Current Controversies in Adult Outpatient Anesthesia - 2018

Jeffrey L. Apfelbaum, M.D.
Professor of Anesthesia & Critical Care
LEARNING OBJECTIVES

At the conclusion of this activity, participants should be able to:

Objective 1: Explain controversial areas of care related to adult ambulatory anesthetic patient care including fast tracking, preoperative evaluation/preparation, surgical site infections, perioperative communication, and the management of patients taking aspirin, beta blockers, ACE inhibitors, and angiotension receptor blocking agents.

Objective 2: Assess methods to resolve these controversies.
DISCLOSURE:

I have no relevant financial relationships with industry to disclose.
Sunshine Act Disclosures

Doctors getting paid billions by drug firms

Critics say the large payments to physicians and hospitals create conflicts of interest and compromise care. Some eye-popping totals: $6 - $10 of 100
Sunshine Act Disclosures

Single  $  9.99

Annual  $ 99.99
Search Open Payments

The Open Payments Search Tool is used to search payments made by drug and medical device companies to physicians and teaching hospitals.

Search Physician, Teaching Hospital, or Company by Name

Or use the Advanced Search

Open Payments data is from August 2013 to December 2016 – See About page

The Facts on Open Payments

Total US Dollar Value
8.19 Billion

Total Records Published
11.96 Million

Explore the Facts on Open Payments Data
Search for an Entity

Loading data...

Entity Name contains "Jeffrey Apfelbaum"

No entities matched search criteria provided. Please refine your search and try again.
CURRENT CONTROVERSIES 2018

- Fast Track
- Preop Prep
- SSI
- Obesity
- Communication
- Aspirin
- Beta Blockers
- ACEi/ARB
Is a Recovery Room Stay Necessary for All Surgical Outpatients?
INTENSIVE CARE (Phase 1 PACU) IS EXPENSIVE
OUTPATIENT ANESTHETIC MANAGEMENT

- Rapid induction
- Light but adequate maintenance
- Smooth, prompt recovery
- Minimal side effects
RAPID AND SAFE RECOVERY
Why Bypass?
SURGERY COSTS

- OR: 52.8%
- DRUGS: 12.0%
- PACU: 35.2%

↓
Awakening, Clinical Recovery and Psychomotor Effects after desflurane and propofol Anesthesia

## Anesthetic Administration Technique

<table>
<thead>
<tr>
<th>Group</th>
<th>Induction</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>PRO</td>
<td>O₂/1.25 MAC DES</td>
</tr>
<tr>
<td>II</td>
<td>PRO</td>
<td>60% N₂O: 40% O₂/1.25 MAC DES</td>
</tr>
<tr>
<td>III</td>
<td>PRO</td>
<td>60% N₂O: 40% O₂ PRO Infusion</td>
</tr>
<tr>
<td>IV</td>
<td>DES</td>
<td>O₂/1.25 MAC DES</td>
</tr>
</tbody>
</table>

**Note:** After induction and endotracheal intubation, anesthesia was maintained for 1 hour and titrated to clinical effect.
DES vs. PRO

HOME READINESS

NO DIFFERENCES

DES vs. PRO

HOME READINESS

No Differences

No Differences From BASELINE!!

Does it Work in the REAL World?
PRACTICAL DISCHARGE CRITERIA

Phase 1

- Baseline Aldrete
- Baseline Orientation
- VSS
- Sit, Stand, Ambulate
- If NDNMB – head lift
- Minimal Nausea
- O2 Sat 94% or Baseline
ELIMINATING INTENSIVE POSTOPERATIVE CARE IN SAME-DAY SURGERY PATIENTS USING SHORT-ACTING ANESTHETICS

SAFE DESIGN

• Prospective
• Open Label
• Specific Outcomes Measures
• n=4862

SAFE OUTCOMES MEASURES

• PACU Bypass Rates
• Adverse Events
• Periop Expenses

<table>
<thead>
<tr>
<th>Type of Site</th>
<th>Area</th>
<th>Annual Ambulatory Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Community</td>
<td>NE</td>
<td>3,845</td>
</tr>
<tr>
<td>2 Community</td>
<td>NE</td>
<td>5,906</td>
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<tr>
<td>3 Community</td>
<td>NE</td>
<td>3,822</td>
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<td>4 Free-Standing</td>
<td>MW</td>
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</tr>
<tr>
<td>5 Free Standing</td>
<td>MW</td>
<td>7,617</td>
</tr>
</tbody>
</table>

SAFE INCLUSION CRITERIA

• Elective Outpatients
• ASA Class 1, 2, 3

SAFE EXCLUSION CRITERIA

- Inpatients
- Emergencies
- SDA, 23°
- ASA Class 4, 5

FORMAT

• Baseline
• Implementation & Learning
• Follow-up

SAFE AGENTS

Opioids
- fentanyl
- alfentanil
- sufentanil

NMB’s
- mivacurium
- succinylcholine

Inhalants
- N₂O
- desflurane
- sevoflurane

Pre-Induction Meds
- midazolam
- defasiculant
- fentanyl
- alfentanil
- sufentanil

Sedative-Hypnotic
- propofol

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</tr>
</tbody>
</table>

Bypass Rates

GA Baseline to Follow-up

Site 1  Site 2  Site 3  Site 4  Site 5

Multidisciplinary
Benchmarking

DATA

INFORMATION

KNOWLEDGE
KNOWLEDGE IS POWER
Anesthesiologists in Preop Assessment, Evaluation and Management?

Do We Make a Difference?
PREOP CLINIC — WHY?

• Efficiency
• Satisfaction
  – Patient
  – Physician
• Improved Care
A PREOPERATIVE CLINIC VISIT IMPROVES OUTPATIENT OPERATING ROOM EFFICIENCY

Freschl MB, et.al. Anesthesiology 103:855-859, 2005
PREOP VISIT IMPROVES EFFICIENCY

• Retrospective
• 4016 Patients

Freschl MB, et.al. Anesthesiology 103:855-859, 2005
## Pre-op Visit Improves Efficiency

<table>
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<tr>
<td>ASA PS</td>
<td>2.37±0.7</td>
<td>1.68±0.74</td>
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<td>Base Units</td>
<td>5.32±1.75</td>
<td>4.38±1.55</td>
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<tr>
<td>% PP</td>
<td>7.7</td>
<td>19.1</td>
<td>&lt;0.05</td>
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</table>

Freschl MB, et.al. Anesthesiology 103:855-859, 2005
Value of Preoperative Clinic Visits in Identifying Issues with Potential Impact on Operating Room Efficiency

PREOP VISIT IMPROVES EFFICIENCY

- Retrospective
- n = 5083

"The preoperative evaluation can identify and resolve a number of medical issues that can impact efficient operating room resource use."

A PREOPERATIVE CLINIC VISIT DECREASES RISK OF READMISSION TO HOSPITAL WITHIN 30 DAYS

PREOPERATIVE EVALUATION CLINIC VISIT DECREASES RISK OF READMISSION TO HOSPITAL WITHIN 30 DAYS

- Retrospective Chart Review
- Single Large Medical Center
- n = 83,645

PREOPERATIVE EVALUATION CLINIC VISIT DECREASES RISK OF READMISSION TO HOSPITAL WITHIN 30 DAYS

“Those patients who were seen in PAT were less likely to be readmitted to our hospital within 30 days (odds ratio [OR] 0.901; 95% confidence interval [CI], 0.838, 0.969)”

PREOPERATIVE EVALUATION CLINIC VISIT DECREASES RISK OF READMISSION TO HOSPITAL WITHIN 30 DAYS

“...these visits allow us to risk-stratify, optimize, and coordinate the plan of care prior to surgery which we believe leads to improved outcomes.”

Preoperative Evaluation Clinic Visit Is Associated with Decreased Risk of In-hospital Postoperative Mortality

Jeanna D. Blitz, M.D., Samir M. Kendale, M.D., Sudheer K. Jain, M.D., Germaine E. Cuff, Ph.D., Jung T. Kim, M.D., Andrew D. Rosenberg, M.D.

This article has been selected for the Anesthesiology CME Program. Learning objectives and disclosure and ordering information can be found in the CME section at the front of this issue.
Preoperative Evaluation and Decreased Postoperative Mortality

- Retrospective Chart Review
- NYU
- n = 64,418

Preoperative Evaluation and Decreased Postoperative Mortality

An in-person assessment at the PEC was associated with a reduction in in-hospital mortality.

RETURN TO ACUTE CARE FOLLOWING AMBULATORY SURGERY

Steiner, et al.  
UNPLANNED ACUTE CARE

Methods:

- Retrospective analysis
- Multiple databases with unique patient ID
- Linkage – Ambulatory Surgery – postop unplanned acute care visits

Methods:
- Six procedures
  - Lap Chole
  - Hernia
  - ACL
  - Spine
  - TURP
  - Hysterectomy

Results:

- 482,034 surgeries
- 45,760 30-day unplanned revisits (9.5%)
- Two-thirds related to surgery (6%)

Patient Satisfaction with Preoperative Assessment in a Preoperative Assessment Testing Clinic

"Satisfaction was highest for visits with clinical providers (p<0.001)."

**Preop Clinic & Satisfaction**

Correlated with:

- Explanation
- Time With Provider

Practice Advisory for Preanesthesia Evaluation
SELECTIVE TESTING

RECOMMENDED after:

- History
- Physical Exam
**SPECIFIC RECOMMENDATIONS**

- EKG
- Cardiac/Pulm Evaluation
- CXR
- H/H
- U/A
- Pregnancy
- Coags
- Chemistries
Practice Advisory for Preanesthesia Evaluation
ACC/AHA 2014 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration with:

- American Society of Echocardiography
- American Society of Nuclear Cardiology
- Heart Rhythm Society
- Society of Cardiovascular Anesthesiologists
- Society for Cardiovascular Angiography and Interventions
- Society for Vascular Medicine and Biology
- Society for Vascular Surgery

SIMPLIFIED CARDIAC EVALUATION FOR NON-CARDIAC SURGERY

Step 1: Emergency Surgery
Proceed to surgery with medical risk reduction and perioperative surveillance

Step 2: Active Cardiac Conditions
- Unstable coronary syndromes (unstable or severe angina, recent MI)
- Decompensated HF (new onset, NYHA, class IV)
- Significant arrhythmias (Mobitz II or 3rd heart block, SVT or AF with rapid ventricular rate, symptomatic ventricular arrhythmia or bradycardia, new VT)
- Severe valvular disease (severe AS or MS)

Postpone surgery until stabilized or corrected

Step 3: Low risk surgery (risk < 1%)
- Superficial or Endoscopic
- Cataract or Breast
- Ambulatory

Proceed to surgery

Step 4: Functional capacity
Good; ≥ 4 METs (can walk flight of stairs without symptoms)

Proceed to surgery

Step 5: Clinical Predictors
- Ischemic heart disease
- Compensated or prior HF
- Cerebrovascular disease (stroke, TIA)
- Diabetes mellitus
- Renal insufficiency

No clinical predictors
Vascular surgery
1-2 clinical predictors
Intermediate risk surgery
≥ 3 clinical predictors
Vascular surgery

Proceed to surgery with HR control or consider noninvasive testing if it will change management
Consider testing if it will change management

ACC/AHA 2014 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Surgical Site Infections
IS YOUR ANESTHESIA CART CONTAMINATED?

Meyer et.al 2014 ASA Annual Meeting A3189
**IS YOUR ANESTHESIA CART CONTAMINATED?**

- Beginning of the day
- Fully scrubbed, gowned, gloved, trained practitioner
- Pressed an agar plate on the top of an anesthesia cart
- Agar plates incubated 72 hour
- 8/9 Carts grew contaminated colonies
A New Approach to Pathogen Containment in the Operating Room: Sheathing the Laryngoscope After Intubation

David J. Birnbach, MD, MPH,* Lisa F. Rosen, MA,* Maureen Fitzpatrick, MSN, ARNP-BC,* Philip Carling, MD,† Kristopher L. Arheart, EdD,‡ and L. Silvia Munoz-Price, MD, PhD§
In a simulated OR, placement of the laryngoscope immediately after endotracheal intubation in a sheath leads to a significant reduction in contamination of the iv hub, patient, and intraoperative environment.

Microbiological Contamination of Drugs during Their Administration for Anesthesia in the Operating Room

Contamination of Drugs During Their IV Administration

Methods

• Prospective, open, audit
• n = 303
• Anesthesiologists inject bolus drugs through a 0.2 µm filter
• Microorganisms, if present, cultured from the filter unit and residual contents of syringes

Contamination of Drugs During Their IV Administration

Multiple microorganisms were regularly injected into patients during the administration of IV drugs.

Injection Rhymes with Infection?

Warren S. Sandberg, M.D., Ph.D., Thomas R. Talbot, M.D., M.P.H.

Injection Rhymes with Infection?

Laboratories long ago moved to maintaining sterility in locally prepared items by buying pre-packaged sterile supplies and introducing engineering controls at every possible step. Is it time for the same in anesthesia?

THE FIST BUMP: A MORE HYGIENIC ALTERNATIVE TO THE HANDSHAKE

Mela, et al.
Am J Infect Control 42:916-917, 2014
THE FIST BUMP: A MORE HYGIENIC ALTERNATIVE TO THE HANDSHAKE

Methods:
An experimental model and assay for bacterial transmission via physical contact was developed using standard microbiologic methods.

A

% relative to mean for moderate handshake

- Contact area of greeting
- Transfer of bacteria
- Transfer during prolonged greeting

Handshake | High five | Fist bump
Improving Patient and Staff Safety by Decreasing Traffic in the Operating Room

Camus S
2016 ACS/NSQIP Conference
Minimizing Foot Traffic in OR Reduces SSI

- ACS/NSQIP Data Base
- Single Medical Center
- TJR Surgeries
- Jan 2014 – June 2016
Minimizing Foot Traffic in OR Reduces SSI

- Initial – 42-70 Door Openings per Case
- Post – 3.5 Door Opening per Case
- SSI from 2.8% to 2.1%
WHAT’S THE RELATIONSHIP BETWEEN OBESITY AND NON CARDIAC SURGERY?
OBESITY – 2 SUBSETS OF PATIENTS

• Metabolically Healthy
• Metabolic Syndrome
  - HT - Dyslipidemia
  - DM - Proinflammatory State
  - - Prothrombotic State
Perioperative outcomes among patients with the Modified Metabolic Syndrome who are undergoing non-cardiac surgery

Glance, et al., Anesthesiology 113: 859-870, 2010
MODIFIED METABOLIC SYNDROME

- Obesity
- HT
- Diabetes

Glance, et al., Anesthesiology 113: 859-870, 2010
MODIFIED METABOLIC SYNDROME

- $n = 310,208$ from 200+ hospitals
- Based on data from ACS (NSQIP)
- Multivariate Logistic Regression Models
  - 30 day mortality
  - 30 day morbidity

Glance, et al., Anesthesiology 113: 859-870, 2010
Modified Metabolic Syndrome

- 20,845 MMS
  - 13,092 obese (BMI 30-39)
  - 5,360 MO (BMI 40-49)
  - 2,393 SO (BMI >50)

Glance, et al., Anesthesiology 113: 859-870, 2010
MMS- SUMMARY

Risk Death
Risk Cardiac Events
Risk Renal Injury

Glance, et al., Anesthesiology 113: 859-870, 2010
## Modified Metabolic Syndrome

### AOR

<table>
<thead>
<tr>
<th></th>
<th>Death</th>
<th>Cardiac</th>
<th>Renal</th>
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<tbody>
<tr>
<td>O</td>
<td>1.04</td>
<td>1.70</td>
<td>3.30</td>
</tr>
<tr>
<td>MO</td>
<td>1.12</td>
<td>2.01</td>
<td>5.01</td>
</tr>
<tr>
<td>SO</td>
<td>1.99</td>
<td>2.66</td>
<td>7.29</td>
</tr>
</tbody>
</table>

Glance, et al., Anesthesiology 113: 859-870, 2010
PERIOPERATIVE TEAM COMMUNICATION
Impact Of Preoperative Briefings On Operating Room Delays

PREOP BRIEFING

Attending surgeon led 2 minute discussion using a standardized form

Conclusions:

• Reduced OR Delays by 31%
• Significant Communications Breakdowns

Intraoperative Transitions of Anesthesia Care and Postoperative Adverse Outcomes

Saager, et al.

*Anesthesiology* 121(4):695-706, 2014
HAND-OFFS AND ADVERSE OUTCOMES

Methods:
• n = 138,932 Adults at CCF
• Assess Association B/T
  • # of hand-offs
  • postop morbidity & mortality

Anesthesiology 121(4):695-706, 2014
HAND-OFFS AND ADVERSE OUTCOMES

Results:

• Each intraoperative anesthetic handoff increased the risk of major in-hospital morbidity or mortality by 8%

• Rates were similar for attending, resident, CRNA

Anesthesiology 121(4):695-706, 2014
Anesthesia Care Transitions and Risk of Postoperative Complications

Joseph A. Hyder, MD, PhD,*†‡ J. Kyle Bohman, MD,* Daryl J. Kor, MD,*‡
Arun Subramanian, MBBS,* Edward A. Bittner, MD, PhD,§ Bradly J. Narr, MD,‖
Robert R. Cima, MD, MA,‡†# and Victor M. Montori, MD, MSc**

Transitions and Risk of Postop Complications

Methods

- Colorectal surgery
- Mayo Clinic
- Database: NSQIP

Transitions and Risk of Postop Complications

Care by additional attending anesthesiologists and in-room providers was independently associated with increased odds of postoperative complications.

Association Between Handover of Anesthesia Care and Adverse Postoperative Outcomes Among Patients Undergoing Major Surgery

Philip M. Jones, MD, MSc; Richard A. Cherry, MD; Britney N. Allen, MSc; Krista M. Bray Jenkyn, PhD; Salimah Z. Shariff, PhD; Suzanne Filer, MD, MSc; Kelly N. Vogt, MD, MSc; Duminda N. Wijeyasurya, MD, PhD

Jones PM, et al. JAMA 319:143-153, 2018
“Handover” of Anesthesia Care

- n = 313,066 Patients (5941 “Complete Handover”)
- Ontario April 2009 – March 2015
- Adult, Inpatients ≥ 18 y.o.
- Major Surgery > 2 Hours
- 30 Day Mortality, Major Complication, Readmission

Jones PM, et al. JAMA 319:143-153, 2018
“Handover” of Anesthesia Care

Results

• Among adults undergoing major surgery, complete handover vs. no handover was associated with > incidence of death, major complication, readmission

• 1:15

Jones PM, et al. JAMA 319:143-153, 2018
THE AMBULATORY HANDOFF: FAST PACED, HIGH STAKES PATIENT CARE TRANSITION

Pukenas et.al 2014 ASA Annual Meeting, A5009
AMBULATORY HANDOFFS

Methods:
• 80 Handoffs
• Audio Recorded
• Satisfaction Questionnaires
• Trained Observers Rate Each Handoff Using A Validated Tool

Pukenas et.al 2014 ASA Annual Meeting, A5009
Ambulatory Handoffs

Results:
• Average Handoff Time 3.56 minutes (SD 1.38)
• Sender/Receiver Satisfaction Very High (4.7+/5)
• But . . .
  • 100% Omitted At Least One Key Item

Pukenas et.al 2014 ASA Annual Meeting, A5009
Challenges in Reducing Surgical “Never Events”

Berger, et al.

*JAMA* 314(13); 1386-1387, 2015
A recurring theme across RCA of “Never Events”

TJC – 56% of “Never Events”

Berger, et al. JAMA 314(13); 1386-1387, 2015
Communication Failures in Anesthesia Malpractice Claims

Douglas, et al. ASA 2016 – A3208
Communication Failures

- ASA Closed Claims Study
- n = 1132 Periop Anesthesia Claims
- Compared claims with communication failures that led to injury with claims devoid of such communication failures

Communication failures contributed to 43% of claims and had a higher proportion of deaths than claims without communication failures.

Douglas, et al. ASA 2016 – A3208
INADEQUATE COMMUNICATION

- Checklists?
- Cognitive Aids?
SIMULATION-BASED TRIAL OF SURGICAL CRISIS CHECKLISTS

Arriaga, et al.
NEJM 368:246-253, 2013
SURGICAL CRISIS CHECKLISTS

Methods:

• 3 Institutions
• 17 OR Teams
• 106 Surgical Crisis Simulations
• Memory vs. Checklist

SURGICAL CRISIS CHECKLISTS

Results:

- Failure to adhere to life saving processes was less common (6%) when checklists were available vs. 23% when unavailable, P < 0.001

SURGICAL CRISIS CHECKLISTS

• Every team performed better with a checklist

• 97% - “if I am the patient”

OR Critical Event Checklists

READ OUT LOUD:
Has somebody called for help?

Who is going to be the team leader?
1: Air Embolism

- Call for help.
- FiO₂ increased to 100%?
- Nitrous oxide anesthetic stopped?

Source of air entry stopped?
- Surgical site lowered below level of heart, if possible?
- Wound filled with irrigation?
- Entry point searched for (including open venous lines)?
- Intermittent jugular venous compression considered if head or cranial case?

Transesophageal echocardiography called for (if available)?

Have we considered:
- Left side down once source controlled?
- Aspiration of air from a central line?
- Vasopressors (e.g. dobutamine, norepinephrine)?
- Chest compressions (100/min; to force air through leak, even if not in cardiac arrest)?

Condition: Suspected air embolism (decreased end-tidal CO₂ and oxygen saturation).
Objective: Restore normal oxygen saturation and hemodynamic stability and stop source of air entry.

Reference:
If cardiac arrest:
Give 1 mg epinephrine IV, begin ACLS and GO TO Cardiac Arrest – Asystole/PEA Checklist or Cardiac Arrest – VT/VF Checklist.
O.R. Critical Event Guide

2: Anaphylaxis

- Call for help.
- Potential causative agents removed?
- FIO₂ Increased to 100%?
- Epinephrine given? (Epinephrine dose may be repeated every 1-2 minutes as clinically indicated).
- Airway established/secured?
- IV access adequate?
- IV fluids opened and/or fluid bolus given at high rate?
- If no response: begin IV epinephrine infusion (rate: 1-4 micrograms/minute).

Have we considered:
- Termination of the procedure to focus on resuscitation?
- Vasopressin? (40 Units IV; for patients with continued hypotension)
- Albuterol? (if bronchospasm a prominent feature)
- Diphenhydramine (25-50mg IV)?
- H₂ blockers (e.g. ranitidine 50mg IM/IV; cimetidine 300mg IM/IV)?
- Glucagon? (1.5mg administered IV over 5 minutes, in patients taking beta blockers)
- Hydrocortisone (100-200mg IV)?
- Tryptase level? (useful to guide future management)

Condition: Suspected anaphylaxis (consistent history, urticaria, hypotension, bronchospasm).
Objective: Restore hemodynamic stability, abort reaction.

Common causative agents:
- Neuromuscular blocking agents, latex products (gloves, blood pressure cuff, Foley catheter), chlorhexidine, IV collodion.

Drug Doses:
- Epinephrine dose:
  1 to 5 ml (0.1-0.5 mg) IV, depending on severity, diluted 1:10,000 before bolus.
  0.3 ml (0.3 mg) IM if no IV access (diluted 1:1,000).
- If cardiac arrest: give 1 mg epinephrine IV, begin ACD and 60 TID (Cardiac Arrest – ACD/PEA Checklist or Cardiac Arrest – VF/VT Checklist).
10: Hypoxia

**Condition:** Unexplained oxygen desaturation.

**Objective:** Restore oxygenation.

- Call for help.
- Pulse oximeter placement checked?
- \( \text{FiO}_2 \) increased to 100%?
- Hand ventilation initiated?
- Oxygen source checked?
- Circuit checked? (disconnection, kinks, holes)
- End tidal CO\(_2\) confirmed?
- Breath sounds checked?
- ET tube position checked?
- Blood gas drawn?

**Suspected Airway/Breathing Issue?**

- Yes
  - Suctioning (mucus plug)
  - Removing circuit and using ambu-bag
  - Bronchoscopy
  - Pulling ET tube and mask ventilation/re-intubation

- No
  - Consider causes:
    - **Airway:**
      - Right mainstem intubation
      - Brochospasm?
      - Ventilator settings, leading to auto-peep
    - **Breathing:**
      - Aspiration
      - Atelectasis
      - Obesity/positioning
      - Pneumothorax
      - Chest X-ray, chest tube, needle decompression considered
      - Hypovolemia
      - Pulmonary Edema
    - **Circulation:**
      - Embolism
      - Pulmonary Embolus
      - Air Embolism? (GO TO: Air Embolism Checklist)
      - Other Emboli (e.g., fat, septic, CO\(_2\))
      - Heart disease?
      - Congestive Heart Failure
      - Coronary Artery Disease
      - Myocardial Ischemia
      - Cardiac Tamponade
      - Congenital/anatomic Defect
      - Electrocardiogram, Transesophageal echocardiogram, bypass considered?
    - **Severe Seizure**
    - If hypoxia associated with hypotension (GO TO: Hypotension Checklist)
    - **Drugs/Allergy:**
      - Recent drugs given
      - Dose error/allergy/anaphylaxis
Intraoperative Care Transitions Are Not Associated with Postoperative Adverse Outcomes

Intraop Care Transitions

Methods:

- n = 140,754 patients
- 30 day mortality or composite morbidity
- Vanderbilt University

Intraop Care Transitions

Results:

• Anesthesia care transition **NOT** associated with increased mortality/morbidity

WHY ARE THE FOUR STUDIES (CCF/MAYO/VANDERBILT/ONTARIO) DIFFERENT?
Why Are They Different?

• Many differences in study design

BUT ONE STANDS OUT
Intraop Care Transitions

Vanderbilt:

• MANDATORY HANDOFF SIMULATION TRAINING
• Required Didactic Webinar
• Electronic PACU Handover Reports form

WHAT ABOUT ASPIRIN?
Antiplatelet Agents in the Perioperative Period

O’Riordan, et al., Arch Surg 144: 70-76, 2009
Aspirin should **NOT** be stopped unless the risk of bleeding exceeds the thrombotic risk.

O’Riordan, et al., Arch Surg 144: 70-76, 2009
WHAT'S UP WITH BETA BLOCKERS?
Beta Blockade

• n = 38,779
• 1996-2008
• All surgical patients – SF-VAMC

Beta Blockade

4 groups

- None
- Addition
- Continuous
- Withdrawal

Beta Blockade

In patients meeting perioperative cardiac risk reduction indications for β-blockade....

### Beta Blockade Mortality

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<td>$p &lt; 0.006$</td>
<td>$p &lt; 0.0001$</td>
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<td><strong>Continue</strong></td>
<td>$p &lt; 0.04$</td>
<td>$p &lt; 0.05$</td>
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<tr>
<th></th>
<th>30d</th>
<th>1yr</th>
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<tr>
<td>Withdraw</td>
<td>p &lt; 0.0001</td>
<td>p &lt; 0.0001</td>
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ACE<sub>i</sub>/ARB
THIRTY-DAY MORTALITY RISK ASSOCIATED WITH THE POSTOPERATIVE NONRESUMPTION OR ANGIOTENSIN-CONVERTING ENZYME INHIBITORS: A RETROSPECTIVE STUDY OF THE VETERANS AFFAIRS HEALTHCARE SYSTEM

Mudumbai, et al.
Methods:

- Retrospective
- VA patients from 1999-2012
- n = 240,978

Results:

• $\text{ACE}_i$: not resumed by postop day 14 in 25%

• 30 day mortality

ASSOCIATION BETWEEN WITHHOLDING ANGIOTENSIN RECEPTOR BLOCKERS IN THE EARLY POSTOPERATIVE PERIOD AND 30-DAY MORTALITY

Methods:
- Retrospective
- VA patients from 1999-2011
- n = 30,173

ARB

Results:

- ARB not resumed by day 2 in 1/3 of patients
- 30-day mortality increased 50%

<table>
<thead>
<tr>
<th>Current Controversies 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Fast Track</td>
</tr>
<tr>
<td>- Preop Prep</td>
</tr>
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<td>- SSI</td>
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<td>- Obesity</td>
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<td>- ACE&lt;sub&gt;i&lt;/sub&gt;/ARB</td>
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Current Controversies in Adult Outpatient Anesthesia - 2018

Jeffrey L. Apfelbaum, M.D.
Professor of Anesthesia & Critical Care