

Perioperative Medicine



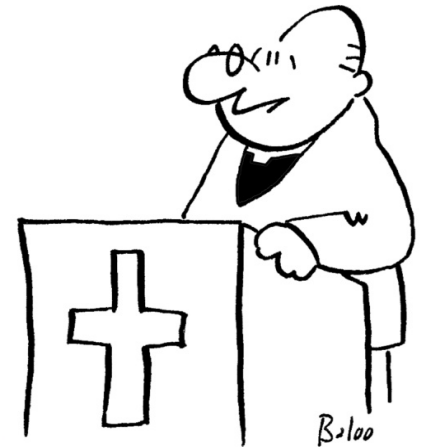
UNIVERSITY OF TENNESSEE
MEDICINE GRAND ROUNDS
MARCH 29, 2017
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Objectives and Disclosures



- Apply new databases to perioperative risk assessment.
- Update perioperative guidelines for cardiovascular patients.
- Administer antiplatelet agents and anticoagulants correctly in the perioperative setting.
- Develop a global approach and template for preoperative evaluation.
- Disclosures: None except...



"In compliance with Federal full-disclosure laws, I'm required to tell you that I'm really not all that sure about some of this stuff."

Case One – Risk Stratification



- A 73 y.o. man with hypertension and diabetes presents with bilateral lower extremity claudications and a non-healing ulcer on his left ankle. He can ambulate only 50 feet without pain. Medications are lisinopril, glargine insulin, aspirin, and metoprolol. He smokes one pack cigarettes per day. Height is 6 feet and weight 230 pounds. Lab shows creatinine of 2.1. Further evaluation reveals the need for an aortofemoral bypass graft. **What is his risk of death and major cardiac complication from the surgery? Should his surgery be delayed for CDV evaluation? Should ASA be held perioperatively?**

Case One – Risk of Death and Cardiac Complication

- A. 1.1%
- B. 3.4%
- C. 7%
- D. 11%
- E. 25%



"Nurse, has the staff been eating in pre-op again? There's mayonnaise on the scalpel."

Case One - Choices



A. 1.1%

B. 3.4% (based on ACS NSQIP calculator)

C. 7%

D. 11% (based on old revised cardiac risk index)

E. 25%

Answers the question: what is the combined risk of major CDV complications and death?

ACS – NSQIP Risk Calculator



- 1.4 million patients
- 393 hospitals
- Dataset from 2009-2012
- 1557 CPT codes
- 21 patient characteristics
- 8 complications
- Average length of stay

<http://riskcalculator.facs.org/>



**Bilimoria KY et al.
Development and
evaluation of the universal
ACS NSQIP surgical risk
calculator. J Am Coll Surg
2013;217:833-842.**

Types of Procedures



- Anorectal
- Aortic
- Bariatric
- Brain
- Breast
- Cardiac
- ENT
- Foregut/hepatopancreatobiliary
- GB/adrenals/appendix/spleen
- Hernia

- Intestinal
- Neck
- Nonesophageal thoracic
- Ob-gyn
- Orthopedic
- Other abdominal
- Peripheral vascular
- Skin
- Spinal
- Urologic
- Vein

ACS NSQIP Patient Characteristics



- Procedure
- Age
- Sex
- Functional Status
- Emergency
- ASA Class
- Wound Class
- Steroid Use
- Ascites Within 30 Days
- Sepsis
- Ventilator Dependent
- Diabetes
- Disseminated Cancer
- Hypertension
- Previous Cardiac Event
- CHF
- Dyspnea
- Current Smoker
- Severe COPD
- Dialysis
- Acute Renal Failure
- BMI (Ht, Wt)

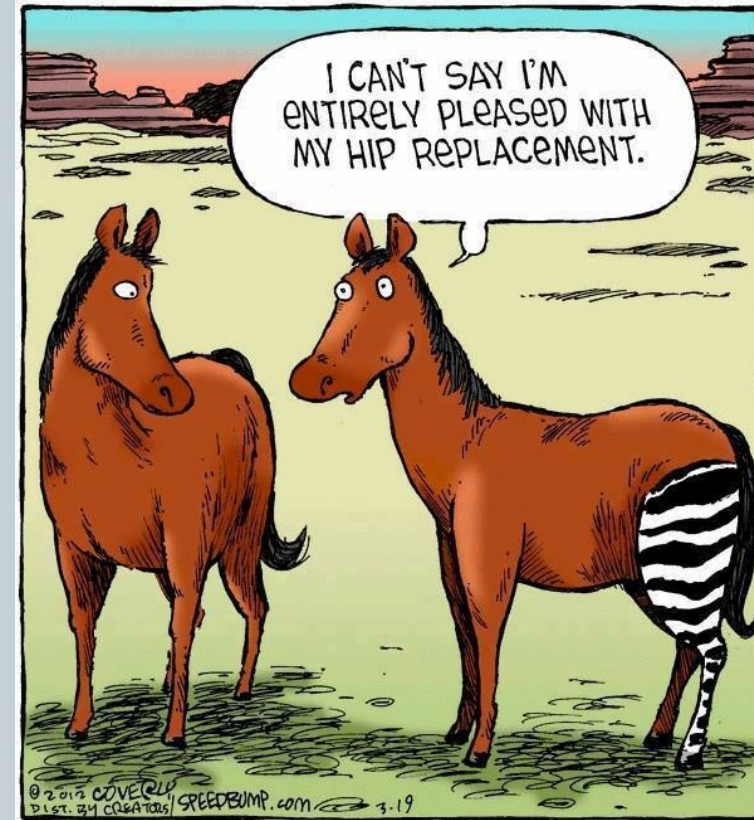


ACS NSQIP Complications



• Any complication	29%
• Serious complication	24.6%
• Pneumonia	2.3%
• Cardiac event	1.5%
• Death	1.9%
• Surgical Site Infection	9%
• UTI	1.5%
• DVT	0.4%
• Renal failure	2.6%
• Return to OR	14.1%
• Rehab or NH	27.7%

LOS – 7.5 days



Comparison of ACS NSQIP and RCRI



	ACS NSQIP	Lee
Year	2013	1999
Patient Numbers	1,414,000 (NSQIP – 393 hospitals – 2007-2012 data)	4,315 (one hospital)
Measurements	21 variables	Presence of CHF, CAD, CKD , CVA/TIA, insulin-requiring DM , high risk surgery
Outcomes	8 outcomes – death, VTE, UTI, PNA, MI/arrest, morbidity, AKI, surgical infection	Major cardiac morbidity and mortality*

*Defined as MI, pulmonary edema, VF, cardiac arrest, complete heart block. MI with elevated CK-MB (>5%) or >3% with EKG ischemic changes.

Reassuring Data and Statistics



- 10% of US hospitals and 30% of all surgeries comprised the database
- CPT codes - 99% with 25+ cases and 94% with 200+ cases
- Universal risk calculator was compared with earlier colectomy calculator - highly comparable
- C-statistic – probability that outcome is better than chance. 0.8-0.94.
- Hosmer-Lemeshow statistic – measures observed data vs data predicted by the model. Model performs well.
- Brier score – compares predicted vs. observed outcomes. Zero is correct and one is wrong. 0.006 to 0.069.

ASA Class Details

ASA Class	Physical Status	Examples
1	Healthy	
2	Well-controlled mild systemic disease	DM, HTN, obesity, seizure disorder – all well controlled
3	Severe systemic disease with functional limitation	Angina pectoris, hx. of MI or CVA or CHF > 3 months ago, DM with vascular problems, poorly controlled HTN
4	Severe systemic disease and a threat to life	Unstable angina. MI or stroke < 3 months, severe CHF or COPD, uncontrolled DM or HTN.
5	Moribund and cannot survive without surgery	Ruptured AAA, pulmonary embolus, CNS injury with ICP increase

Activities of Daily Living



NEC © 2007 Nursing Education Consultants, Inc.

ADLs = BATTED
(Activities of Daily Living)



Bathing

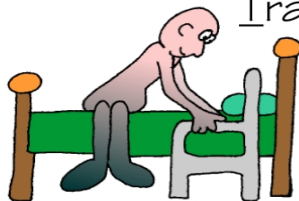
Ambulation



Toileting



Transfers



Eating



Dressing



Limitations of the ACS NSQIP Calculator



- Transplants and trauma surgeries not included
- Indications for procedure not included
- Fudge factor included if surgeon (or internist) believes risk is higher
- Not universally accepted
- No prospective external evaluation of the calculator – validated against a previously validated standard



VA Use of a Different Risk Calculator

- VASQIP
- Based upon 418,000 VA patients (1998)
- Forerunner of ACS NSQIP
- On VA intranet – QM
- Sicker patients
- Triggers facility review based upon 30 day mortality
- Improves care – 27%
reduced mortality and 45%
reduced morbidity



Case One – Risk Stratification

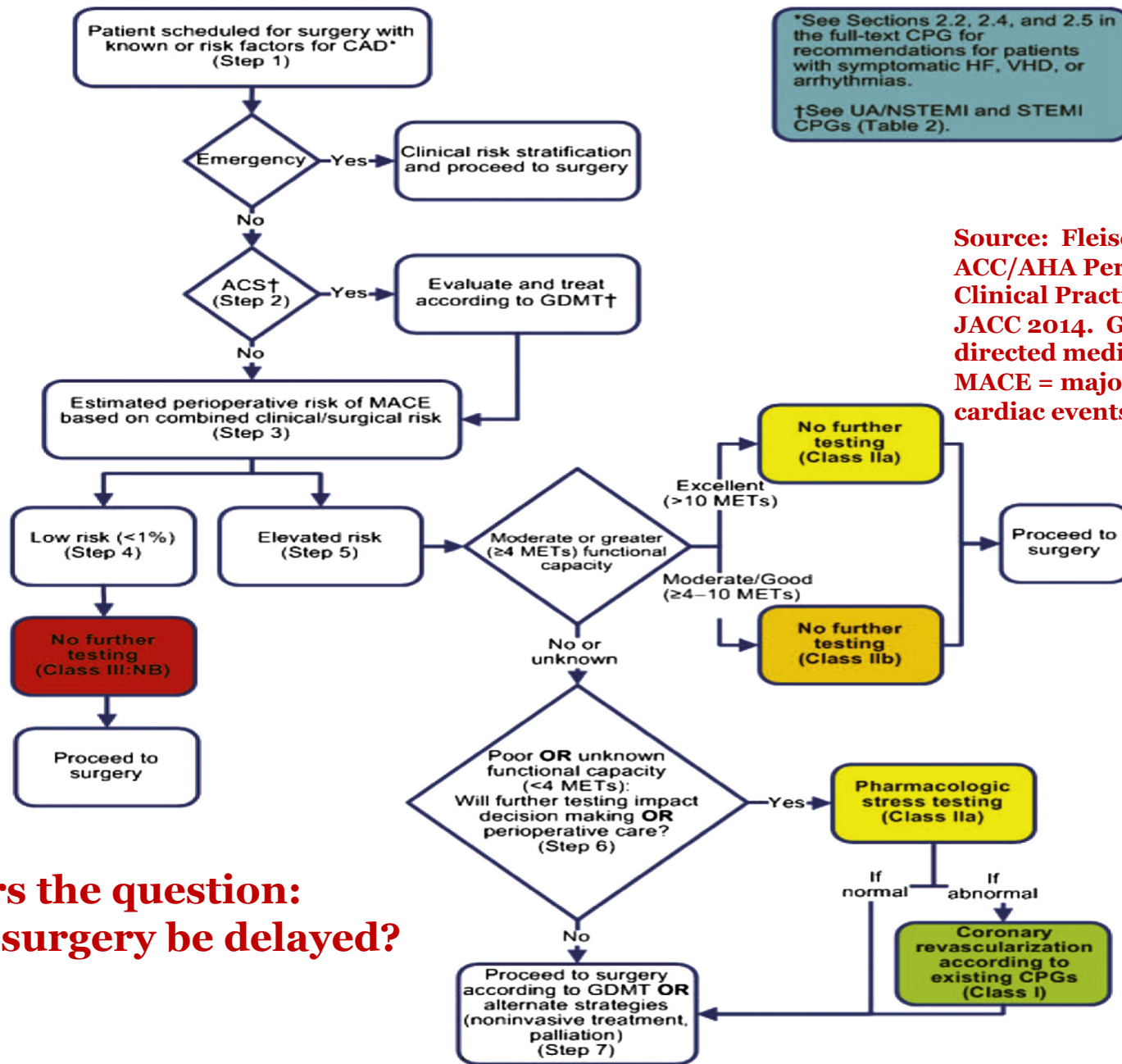


- A 73 y.o. man with hypertension and diabetes presents with bilateral lower extremity claudications and a non-healing ulcer on his left ankle. He can ambulate only 50 feet without pain. Medications are lisinopril, glargine insulin, aspirin, and metoprolol. He smokes one pack cigarettes per day. Height is 6 feet and weight 230 pounds. Lab shows creatinine of 2.1. Further evaluation reveals the need for an aortofemoral bypass graft. What is his risk of death and major cardiac complication from the surgery?
Should his surgery be delayed for CDV evaluation?
Should ASA be held perioperatively?

AHA Algorithm - 2014



- **Acute coronary syndrome**
 - Also severe valvular disease, severe arrhythmia, decompensated CHF, Class III+ angina or recent MI – manage by guidelines
- **Low risk surgery (vs. high risk with > 1% complications)**
 - Endoscopic, superficial, ambulatory, cataract, breast
- **Functional capacity ≥ 4 METS**
 - Washing dishes, dusting, 1 flight stairs, sexual activity, bicycling, singles tennis
- **Clinical risk factors**
 - CAD, CHF, **insulin-requiring DM, CKD with creatinine ≥ 2 , cerebrovascular disease**



*See Sections 2.2, 2.4, and 2.5 in the full-text CPG for recommendations for patients with symptomatic HF, VHD, or arrhythmias.
 †See UA/NSTEMI and STEMI CPGs (Table 2).

Source: Fleischer, et al. ACC/AHA Perioperative Clinical Practice Guideline. JACC 2014. GDMT = goal directed medical therapy. MACE = major adverse cardiac events.

Answers the question: should surgery be delayed?

POISE-2 Trial



- 10,010 patients undergoing non-cardiac surgery (78% major surgery)
- High risk for CDV complications – 33% with vascular disease, mean age 68.6, 37.5% on diabetic medication.
- Intervention – ASA at 100-200 mg/day vs. no ASA (if on ASA, none for 4-8 days preop and not resumed until 8 days postop)
- Death and fatal MI same (7%) at 30 days. Major bleeding 4.6% with ASA and 3.8% without ASA.

Answers the question: should ASA be held?

Devereaux PJ, et al. Aspirin in patients undergoing noncardiac surgery. NEJM 2014;370:1494-1503.

Conclusions from Case One



- Expect overall risk for death and major cardiac complications to be as high as 3.4% using ACS NSQIP.
- Consider pharmacologic cardiac imaging in view of high risk surgery and poor exercise tolerance. Do not expect to improve perioperative outcome, but possibly improve long term outcome.
- Hold aspirin for 4-8 days preoperatively and eight days postoperatively based upon POISE -2 trial.

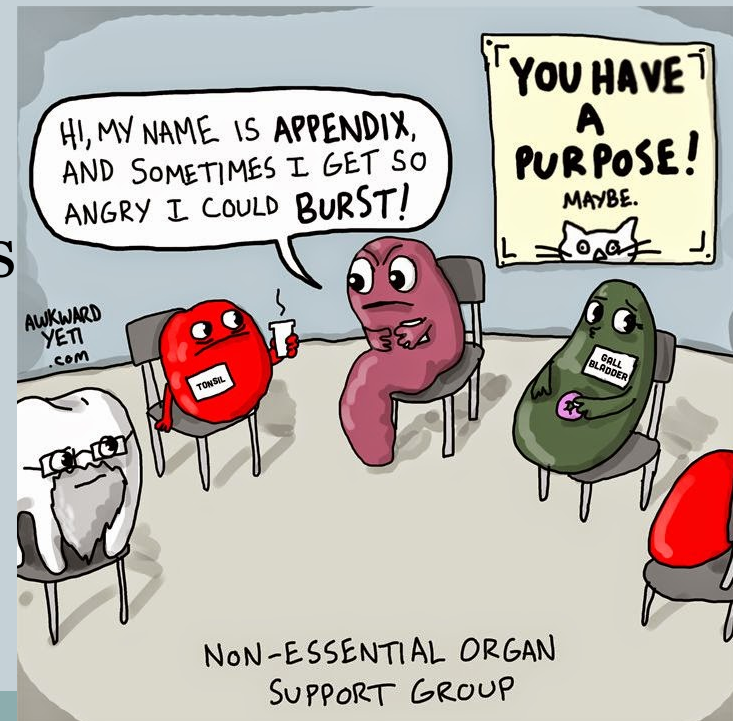
Case 2 – Cardiac Medication Management



- A 67 y.o. woman is referred to you for medical management perioperatively for an elective cholecystectomy following an episode of acute pancreatitis five days ago. Abdominal US showed gallstones. She has hypertension. She received a **drug-eluting coronary stent** seven months ago and is on **aspirin, clopidogrel, metoprolol, and atorvastatin**. She takes **rivaroxaban** for **chronic atrial fibrillation**. She is able to walk a half mile without symptoms. How should her medications be managed perioperatively?

Case 2 – Cardiac Medication Management

- A. Stop aspirin, clopidogrel, and rivaroxaban preoperatively and resume postoperatively.
- B. Stop all three above but bridge perioperatively with low molecular weight heparin.
- C. Leave on aspirin, but stop clopidogrel and rivaroxaban.
- D. Delay surgery for five months and then do C.
- E. Continue all medications except the rivaroxaban.

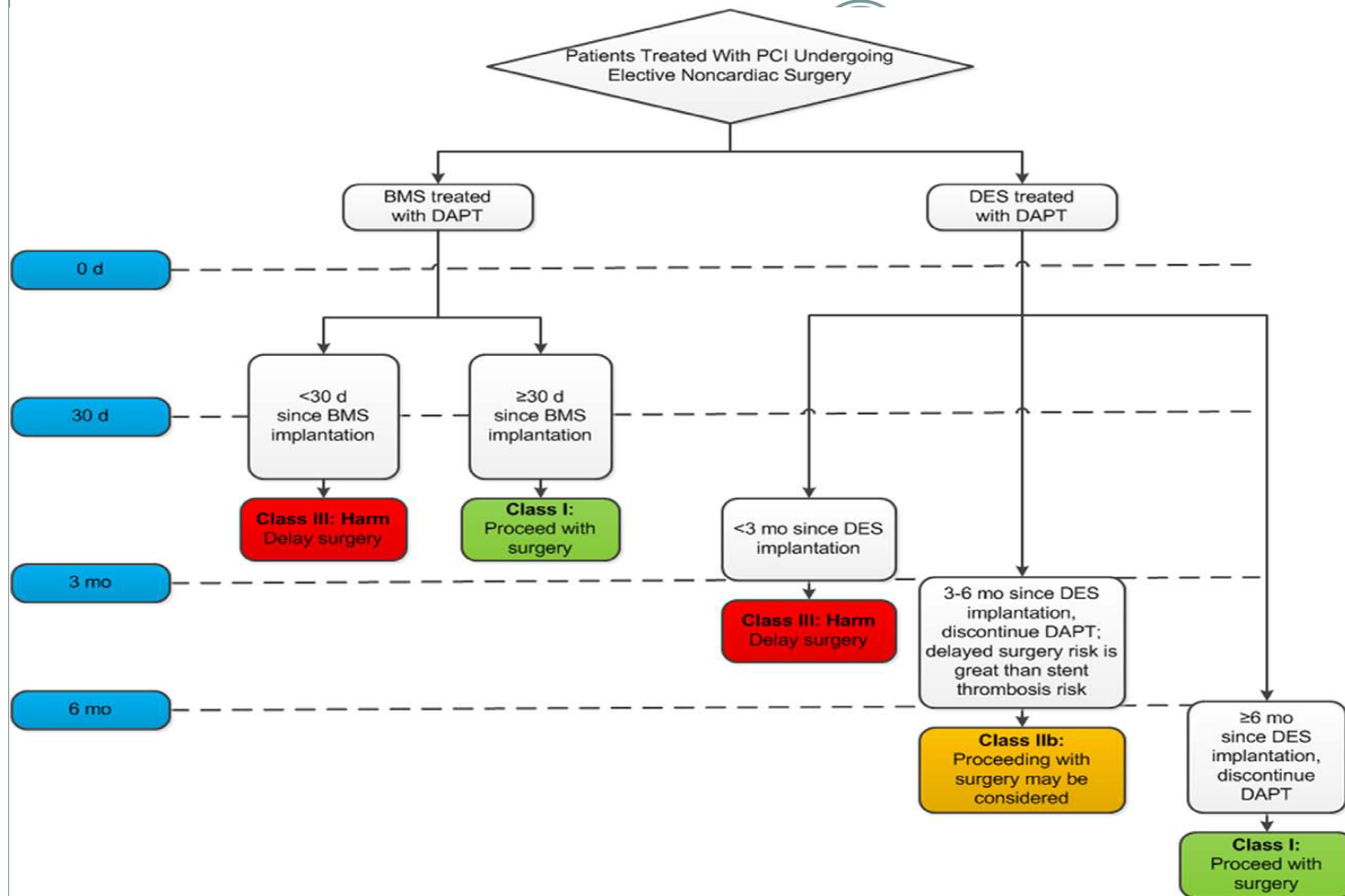


Case 2 – Cardiac Medication Management



- A. Stop aspirin, clopidogrel, and rivaroxaban preoperatively and resume postoperatively.
- B. Stop all three above but bridge perioperatively with low molecular weight heparin.
- **C. Leave on aspirin, but stop clopidogrel and rivaroxaban.**
- D. Delay surgery for five months and then do C.
- E. Continue all medications except the rivaroxaban perioperatively.

Antiplatelet Therapy, Stents, and Surgery



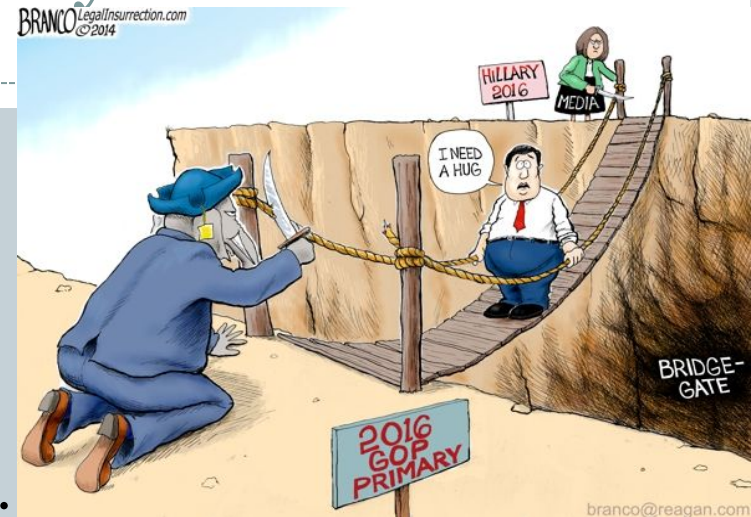
**Warning:
do not stop
the aspirin.**

Levine G et al. 2016 ACC/AHA guideline focused update on duration of DAPT in CAD. Circulation. 2016; 68:1082-1115.

BRIDGE Study

- 1884 patients with atrial fibrillation undergoing surgical procedures
- 1-6 CHADS₂ score with 38% at 3+
- Exclusions – mechanical heart valves, stroke, systemic embolism, recent TIA, cardiac/intracranial/intraspinal surgery.
- Warfarin stopped five days before and LMWH started three days before with last dose at 24 hours pre-procedure. Warfarin resumed within 24 hours and LMWH resumed 24-72 hours post-procedure
- Control group with warfarin (stopped) and LMWH placebo.
- No difference in mortality, no difference in arterial TE, but major bleeding in 3.2% of bridged (vs. 1.3%).

Douketis JD et al. Perioperative bridging anticoagulation in patients with atrial fibrillation. NEJM 2015;373:823-833.



Holding Anticoagulation for Surgery (Last Dose)



- Warfarin – 5 days. Resume within 24 hours postop.
- LMWH – 24 hours. Resume at 12-72 hours postop.
- Fondaparinux – 36-48 hours.
- Dabigatran – 1-2 days if CC>50; 3-5 days if CC<50
- Rivaroxaban – 1 day; 2 days if CC 60-90; 3 days if CC 30-59; 4 days if CC 15-29
- Apixaban – 1-2 days; 3 days if CC 50-59; 5 days if CC < 30-49.

- NOACs –GI Guidelines. LR – omit on day of procedure; HR- last dose 48+ hours preprocedure. Includes edoxaban.

Baron TH et al. Management of antithrombotic therapy in patients undergoing invasive procedures. NEJM 2013;368:2113-2124.

Veitch AM et al. Endoscopy in patients on antiplatelet or anticoagulant therapy. Gut 2016;65:374-389.

Statins and Perioperative Care



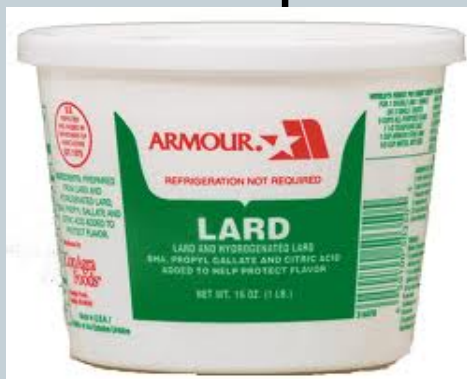
- Zheng Z et al. NEJM 2016;374:1744-57. – rosuvastatin caused AKI and did not prevent MI or atrial fibrillation in cardiac surgery. Initiated 8 days preoperatively. 1922 patients
- Billings FT et al. JAMA 2016;315:877-888 – atorvastatin did not prevent AKI in cardiac surgery patients. 617 patients
- Elgendy IY et al. AJC 2015;115:1523-28 – atorvastatin reduced the risk of atrial fibrillation in CABG patients. 2980 patients. May need at least two weeks for effect.
- Antoniou G et al. J Vasc Surg 2015;61:519-532 – statins reduced all cause mortality, stroke, and MI. No difference in AKI. All types of non-cardiac vascular surgery – 23,536 patients, but only 675 from RCTs.
- Two meta-analyses in 2016 showed divergent results for prevention of atrial fibrillation.
- Canadians – continue statins if on statins (2017). Americans – continue statins; add statins if vascular surgery (2014 -IIA)

Base Statin Use on ACC/AHA Guidelines



- **L** – LDL > 190
- **A** – Atherosclerotic disease
- **R** – 10-year risk of > 7.5%
- **D** – diabetes present

<http://tools.cardiosource.org/ASCVD-Risk-Estimator/>



Stone NJ et al. ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults. *J Am Coll Cardiol* 2013; Nov. 7.



They're young... They're in love...
They eat LARD

©1957. Issued by The British Lard Marketing Board in conjunction with the Department of Health.



New Canadian Guidelines



- Check BNP preoperatively if > 65 or age 45-65 with CDV risk factors. NTpBNP > 300 or BNP > 92 is linked to poor outcome.
- Withhold ACEIs and ARBs 24 hours preoperatively.
- Measure daily troponin for 48-72 hours after surgery if BNP elevated, if Revised Cardiac Risk Index ≥ 1 , or if $>$ age 65. Also obtain EKG in PACU in these patients.



Duceppe E et al. Canadian CDV Society guidelines on perioperative cardiac risk assessment and management for patients who undergo noncardiac surgery. CJC 2017;33:17-32.

Sessler DI, Devereaux PJ. Perioperative troponin screening. Anesth Analg 2016;123:359-60. Suggests screening T on POD 1/2/3 in all patients over 45. NNT only 15. Mortality is 10% if MI with threshold of ≥ 0.03 ng/ml.

Rodseth RN et al. Prognostic value of preop and postop BNP in patients undergoing non-cardiac surgery. JACC 2014;63:170-180.

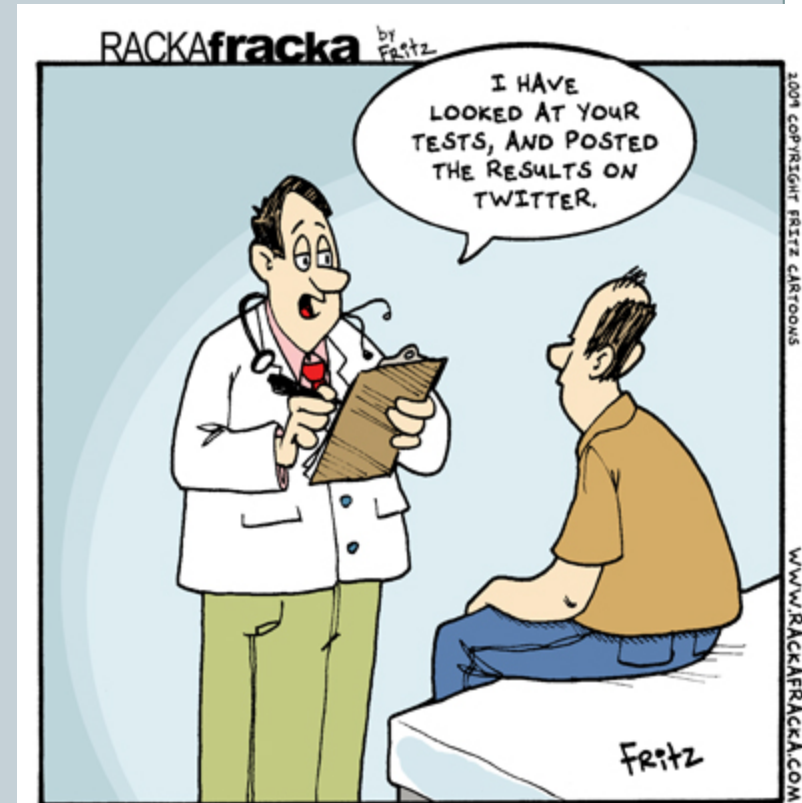
Case 3 – Preoperative Testing



A 70 y.o. man is referred for preoperative evaluation prior to an elective total knee arthroplasty. He has hypertension controlled on HCTZ and amlodipine but no other medical illnesses. He takes ibuprofen to control his osteoarthritis symptoms and also omeprazole to prevent NSAID-induced bleeding. He feels fatigued and occasionally sleepy during the day. He denies any unusual bleeding or history of blood transfusions. On examination: T - 98.2 degrees, P-62, BP 145/95, R-16, height- 5 feet 9 inches, and weight - 252 pounds. SaO₂ is 94%. CBC and BMP are normal. EKG shows a normal sinus rhythm. What additional evaluation should be done prior to surgery?

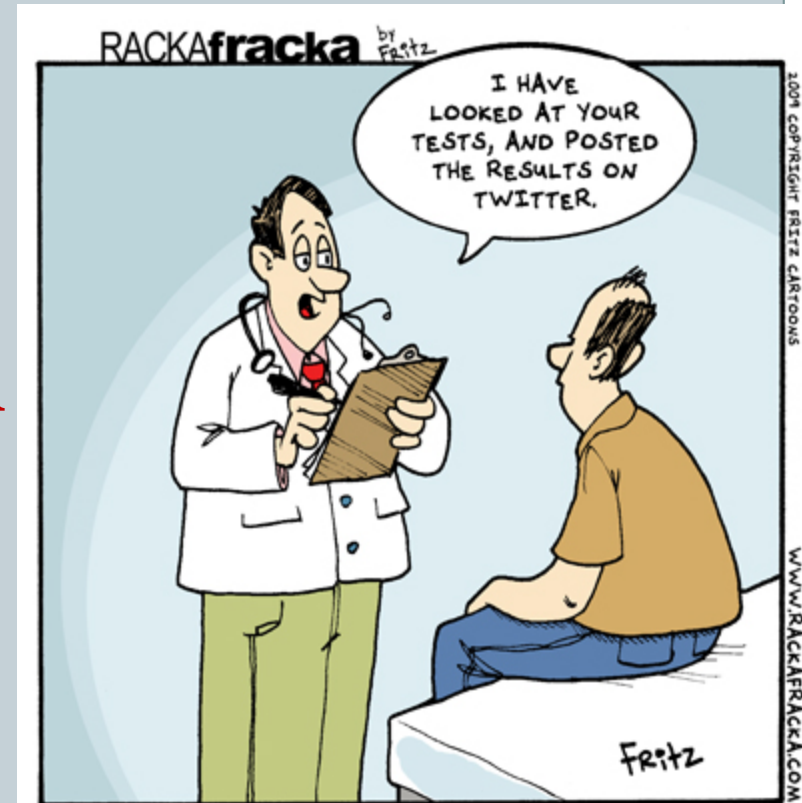
Case 3 – Preoperative Testing

- A. Pro-time and APTT
- B. Chest X-ray
- C. Sleep study
- D. Liver enzymes
- E. No additional evaluation



Case 3 – Preoperative Testing

- A. Pro-time and APTT
- B. Chest X-ray
- C. Sleep study**
- D. Liver enzymes
- E. No additional evaluation**



Case 3 – Sleep Apnea and Surgery



- 7-25% of patients undergoing surgery have sleep apnea
- Complications attributable to sleep apnea
 - Cardiac events including atrial fibrillation
 - Acute respiratory failure
 - Postoperative oxygen desaturation
 - Postoperative ICU transfer
 - Overall 2-4X increased risk of postop complications
 - No definite decrease in surgical mortality, but decrease in mortality long-term with use of CPAP

R. Kaw et al. Meta-analysis of the association between OSA and postoperative outcome. Br.J.Anes. 2012;109:897-906.

Screening for Sleep Apnea



- **S** – Do you snore loudly
- **T** – Do you feel tired, fatigued, or sleepy during the day
- **O** – Has anyone observed you stop breathing during sleep
- **P** – Do you have high blood pressure

- **B** – BMI ≥ 35 kg/m²
- **A** – Age > 50
- **N** – Neck circumference > 40 cm
- **G** – Male?



Interpretation of Stop-Bang



- High risk for OSA ≥ 3 points
- Sensitivity 84% and specificity 56%
- Critical care admission odds ratios
 - 4 points – 2.2
 - 5 points – 3.2
 - 6 points – 5.1



Screening and Then What?



- Consider sleep study. Unclear if treatment then improves outcomes. **Note: 2017 study shows reduction in atrial fibrillation**
- Consider mandibular device.
- Prepare for difficult intubation.
- Use local/regional anesthesia if possible.
- Use upright/lateral positioning.
- Continuous pulse ox even after recovery room.
- If moderate sedation, use capnography monitor.
- Extubate when awake.
- Avoid continuous opiates.
- Consider use of autotitrating CPAP postoperatively.

American Society of Anesthesiologists. Practice guidelines for the perioperative management of patients with OSA. Anesthesiology 2014;120:268-286.

Wong J et al. Preop treatment of OSA with PAP associated with decreased incidence of atrial fibrillation after cardiac surgery. JCTV Anesthesia. 2017; epub.

If No Screening, Then What?



1. Screen only patients with high probability of OSA plus uncontrolled systemic conditions such as hypoventilation syndromes, severe pulmonary hypertension, or resting hypoxemia. Also excepted: bariatric surgery, tonsillectomy.
2. Prepare to mitigate for complications related to OSA.
3. Notify primary care physician that evaluation for OSA is needed as an outpatient.
4. If OSA diagnosed, consider treatment in cardiac patients for 3-6 months to prevent a-fib.

Chung F et al. SASM guidelines on preoperative screening and assessment of adults patients with OSA. Anesth Analg 2016;123:452-473.

Case 4 – Postoperative Fever



- A 71 y.o. man receives a right total hip arthroplasty. The surgery was uneventful. The following morning he spikes a fever to 101.3 degrees. He denies headache, cough, dyspnea, chest or abdominal pain, or dysuria. Physical examination reveals a nonerythematous oropharynx, clear lungs, no cardiac murmur, and no abdominal tenderness. The wound per orthopedic surgery shows no unusual redness or drainage. What should be ordered at this time?

Case 4 – Postoperative Fever



- CBC with differential
- Blood cultures
- Chest X-ray
- Urinalysis and culture
- Ultrasound of right leg
- No further evaluation



“Tails it is. OK, that’s how we’ll take your temperature.”

Case 4 – Postoperative Fever



- CBC with differential
- Blood cultures
- Chest X-ray
- Urinalysis and culture
- Ultrasound of right leg
- **No further evaluation**



“Tails it is. OK, that’s how we’ll take your temperature.”

The “Ws” of Postoperative Fever



- Wound
- Water
- Wonder Drug
- Walk
- Wind – PNA, not atelectasis
- Wire
- What Else – MI, gout, pancreatitis, sinusitis, **benign postop fever**



Mavros MN et al. Atelectasis as a cause of postoperative fever: where is the clinical evidence? Chest 2011; 140:418-424.

Case Five – DVT Prophylaxis



A 52 y.o. woman is scheduled for a hysterectomy due to uterine myomata with severe anemia. Her medical problems include hypertension, ESRD on hemodialysis and remote stroke. She takes aspirin, ferrous sulfate, calcitriol, cinacalcet, calcium, and amlodipine. She has no history of DVT/PE and no family history of hypercoagulability. BMI is 31. BP is 164/96. Her hemoglobin is 8.1 following menses one week ago. In preparation for surgery **what should be used for perioperative DVT prophylaxis** and should she be given PRBCs?

Case Five – DVT Prophylaxis Choices



- A. No DVT prophylaxis indicated
- B. Mechanical prophylaxis only
- C. Prophylaxis with SQ heparin
- D. Prophylaxis with LMWH
- E. Prophylaxis with both mechanical and pharmacologic methods
- F. Prophylaxis with apixaban
- G. IVC filter



Case Five – DVT Prophylaxis Choices



- A. No DVT prophylaxis indicated
- **B. Mechanical prophylaxis only**
- C. Prophylaxis with SQ heparin
- D. Prophylaxis with LMWH
- E. Prophylaxis with both mechanical and pharmacologic methods
- F. Prophylaxis with apixaban
- G. IVC filter



Case Five – Advice from Chest 2012



- Use DVT risk scoring system such as Caprini
- Caprini score is 4 – moderate risk (3-4 = MR, 5+ = HR)
 - One point – age 41-60 One point – BMI > 25
 - Two points – major surgery (> 45 minutes)
- Assess bleeding risk – high (see next slide)
- Use mechanical prophylaxis

Gould MK et al. Prevention of VTE in nonorthopedic surgical patients. Chest 2012; 141 (Supp). e227S-e277S.

<https://itunes.apple.com/us/app/caprini-dvt-risk/id657529721?mt=8#>

Assessment of Bleeding Risk



- **Subjective – HASBLED not used perioperatively**
- **Risk factors in patient**
 - ESRD
 - Uncontrolled hypertension
 - Antiplatelet therapy
 - Stroke (especially if acute)
 - Abdominal surgery with anemia
- **Other risk factors**
 - Hepatic resection with malignancy or anemia
 - ESLD
 - Abdominal surgery with malignancy
 - Pancreaticoduodenectomy with sepsis, leak
 - Cardiac surgery with advanced age, multiple grafts, or high BMI
 - Cranial or spinal surgery

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Case Five – Transfusion Choices



- A. No PRBCs indicated
- B. Type and screen for two units PRBCs before surgery
- C. Type, cross match, and give two units of PRBCs before surgery
- D. Administer IV iron and operate when hemoglobin is 10 or above



Case Five – Transfusion Choices



- A. No PRBCs indicated
- **B. Type and screen for two units PRBCs before surgery**
- C. Type, cross match, and give two units of PRBCs before surgery
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Case Five – Transfuse or Not



- Hospitalized and critically ill - Hg < 7.
- Cardiac or orthopedic surgery – Hg < 8.
- Acute coronary syndrome – unclear: ? < 8-10.
- Single unit transfusions are associated with infection, MI, stroke, and malignant ventricular arrhythmias.
- Transfusions already known to increase infection risk, increase overall mortality – or do they??

Myles PS et al. Restrictive vs liberal transfusion strategy in the perioperative and acute care setting. *Anesth* 2016;125:46-61.

Whitlock et al. Harms associated with single unit perioperative transfusion. *BMJ*. 2015;350:1-9.

Case Five – When Transfusion is OK



- **Cardiac Surgery**
 - Murphy et al. NEJM 2015; 372:997-1008
 - 2000 patients. Threshold was 7.5 (restrictive) or 9 (liberal)
 - CABS 41% and valve surgery 31%
 - No difference in outcomes (infection, ischemic event)
 - **Significant increase in mortality in restrictive group (4.2% vs. 2.6%)**
- **Noncardiac Surgery**
 - Docherty et al. BMJ 2016;352:1351
 - Meta-analysis and systematic review of 11 trials
 - **Restrictive (<8 Hg) with non-significant increase in mortality, increased risk of ACS (4.6% vs 2.7), but decreased risk of pulmonary edema. Liberal was 9-10 Hg.**
- **Hip surgery**
 - Carson et al. Lancet 2015;385:1183-1889. F/U FOCUS study (2011)
 - 2016 patients with hip fracture. Median age was 81.6 years and 63% with CDV disease.
 - Restrictive with transfusion < 8 Hg. Liberal with transfusion < 10 Hg.
 - **No increased death risk in 3 years in liberal and restrictive groups.**

Case Six - Ileus



- A 55 y.o. man undergoes a hemicolectomy for an adenocarcinoma detected by colonoscopy. He has hypertension controlled with lisinopril and amlodipine and T2DM diet-controlled. Despite early enteral feedings, at four days after surgery he develops abdominal distension, vomits his feedings, and has no flatus or stool. His bowel sounds are hypoactive, and a KUB shows diffuse distension with air throughout the large and small intestines. CT abdomen confirms a nonobstructing ileus. CBC and electrolytes are checked and an NG tube placed.

Case Six - Ileus



What might have been done immediately postoperatively to prevent ileus?

- A. Gum-chewing
- B. Neostigmine
- C. Daikenchuto
- D. Total parenteral nutrition
- E. Coffee



Case Six - Ileus



What might have been done immediately postoperatively to prevent ileus?

- **A. Gum-chewing**
- B. Neostigmine
- C. Daikenchuto
- D. Total parenteral nutrition
- E. Coffee

Gum Chewing



- 120 patients with colon resections randomized to gum chewing or dermal patch (control)
- Three sticks gum per hour initiated preoperatively but patients could refuse.
- Postop ileus – 27% gum chewers vs 48% of controls.
- Stooling ≤ 4 days in 85% vs. 57% controls. Flatus ≤ 48 hours in 65% vs. 50% controls.
- Improved gastric emptying and reduction in IL-8 and TNF in gum chewers.

Heijkant TC et al. Randomized, clinical trial of the effect of gum chewing on POI and inflammation in colorectal surgery. BJS 2015;102:202-211.

Other Treatments



- Coffee – beneficial in 2012 BJS trial involving 80 colectomy patients. Coffee vs. water – 100 cc tid. First stool at 60 hours with coffee and 74 hours with water. Further studies in progress with caffeine.
- Daikenchuto – Japanese herbal with cholinergic effects. Ineffective in 2016 study of Whipple patients.
- Avoid routine NG tube placement after GI surgery.

Muller SA et al. Effect of coffee on postoperative ileus following elective colectomy. Br J Surg. 2013;99:1530-1538.

Other Key Literature Changing Practice



- Cardinale D et al. Prevention of A-fib in high risk patients undergoing lung cancer surgery. *Ann Surg.* 2016;264:244-51. BB or ARB started postop within 12 hours based on elevated NT-proBNP levels. Dose was 25 bid increased to 100 bid metoprolol or 12.5 bid increased to 50/day losartan. Rates of A-fib of 6-12% on meds and 40% without.
- Cheungpasitporn W et al. Preop ACEI, ARB use linked to reduced AKI: systematic review and meta-analysis. *Nephrol Dial Transplant* 2015;30:978-988. 102675 patients. CT and noncardiac surgeries. Better studies showed AKI risk of 0.52 if used > 2 weeks preop.
- Lee SM et al. Association between withholding ARB in early postop period and 30-day mortality. *Anesth.* 2015;123:288-306. Holding ARB after day 2 postop is associated with a 2.5X increase in 30 day mortality.

Other Key Literature Changing Practice



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Other Key Literature Changing Practice



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Perioperative Mnemonic



- **A**nesthesia and ADLs
- **B**leeding
- **C**orticosteroid Use
- **D**rug Use
- **E**xercise

Preoperative Assessment - Summary



- Cardiovascular – ACS NSQIP risk calculator, AHA algorithm, postoperative MI surveillance
- Pulmonary – Gupta or Ariscat respiratory failure assessment, smoking cessation, DVT prophylaxis
www.qxmd.com/calculate/calculator_261/postoperative-respiratory-failure-risk-calculator
- Endocrine – DM management, adrenal assessment and supplementation
- Hematology – platelets $> 50,000$, INR < 1.5 , Hg $> 7-8$
- GI/Hepatology – MELD or Child-Pugh scales
<https://itunes.apple.com/us/app/model-for-end-stage-liver/id955166907?mt=8>
<http://www.mdcalc.com/child-pugh-score-for-cirrhosis-mortality/>

Preoperative Assessment - Summary



- Rheumatology – C-spine stability, cricoarytenoid dysfunction, Raynaud’s management
- Nephrology – dialysis timing, electrolyte and fluid corrections
- Infectious Diseases – endocarditis prophylaxis (high risk cardiac lesion and high risk procedure)
- Neurology – AED level, delirium prevention, specific disease management
- Pharmacology – medication management in setting of NPO status

Perioperative Evaluation- Summary



- Use ACS NSQIP and VASQIP to assess risk.
- Stop ASA unless stent or CEA. Hold NOACs 48 hours preoperatively. Avoid bridging in atrial fibrillation at low-moderate risk.
- Use AHA and Canadian guidelines in perioperative CDV patients.
- Manage OSA expectantly.
- Delay evaluation of early postop fever.
- Assess thrombosis and bleeding risk before prescribing DVT prophylaxis.
- Create template for periop evaluation.



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“What the . . . There’s the gold earring I lost when we did his triple bypass four years ago.”