6 revised cardiac risk index (RCRI) criteria and helped tabulate its total count. Another drop-down menu reminded the physician with regard to starting a beta-blocker if the RCRI was greater than 2, increasing the dosage for suboptimal heart rate or blood pressure, or not starting beta-blockers for listed absolute or relative contraindications. It also reminded the physician of the patient's metabolic equivalents (METs) capacity and cardiac risk factors and to order stress testing if appropriate with the guidelines.

Results: After the implementation of our smart set and re-education of our staff, our compliance with the current ACC/AHA guidelines went up to 100%. As a result of the above success we are now in the process of incorporating venous thromboembolism prophylaxis, stress dose steroids, the new guidelines for infective endocarditis prophylaxis, antibiotic prophylaxis for patients with prior prosthesis, preoperative pulmonary assessment, anemia management, and diabetic management into the above smart set.

Abstract 17

Development of a Perioperative Electronic Medical Record Research and Quality Improvement Database

Anitha Rajamanickam, MD; Ali Usmani, MD; Feza Remzi, MD; Brian Harte, MD; and Ajay Kumar, MD

Cleveland Clinic, Cleveland, OH

Background: Approximately 14,500 patients are evaluated by our Internal Medicine Preoperative Assessment Consultation and Treatment Center each year, and there is enormous research potential from this large volume of patients. The perioperative evaluation is done by our group of 35 physicians who rotate through the perioperative center. We use electronic medical records (EMRs) for documentation, which has generally only permitted free text entry. Data entry was individual-dependent and research required painstaking manual EMR chart review.

Purpose: Our aim was to enable standardized data entry that was easily queriable, retrievable, and searchable for research purposes and quality control monitoring.

Description: With the help of a task force involving our information technology (IT) department, we developed a smart form for data collection that involved the physician clicking either “Yes” or “No” for pertinent history and symptoms for 10 different reviews of systems. This involved 114 data entry points, of which 41 were mandatory. This was to replace prior manual entry of symptoms and history. This smart form was set up to be easily queriable, retrievable, and accessible for research once the data were entered during perioperative assessment by our physicians.

Results: After the implementation of our smart form, we were able to set up a perioperative database that was easily accessible and accurate, as it was standardized and not individual-dependent. This helped to eliminate the huge time constraint involved with retrospective chart research. The workflow of our physicians and the time spent in patient evaluation after the smart form was rolled out compared with our prior evaluation form remained unchanged. Also, this database has enabled us to collect and contribute the preoperative data for the National Surgical Quality Improvement Program (NSQIP) at 100%, compared to prior manual data collection and retrieval, which achieved the minimal requirement of 40 patients per month per service.

Conclusion: Creation of an EMR database as a part of the preoperative evaluation workflow process provides easily queriable, retrievable, and accessible data for research and surgical quality monitoring in a large surgical center.

Abstract 18

An Innovative Perioperative/Consultative Curriculum for Third-Year Internal Medicine Residents

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Background: Third-year internal medicine residents at Jackson Memorial Hospital rotate through 4 weeks of a medical consult service, during which they may be contacted by any nonmedical service. The majority of consults center on perioperative medicine issues such as preoperative evaluation, delirium, and diabetes and hypertension management. The consult resident also leads the code team for all in-hospital cardiac and/or respiratory arrests and often initiates an induced hypothermia protocol for return of spontaneous circulation. To this end, the Division of Hospital Medicine at the University of Miami has developed learning objectives, educational tools, and feedback mechanisms to create an innovative consultative curriculum.

Purpose: To outline the design, goals, objectives, and educational tools that encompass the content of a perioperative/consultative curriculum for third-year internal medicine residents.

Description: The overall goals of this rotation and curriculum are to provide internal medicine residents with the knowledge and skill set to provide evidence-based consultations to all nonmedical services at Jackson Memorial Hospital, with a focus on perioperative medicine. To meet these goals, the curriculum's objectives are focused around the Accreditation Council for Graduate Medical Education (ACGME) core competencies. The learning objectives are taught through required reading, covering 15 key evidence-based articles, that reviews relevant perioperative topics. Prior to discussing each article, a case vignette with pertinent questions is administered to the residents. Subsequently, the case and answers are discussed and the salient points identified; the faculty is provided an answer key for test review. Residents also complete a pre- and post-test regarding perioperative medicine; the answers are reviewed during the first and last week of the rotation. Residents are expected to submit a written consultation at the beginning and end of the rotation for peer and supervisory review, and feedback will be provided.

Results and Conclusions: We believe that this curriculum, with its goals, learning objectives, and educational tools, provides graduating internal medicine residents with an enhanced fund of knowledge in perioperative medicine and a skill set that will augment their abilities to provide excellent consultative care. We believe it to be a highly valued part of the residency program.

Abstract 19

Preoperative Medicine Infobutton

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Background: Preoperative medical exam consultations provide patient-specific medical risk assessment for patients undergoing surgical interventions. The primary preoperative evaluation focuses on cardiac and pulmonary risk assessments, medical condition optimization, and medication therapy evaluation. Beyond medical care optimization and risk stratification, consult reporting to the surgical and anesthesia providers is needed prior to the surgical intervention to facilitate recommendations. A Preoperative Medicine Infobutton solution can provide important clinical decision support and reporting capabilities by providing context-specific links to information resources at the point of care.¹

Purpose: The preoperative medical examination focuses on the clinical information needs of the surgical and anesthesia teams for peri- and postoperative medical care. One of the core diagnostic challenges is to provide risk stratification specific to the patient's procedural and clinical comorbidities. Many surgical and anesthetic interventions are not part of the usual expertise of the primary care physicians who are frequently the providers of preoperative evaluations. Decision support tools can help provide data for the preoperative practitioners to better assess procedural risk. In addition to surgical procedural information, knowledge management of specialty care recommendations is needed by the preoperative care providers. The use of an Infobutton tool provides a mechanism to support clinical work efficiency and insure that providers have up-to-date and easily accessible clinical information.

Description: Cardiac, pulmonary, and endocarditis prophylaxis guidelines provided by the respective specialty organizations were incorporated into the Infobutton tool. The guideline recommendations were supplemented with contextually pertinent literature resources to facilitate risk stratification decision support. Patient-specific data are entered into the Infobutton for decision support and information gathering at the point of care. Direct contextual Web links are also available to obtain relevant references for the underlying risk assessment tools and clinical guideline information. The data can then be output either in electronic or paper form for consult completion and communication. Key functional components include cardiac, pulmonary, neurologic, and functional status assessment.

Conclusions: The Preoperative Medicine Infobutton provides a potential mechanism to optimize preoperative evaluation and testing. Future work will involve additional refinement of the Infobutton tool by including additional medication management functionality and integration of additional context-sensitive information resources.

1. *The Infobutton Manager. The Infobutton Manager Columbia University Web site. <http://www.dbmi.columbia.edu/cimino/Infobuttons.html>. Accessed December 22, 2008.*

Abstract 20

Nurse Practitioners: Bridging the Gap in Perioperative Care

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Perioperative nurse practitioners (PONPs) continue to provide a vital link in the perioperative arena. While the positive impact of the nurse practitioner in preoperative assessment centers has been identified, the PONP role in the preoperative hospital setting is emerging to bridge the gaps in perioperative care. In 2008, a preoperative assessment center (PAC) opened at an academic medical center, encouraging physicians to send American Society of Anesthesiologists (ASA) III and ASA IV patients for presurgical evaluation. Almost immediately the PONPs recognized their role in providing a seamless transition between the PAC and the operating room. Patients not seen by the PAC are assessed by the PONP, who is responsible for ordering and reviewing preoperative testing. Even patients evaluated in the PAC may present with issues requiring PONP involvement prior to the start of surgery. PONPs continue to update histories and physicals, provide prompt preoperative management of hypertension and hyper/hypoglycemia, and implement Surgical Care Improvement Project (SCIP) measures ensuring appropriate glucose, antibiotic, and beta-blocker management. In collaboration with the PAC, PONPs provide a continuum of care that is crucial for patient safety, cost reduction, handoff of care, and regulatory compliance/accreditation, as well as facilitate positive patient, nurse, and physician satisfaction. Nurse practitioners working in the perioperative setting identify complex needs of patients; recognize and manage medical, educational, and emotional issues of the surgical patient; and foster a more positive surgical experience for the patient and staff.

Abstract 21

Intubation Training of Deploying Far Forward Combat Medical Personnel with the Video Laryngoscope

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Background: Expertise in basic airway management is essential for emergency medical providers. Emergency airway management attempts on the battlefield may frequently end in failure. Studies show the video laryngoscope (VL) enhances intubation training by facilitating anatomical visualization of airway anatomy. We examined the performance and training of military health care providers in a brief intubation training course using both direct view (DV) and VL.

Methods: After IRB approval, trainees completed an online training course in basic intubation. Subjects then completed a pretraining questionnaire followed by a hands-on training session using the Storz Video Laryngoscope on a Laerdal Manikin (standard and difficult airway settings). The participants intubated with DV (covered monitor) and VL (uncovered monitor) under the supervision of an anesthesiologist. Participants then completed a questionnaire indicating confidence levels in successful intubation, airway visualization scores, and technique preference.

Results: All participants agreed that video laryngoscopy improved airway visualization, which resulted in an improved success rate of intubation and decreased intubation time. This training boosted confidence levels in standard airway intubation (**Table, next page**). Eighty-six percent preferred video laryngoscopy in standard airway intubation and 100% preferred video laryngoscopy for difficult intubations. Ninety-five percent of participants considered this training course worthwhile and would recommend this course to other health care providers.

Discussion: An improved view of the glottic opening would likely enhance the chance of performing a successful intubation. This training format with the video laryngoscope improved airway visualization and intubation performance, promoting increased trainee confidence levels for successful intubation.

Conclusion: Web-based training paired with hands-on instruction with the video laryngoscope improved trainee performance and confidence. This training should be considered as a model for military basic airway management training.

TABLE
Performance data

Confidence levels in successfully intubating a patient on 1st attempt	Average pretraining confidence level (mean \pm SD)	Average post-training confidence level (mean \pm SD)
Average confidence level (scale 1–10: 1 = not confident; 10 = very confident)	5.00 \pm 2.65 (n = 20)	8.33 \pm 1.41 (n = 18)
Average Cormack-Lehane airway grading score		
Airway type	Direct view	Indirect view (VL)
Standard manikin airway	2.86 \pm 0.88 (n = 22)	1.45 \pm 0.60 (n = 22)
Difficult manikin airway	3.90 \pm 0.42 (n = 22)	1.82 \pm 0.80 (n = 22)
Success rates of intubation		
Airway type	Direct view	Indirect view (VL)
Standard manikin airway	73% (n = 22)	100% (n = 22)
Difficult manikin airway	9% (n = 22)	100% (n = 22)
Post-training preference for laryngoscopic technique		
	Standard laryngoscope	Video laryngoscope
For difficult airway	0%	100% (n = 22)
Post-training overall preference for laryngoscopic technique		
	Standard laryngoscope	Video laryngoscope
Percentage of respondents	6% (n = 18)	94% (n = 18)

Abstract 22

The Establishment of a Perioperative Skin Integrity Committee

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Background: A hospital committee was created to explore the basis for repeated incidents of skin breakdown.

Objectives: To create a team approach for communicating patients' information regarding skin assessment, perioperative requirements, and postoperative needs. To identify patients with actual and potential skin breakdown prior to admission.

Implementation: A communication system relaying information to appropriate caregivers was developed.

Positive Outcome: Patients with actual or potential skin integrity issues are identified earlier. Staff became aware of resources that can be accessed to manage patients with skin integrity issues.

A grant was awarded to the committee to explore and develop a perioperative skin assessment tool.

Implications for Perianesthesia Nursing: The involvement of perianesthesia nurses on the committee will ensure a consistent level of participation in the treatment and prevention of skin breakdown.

Abstract 23

**Development and Implementation of a Perianesthesia
Integrative Care Committee**

Jeanne Lanchester, RN, MEd; Jeanette Cote, BWN, RN; Terri Jamros, RN;
Charla Delillo, RN; Sherie Lavoie, BSN, RN; Jennifer Therminos, SN;
Joan Compagnone, RN; and Nicole Engel, MSN, RN

Brigham and Women's Hospital, Boston, MA

Background: The staff identified a need to offer alternative therapies for perianesthesia patients in congruence with the 2005 American Hospital Association (AHA) Complementary Alternative Medicine (CAM) usage survey.

Objective: To certify as many nurses and ancillary staff within the perianesthesia area as possible in Reiki and therapeutic touch.

Implementation: Collaborated with Center for Preoperative Evaluation to inform patients of available services and developed an e-mail communication list to notify practitioners.

Positive Outcome Achieved: Positive feedback received from patients, staff nurses, and leadership.

Implications for Perianesthesia Nurses: There is available evidence in the literature to show a correlation between integrative therapies and decreased pain and anxiety and the promotion of healing.

Abstract 24

Development of a Screening System to Identify Patients Preoperatively Who May Benefit from a Postoperative Hospitalist Consult

Elizabeth Marlow, MD, MA; and Chad Whelan, MD

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Background: While pure consultative and co-management models are common in hospitalist consultation, both have their weaknesses. Pure consultative models likely select for sicker patients, but patients who would benefit from consultation may be missed and also may miss opportunities to prevent medical complications. Strictly co-management models cast a wide net and therefore patients are followed who may not need the care of a hospitalist. This model may not best match clinical need with the additional resource of hospitalist consultation.

Purpose: Our group operates under a pure consultative model and does not participate in a perioperative clinic. Review of our administrative data indicates that the primary services may be calling consults later into the patient's clinical course when earlier consultation would have been indicated. We sought to develop a system to better identify patients who would benefit from a hospitalist medicine consult.

Description: We developed our pilot system in conjunction with our two highest-volume orthopedic attendings who care mostly for total joint replacement patients. While these patients tend to be older and have more comorbidities, not all of these patients require hospitalist input. To identify patients, the consulting hospitalist reviews the list of patients scheduled for the operating room and screens for preselected indications for consultation by reviewing the electronic medical record: age > 75 years, stage 3 kidney disease, diabetes mellitus, hypertension, congestive heart failure, patients on chronic anticoagulation, and subjective selection by our group or by the surgeon. Once identified, we notify the surgeon the week of the planned surgery that their patient may benefit from a hospitalist consult and plan to follow up postoperatively unless the surgeon feels otherwise.

Results and Conclusions: To date, 75% of the patients screened have required inpatient consultation. Difficulties have arisen during the pilot, including inconsistent communication within our group regarding the patients to be seen and inconsistent consultative practice by our group. Overall, satisfaction level has been high among the surgical teams. We are working to refine our criteria to create a more effective service. We also hope to expand our program to other surgical services, including vascular surgery and neurosurgery.

Abstract 25

An Algorithm for Preoperative Screening and Management of Sleep Apnea: Have We Created a Monster?

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Background and Purpose: Obstructive sleep apnea is a prevalent and under-diagnosed/underreported condition. The screening worksheet in our preoperative assessment clinic included the question: "Have you ever been diagnosed with sleep apnea?" This identified many patients with the disease who did not otherwise report it on a standard history. Undiagnosed patients were still presenting with perioperative complications.

Description: We recently refined the screening process by adding the "STOP"¹ questions. The worksheet already included age, gender, and height/weight (3 of the 4 elements of "Bang"¹). Nurses screened all questionnaires for "positive" STOP responses. An anesthesiologist reviewed the screen-positive cases to select the patients at high risk of perioperative complications from sleep apnea. Our collaborating sleep center added urgent consult slots to accommodate patients needing consultation.

Results: In the initial 4 weeks, 958 patients were seen in preoperative clinic; the 106 screen-positive patients were managed as follows:

- 68 had modifications in the timing and location of surgery, or type of anesthesia administered, per American Society of Anesthesiologists practice guidelines.²
- 12 high-risk patients were referred for a preoperative sleep consultation.
- 26 were having procedures under local anesthesia and were advised to follow up with their primary care physicians or were having major cancer surgery and were being closely monitored postoperatively anyway.

Of the 12 patients referred for sleep consults, polysomnography (PSG) was advised in all 12. Six agreed to immediate PSG. All were positive for sleep apnea.

Conclusions:

1. Our algorithm for active management of sleep apnea screening:
 - Changed the timing and/or location of surgery or the type of anesthesia in 7% of cases.
 - Led to considerable time-consuming work for the preoperative staff and some patient inconvenience.
 - Increased the number of sleep consult referrals.
 - Detected sleep apnea in all patients referred for PSG.
2. The fact that all patients undergoing PSG had sleep apnea indicates that our algorithm does not lead to frivolous preoperative testing. It also suggests

many other patients are going undetected; despite the extra workload, we are seeing only the tip of the iceberg. We have established a database to further assess and refine the process.

1. Chung F, Yegneswaran B, Liao P, et al. STOP questionnaire: a tool to screen patients for obstructive sleep apnea. *Anesthesiology* 2008; 108:812–821.
2. Gross JB, Bachenberg KL, Benumof JL. Practice guidelines for the perioperative management of patients with obstructive sleep apnea: a report by the American Society of Anesthesiologists Task Force on Perioperative Management of patients with obstructive sleep apnea. *Anesthesiology* 2006; 104:1081–1093.

Abstract 26

Constructing a Collaborative Neuroscience Hospitalist Program

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In the decades of developing hospitalist programs across the nation, multiple models of care have arisen, from the more traditional hospitalist medicine program to surgicalist and laborist programs. As training programs have implemented work restrictions, hospitals have had to look to alternatives. At Harborview Medical Center in Seattle, WA, a 400-bed, Level 1 trauma center owned by the county and operated by the University of Washington, we have developed a multidisciplinary solution to the care of neurologically ill patients. The model consists of 5 services: a primary neurosurgical team, a neurocritical care service, a neurohospitalist team, a perioperative medicine team, and a medicine consult service. In this report we describe the key elements of program development, costs, and anticipated return on investment.

Abstract 27

The Development of Algorithms for Preoperative Management of Antiplatelet and Anticoagulation Therapy in Patients Undergoing Surgical or Invasive Procedures

Catherine McGowan, MSN; and Patricia Kidik, MSN

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Background: Patients receiving chronic antiplatelet and anticoagulation therapy pose a clinical challenge when they present for surgical or invasive procedures. The nurse practitioners (NPs) at Brigham and Women's Hospital Weiner Center for Preoperative Evaluation (WCPE) encountered inconsistencies in the management of these patients in the preoperative period. Procedures were postponed or cancelled due to a lack of consensus and planning in determining whether this therapy should be interrupted, bridged with a substitute agent, or continued. In addition, serious cardiovascular morbidity and mortality can result when anticoagulation therapy is interrupted.

Purpose: To address the lack of interdisciplinary consensus and bridge the gap between current clinical practice and research in this area, algorithms were developed for use as guidelines in the management of this patient population.

Description: NPs in the WCPE document the preoperative medication list for each patient visit. If a patient is taking an antiplatelet or anticoagulant, reference is made to the specific algorithm for preoperative management. This includes consultation with the physician who is managing the patient's therapy to develop an optimal strategy for complex cases. Areas for consideration include the type of medication, the reason for therapy, the surgery/procedure, and the type of anesthesia being used. The medications addressed in the algorithms include clopidogrel, aspirin, Coumadin, and enoxaparin. The algorithms will be presented in detail in the poster.

Results: Preoperative antiplatelet and anticoagulation strategies for all patients are clearly identified prior to the surgical procedure and documented in the patient medication record. Periods without antiplatelet and anticoagulation therapy are kept to a minimum. The practice in the WCPE no longer advises all patients to stop low-dose aspirin therapy in the preoperative period.

Conclusion: These algorithms, when consistently used by the NPs in their preoperative assessments, provide a constant standard of care and allow efficient patient management. The improvement in interdisciplinary communication yields increased patient safety and improved patient outcomes.

Abstract 28

Surgeon-Initiated Preoperative Screening: A New Approach

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Traditionally, preoperative screening was mostly the responsibility of hospital-based personnel. Now, patients can be screened and evaluated sooner and more efficiently at the surgeon's office or a clinic staffed by advanced practice nurses and physician assistants. This early screening will make the surgeon immediately aware of any issues that may delay or hinder surgery. The surgeon is now in the loop. Electronic screening programs, originally used and marketed for hospital use, can be adapted and modified for use in a private practice. We have found an electronic screening program, such as DocuSys, which can be utilized by surgeons to start the preoperative screening process. At the surgeon's office the patient completes a simple questionnaire at a computer terminal in a kiosk in the waiting room. The computer terminal has a touch screen for ease of operation. The program can be utilized in several different languages. Upon completion of the questionnaire, an office nurse verifies the information and completes a medication component. When verification is complete, the application provides a comprehensive list of comorbid conditions that could be utilized by coders. This system will then assign risk scores to triage the patients medically and/or for additional anesthesia consults. At this time, information will be provided regarding the type of clearances, if any, or evaluations that the patient might need. A history and physical exam will be generated when the surgeon completes the exam. The scheduler can now book the case with full knowledge of what additional workup is needed, thus avoiding needless delays or postponements. The system is designed to generate letters to primary and specialist physicians based upon the findings of the screening questionnaire. Algorithms are provided for clearance, identifying practice-specific recommended presurgical testing. At the completion of the process the patient will receive specific instructions relating to pre- and postop care. The patient will then be given a slip to complete any necessary testing required, such as labs, chest x-rays, or electrocardiography. This program will allow the surgeon to be an integral part of the prescreening process.

The authors of this abstract have no financial interest or arrangements with the electronic program DocuSys.

Abstract 29

A New Process for Ensuring the Safety of Patients Having Anesthesia Outside of the Operating Room

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Background: The Nurse Practitioners (NPs) in the Brigham and Women's Hospital Weiner Center for Preoperative Evaluation (WCPE) perform an extensive evaluation to assess patients' readiness for surgery. Patients having procedures requiring anesthesia outside of the traditional operating room (OOOR) were not consistently evaluated in the same way. Procedures were postponed or canceled due to lack of information and patient comorbidities that required further workup.

Purpose: To safely address the special periprocedure concerns for patients receiving anesthesia in the OOOR areas, the WCPE NP role was expanded to incorporate evaluations of this patient population.

Description: A core group of NPs volunteered to participate in the initiation of this service in the interventional radiology department. The service eventually expanded to include the endoscopy, CT/MRI, and emergency departments. The NPs were oriented to the patient population, procedures, anesthesia requirements, and area staff; and they established interdisciplinary relationships. Both inpatients and outpatients are evaluated, and the NP collaborates with the OOOR anesthesia attending to develop an appropriate plan of care using the determined standards of documentation.

Results: The NP staff has gained increased knowledge of OOOR procedures, anesthesia requirements, and special concerns. The role has been well accepted by, and integrated with, the OOOR anesthesia team. Comprehensive preprocedure evaluations provide information to the OOOR anesthesia attending. This process assists in resource allocation, contributes to safe patient care, and has led to a decrease in procedure delays and last-minute cancellations.

Conclusions: The comprehensive assessment of patients undergoing anesthesia in areas OOOR generates safe, consistent patient care in the perianesthesia period.

Abstract 30

Establishing a Virtual Preoperative Evaluation Clinic

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Background: Health care resources are becoming increasingly limited. Telemedicine has the potential to offer patients timely, evidence-based care in a cost-effective format. Preoperative evaluation is essential to efficient operating room performance as well as being vital to patient safety. The authors contend that effective preoperative evaluation can be performed using a telemedicine-based format. In addition, patients will have a positive perception of the virtual evaluation.

Methods: To evaluate the effectiveness and patient perceptions of a telemedicine-based preoperative evaluation unit, a pilot program involving evaluation of patients via a video teleconferencing (VTC) link was established in 2 clinics in the VA Midwest Health Care Network. The central evaluation site was based at the Omaha VA Medical Center with 2 sites for patient evaluation: 1 within the urology clinic in Omaha and the second within an ophthalmology clinic at the Lincoln VA Outpatient Clinic approximately 50 miles away. The evaluations were performed by an anesthesiology research fellow via VTC link.

Results: A 15-item, 5-point Likert scale questionnaire was completed by the patients following their preoperative examination. Five questions dealt with the technical quality of the teleconference link. Ninety-four percent of the patients answered positively in regard to the video and audio quality of the teleconference link; only 6% felt that the video quality was not as clear as their TV at home. Four questions evaluated the efficacy and benefits of virtual evaluation. Seventy-five percent to 95% felt that teleconsultation could save time and money and avoid unnecessary travel for the patients. In questions that evaluated the patients' overall comfort level with virtual evaluation, only 6% were embarrassed to speak to the examiner using the VTC link and 6% felt the appointment took longer than expected. On questions regarding patient preference, 50% indicated they would prefer virtual preoperative evaluation, with only 6% claiming they would prefer face-to-face evaluation; however, up to 44% were unsure. The patients' clinical course was followed after virtual evaluation. To date, 1 patient awaits cardiology evaluation, all other patients had no further delays before their surgery, and no day-of-surgery cancellations have occurred.

Conclusions: A virtual preoperative evaluation unit can provide effective, evidence-based evaluations; patients have a positive opinion of the process and in most cases prefer this format.

Abstract 31

Perioperative Hypoxemia and Rhabdomyolysis in a Medically Complicated Patient

Sarah Bodin, MD

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Case Presentation: A 45-year-old morbidly obese (BMI > 43) male presented for biopsy and resection of an epididymal lesion. Past medical history included type 2 diabetes mellitus and antiphospholipid antibody on anticoagulation for prior deep vein thrombosis (DVT) and pulmonary embolus (PE). Coumadin was discontinued with normal international normalized ratio (INR). He preferred general anesthesia (GA) to subarachnoid block despite generalized muscle soreness after previous GA.

After induction of GA, a laryngeal mask airway was placed, and spontaneous ventilation ensued with maintenance sevoflurane. Within 1 hour of induction, the patient became mildly tachycardic and hypoxic, with presumed obesity hypoventilation syndrome, requiring endotracheal intubation facilitated by succinylcholine and propofol. Hypoxemia was unresolved despite clear, equal breath sounds. Arterial blood gases were pH 7.15, pCO₂ 59.8 mm Hg, pO₂ 78.5 mm Hg, HCO₃ 20.3 mmol/L, and potassium 6.43 mEq/L. Chest radiograph and fiberoptic bronchoscopy were reassuring. Skin mottling and sweating were noted at the end of the procedure, with tachycardia to 120 bpm. An emergent computed tomography scan was negative for PE, and an electrocardiogram showed sinus tachycardia without other abnormalities. Within 5 hours of GA induction, hypoxemia and hypercarbia began to improve, but cola-colored urine was noted, suggesting elevation of creatinine phosphokinase (CPK) and troponins. Hyperkalemia was treated with insulin. In the medical intensive care unit (ICU), the patient was sedated and hydrated overnight, and he was weaned from mechanical ventilation the following morning.

Rhabdomyolysis was identified by the medical ICU team with initial CPK > 9,000 U/L. The anesthesiologist was unaware until the following morning, strongly suspected malignant hyperthermia (MH), and discussed this diagnosis with the medical team. Intraoperative hyperthermia to 38.7°C was then discovered, overlooked during distracting events. The patient received sodium bicarbonate for myoglobinuria and physical therapy for muscle weakness. CPK levels peaked at 99,000 U/L on postoperative day 2 and decreased prior to discharge home on postoperative day 5 with baseline renal function, on anticoagulation therapy, or physical therapy for weakness, and with awareness of his MH susceptibility. Caffeine-halothane contracture testing is planned in several months to confirm the diagnosis, and he will enter the North American MH Registry.

Discussion: Confounded by morbid obesity-related hypoventilation, hypercoagulability, and suspected PE, this patient's care and presumptive diagnoses required collaboration between surgical, medical, and anesthesia teams, leading

to enhanced learning about this rare genetic disease. A syndrome of MH-like hyperthermia and hypermetabolism is described in new-onset type 2 diabetes mellitus in adolescents and young adults, and was included in his differential diagnosis. Additionally, the patient takes bupropion, an atypical antidepressant that has been associated with neuroleptic malignant syndrome, which can present similarly to MH. The patient also has symptoms suggestive of underlying myopathy.

Conclusions: Collaborative, interdisciplinary care achieved a good outcome for this patient with multiple medical problems and a confusing intraoperative and postoperative course. The case was an intriguing learning opportunity for distinguishing causes of perioperative rhabdomyolysis and hyperthermia.

Abstract 32

How Soon Is Too Soon? General Anesthesia after Coronary Intervention with Bare Metal Stents

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Case Presentation: A 66-year-old male with significant history, including coronary artery disease (CAD), diastolic dysfunction, hypertension, lung cancer, pancytopenia, HIV, cirrhosis with ascites, and jaundice, presented for endoscopic retrograde cholangiopancreatography (ERCP) and biliary stent placement under general anesthesia. Patient was admitted to hospital 22 days earlier with dyspnea; cardiac workup led to placement of 2 bare metal stents (BMS) to his mid left anterior descending artery. Patient was discharged home and returned 10 days later with jaundice and nausea/vomiting. After admission, patient developed a severe upper gastrointestinal (GI) bleed. Patient was intubated for decreased mental status and impending respiratory failure secondary to either aspiration or pulmonary emboli. Antiplatelet therapy was held during the acute bleeding episode, and patient developed lower extremity deep vein thromboses (DVTs) despite a coagulopathy with elevated international normalized ratio (INR) attributed to liver dysfunction. Patient received several blood transfusions, GI bleeding resolved with clipping, and antiplatelet therapy was reinstated. Respiratory function and mental status improved and patient was extubated. When patient presented for ERCP, his physical exam revealed a cachectic male who had stable vital signs and severe jaundice and was somewhat somnolent but able to answer direct questions. The GI interventional physicians were willing to proceed on antiplatelet therapy.

Discussion: This case highlights the need for further investigation and education regarding the timing of anesthetics after coronary interventions. American College of Cardiology/American Heart Association guidelines recommend at least 4 and ideally 6 weeks after placement of BMS to permit neoendothelialization to occur and minimize risk of major cardiac events. Recent articles in *Anesthesiology* suggest that longer delays proportionally decrease cardiac events. Although the patient was having a low-risk procedure, his temporal proximity to BMS placement put him at high risk for in-stent stenosis with high mortality rates. The patient seemed to be at particularly high risk of stenosis given his development of DVTs while coagulopathic. The procedure was delayed until cardiology could see the patient and a discussion among all attending care providers—anesthesiology, gastroenterology, hepatology (primary service), and cardiology—could take place. After that discussion, informed consent could be obtained from the patient and family and realistic treatment goals could be conveyed.

Conclusions: Timing of noncardiac surgery after percutaneous coronary intervention with placement of stents requires a multidisciplinary approach that allows for a full evaluation of risks and benefits in order to maximize patient outcomes.

Abstract 33

Can Patients with Critical Aortic Stenosis Undergo Noncardiac Surgery without Intervening Aortic Valve Replacement?

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Case Presentation: A 65-year-old female patient with past medical history of hypertension, diabetes mellitus, and hyperlipidemia was seen for preoperative clearance for repair of right femur fracture. Patient denied chest pain but admitted to progressively worsening dyspnea on exertion over the last few months. Her medications were lisinopril, metformin, and simvastatin. Vital signs on admission were stable, with a blood pressure of 136/72 mm Hg and heart rate of 92 bpm. Labs were normal. Her exam was unremarkable except for a 3/6 harsh systolic murmur. Echocardiogram revealed critical aortic stenosis (AS) with valve area of 0.7 cm². Cardiology recommended aortic valve replacement (AVR), but patient refused surgery. Patient chose to undergo fracture repair surgery despite the explained risks. She was started on beta-blockers and appropriate anesthetic precautions were undertaken. Her postoperative course was complicated by prolonged ventilator support, but patient was successfully extubated after 2 days and was discharged in stable condition.

Discussion: Per the American College of Cardiology/American Heart Association guidelines, severe valvular disease is a major clinical predictor of cardiac risk and elective noncardiac surgery (NCS) should be delayed for intervening cardiac catheterization and/or possible valve surgery. However, several reviews have suggested that patients with severe AS may undergo NCS with relative safety if appropriate perioperative care is provided and careful management of the pathophysiologic changes associated with AS is undertaken. O'Keefe et al reported that in 48 severe AS patients (mean valve area 0.6 cm²) who were not eligible for AVR and underwent NCS, only 1 cardiac event with no deaths and a complication rate of about 2% was seen. This would compare favorably with the national 4% mortality rate for AVR reported by the Society of Thoracic Surgeons. On the other hand, a subsequent report of 19 patients with severe AS (mean valve area < 0.5 cm²) reported 2 perioperative deaths. Raymer and Yang compared 55 patients with significant AS (mean valve area 0.9 cm²) with case-matched controls with similar preoperative risk profiles other than AS undergoing similar surgeries, and cardiac complication rates were not significantly different between the two groups. Thus, patients with severe AS may undergo indicated NCS provided that the presence of severe AS is recognized preoperatively and the patients receive intensive perioperative care.

Conclusion: Critical AS needs to be detected preoperatively, given its prognostic importance. When detected, surgery may still be considered even if AVR is not feasible, and requires a comprehensive co-management team involving anesthesia, cardiology, surgery, and internal medicine.

Abstract 34

Is It Safe to Operate on Cocaine-Positive Patients?

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Case Presentation: A 62-year-old gentleman with past medical history significant for hypertension, benign prostatic hyperplasia, and chronic cocaine abuse presented to outpatient clinic for medical clearance for elective prostatectomy. Patient denied chest pain, shortness of breath, dyspnea on exertion, or palpitations. He had smoked cocaine for the last 15 years. Physical exam was negative and his vital signs were: blood pressure 128/56, heart rate 78 bpm, respiration rate 18, and SpO₂ 100% on room air. Patient electrocardiogram (ECG) showed normal sinus rhythm with no QRS, QT, or interval prolongation and no ST-T changes. Chest x-ray was normal. His urine toxicology screening was positive for cocaine. Given the patient's stable ECG and absence of cardiac symptoms, the case was discussed with the anesthesia team and the plan was to go ahead with surgery under general anesthesia. Patient had his surgery 2 days later without any complications. His operative report did not show any accelerated hypertension, tachycardia, ventricular dysrhythmia, body temperature changes, ST-T wave changes, prolonged anesthesia, or recovery room time.

Discussion: Physiologic effects of cocaine ingestion include inhibition of active reuptake of norepinephrine at adrenergic nerve fibers. Thus, the increase in systolic, diastolic, and mean arterial blood pressure, heart rate, and body temperature, and the potential for coronary artery vasospasm resulting in ischemia-induced cardiac arrhythmias, are considered to be caused by a sympathetic stimulation syndrome secondary to increased plasma levels of norepinephrine. Cocaine metabolites possess no cocaine-like effects and can be detected in urine for as long as 60 hours and up to 10 days after cocaine ingestion. Therefore, the cocaine abuser may present with a positive urine test for cocaine metabolites but with normal physiologic variables. General anesthesia in this group of patients is generally considered to have increased risk, particularly if ketamine is used. Cocaine causes sodium and potassium channel blockade resulting in QRS and QTc prolongation, which is considered to be the primary underlying mechanism for the induction of these cocaine-induced arrhythmias, especially the torsades de pointes type of polymorphic ventricular tachycardia. QTc interval of < 500 ms is required by our anesthesia department before proceeding with elective surgery requiring general anesthesia.

Conclusion: Patients presenting for elective surgery requiring general anesthesia who test urine-positive for cocaine but are clinically nontoxic are at no greater risk than drug-free patients. Routine cancellation of these patients is unwarranted and wasteful of medical resources. However, a cocaine-abusing patient with a QTc interval of 500 ms or greater on the preoperative ECG or patients whose vital signs indicate acute cocaine intoxication need cancellation of surgery to avoid perioperative complications.

Abstract 35

To Intensive Care or Not?

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Case Presentation: Patient is a 73-year-old gentleman scheduled for left total knee arthroplasty. His medical history is significant for myocardial infarction followed by a 4-vessel bypass in 2002. Patient had a preoperative stress test done at his outside cardiologist's office showing nonreversible ischemia with evidence of "preinfarct ischemia" in inferior lateral regions of the heart. Ejection fraction was 45%; this is "unchanged" from prior study.

In clinic visit, patient denies snoring and also tests negative for sleep apnea based on his responses to the Berlin Questionnaire. On subsequent phone conversation closer to surgical date, wife confesses her husband (patient) "stops breathing at night."

Exam:

Blood pressure: 140/80, heart rate 82 bpm

General: overweight but not obese

Cardiovascular: regular rate and rhythm, no murmurs

Lungs: clear to auscultation bilaterally

Extremities: no edema

Electrocardiogram: left bundle branch block, rate 82 bpm

Patient proceeded through surgery without complication, but postoperatively was desaturating to 85% on 2 L of nasal cannula. Patient was started on continuous positive airway pressure with autotitration in the postanesthesia care unit (PACU).

Discussion: The decision regarding transition of care out of the PACU was made with the internist as well as the anesthesia resident and the attending in recovery.

Patient had known coronary artery disease and likely has undiagnosed, never previously treated, obstructive sleep apnea.

Patient was felt to be at higher risk for arrhythmia, respiratory failure, and other adverse outcomes. The decision was made to send the patient to the surgical intensive care unit postoperatively for intense monitoring overnight.

Conclusion: Internists screening patients for surgery should have either a questionnaire or routine discussion with patients regarding signs and symptoms of sleep apnea prior to surgery, just as is routinely done for coronary artery disease in a preoperative setting.

Patients with coronary artery disease and undiagnosed, untreated obstructive sleep apnea should be routinely admitted postoperatively to intensive care overnight for monitoring for episodic hypoxemia, arrhythmia, and mental status changes.

Undiagnosed sleep apnea in postoperative patients remains an important issue regarding patient safety.

Abstract 36

Predicting Surgical Complications from Liver Disease

Mona Lazar, DO; and Peter Kallas, MD

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Case Presentation: Patient is a 45-year-old male scheduled for a right ankle fusion. Medical history includes alcohol cirrhosis complicated by transjugular intrahepatic portosystemic shunt procedure and regularly scheduled large-volume paracentesis. Patient had emergent surgery 1 year ago for methicillin-resistant *Staphylococcus aureus*-infected hardware in the right ankle. Model for end-stage liver disease (MELD) score at time of surgery was 30. At that time, postoperative course was complicated by exsanguination. Patient was resuscitated by 7 U of packed red blood cells, Factor VII, and fresh frozen plasma.

Today in preoperative clinic, patient reports he has not had a drink in 1 year. He has “cleaned himself up.” He wants to “return to the golf course,” and cannot do so until his ankle is repaired. In addition to abruption of alcohol, he has started to attend a gymnasium.

Physical Exam:

Vital signs: blood pressure 130/80, heart rate 63 bpm, temperature 98.6, respiration 12

General: appears older than stated age

Cardiovascular: + gynecomastia, regular rate and rhythm

Lungs: + hepatosplenomegaly, + large umbilical hernia, + caput medusa

Extremities: trace edema

Laboratory:

Hemoglobin: 9.6 g/dL

Platelets: 125,000 K/ μ L

Creatinine: 1.36 mg/dL

International normalized ratio: 1.4

Discussion: Decision regarding patient’s safety going for an ankle fusion was multifaceted:

(1) What was patient’s MELD score today compared to 1 year ago?

(2) Does the risk of surgery outweigh the benefit of an ankle repair?

After calculating the patient’s MELD score, it was evident the MELD had improved drastically since time of last surgery: MELD 12 today vs MELD 30 one year ago.

The patient’s surgical risk was felt to be increased even with this low-risk surgery. Despite the surgeon’s hesitation, the patient was approved for surgery.

Conclusion: MELD score alone does not give enough information.

A MELD score of 12 in combination with a low-risk surgery equals moderate or increased risk for surgical complications relating to liver disease.

It is recommended that perioperative medicine clinics have a modality available to objectively decide on patient’s hepatic risk for surgery in addition to routinely calculating MELD score.

Abstract 37

Preoperative Coronary Angiography: Friend or Foe?

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This is a case from an Australian teaching hospital that is a nationally recognized leader in perioperative medicine.

A 54-year-old male with pre-existing well-treated hypertension and type 2 diabetes was seen for preoperative evaluation 10 days prior to laparoscopic hemicolectomy for a stenosing, but currently unobstructed, bowel cancer.

He had suffered exertional dyspnea and 1 episode of chest pain prior to diagnosis, when he was anemic (Hb 65 g/L). This resolved after transfusion and oral iron therapy. Subsequent noninvasive cardiac tests were moderately positive for ischemic heart disease. After transfusion, he had good exercise tolerance.

The anesthetist in the preoperative clinic accepted the patient for surgery without coronary angiogram, on the basis that investigations would not alter management. The procedural anesthetist on the day of surgery disagreed, and sought a cardiology opinion. The first cardiologist suggested proceeding with surgery as planned. A second cardiologist disagreed, and ordered an angiogram. This was then done by a third cardiologist. At angiogram, multiple lesions were demonstrated, of which 2 were angioplastied and stented with bare-metal stents. Cardiologists' opinions then varied as to when it would be safe to cease clopidogrel temporarily for surgery, and for how long.

After discussions between anesthetists, the surgeon, and cardiologists, the patient eventually had surgery (uneventfully) 6 weeks after angioplasty. It is not clear if the patient's coronary artery disease has been optimally treated, as some clinicians believe coronary artery bypass surgery would have been preferable.

This case has been discussed in multiple clinical review forums. Even after these discussions, opinions vary between different anesthetists, between cardiologists, and between surgeons as to the appropriate management. A particular issue is the value (or otherwise) of a preoperative angiogram to demonstrate coronary anatomy when no intervention is planned. The choice between surgical and endovascular treatment of coronary artery disease is also controversial.

After this case, we established a weekly case review meeting involving senior perioperative anesthetists and cardiologists. We are now taking a more proactive, planned approach to cases such as these. Effective communication between surgeon, anesthetists, and cardiologist is crucial.

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Abstract 38

Heparin-Induced Thrombocytopenia with Low Molecular Weight Heparin after Total Knee Replacement

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Case Presentation: A 77-year-old woman underwent right total knee replacement (TKR) under epidural anesthesia. For deep vein thrombosis (DVT) prophylaxis, she received warfarin for 2 days and then enoxaparin in addition to intermittent pneumatic compression. On postoperative day 2 she was transferred to the rehabilitation service.

The patient continued to have knee pain but was otherwise doing well and was scheduled for discharge. On postop day 12 she complained of increased pain in her right knee and leg; a venous duplex study revealed an acute proximal DVT, and she was transferred to the medical service.

She was initially treated with enoxaparin and warfarin, which were discontinued after 1 dose when the patient's platelet count was noted to be 98,000. Hematology was consulted for possible heparin-induced thrombocytopenia (HIT), heparin antibody study was requested, and argatroban was started. The dose was adjusted, and when the patient's platelet count was 139,000, warfarin was restarted. When the international normalized ratio (INR) was therapeutic, argatroban was discontinued. The patient was discharged home on postop day 36 (**Table, next page**).

Discussion: HIT is a complication more commonly associated with unfractionated heparin (UFH) than low molecular weight heparin (LMWH). After stopping heparin therapy, thrombosis (arterial or venous) may occur in up to 50% of cases, and alternate anticoagulant therapy is indicated. In retrospect, this patient had relative thrombocytopenia as early as postop day 7 (< 50% of baseline) but definitely by day 8 (absolute thrombocytopenia < 150,000); however, it was not recognized, possibly due to the feeling that HIT is rare, especially with LMWH. Earlier recognition and discontinuation of LMWH might have prevented the DVT, although the risk of DVT after TKR is significant (up to 20% even with appropriate prophylaxis).

Key Points: (1) Recognize that HIT can occur with LMWH as well as with UFH. (2) Stop the offending agent (UFH/LMWH) immediately once HIT is suspected.

TABLE
HIT and LMWH after TKR

Hospital day	Comments	Platelet count (thousand)	Treatment
–1	Preop (baseline)	631	Warfarin 5 mg
0	Day of surgery	604	Warfarin 5 mg
1	Postop day 1	596	Enoxaparin 30 mg q12h
2	Transfer to rehab	570	Enoxaparin 30 mg q12h
4	—	749	Enoxaparin 30 mg q12h
6	—	338	Enoxaparin 30 mg q12h
7	Relative thrombocytopenia	168	Enoxaparin 30 mg q12h
8	Absolute thrombocytopenia	118	Enoxaparin 30 mg q12h
9	Friday	98	Enoxaparin 30 mg q12h
12	DVT Dx – transfer to med service; enoxaparin treatment dose started		Enoxaparin 100 mg q12h + warfarin 5 mg
13	Enoxaparin/warfarin stopped; HIT Dx	44	Argatroban
14	—	50	Argatroban
15	Heparin Ab reported as +	95	Argatroban
16	Warfarin restarted	139	Argatroban + warfarin
17	—	184	Argatroban + warfarin
18	—	221	Argatroban + warfarin
25	—	534	Argatroban + warfarin
28	Argatroban stopped	591	Warfarin
36	Discharged home on warfarin	855	Warfarin 14 mg daily

Abstract 39

Patient with Parkinson's Disease Treated with Implanted Deep Brain Stimulators for Laparotomy

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Case Presentation: A 72-year-old woman with Parkinson's disease was evaluated in our preoperative clinic prior to laparotomy for a complex ovarian mass.

Bilateral deep brain stimulators (DBS) had been implanted for progressive rigidity and tremor despite maximal medical therapy. At the time of implantation, these devices were not covered by her insurance and she is still paying out of pocket for the 1996 procedure. She is happy with the outcome 11 years later and has had no specific problems with the DBS other than need for battery replacement. She reports her stiffness and immobility worsen if the battery is low or if the device is turned off for medical interventions (example: electrocardiogram).

Discussion: Our large academic hospital does not currently implant these devices, and her treating neurologist is based at another hospital. Was it appropriate to proceed at our hospital?

Preparation for surgery was coordinated by our anesthesia preoperative clinic. This involved discussions between the anesthesiologists, our neurology department, the outside treating neurologist, the device company, the gynecologic surgeon, and the service that had originally implanted the DBS. It was decided that the patient could be safely managed at our hospital if the device company provided technical support. The patient elected to stay with her chosen surgeon.

Case (continued): Surgery was performed under general anesthesia with the device turned off. Mechanical ventilation was continued until she met extubation criteria. Of note, muscle rigidity was severe enough to restrict tidal volumes to < 150 cc and was rapidly reversed with DBS reactivation. The recovery period was uneventful with discharge home on postop day 5.

Conclusion: We continue to do surgery in patients with DBS and developed the following clinical pathway:

- a dedicated team from anesthesia and neurology to manage these patients
- administration of prophylactic antibiotics
- general anesthesia and mechanical ventilation while the device is turned off to manage the respiratory compromise caused by the rigidity
- electrocautery precautions
- device management by the technician from the company
- all of the above under the coordination of our preoperative assessment clinic.

Our poster discusses the case, focusing on Parkinson's disease and its treatment with special attention to DBS and their perioperative management for unrelated surgeries. Details of our clinical pathway for the safe management of these patients are presented.

Abstract 40

Ethical Dilemma in the Preoperative Assessment Clinic: Can a Patient Refuse an Indicated Cardiac Workup? Can We Refuse to Anesthetize?

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Case: A 62-year-old diabetic woman with peripheral vascular disease presents for femoral-popliteal bypass for rest pain. She is seen in the preoperative assessment clinic 5 days preoperatively.

Past medical history includes coronary artery disease with a myocardial infarct 6 months prior. Subsequent percutaneous coronary intervention and stenting was done, but she continues to have chest pain, even at rest.

She is assessed as having an active cardiac condition for peripheral vascular surgery and referred to her cardiologist for further evaluation and optimization. She refuses any further testing. She repeats her request for surgery to relieve her intolerable rest pain and refuses to discuss the risks.

The surgeon is contacted and confirms that she only comes for medical attention when she needs help, and this is her standard response to cardiac evaluation.

He books the case.

The assigned anesthesiologist reviews the chart the night before surgery and cancels the case, pending cardiac evaluation.

Does the patient have a right to refuse further evaluation and optimization, thereby putting herself at risk? Is her consent informed? Do we have the right to refuse to treat?

Discussion: Anesthesiologists are well known for canceling cases. We have always had the dual roles of paternalistic “patient protector,” keeping our patients safe from the knife-happy surgeon; and technician, facilitating the patient’s surgery.

Anesthesiologists, in their technician role, have “stopped the line” if something is not working right, whether it be the laryngoscope battery, suction strength, plasma potassium, or expiratory wheeze. Knowing “what’s best” has kept us in our comfort zone—but now modern attention to medical ethics has brought patient autonomy to the forefront with an emphasis on the role of the patient in medical decision making. To make a decision to accept or refuse an intervention, the elements of informed consent (voluntariness, information, and capacity) need to be satisfied. A physician has a right to refuse to treat if treatment goes against his or her moral values, including nonmaleficence—“do no harm.”

Conclusion: An understanding of medical ethics—specifically the concepts of patient autonomy, nonmaleficence, informed consent, and the right to refuse to treat—is needed to know how to proceed in this case. The ethical arguments on both sides will be reviewed in the poster, enabling us to come to a more informed decision on what our moral duty is to this lady.

Abstract 41

Coronary Artery Bypass Grafting as a Precipitating Factor in Diabetic Ketoacidosis in Type 2 Diabetes

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Case Presentation: A 56-year-old woman with type 2 diabetes (T2DM) presented with unstable angina. Electrocardiogram showed ST elevation in all leads. On admission, she developed ventricular tachycardia followed by asystole and was resuscitated with transvenous pacing. Angiogram showed triple-vessel disease. Preoperatively the patient was on insulin lispro, 4.5 U/hr, with subcutaneous (SC) doses of sliding-scale insulin every 2 hours. On the day of surgery, her fasting blood glucose was 180 mg/dL with no ketone or abnormal electrolytes. She received 6 U of lispro SC and was premedicated 1 hour before surgery and was preoxygenated. Anesthesia was induced with thiopentone, morphine, isoflurane, and vecuronium.

Postinduction blood glucose was increased to 463 mg/dL with HCO₃ of 15.1, pH 7.25, and urine ketone of 3+. The patient received intravenous (IV) dose of 10 U of lispro and 25 mL of 7.5% HCO₃. The following Table depicts the patient's treatment during surgery and postoperatively with responses to therapy. She also received 100 mL (20%) of mannitol as a prophylaxis for possible hypercoagulation state.

TABLE

Time	Procedure	Serum values for:						Insulin received	
		Glucose	HCO ₃	PO ₂	PCO ₂	pH	K+	Infusion/hr	IV bolus
11:24	Induction	463	15.1	148	33	7.25	4.2	10 U	10 U
11:55	Operation	398	17.1	155	39	7.53	3.9	10 U	10 U
12:32	Operation	395	18.1	181	40	7.28	3.7	10 U	10 U
13:09	Operation	304	21.3	178	38	7.35	3.7	10 U	10 U
13:38	Operation	315	21.6	181	35	7.35	3.7	10 U	10 U
14:32	Operation	295	24.1	148	35	7.42	3.6	10 U	10 U
15:12	Postop	194	24.4	90	37	7.41	3.4	10 U	10 U

Patient recovered uneventfully. Her insulin requirement postoperatively was 2 U/hr on average blood glucose of 118 to 170 mg/dL with normal electrolytes. Patient was discharged 5 days later.

Conclusion: We conclude that anesthesia induction and coronary artery bypass grafting in this T2DM patient resulted in the emergence of diabetic ketoacidosis (DKA); hydration, low to moderate doses of insulin, and frequent monitoring of the patient resulted in uneventful recovery from DKA.

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