Perioperative Pearls

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California Pacific Medical Center
ACP Northern California Chapter Scientific Meeting
November 3, 2018
9 Rapid Fire Cases

Preop labs/ECG
Cardiac Stratification
Pulmonary Risk
Cirrhosis
VTE prophylaxis

Anticoagulation
DMARDs
Diabetes Meds
Stents

Text
HARDYPLANT472 to 22333
Prior to playing at Candlestick Park, where was the home of the 49ers?

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>A. Seal Stadium</td>
<td>A</td>
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<tr>
<td>B. Kezar Stadium</td>
<td>B</td>
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<tr>
<td>C. Monster Park</td>
<td>C</td>
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<tr>
<td>D. Oakland Coliseum</td>
<td>D</td>
</tr>
<tr>
<td>E. Polo Grounds</td>
<td>E</td>
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</tbody>
</table>
B. Kezar Stadium (played there 1946-1970)
Case #1

• A 50 year old man needs an elective total hip replacement. His PMHx includes HTN treated with atenolol, HCTZ. He has no prior bleeding problems. His basic metabolic panel and lipid profile 6 months ago were normal.

• Exam is unremarkable.

• Which of the following is the most appropriate approach to preoperative laboratory testing in this patient?
  • A. ECG
  • B. CBC, basic metabolic panel (BMP)
  • C. ECG, CBC, BMP
  • D. CBC, BMP, UA
  • E. ECG, CBC, BMP, PT/INR, UA
Which of the following is the most appropriate approach to preoperative laboratory testing in this patient?

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Case #1

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- A. ECG
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- C. ECG, CBC, BMP
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- E. ECG, CBC, BMP, PT/INR, UA
Cardiac risk differs based on surgery type.

**Low Risk (<1%)**
- Ambulatory
- Cataract
- Endoscopic procedures
- Breast surgery

**Elevated Risk (>1%)**
- Intraperitoneal
- Intrathoracic
- Carotid endarterectomy
- Orthopedic
- Prostate
- Neurosurgical
- Aortic/major vascular
- Peripheral arterial surgery
A pre-op ECG is not routinely recommended in all asymptomatic patients undergoing non cardiac surgery.

5.1. The 12-Lead Electrocardiogram: Recommendations

CLASS IIa

1. Preoperative resting 12-lead electrocardiogram (ECG) is reasonable for patients with known coronary heart disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease, except for those undergoing low-risk surgery (137-139).

(Level of Evidence: B)

Age alone is not an indication.
Order lab tests based on history and physical exam first.

**CBC**
- Higher pretest probability for anemia (e.g. CKD, liver disease, anemia symptoms)
- Procedure w/ higher anticipated blood loss

**BMP**
- HTN
- *diuretics, ACEI, ARBs
- CHF
- CKD
- DM, liver disease

**Coags**
- H/O bruising or excessive surgical bleeding or family history
A UA is only indicated if there are symptoms suggestive of UTI or if GU instrumentation is planned.

Proceedings of International Consensus Meeting on Periprosthetic joint infection 2013
Case 1: Take Home Points

- Low Risk Procedures ➔ generally no need for labs or ECG

- Elevated Risk Procedures
  - ECG in patients with CAD, arrhythmia, cerebrovascular disease, CHF, significant structural heart disease
  - H/P and type of surgery guide what labs you order
  - No routine UA in joint replacement surgeries
Case #2

A 68 year old man with adenocarcinoma of the cecum needs surgical resection. He has inoperable CAD, CHF with LVEF 35%, HTN, HLD. He has stable angina, no orthopnea or PND. He can walk up a flight of stairs with groceries.

Exam: unremarkable

ECG: NSR and evidence of old inferior infarction

Which of the following is the most appropriate next step in the preoperative evaluation of this patient?

- A. BNP level
- B. Echocardiography
- C. Treadmill Exercise Stress Test
- D. Thallium Stress Test
- E. No further evaluation
Which of the following is the most appropriate next step in the preoperative evaluation of this patient?

A. BNP level
B. Echocardiography
C. Treadmill Exercise Stress Test
D. Thallium Stress Test
E. No further evaluation
Case #2

Which of the following is the most appropriate next step in the preoperative evaluation of this patient?

A. BNP level
B. Echocardiography
C. Treadmill Exercise Stress Test
D. Thallium Stress Test

E. No further evaluation
Use the ACC/AHA perioperative guidelines to help you.

Emergent surgery
Proceed

Non-emergent surgery +ACS (symptoms or recent MI in 2 mo)?
Evaluate & treat based on usual guidelines

Low risk with no ACS
Proceed don’t worry about the risk factors
Elevated Risk Surgery is when you have to look at functional status and consider cardiac risk factors.

**Good Functional Capacity**

≥4 METs without symptoms

- **YES** Proceed with Surgery
- **NO** or unknown

**Will further testing impact decision making or perioperative care?**

- **YES** Pharmacologic stress testing & possible revascularization
- **NO** Proceed or alternate strategies
What do you do next?

Use a cardiac risk calculator to estimate perioperative risk of major adverse cardiac events.
Choose your risk calculator wisely...

<table>
<thead>
<tr>
<th>RCRI</th>
<th>9-11%</th>
<th>MICA (Gupta)</th>
<th>0.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher risk surgery</td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAD</td>
<td>Functional status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHF</td>
<td>ASA Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulin dependent diabetes</td>
<td>Cr &gt; 1.5</td>
<td></td>
<td></td>
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<tr>
<td>Cr &gt; 2</td>
<td>Procedure type</td>
<td></td>
<td></td>
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<tr>
<td>Stroke or TIA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI, cardiac arrest, VF, CHB, pulm edema</td>
<td>MI, cardiac arrest</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The ACS NSQIP surgical risk calculator uses 21 factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Option</th>
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</thead>
<tbody>
<tr>
<td>Age Group</td>
<td>65-74 years</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
<tr>
<td>Functional Status</td>
<td>Independent</td>
</tr>
<tr>
<td>Emergency Case</td>
<td>No</td>
</tr>
<tr>
<td>ASA Class</td>
<td>Severe systemic disease</td>
</tr>
<tr>
<td>Steroid use for chronic condition</td>
<td>No</td>
</tr>
<tr>
<td>Ascites within 30 days prior to surgery</td>
<td>No</td>
</tr>
<tr>
<td>Systemic Sepsis within 48 hours prior to surgery</td>
<td>None</td>
</tr>
<tr>
<td>Ventilator Dependent</td>
<td>No</td>
</tr>
<tr>
<td>Disseminated Cancer</td>
<td>No</td>
</tr>
<tr>
<td>Diabetes</td>
<td>No</td>
</tr>
<tr>
<td>Hypertension requiring medication</td>
<td>Yes</td>
</tr>
<tr>
<td>Congestive Heart Failure in 30 days prior to surgery</td>
<td>No</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>No</td>
</tr>
<tr>
<td>Current Smoker within 1 Year</td>
<td>No</td>
</tr>
<tr>
<td>History of Severe COPD</td>
<td>No</td>
</tr>
<tr>
<td>Dialysis</td>
<td>No</td>
</tr>
<tr>
<td>Acute Renal Failure</td>
<td>No</td>
</tr>
<tr>
<td>BMI Calculation</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>70 in / 178 cm</td>
</tr>
<tr>
<td>Weight</td>
<td>150 lb / 86 kg</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Your Risk</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Serious Complication</td>
<td>9.8%</td>
</tr>
<tr>
<td>Any Complication</td>
<td>12.6%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1.6%</td>
</tr>
<tr>
<td>Cardiac Complication</td>
<td>1.1%</td>
</tr>
<tr>
<td>Surgical Site Infection</td>
<td>5.9%</td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
<td>1.5%</td>
</tr>
<tr>
<td>Venous Thromboembolism</td>
<td>1.2%</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>1.0%</td>
</tr>
<tr>
<td>Ileus</td>
<td>11.4%</td>
</tr>
<tr>
<td>Anastomatic Leak</td>
<td>2.5%</td>
</tr>
<tr>
<td>Readmission</td>
<td>8.0%</td>
</tr>
<tr>
<td>Return to OR</td>
<td>3.6%</td>
</tr>
<tr>
<td>Death</td>
<td>0.7%</td>
</tr>
<tr>
<td>Discharge to Nursing or Rehab Facility</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Predicted Length of Hospital Stay: 5 days
US/European guidelines are not recommending routine BNP or troponin levels pre/post-op.

Pre-op BNP in age > 65 or age > 45 with RCRI ≥1 or CVS disease
If BNP elevated, check post-op daily troponin/ECG x 48-72 hrs.
Case #2: Take Home Points

• Emergent surgery or low risk surgery without ACS → That’s easy!

• Functional status of ≥ 4 METs w/o ACS

• Poor functional status or unknown → will further testing impact decision making?

• Use a calculator to further risk stratify – helps your decision on further stress testing and counseling the patient.
Case #3

• 47 year old man with morbid obesity, diabetes, HTN, and mild asthma presents for a pre-op exam for an abdominal hernia repair. He has no complaints. His vital signs are normal. BMI is 36 Kg/M^2. He has a small jaw and a short neck. Rest of the exam is unremarkable. Labs from recent annual physical showed a serum bicarb of 28mmol/L.

• Which of the following would you recommend?
  • A. Chest x-ray
  • B. Echocardiogram
  • C. Pulmonary function test
  • D. ABG
  • E. Sleep study
Which of the following would you recommend?

A. Chest x-ray
B. Echocardiogram
C. Pulmonary function test - 80%
D. ABG - 20%
E. Sleep study
Case #3

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  • B. Echocardiogram
  • C. Pulmonary function test
  • D. ABG
  • E. Sleep study
Preoperative Pulmonary Evaluation

- Optimize known conditions
- COPD, Smoking, Pulm HTN, OSA, ILD
- Determine risk
- Pre-op testing
- ARISCAT, Arozullah, Gupta, PERISCOPE
- CXR, PFT, ABG, Etc.
Estimate risk for post-op pulmonary complications.

<table>
<thead>
<tr>
<th>ARISCAT – Overall</th>
<th>13.3%</th>
<th>Gupta – Respiratory Failure</th>
<th>0.61%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td>Functional status</td>
<td></td>
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<tr>
<td>Pre-op O2 Sat</td>
<td></td>
<td>ASA class</td>
<td></td>
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<tr>
<td>Respiratory infection in past month</td>
<td></td>
<td>Pre-op sepsis</td>
<td></td>
</tr>
<tr>
<td>Pre-op anemia</td>
<td></td>
<td>Type of surgery</td>
<td></td>
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<tr>
<td>Surgical incision</td>
<td></td>
<td>Emergency surgery</td>
<td></td>
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<tr>
<td>Duration of surgery</td>
<td></td>
<td></td>
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<tr>
<td>Emergency surgery</td>
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</table>

Anesthesiology 2010
Br J Anaesth 2017
Screen for OSA and obesity hypoventilation syndrome.

- Focused history and physical
- Incorporate risk prediction models
- BMI >35 Kg/M² and serum bicarb >27mmol/L highest risk

<table>
<thead>
<tr>
<th>S</th>
<th>Do you <strong>snore</strong> loudly (loud enough to hear through closed doors)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Do you often feel <strong>tired</strong>, fatigued or sleepy during daytime?</td>
</tr>
<tr>
<td>O</td>
<td>Has anyone <strong>observed</strong> you stop breathing during your sleep?</td>
</tr>
<tr>
<td>P</td>
<td>Do you have or are you being treated for high blood <strong>pressure</strong>?</td>
</tr>
<tr>
<td>B</td>
<td>BMI &gt; 35 Kg/M²</td>
</tr>
<tr>
<td>A</td>
<td>Age &gt; 50 years</td>
</tr>
<tr>
<td>N</td>
<td><strong>Neck</strong> circumference &gt; 40 cm</td>
</tr>
<tr>
<td>G</td>
<td>Male <strong>gender</strong></td>
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</tbody>
</table>

SASM 2016
ATS 2018
Known OSA and treated → continue CPAP

Known OSA not treated
High risk for OSA
• Proceed with risk reduction strategies
• Delay surgery and get sleep study

Major Elective Surgery & Significant Comorbidities
- Heart failure
- Arrhythmias
- Uncontrolled hypertension
- Cerebrovascular disease
- Metabolic syndrome
- Obesity with BMI > 35 kg/m²

References:
- Chest 2010
- SASM 2017
- ATS 2018
- Can J Anesth 2010
Case #3: Take Home Points

• Estimate the risk for postoperative pulmonary complications using validated calculators.

• Be selective about ordering pre-op CXRs or PFTs – most do not change management.

• Screen patients for OSA and obesity hypoventilation syndrome, consider delaying surgery for sleep studies in high risk patients.
Case #4

A 68 year old woman with alcoholic cirrhosis and osteoarthritis asks your opinion on an elective knee replacement. She has no hepatic encephalopathy or prior GI bleeding. Her ascites is well-controlled on furosemide and spironolactone. Labs show platelet 130, Cr 0.8, bilirubin 1.3, INR 1.2, MELD score 9, Child-Pugh Class A.

What do you tell the patient?

A. Proceed with surgery. There’s no additional risk from your liver disease.
B. You are at higher risk for decompensation post-op but it can be managed. You may proceed with surgery if you understand the risks.
C. The risk of post-op liver decompensation is high. You should be evaluated by a transplant team first before surgery is considered.
D. Surgery is too risky due to your liver disease. It should not be done unless you have a liver transplant.
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  • B. You are at higher risk for decompensation post-op but it can be managed. You may proceed with surgery if you understand the risks.
  • C. The risk of post-op liver decompensation is high. You should be evaluated by a transplant team first before surgery is considered.
  • D. Surgery is too risky due to your liver disease. It should not be done unless you have a liver transplant.
No single best risk prediction model to estimate post-operative mortality in cirrhotic patients.

- Child-Pugh Score
- MELD
- Mayo Post-operative Mortality Risk Calculator

AGA 2018
Candidacy for surgery depends on severity of cirrhosis and type of surgery.

**Child-Pugh A**
- MELD < 8
- Most procedures ok
- Post-op complications more likely

**Child-Pugh B**
- MELD 8-20
- Procedure and patient dependent
- Transplant eval if 90-day mortality >15% or MELD ≥ 15

**Child-Pugh C**
- MELD > 20
- Avoid elective procedures
- Consider life-saving procedures vs hospice referral

AGA 2018
Case #4: Take Home Points

• Cirrhotic patients are at increased risk of post-operative morbidity and mortality for all invasive procedures.

• Elective surgeries require careful patient selection and should be avoided in Child-Pugh Class C patients.

• Low threshold to involve hepatology in the perioperative period.
Case #5

• You are co-managing a 68 year old woman with HTN, hyperlipidemia, osteoarthritis and anxiety with depression, who just underwent a right total hip replacement. The surgeon expects to discharge the patient in 3 days. She has a needle phobia and her GFR is 65mL/min.

• Which of the following would you recommend for VTE prophylaxis?
  • A. ASA 325mg BID
  • B. Apixaban 2.5mg BID
  • C. Rivaroxaban 10mg daily while in the hospital, switch to ASA 81mg daily on discharge
  • D. Fondaparinux 2.5mg daily
  • E. Enoxaparin 40mg daily
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  • E. Enoxaparin 40mg daily
VTE Prophylaxis After Major Orthopedic Surgery

**ACCP 2012 Guideline**
- Pharmacological or mechanical
- 10-14 days minimum, up to 35 days

**AAOS 2011 Guideline**
- Pharmacological and/or mechanical
- Duration up to the patient and the surgeon

![Diagram](https://via.placeholder.com/150)

- **LMWH**: Fondaparinux, Dabigatran*, Apixaban*, Rivaroxaban*, UFH
- **Warfarin ASA**
- **Intermittent pneumatic compression**
All patients received rivaroxaban until POD 5
Hybrid with ASA noninferior to rivaroxaban alone
All TKA or THA, excluded fracture or cancer patients
No difference in bleeding complication

ASA alone noninferior to other pharmacological prophylaxis
Retrospective cohort of unilateral primary TKA patients
No details on dosage and duration
Case #5: Take Home Points

• Give pharmacological VTE prophylaxis for up to 35 days unless significant bleeding risk.

• LMWH has the strongest data, but oral agents often preferred by patients.

• May see more use of ASA for VTE prophylaxis with newer evidence.
Case #6

A 74 year-old man with DES placed for NSTEMI two months ago has ongoing radiculopathy due to lumbar stenosis without focal neurological weakness. His surgeon is recommending decompression. His current medications include aspirin and prasugrel.

In terms of further management, what would you recommend?

A. Surgery now; continue aspirin but hold prasugrel one week prior
B. Surgery at 3 months post-stent, hold aspirin and prasugrel one week prior
C. Surgery at 6 months post-stent, hold aspirin and prasugrel one week prior
D. Surgery at 1 year post stent, hold aspirin and prasugrel one week prior
E. Epidural injection now under fluoroscopic guidance, continue aspirin and hold prasugrel for a week before the injection
In terms of further management, what would you recommend?

A. Surgery now on aspirin but hold prasugrel prior to surgery

B. Surgery at 3 months post-stent placement, hold aspirin and prasugrel before surgery

C. Surgery at 6 months post-stent placement, hold aspirin and prasugrel before surgery

D. Surgery at 1 year post stent placement, discontinue aspirin and prasugrel

E. Epidural injection now under fluoroscopic guidance, continue aspirin and hold prasugrel for a week before the injection
Case #6

• In terms of further management, what would you recommend?
  • A. Proceed with surgery now; continue aspirin but hold prasugrel for a week prior to surgery
  • B. Surgery at 3 months post-stent placement, hold aspirin and prasugrel a week before surgery
  • C. Surgery at 6 months post-stent placement, hold aspirin and prasugrel one week before surgery
  • D. Surgery at 1 year post stent placement, discontinue aspirin and prasugrel
  • E. Epidural injection now under fluoroscopic guidance, continue aspirin and hold prasugrel for a week before the injection
Case #6: Take Home Points

• Elective non cardiac surgery should be delayed 1 month after BMS.
• Elective non cardiac surgery should be delayed 6 months after DES.
• Consider surgery between 3 to 6 months if the benefit outweighs the risk.
Case #7

- A 76 year-old woman is scheduled for a left THA under spinal anesthesia in one month. She has DM, HTN, atrial fibrillation with prior stroke, and RA. Cr is 0.8mg/dL. A1C is 7.5%. INR is 2.4. CHADs-Vasc is 7.

- Meds include Warfarin, Insulin glargine daily, Sitagliptan, Metoprolol succinate, Atorvastatin, Folic Acid, Methotrexate, Etanercept

In terms of diabetes management, what would you recommend?

- A. Stop sitagliptin and insulin the day prior to surgery
- B. Stop sitagliptin and insulin the day of surgery
- C. Stop sitagliptin on day of surgery, give 80% dose of insulin the AM of surgery
- D. Continue sitagliptin and 80% dose of insulin the AM of surgery
- E. Continue sitagliptin and 50% dose of insulin on the AM of surgery
In terms of diabetes management, what would you recommend?

A. Stop sitagliptin on day of surgery and insulin glargine the day prior to surgery

B. Stop sitagliptin and insulin glargine the day of surgery

C. Stop sitagliptin on day of surgery, give 80% dose of insulin glargine the morning of surgery

D. Continue sitagliptin on day of surgery and 80% dose of insulin glargine the morning of surgery

E. Continue sitagliptin and 50% dose of insulin glargine on the morning of surgery
In terms of diabetes management, what would you recommend?

- A. Stop sitagliptin and insulin the day prior to surgery
- B. Stop sitagliptin and insulin the day of surgery
- C. Stop sitagliptin on day of surgery, give 80% dose of insulin the AM of surgery
- **D. Continue sitagliptin and 80% dose of insulin the AM of surgery**
- E. Continue sitagliptin and 50% dose of insulin on the AM of surgery
## Insulin Management

<table>
<thead>
<tr>
<th>Day Before Surgery</th>
<th>Glargine or Detemir</th>
<th>NPH or 70/30 Insulin</th>
<th>Lispro, Aspart, Glulisine, Regular</th>
<th>Noninsulin Injectables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin Regimens</td>
<td>AM Dose</td>
<td>PM Dose</td>
<td>AM Dose</td>
<td>PM Dose</td>
</tr>
<tr>
<td>Normal diet until midnight (includes those permitted clear liquids until 2 h before surgery)</td>
<td>Usual dose</td>
<td>80% of usual dose</td>
<td>80% of usual dose</td>
<td>Usual dose</td>
</tr>
<tr>
<td>Bowel prep (and/or clear liquids only 12–24 h before surgery)</td>
<td>Usual dose</td>
<td>80% of usual dose</td>
<td>80% of usual dose</td>
<td>Usual dose</td>
</tr>
</tbody>
</table>

**NPH = neutral protamine Hagedorn.**

<table>
<thead>
<tr>
<th>Day of Surgery Insulin Regimens</th>
<th>Glargine or Detemir</th>
<th>NPH or 70/30 Insulin</th>
<th>Lispro, Aspart, Glulisine, and Regular</th>
<th>Noninsulin Injectables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usual dose</td>
<td>80% of usual dose if patient uses morning only or twice daily basal therapy</td>
<td>50% of usual dose if BG &lt; 120 mg/dL Hold for BG &lt; 120 mg/dL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*6.6 mM.*

BG = blood glucose; NPH = neutral protamine Hagedorn.

Anesthesiology 2017:126(3):547-560
Non-insulin Management

<table>
<thead>
<tr>
<th>Oral Medication for Elective Surgery</th>
<th>Day Before Surgery</th>
<th>Day of Surgery if Normal Oral Intake Anticipated Same Day and Minimally Invasive Surgery</th>
<th>Day of Surgery if Reduced Postoperative Oral Intake or Extensive Surgery, Anticipated HD Changes and/or Fluid Shifts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretagogues</td>
<td>Take</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>SGLT-2 Inhibitors</td>
<td>Hold</td>
<td>Hold</td>
<td>Hold</td>
</tr>
<tr>
<td>Thiazolidinediones</td>
<td>Take</td>
<td>Take*</td>
<td>Hold</td>
</tr>
<tr>
<td>Metformin</td>
<td>Take*</td>
<td>Take*</td>
<td>Hold</td>
</tr>
<tr>
<td>DPP-4 Inhibitors</td>
<td>Take</td>
<td>Take</td>
<td>Take</td>
</tr>
</tbody>
</table>

*Hold if patient having a procedure with intravenous contrast dye administration, particularly in those with glomerular filtration rate < 45 ml/min.  
DPP = dipeptidyl peptidase-4; HD = hemodynamic; SGLT = sodium glucose cotransporter-2.
Case #7: Take Home Points

- Sitagliptin can be continued perioperatively
- Patients on insulin glargine should consider taking 80% or full dose depending on timing of administration
- Patients on twice daily 70/30 should take ½ of dose on morning of surgery
Case #8

- A 76 year-old woman is scheduled for a left THA under spinal anesthesia in one month. She has DM, HTN, atrial fibrillation with prior stroke, and RA. Cr is 0.8mg/dL. A1C is 7.5%. INR is 2.4. CHADs-Vasc is 7.
- Meds include Warfarin, Insulin glargine daily, Sitagliptan, Metoprolol succinate, Atorvastatin, Folic Acid, Methotrexate, Etanercept

- In terms of pre-operative RA management, what do you recommend?
  - A. Hold etanercept and methotrexate
  - B. Continue etanercept and methotrexate
  - C. Hold etanercept and continue methotrexate, but also schedule surgery one week after skipped dose of biologic
  - D. Add stress-dose steroids
In terms of pre-operative RA management, what do you recommend?

A. Hold one dose of etanercept and methotrexate

B. Continue etanercept and methotrexate

C. Hold etanercept and continue methotrexate, but also schedule surgery one week after skipped dose of biologic

D. Add stress-dose steroids

100%
Case #8

• In terms of pre-operative RA management, what do you recommend?
  • A. Hold one dose etanercept and methotrexate
  • B. Continue etanercept and methotrexate
  • C. Hold etanercept and continue methotrexate, but also schedule surgery one week after skipped dose of biologic
  • D. Add stress-dose steroids
ACR 2017 Guideline Summary

• Continue steroids and non-biologic DMARDs throughout perioperative period

• Biologic medications should be withheld as close to one dosing cycle as scheduling permits, then plan to resume after 14 days if adequate wound healing

• Limited evidence on whether prednisone dosing <20mg merits stress-dose steroids
Case #9

• A 76 year-old woman is scheduled for a left THA under spinal anesthesia in one month. She has DM, HTN, atrial fibrillation with prior stroke, and RA. Cr is 0.8mg/dL. A1C is 7.5%. INR is 2.4. CHADs-Vasc is 7.

• Meds include Warfarin, Insulin glargine daily, Sitagliptan, Metoprolol succinate, Atorvastatin, Folic Acid, Methotrexate, Etanercept

• What would you recommend for anticoagulation?
  • A. Stop warfarin 5 days prior to surgery, no bridging
  • B. Stop warfarin 5 days prior to surgery, bridge with aspirin 325mg
  • C. Stop warfarin 5 days prior to surgery, bridge with enoxaparin
  • D. Change to rivaroxaban, hold dose 2 days prior to surgery
  • E. Change to dabigatran, hold dose 2 days prior to surgery
In terms of pre-operative anticoagulation management, what would you recommend?

A. stop warfarin 5 days prior to surgery without bridging anticoagulation
B. stop warfarin 5 days prior to surgery and replace this with ASA 325mg daily
C. stop warfarin 5 days prior to surgery, bridge with enoxaparin
D. Change to rivaroxaban, hold dose 2 days prior to surgery
E. Change to dabigatran, hold dose 2 days prior to surgery
Case #9

• What would you recommend for anticoagulation?
  • A. Stop warfarin 5 days prior to surgery, no bridging
  • B. Stop warfarin 5 days prior to surgery, bridge with aspirin 325mg
  • C. Stop warfarin 5 days prior to surgery, bridge with enoxaparin
  • D. Change to rivaroxaban, hold dose 2 days prior to surgery
  • E. Change to dabigatran, hold dose 2 days prior to surgery
# BRIDGE trial

## Table 3. Study Outcomes.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>No Bridging (N=918)</th>
<th>Bridging (N=895)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number of patients (percent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arterial thromboembolism</td>
<td>4 (0.4)</td>
<td>3 (0.3)</td>
<td>0.01*, 0.73†</td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (0.2)</td>
<td>3 (0.3)</td>
<td></td>
</tr>
<tr>
<td>Transient ischemic attack</td>
<td>2 (0.2)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Systemic embolism</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Major bleeding</td>
<td>12 (1.3)</td>
<td>29 (3.2)</td>
<td>0.005†</td>
</tr>
<tr>
<td><strong>Secondary</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>5 (0.5)</td>
<td>4 (0.4)</td>
<td>0.88†</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>7 (0.8)</td>
<td>14 (1.6)</td>
<td>0.10†</td>
</tr>
<tr>
<td>Deep-vein thrombosis</td>
<td>0</td>
<td>1 (0.1)</td>
<td>0.25†</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>0</td>
<td>1 (0.1)</td>
<td>0.25†</td>
</tr>
<tr>
<td>Minor bleeding</td>
<td>110 (12.0)</td>
<td>187 (20.9)</td>
<td>&lt;0.001†</td>
</tr>
</tbody>
</table>

* P value for noninferiority.
† P value for superiority.
**BRIDGE trial**

**Table 1. Baseline Characteristics of the Patients.**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No Bridging (N = 950)</th>
<th>Bridging (N = 934)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age — yr</td>
<td>71.8±8.74</td>
<td>71.6±8.88</td>
</tr>
<tr>
<td>Male sex — no. (%)</td>
<td>696 (73.3)</td>
<td>686 (73.4)</td>
</tr>
<tr>
<td>Race — no. (%) †</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>860 (90.5)</td>
<td>849 (90.9)</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>88 (9.3)</td>
<td>82 (8.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (0.2)</td>
<td>3 (0.3)</td>
</tr>
<tr>
<td>Weight — kg</td>
<td>96.2±24.87</td>
<td>95.4±23.50</td>
</tr>
<tr>
<td>CHADS2 score:‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution — no. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1 (0.1)</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>1</td>
<td>216 (22.7)</td>
<td>212 (22.7)</td>
</tr>
<tr>
<td>2</td>
<td>382 (40.2)</td>
<td>351 (37.6)</td>
</tr>
<tr>
<td>3</td>
<td>229 (24.1)</td>
<td>232 (24.8)</td>
</tr>
<tr>
<td>4</td>
<td>96 (10.1)</td>
<td>108 (11.8)</td>
</tr>
<tr>
<td>5</td>
<td>23 (2.4)</td>
<td>27 (2.9)</td>
</tr>
<tr>
<td>6</td>
<td>3 (0.3)</td>
<td>5 (0.5)</td>
</tr>
<tr>
<td>CHF or left ventricular dysfunction — no. (%)</td>
<td>289 (30.4)</td>
<td>210 (23.2)</td>
</tr>
<tr>
<td>Hypertension — no. (%)</td>
<td>833 (87.7)</td>
<td>806 (86.3)</td>
</tr>
</tbody>
</table>

*NEJM 2015; 373: 823-33*
# CHA2DS-VASc2

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age 75 or greater</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Prior stroke, TIA, or thromboembolism</td>
<td>2</td>
</tr>
<tr>
<td>Vascular disease</td>
<td>1</td>
</tr>
<tr>
<td>Age 65-74</td>
<td>1</td>
</tr>
<tr>
<td>Sex (female)</td>
<td>1</td>
</tr>
<tr>
<td>Thrombotic Risk</td>
<td>Recommendation</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Low (&lt;5% per year, CHADS-Vasc ≤4)</td>
<td>Hold warfarin without bridging</td>
</tr>
<tr>
<td>Intermediate (5-10% per year, CHADS-Vasc 5-6)</td>
<td>Hold warfarin without bridging</td>
</tr>
<tr>
<td><strong>Intermediate with prior stroke (5-10% per year, CHADS-Vasc 5-6)</strong></td>
<td>Consider bridging</td>
</tr>
<tr>
<td>High (&gt;10% per year, CHADS-Vasc 7-9)</td>
<td>Strongly consider bridging with parenteral agent</td>
</tr>
</tbody>
</table>
What about DOACs?

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Recommended Durations for Withholding DOACs Based on Procedural Bleed Risk and Estimated CrCl When There Are No Increased Patient Bleed Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dabigatran</td>
</tr>
<tr>
<td></td>
<td>Apixaban, Edoxaban, or Rivaroxaban</td>
</tr>
<tr>
<td>CrCl, mL/min</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>50-79</td>
</tr>
<tr>
<td></td>
<td>30-49</td>
</tr>
<tr>
<td></td>
<td>15-29</td>
</tr>
<tr>
<td></td>
<td>&lt;15</td>
</tr>
<tr>
<td>Estimated drug half-life, h</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>30 (off dialysis)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedural bleed risk</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Uncertain, intermediate, or high</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The duration for withholding is based upon the estimated DOAC half-life withholding times of 2 to 3 half-lives for low procedural bleeding risk and 4 to 5 drug half-lives for uncertain, intermediate, or high procedural bleeding risk (46,60-67).

CrCl = creatinine clearance; DOAC = direct-acting oral anticoagulant; dTT = dilute thrombin time.
Medication | Time to wait after last dose
--- | ---
Enoxaparin (Therapeutic) | 1 day (24 hours)
Warfarin | 5 days and normal INR
Dabigatran | 5 days (120 hours)***
Rivaroxaban, Apixiban, Edoxaban | 3 days (72 hours)
Case #9: Take Home Points

• Consider bridging for CHA2DS-VASc2 ≥ 5.
• No need to bridge DOACs – await PAUSE trial.
• Keep in mind that spinal anesthesia requires additional holding time.
The 9 Perioperative Pearls

1. Don’t order preop labs, ECG, or routine UA for low risk procedures.
2. Use risk calculators to stratify CV risk and ask if further testing will impact management.
3. Screen for OSA and obesity hypoventilation syndrome with STOP-BANG.
4. Child-Pugh class A cirrhotic patients can be considered for elective surgery but risk for complication is higher.
5. ASA is gaining popularity for VTE prophylaxis in elective joint replacements.
6. Elective surgery should be delayed 6 months post DES.
7. Long-acting insulin should be continued at minimum 80% dose and sitagliptin is okay to continue on day of surgery.
8. Continue non-biologic DMARDs perioperatively for elective joint replacement.
9. Consider bridging for CHADS2Vasc ≥ 5 if on warfarin; no bridge for DOACS.
Questions?

• Maggie So (som@sutterhealth.org)
• Yile Ding (dingy@sutterhealth.org)
• Rob Taylor (taylorrx@sutterhealth.org)
References Cases 1-2

• Cohn, S. In the Clinic Preoperative Evaluation for Noncardiac Surgery. Annals of Internal Medicine 2016;81-95.

• Cohn, S. Updated guidelines on cardiovascular evaluation before noncardiac surgery: A view from the trenches. Cleveland Clinic Journal of Medicine 2014;81:742-754.

• Cohn, S. Fernandez Ros, N. Comparison of 4 Cardiac Risk Calculators in Predicting Postoperative Cardiac Complications After Noncardiac Operations. The American Journal of Cardiology 2018;121:125-130.


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• Sharma et al. Should all patients have a resting 12 lead ECG before elective noncardiac surgery? Cleveland Clinic Journal of Medicine 2014;81:594-596.
References Cases 3-5


References Cases 3-5


References Cases 6-9


• Duggan EW, Carlson K, Umlplerrez GE. Perioperative Hyperglycemia Management: An Update. Anesthesiology 2017:126(3);547-560.

References Cases 6-9


