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We also treat the human spirit.

Preop Risk Stratification and Optimization


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Disclosure

- None

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Goals and Objectives

- Recognize the vital role primary care physicians play in assessing risk and optimizing chronic medical conditions in the preoperative setting
- Identify tools to help risk stratify the preoperative patient
- Understand how to manage various medications prior to surgery

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Outline

- Cardiovascular risk assessment, revascularization, and medical therapy
 - CAD/CHF
 - HTN
 - Med management
- Endocrine disease assessment and optimization
 - Diabetes Mellitus
 - Thyroid disease

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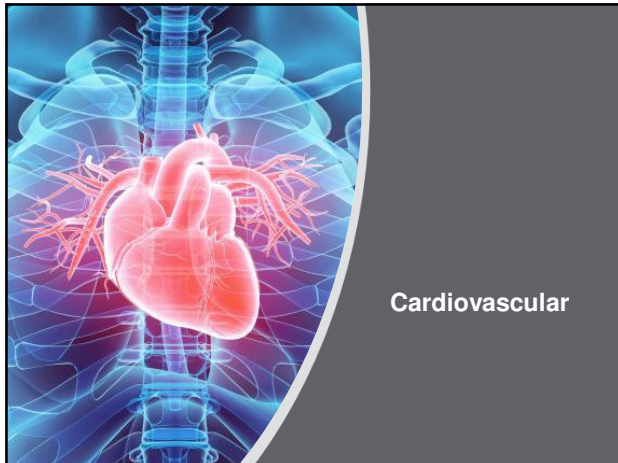
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Outline – cont.

- Pulmonary assessment and optimization
 - Smoking
 - COPD
 - URI
 - Asthma
 - OSA
- Chronic pain considerations
- Geriatrics/Frailty

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Cardiac Assessment– Predicting Major Adverse Cardiac Events (MACE)

- Revised Cardiac Risk Index (RCRI)
- National Surgical Quality Improvement Project (NSQIP)
 - Surgery-specific risk calculated
 - American College of Surgeons (2013)

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Cardiac Assessment - Update

- Glance, et al 2018 – 10,000 pts
 - Disagreement of low vs. high risk between RCRI and NSQIP ~29% of the time
- Fronczek, et al 2019 – sought to externally validate RCRI and NSQIP with vascular pts
 - Predictive accuracy of MACE poor in both
- Vascular Quality Initiative – VQI
 - Developed own algorithm for predicting MI – troponin level, clinical and echocardiographic criteria
 - NOT EXTERNALLY VALIDATED

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Cardiac Assessment – Future Direction

- In developmental stages
 - Frailty?
 - Mobility?
 - Functional capacity assessment?
 - Echocardiography?

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In the meantime

- RCRI and NSQIP

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Possible Interventions

- Forgo surgery
- Modify procedure
- Delay surgery to treat unstable sx's
- Modify perioperative medical therapy
- Initiate beta-blockers, statins, alpha-2 agonists
- Modify postop monitoring
- Coronary revascularization
- Modify location of care

Fleisher, 2016

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Coronary Revascularization

- 1997
 - Eagle, et al. – incidence of periop MI and mortality by procedure - 1997
 - Procedures where CABG reduces risk compared with medical therapy
 - Major vascular
 - Abdominal Sx
 - Thoracic Sx
 - Orthopedic Sx

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Coronary Revascularization

- 2004 - Coronary Artery Revascularization Prophylaxis (CARP) study
 - No reduction in MI, death or LOS with revascularization (elective major vascular sx)
- 2015
 - Eagle et al – “Prophylactic coronary revascularization exclusively to reduce perioperative cardiac events is not recommended”
 - Includes elective elevated-risk sx

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Coronary Revascularization

- When revascularization IS necessary – delay sx
 - 60 days for CABG
 - 14 days for balloon angioplasty
 - 30 days bare metal stent
 - 365 days for drug eluting stents (DES)
 - 6 months for new generation stents on DAPT (continuation of ASA recommended)

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Hypertension

- 72 million Americans
 - 30% of the population > 25 years
- Perioperative setting
 - No set guidelines for chronic HTN patients

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Hypertension

- Recent studies – fail to establish link between periop complications and elevated BP <180/110
- Uncomplicated BP >180/110 – little evidence to support causal relationship with surgical risk
 - Evidence to delay sx poor
 - Treating periop may risk ischemic damage and adverse drug reaction

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Hypertension

- Chronic, poorly controlled → Intravascular volume depletion
 - Anesthetics → vasodilation → refractory hypotension → arrhythmias, ischemia
- Stage 1 or mild stage 2 HTN → do not delay

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Hypertension

- Advanced stage 2 (systolic > 180 mmHg, diastolic > 110 mmHg) → few data to support postponement
- Hypertensive crisis (>180/120 mmHg) and/or symptomatic (headache, blurred vision, etc.) → delay

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Medical Interventions

- Beta-blockade
 - Perioperative Ischemic Evaluation Study (POISE) Trial – ACC/AHA
 - Reduce nonfatal MI
 - Increased stroke and death
 - Used high dose, long-acting B-blockers, no titration protocol
 - Current guidelines
 - Continue in pts on long-term B-blocker therapy (class I)
 - Consider in 1) high risk CV profiles 2) undergoing high risk surgical intervention
 - 1 week- 30 days prior

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Medical Intervention

- Statins
 - Continue
 - Start for CAD patients not already on
- Alpha agonists
 - Do not initiate
 - May continue if on
- ACE-I's/ARB's
 - Do not initiate and consider discontinuing before sx
 - Intraop hypotension

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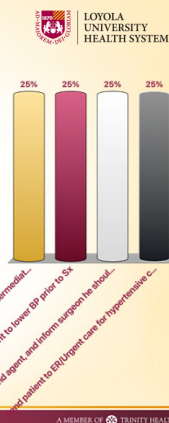
Medical Intervention

- Calcium Channel Blockers
 - Continue if on
 - Withhold on day of surgery
- Diuretics
 - Continue up to DOS
 - Consider withholding on DOS (electrolyte imbalance, hypovolemia, etc.)

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82y M with hx of poorly controlled HTN and prostate CA presents for assessment prior to TURBT 5 days from now. Pt takes HCTZ only. BP in the office is 185/121 mmHg. Pt complains only of a mild headache because he did not have his coffee that morning.

- A. Continue with current regimen for this intermediate risk Sx
- B. Add a second agent to lower BP prior to Sx
- C. Add a second agent, and inform surgeon he should be delayed for at least 2 weeks
- D. Send patient to ER/Urgent care for hypertensive crisis

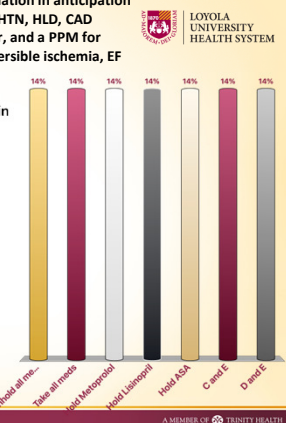


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82-year male presents for preoperative evaluation in anticipation of a THA. He has a 50-pack year smoking hx, HTN, HLD, CAD including 3 cardiac stents placed 3 years prior, and a PPM for sinus arrhythmia. Stress echo showed no reversible ischemia, EF 45%.

Meds: Lisinopril, ASA, Metoprolol, Simvastatin

- A. Withhold all meds
- B. Take all meds
- C. Hold Metoprolol
- D. Hold Lisinopril
- E. Hold ASA
- F. C and E
- G. D and E



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Diabetes Mellitus

- 20 million Americans
- 90% type 2
- 50% require surgery at some point

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Diabetes

■ Testing

- Point testing – only useful on DOS
- A1C – indicative of glycemic level over 3 months
 - ADA goal - < 7%
- Renal function
 - DM – leading cause of renal failure
 - Reasonable to obtain

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Diabetes – Periop Goals

■ Goal – avoid glycemic extremes

- Outpatient – lowest possible without undue hypoglycemia
 - Potentially dangerous in the inpatient/periop setting
- American College of Endocrinology – position statement
 - <200 mg/dL intraop
 - <150 mg/dL postop
 - Avoid glucose <80 mg/dL

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Diabetes – Med Mgmt

- **Insulin**
 - Continue typical regimen up to the night before sx
 - Long-acting (Lantus, Levemir, Detemir, etc.)
 - Slight reduced dose night before sx (~75%)
 - Insulin pump – maintain basal rate
 - Intermediate and short-acting insulin – HOLD in AM
- **Oral hypoglycemic agents**
 - Hold on AM
 - Metformin – consider holding 24 hrs prior
 - Lactic acidosis



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Thyroid Dz

- **Hyperthyroid**
 - Chronically elevated T3 and T4 - limit ability to respond to stress
 - Cardiovascular collapse
 - Thyroid storm – 10-75% mortality
 - Continue antithyroid meds on AM of sx
 - Emergent sx – beta-blockers inhibit conversion of T3-T4



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Thyroid Dz

- **Hypothyroid**
 - Plasma catecholamine levels normal
 - Beta-adrenergic receptor function depressed
 - Depressed cardiac function (inotropy and chronotropy)
 - Increased SVR (alpha receptor activity predominating)
 - Moderate to well-controlled pts - proceed to sx
 - Poorly-controlled – delay
 - Myxedema coma
 - Meds – levothyroxine half-life → 1 week
 - Not imperative to take on AM of sx

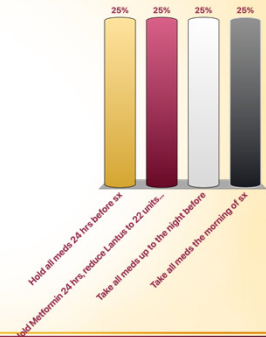


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52y M with obesity, arthritis, and type 2 DM is presenting for evaluation prior to a TKA. His A1C is 7.9 and basic labs otherwise normal. METs > 6. Meds – Lantus 30 units at night, Metformin, Simvastatin, Celebrex. Recommendations?

- A. Hold all meds 24 hrs before sx
- B. Hold Metformin 24 hrs, reduce Lantus to 22 units night before, take others
- C. Take all meds up to the night before
- D. Take all meds the morning of sx



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Pulmonary

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Pulmonary Complications

- **Postop pulmonary complications (PPC's)**
 - Bronchospasm, atelectasis, exacerbation of chronic conditions, infection, respiratory failure/mechanical ventilation
 - Second most common postop complication
 - 2-5.6%
 - Poor outcomes, prolonged hospital stay, mortality
- **Predictors**
 - ASA class, functional status, age, surgical site, operative time



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Smoking

- Smoking cessation
 - 4 weeks or more – reduces PPC's
 - Longer duration – more effective (8 weeks – optimal)
 - At least 2-3 days - reduces carboxyhemoglobin levels



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COPD

- Increased odds ratios
 - Pneumonia – 2.0
 - Unplanned intubation – 1.6
 - Prolonged ventilator dependence – 1.6
- Exacerbations or infection – delay surgery



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URI's

- Clinical prudence – delay surgery
- Evidence is weak
- Elevated risk of bronchospasm, laryngospasm, desaturation
- No increased morbidity or long-term sequelae (Tait, et al.)



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Asthma

- No increased rate of PPC's in well-controlled asthmatics
- Continue inhalers in the perioperative period
- Exacerbations – delay surgery



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OSA

- Odds ratios
 - Acute respiratory failure – 2.4
 - Postop O2 desaturation – 2.3
- Underdiagnosed
 - STOP-BANG questionnaire useful in identifying those at high risk
- Known and high risk OSA pts – treat with positive airway pressure therapy perioperatively

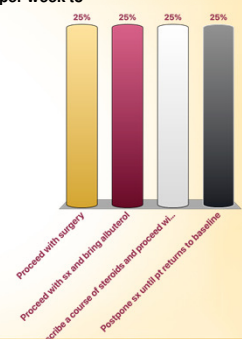


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38y M with a hx of obesity and asthma presents for preop evaluation for a shoulder arthroscopy scheduled in 3 days. He had a viral URI with nonproductive cough last week. His albuterol use has gone from once per week to multiple times per day. Recommendations?

- Proceed with surgery
- Proceed with sx and bring albuterol
- Prescribe a course of steroids and proceed with sx
- Postpone sx until pt returns to baseline



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Renal disease

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Chronic Kidney Disease (CKD)



- Affects 14% of Americans
- Underdiagnosed
- Strongly correlated with higher 30-day mortality rates
- More susceptible to AKI
 - AKI most common after cardiac sx

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CKD



- Labs – Cr, GFR
 - $GFR < 45 \text{ mL/min} \rightarrow$ consider nephrology consult
- Meds
 - NSAIDs, abx, contrast, low-molecular-weight heparin, ACEI/ARBs

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Chronic Pain

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Chronic Pain



- ~100 million US adults
- Concerns
 - Tolerance
 - Substance abuse
 - Several validated screening tools
- Strategies
 - Multidisciplinary management plan
 - Multimodal analgesia
 - Opioid-sparing techniques (regional anesthesia, etc.)

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My advice . . .



- Refer to chronic pain physician if possible

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Darvall, et al. 2018

- Systemic Review of Frailty Indexes
- Effective in predicting . . .
 - Hospital LOS
 - Postop delirium
 - Major complications – MI, CVA, death
 - Pneumonia, sepsis, UTI, return to OR
- However . . .
 - Significant heterogeneity in measurement tools
 - No consensus on best way to measure

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Frailty Index

- Canadian Study of Health and Aging
- Modified Frailty Index (mFI) – 11 variables
 - Lack of independence
 - DM
 - COPD or pneumonia
 - CHF
 - TIA or CVA
- Neurologic deficit after CVA
- MI
- PCI, PCS, or angina
- HTN requiring treatment
- Impaired sensorium
- PVD or rest pain

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Frailty Index

- Since 2012, 6 of the mFI-11 are no longer in NSQIP . . .
- mFI-5
 - DM
 - CHF
 - HTN requiring treatment
 - COPD or pneumonia
 - Lack of independence

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Traven, et al. 2018

- mFI-5 to predict morbidity and mortality in TKA and THA

Frailty Index Score	Any Complication (%)	CDIV Complications (%)	SSI (%)	Readmission (%)	Mortality (%)
0	~2	~1	~1	~1	~1
1	~4	~2	~2	~2	~2
2	~8	~4	~3	~4	~3
3	~15	~8	~5	~8	~5
4	~25	~15	~10	~12	~8
5	~30	~20	~15	~18	~10

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Frailty Index – Charlson Comorbidity Index (CCI)

Comorbidity	Score
Prior myocardial infarction	1
Congestive heart failure	1
Peripheral vascular disease	1
Cerebrovascular disease	1
Dementia	1
Chronic pulmonary disease	1
Rheumatologic disease	1
Peptic ulcer disease	1
Mild liver disease	1
Diabetes	1
Cerebrovascular (hemiplegia) event	2
Moderate-to-severe renal disease	2
Diabetes with chronic complications	2
Cancer without metastases	2
Leukemia	2
Lymphoma	2
Moderate or severe liver disease	3
Metastatic solid tumor	6
Acquired immuno-deficiency syndrome (AIDS)	6

doi:10.1371/journal.pone.0154627.t003

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An 85y F presents for assessment for a L upper lobectomy for lung CA. She has a hx of COPD, HTN, and lives in an assisted living facility. What is her mFI-5 score?

- A. 1
- B. 2
- C. 3
- D. 4



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Preop Assessment Example

- 72y M with a hx of HTN, IDDM, HLD, TIA, obesity who presents for assessment for TURP. METs > 4, DM and HTN well-controlled, no hx of CAD.



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Preop Assessment - Example

- Version 1 - "This is a 72y M who is a moderate-risk patient (based on RCRI) scheduled for a low-risk procedure. His mFI-5 frailty score is 2, placing him at a moderately elevated risk".
- Version 2 - "This is a 72y M who is at an elevated risk for complications (9.4% based on NSQIP) for a low-risk procedure"



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Summary

- The primary care physician plays a vital role in ensuring the patient is optimized for surgery
- Optimizing the patient medically prior to surgery helps to reduce risk of complications and hospital LOS
- There are several tools available to help assess patient risk (e.g. RCRI, NSQIP, mFI-5, etc.)



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Thank you!



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