

Tough Cases in Perioperative Medicine

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Topics in Perioperative Medicine

1. Perioperative Anticoagulation
2. Postoperative Delirium
3. Delaying Surgery after MI & Stroke
4. Transfusion Threshold
5. Surgical Risk with Cirrhosis
6. Obstructive Sleep Apnea
7. Curbside Consultation

Managing Perioperative Anticoagulation

Your orthopedic colleague asks your advice on how to manage anticoagulation in two patients who had hip fractures.

- One has atrial fibrillation due to HTN.
- The other has a mechanical AVR.
- Neither has any other relevant comorbidity

1. Heparin bridge for AVR only
2. Heparin bridge for AF only
3. Heparin bridge for both
4. Heparin bridge for neither

Benefits & Risks

Review of retrospective cohort studies:

	Bridged	No Bridge	Hazard Ratio
Embolic Event	1.1%	0.9%	0.8 (0.4-1.5)
Bleeding	11%	2%	5.4 (3.0-9.7)
Serious Bleeding	3.7%	0.9%	3.6 (1.5-8.5)

BRIDGE Trial

Randomized trial of perioperative bridging for AF

- 1884 patients on warfarin for atrial fib or flutter
- CHADS-2 score ≥ 1
- Excluded: mechanical valve, stroke < 12 wks, cardiac & neurologic surgery
- Randomized to bridging with LMWH or placebo
- Outcomes: 30-day arterial thromboembolism & bleeding

BRIDGE Trial

	Bridged	No Bridge	
Embolic Event	0.3%	0.4%	Non-inferior
Major Bleeding	3.2%	1.3%	NNH = 53
Minor Bleeding	21%	12%	NNH = 12

BRIDGE Trial for Atrial Fibrillation

Conclusions:

- Bridging did not reduce risk of embolism
- Bridging increases bleeding risk

Caveats:

- Few patients with high CHADS-2 score (average = 2.3)

My take-away:

- Don't bridge majority of atrial fibrillation
- Carefully consider bridging if stroke risk is very high (CHADS-2 score 5 or 6, rheumatic atrial fibrillation)

ACC Guideline for AF (2017)

General considerations:

- Continue anticoagulation if procedure has low or negligible bleeding and patient's bleeding risk is normal
- No bridging needed with DOACs

Bridging decision based on both clotting & bleeding risk:

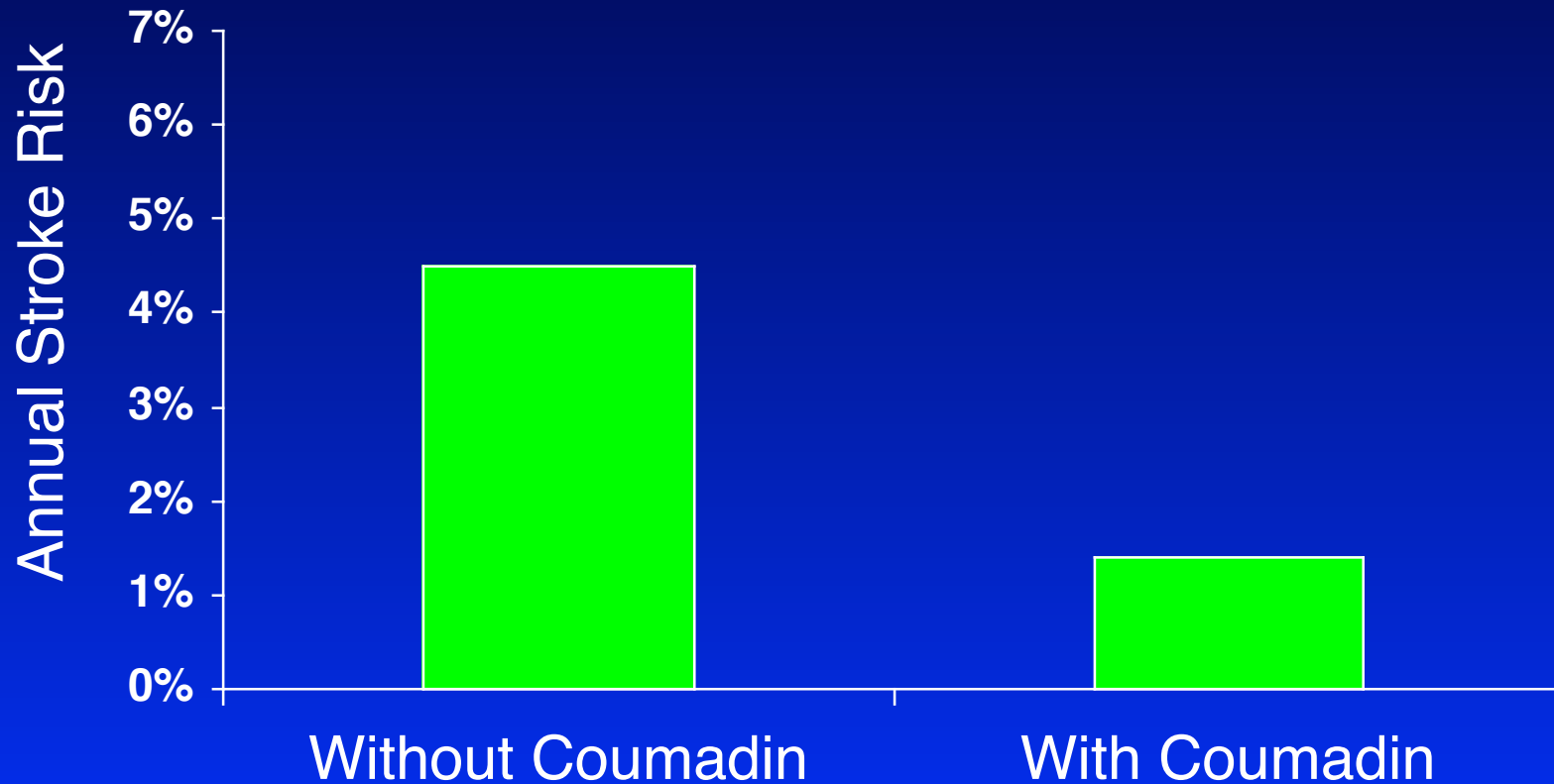
- CHA₂DS₂-VASc: 1-4 = low risk; 5-6 = mod; 7-9 = high
- Elevated bleeding risk: major bleed or ICH in last 3 months, platelets low or abnormal, aspirin use, supratherapeutic INR, or prior bleeding with bridging or similar surgery

ACC Guideline for AF (2017)

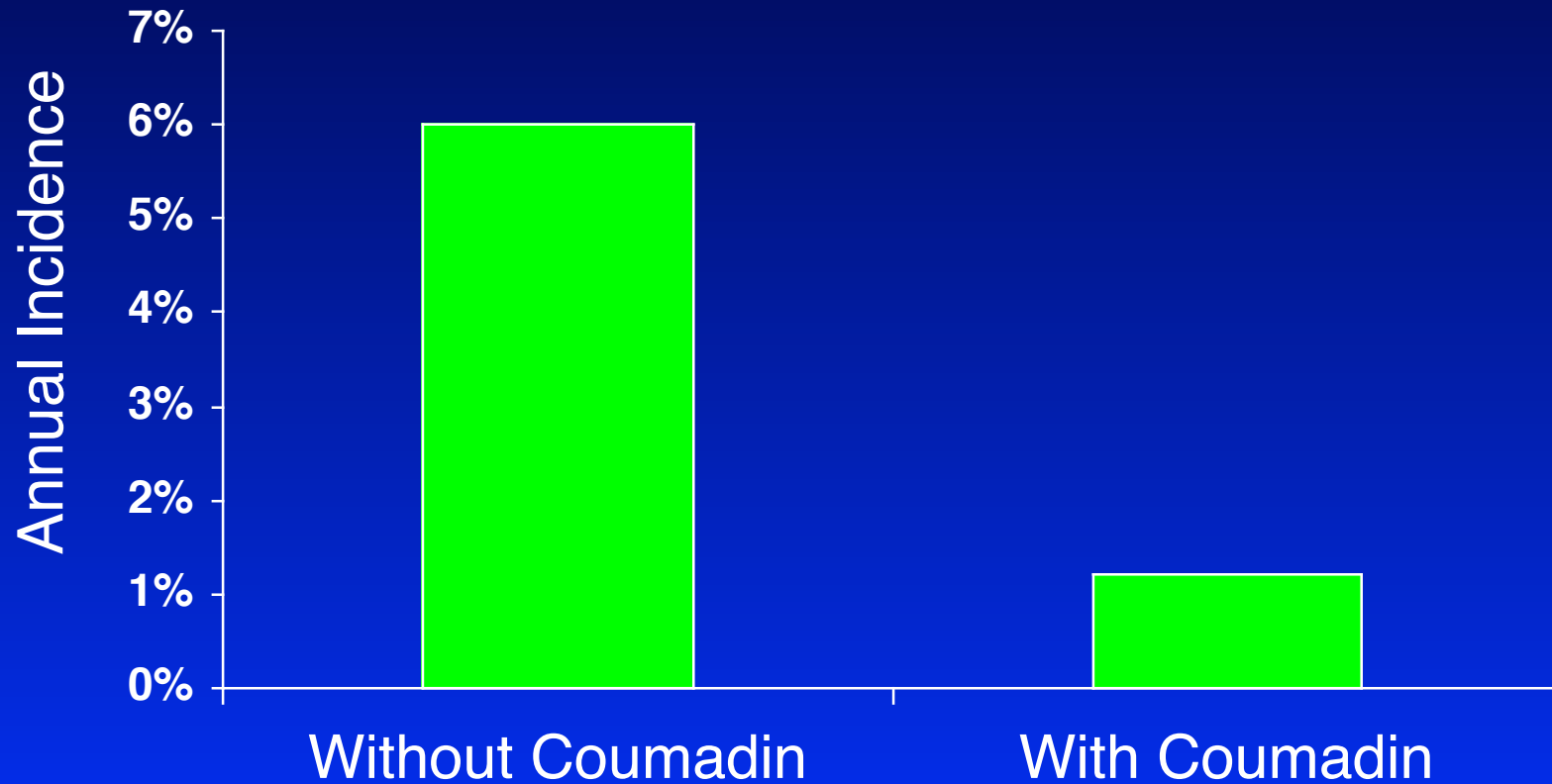
	Normal Bleeding Risk*	Elevated Bleeding Risk*
High Thrombotic Risk CHA ₂ DS ₂ -VASc = 7+	Bridge	Clinical Judgment
Mod Thrombotic Risk CHA ₂ DS ₂ -VASc = 5-6	Clinical Judgment	No Bridge
Low Thrombotic Risk CHA ₂ DS ₂ -VASc = 1-4	No Bridge	

* **Bleeding risk elevated** if major bleed or ICH < 3 months, platelets low or abnormal, aspirin use, supratherapeutic INR, or prior bleeding with bridging or similar surgery

Thromboembolic Risks with Non-rheumatic Atrial Fibrillation



Thromboembolic Risks with Mechanical Valves



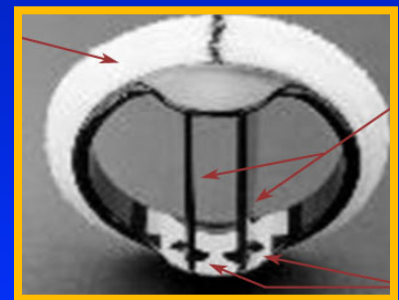
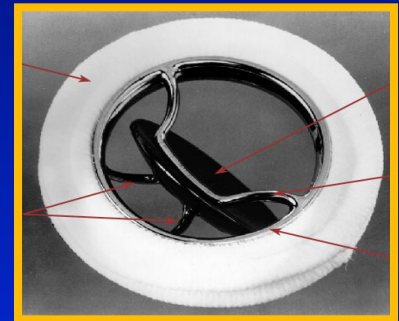
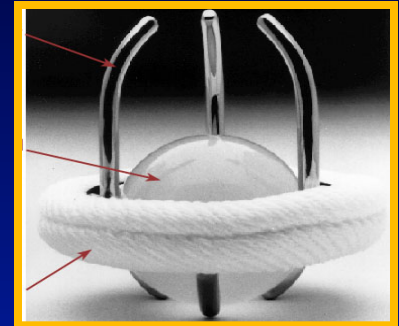
Effect of Mechanical Valve Location & Design on Thromboembolic Risk

Valve Location:

Aortic	RR = 1.0
Mitral	RR = 1.8

Valve Design:

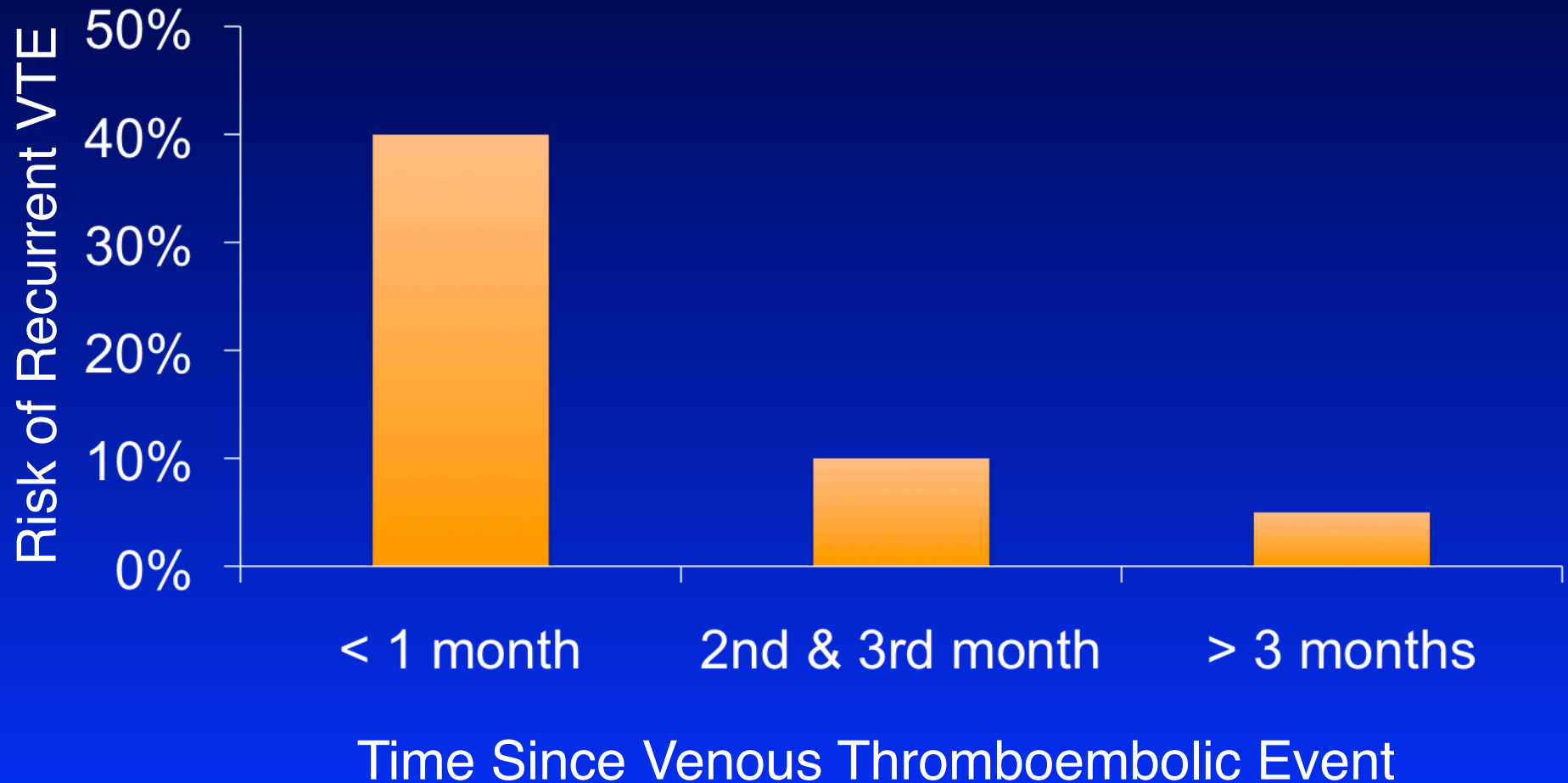
Caged Ball	RR = 1.0
Tilting Disk	RR = 0.7
Bi-leaflet	RR = 0.6



Perioperative Anticoagulation: 2012 ACCP Guidelines (9th Edition)

Atrial Fib.	Mechanical Valve	Recommendation
CHADS ₂ = 5-6; recent CVA; rheumatic AF	Any MVR; older (caged- ball or tilting disc) AVR; recent CVA	Bridge with heparin
CHADS ₂ = 3-4	Bileaflet AVR plus other stroke risk factor(s)	???
CHADS ₂ = 0-2	Bileaflet AVR without AF or other stroke risk factor	No heparin bridge

Thromboembolic Risk with DVT & PE



How About Venous Clots?

Retrospective cohort study

- 1178 patients on warfarin for DVT or PE

	Recurrent VTE	Bleeding	Major Bleeding
Bridged	0%	2.7%	2.2%
Not Bridged	0.2%	0.2%	0.2%
Hazard Ratio (95% CI)	ns	17 (4-75)	

How About Venous Clots?

Conclusions:

- Recurrent VTE is rare & bridging didn't affect risk
- Bridging increases bleeding

Caveats:

- Nonrandomized study, so selection bias
- Few patients were considered high-risk for recurrence

My practice:

- Bridge or place temporary IVC filter only in high-risk group

Perioperative Anticoagulation Guidelines: Venous Thromboembolism

Risk of Recurrent VTE	Recommendation
VTE < 3 months ago; Severe thrombophilia (Protein C or S deficiency, homozygous Factor V Leiden)	Full dose heparin bridge advised
VTE 3-12 months ago; recurrent VTE; VTE with cancer other thrombophilia	Heparin bridge on case-by-case basis
Single VTE > 12 months ago	No heparin bridge

All patients should receive appropriate DVT prophylaxis

Postoperative Delirium

An 80-year-old woman falls and sustains a hip fracture at her assisted living facility. She has a history of stroke and uses a walker. Her family reports she has mild dementia. She complains of moderate-to-severe hip pain. She is alert, oriented to self & place but not date (baseline).

1. How likely is this patient to develop delirium?
2. What can be done to prevent delirium?
3. What should you do if she becomes delirious?

Postoperative Delirium Guideline

American Geriatrics Society Expert Panel on Postoperative Delirium
in Older Adults:

Clinical Practice Guideline for Postoperative Delirium in Older Adults

<http://archcare.org/static/files/pdf/ags-2014-clinical-practice-guideline-for-postop-delirium-in-older-adults.pdf>

Postoperative Delirium in Older Adults: Best Practice Statement
from the American Geriatrics Society

<http://dx.doi.org/10.1016/j.jamcollsurg.2014.10.019>

Postoperative Delirium

Clinical Features:

- Acute, fluctuating disturbance of consciousness
- Reduced ability to focus & attend
- Accompanied by cognitive and perceptual disturbances
- Postop delirium has onset peak 1-3 days after surgery

Usually self-limited but associated with bad outcomes:

- Increased mortality (10-20% rise per 48 hours of delirium)
- Increased LOS, higher risk of institutionalization

Incidence of Delirium

Population	Incidence	Author
Post-hip fracture	44 - 61% (up to one-third delirious on admission)	Berggren et al. Dolan et al.
Elective orthopedic	18%	Fisher et al.
Liver resection	17%	Yoshimura et al.
Major elective surgery	9% (46% in aortic surgery)	Marcantonio et al.

Risk Factors (a partial list)

Patient (Chronic) Factors

- Advanced age
- Cognitive impairment
- Functional impairment
- Severe chronic illness
- Substance abuse
- Sensory deficits
- Malnutrition

Acute Factors

- Hip fracture
- Aortic or thoracic surgery
- Fluid / electrolyte disorder
- Sepsis
- Uncontrolled pain
- Polypharmacy
- Anemia
- Kidney injury
- Sleep deprivation

Assessing the Risk of Delirium

AGS guideline recommends preoperative assessment of risk of delirium:

- Consider age > 65, cognitive impairment, sensory deficit, severe illness, and infection
- Validated prediction tools available, but less practical
- For increased risk, would counsel patient & family and consider applying multi-component delirium prevention interventions (if available at your hospital)

Prevention: Care Packages

Multi-component intervention packages:

- e.g., Acute Care for Elderly (ACE) units, Comprehensive Geriatric Assessment (CGA), delirium prevention order sets
- Reorientation, non-drug sleep hygiene, bowel/bladder care, early PT/OT, nutrition, pain assessment, delirium screening
- Moderate evidence for benefit from numerous trials but requires institutional support & group effort

Prevention: Pharmacology

Avoid high-risk medications:

- Anticholinergics, meperidine, BZD & other sedatives
- Minimize opiates by using non-opiate analgesics

Role for prophylactic neuroleptics?

- Several trials of neuroleptics *to prevent* delirium
- Inconsistent findings, poor study quality
- **Bottom line:** insufficient evidence for or against

Screening & Diagnosis

- AGS doesn't take position on whether to screen
- Hyperactive (agitated) delirium usually obvious but hypoactive (sedated) delirium often missed

Confusion Assessment Method (CAM):

1. Acute change or fluctuation in mental status

AND

2. Inattention (trouble focusing or distractable)

AND

3. Disorganized thinking **or** altered level of consciousness

Evaluating the Delirious Patient

Specific, reversible etiology seldom identified

Approach to working up postoperative delirium:

- CBC, basic chemistry, urinalysis, EKG
- Other studies only if indicated by clinical findings
- Brain imaging rarely useful
- Low yield for thyroid tests, vitamin levels, RPR, LP, etc.

Review medications closely:

- Anticholinergic, BZD, opiate, antiemetic, antispasmodic

Treating Postoperative Delirium

Identify & treat reversible causes:

- Recommended but beware of excessive work-up

Multidisciplinary teams & multicomponent interventions:

- Similar to delirium prevention packages
- Weak & inconclusive evidence for benefit (vs. prevention)

Physical restraints:

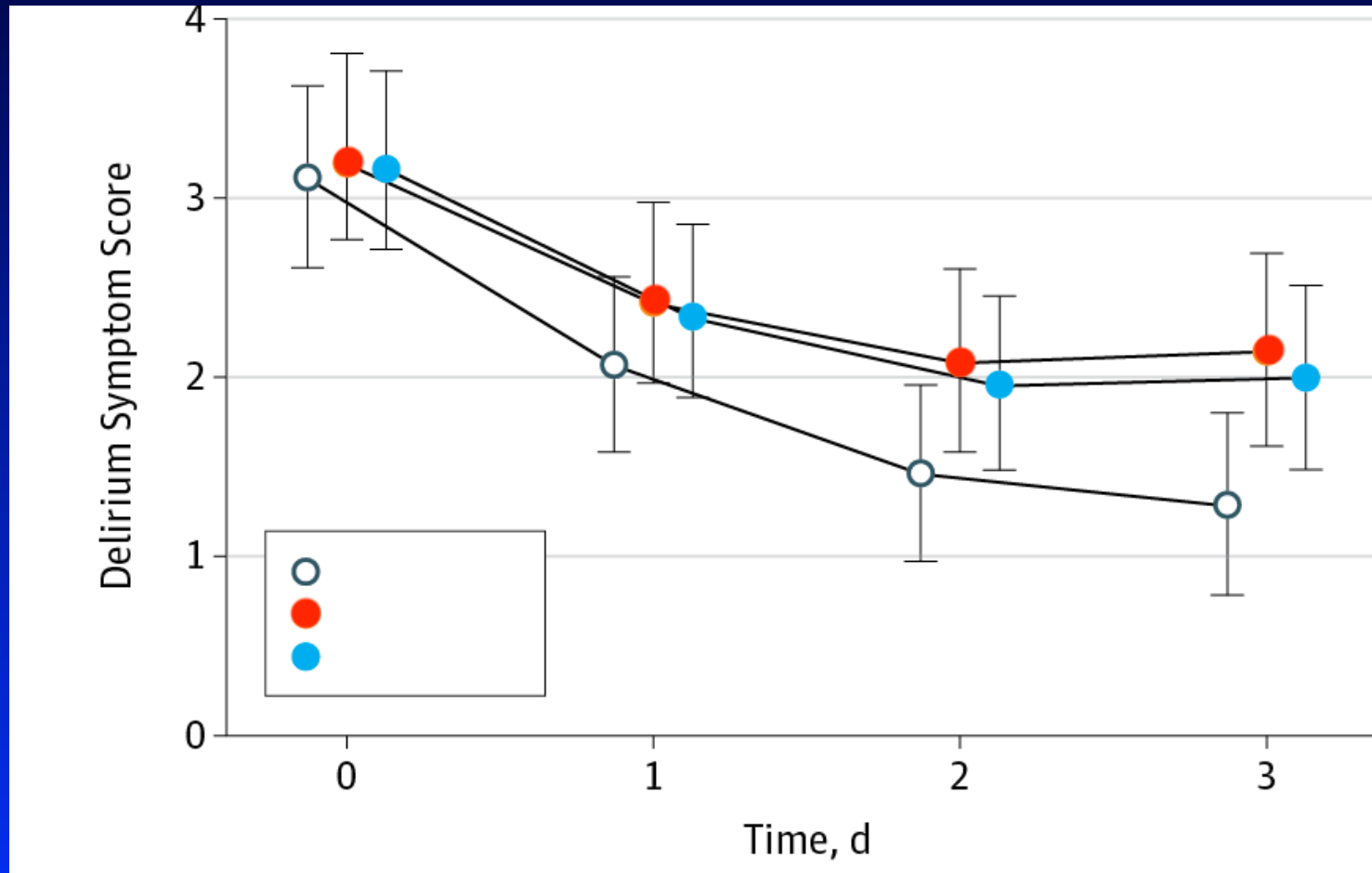
- Not recommended unless no other option to prevent harm

Treating Postoperative Delirium

Recommendations are based largely on expert opinion:

- Treat specific causes
- Adequate pain control
- Eliminate unnecessary medications, lines, catheters
- Mobilization during daytime
- Quiet, uninterrupted sleep at night
- Frequent re-orientation and reassurance
- Reserve sedation for patients at high risk for self-harm

Red Pill, White Pill, Blue Pill



Antipsychotics for Management of Postoperative Delirium

Commonly used but poorly studied

- Lack of placebo-controlled trials in postop patients
- Unclear if changing natural history or just sedating them

Indications & Recommendations:

- Only for severe agitation or distress, if threatening substantial harm to self and/or others
- Try behavioral interventions first
- Use lowest effective dose for the shortest possible duration
- Don't treat hypoactive delirium with antipsychotics

Antipsychotic Regimens for Delirium

Haloperidol:

- Start 0.5 – 1 mg (PO, IV, IM); can repeat in 30-60 min

Risperidal

- Start at 0.5 – 1 mg (PO) BID; peak 1 hr; renal dose

Quetiapine

- Start 25 mg (PO) QHS or BID; peak 1.5 hr
- Preferred for patients with Parkinsonism

Olanzapine

- Start 2.5 mg (PO – also available IV/IM) QHS; peak 6 hr

IV Haldol & Long QTc

- Haldol not approved for IV use, but commonly done
- Risk of QTc prolongation and torsades de pointes
- Risk mainly if ≥ 2 mg single dose or ≥ 20 mg / 24 hrs
- Watch for other drugs that prolong QTc (e.g., methadone)
- UCSF policy:
 - Tele or daily ECG needed if exceeding above doses
 - IV haldol held if QTc > 440 ms

Delaying Surgery After MI

A 63-year-old man suffers an acute myocardial infarction, treated without PCI. He was already scheduled for prostate cancer surgery in one month.

Because of his recent MI, surgery should be delayed for:

A. 1 month

B. 2 months

C. 3 months

D. 6 months

E. At least a year

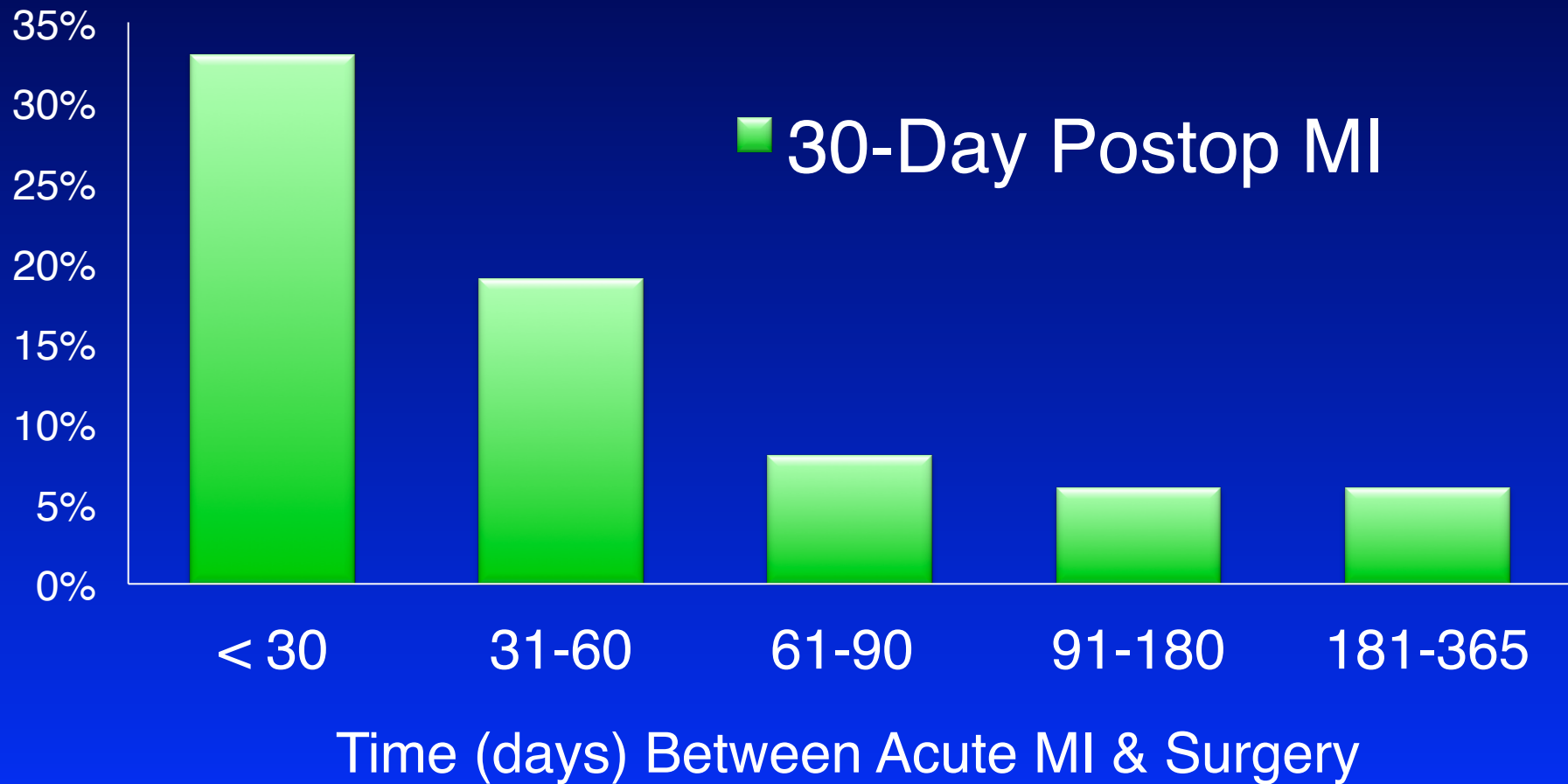
Delaying Surgery After Acute MI

Question: How does time between acute MI and surgery affect the risk of postoperative MI?

563,842 patients (1999-2004) discharged after hip surgery, colectomy, cholecystectomy, AAA repair, or lower extremity amputation:

- 2.9% of cohort had experienced acute MI in prior year
- Outcome: 30-day postoperative MI

Delaying Surgery after Acute MI



How Long to Wait after MI?

Conclusions:

- Surgery within one year of acute MI associated with high risk of postoperative MI
- Risk falls over time; most of the reduction within 2 months
- Trend is similar when only elective surgery considered

Caveats:

- Nonrandomized, observational study

ACC/AHA Guidelines:

- Delay elective surgery for at least 2 months after MI

Delaying Surgery After Stroke

A 63-year-old man suffers an acute stroke that is managed without thrombolysis. Brain MRI incidentally detects a large meningioma. The neurosurgeon wants to do a craniotomy to resect the tumor in 2 weeks.

Because of his stroke, you recommend delaying surgery for:

- A. 1 month
- B. 3 months
- C. 6 months
- D. 9 months
- E. At least a year

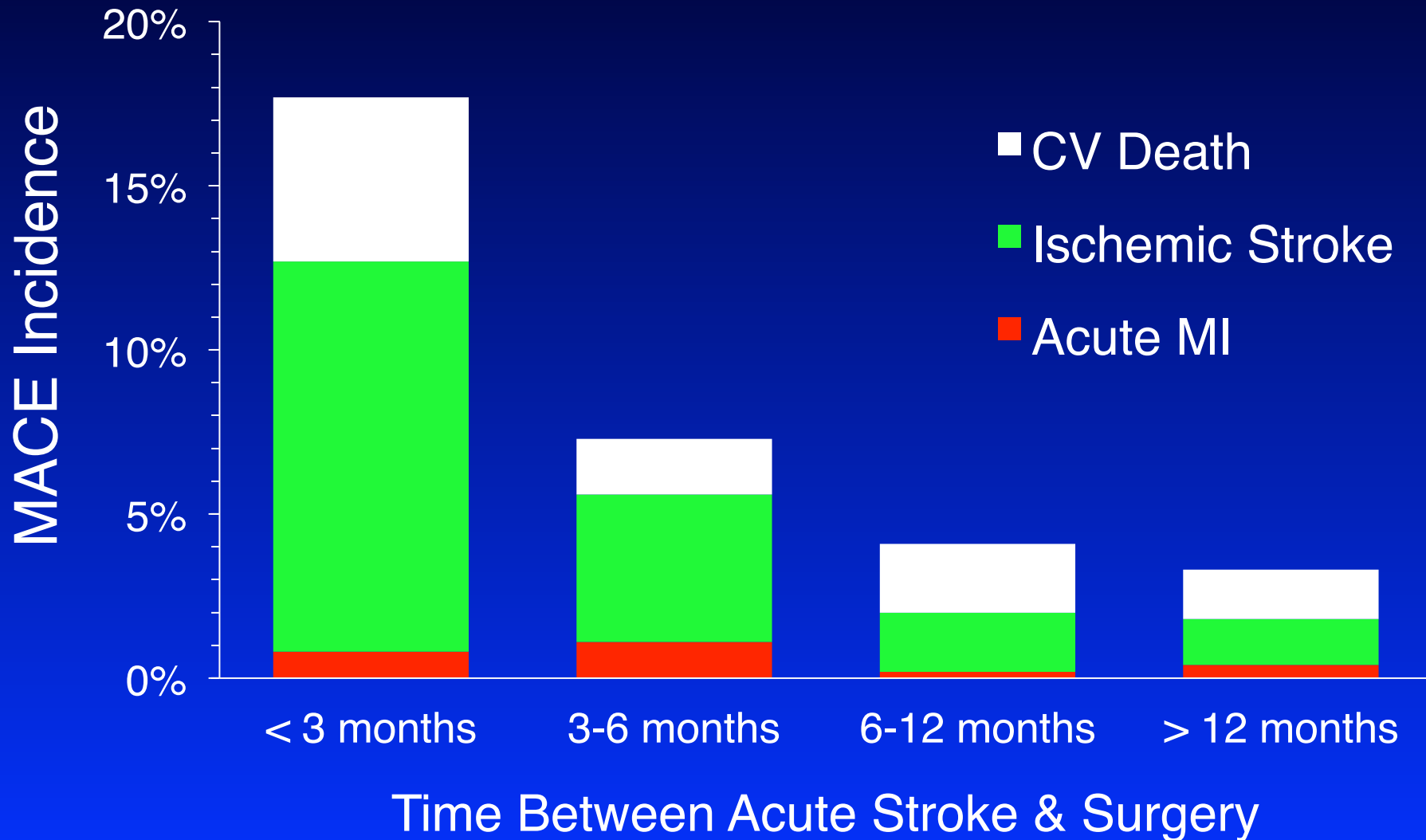
Delaying Surgery After Stroke

Question: How does time between stroke and surgery affect the risk of cardiovascular complications?

Danish cohort study of all adults undergoing elective noncardiac surgery from 2005-2011:

- 7137 patients had prior stroke (1.5% of total cohort)
- Outcome: 30-d postop Major Adverse Cardiac Events (MACE): cardiovascular death, nonfatal MI, ischemic stroke
- Looked at effect of time since stroke on MACE rate

Delaying Surgery After Stroke



How Long to Wait after CVA?

Conclusions:

- Surgery after CVA associated with high CV risk
- Risk falls over 9 months, biggest drop after first 3 months

Caveats:

- Nonrandomized, observational study

My take-away:

- Delay elective surgery for at least 3 months (up to 9 months) if possible

Perioperative Transfusion Threshold

82 y.o. woman has undergone repair of a femoral neck fracture. She denies heart disease, but has old pathologic Q-waves on her ECG. On post-op day # 2, she only complains of hip pain.

Exam: BP 140/80 HR 75
 Heart, Lung, Abdomen exams normal

Labs: Hemoglobin = 8.3 (Hct = 25%)

When should she receive a blood transfusion?

Perioperative Transfusion Threshold

1. Transfuse to keep Hgb > 10
2. Transfuse to keep Hgb > 9
3. Transfuse to keep Hgb > 8
4. Transfuse to keep Hgb > 7
5. Only if symptomatic

FOCUS* Trial

(*Functional Outcomes in Cardiovascular Patients Undergoing Surgical Hip Fracture Repair)

Patients: 2016 patients undergoing hip fracture repair. All patients had either diagnosis of or risk factors for cardiovascular disease.

- Mean age = 82
- HTN (82%); CAD (40%); DM (25%); CVA (24%); CHF(17%)

Treatment: Randomized to 2 transfusion strategies:

1. Hemoglobin < 10 g/dL
2. Symptoms of anemia (also permitted for hgb < 8)

FOCUS Trial Results

	PRBC Units Transfused Median (IQR)	Total Units Transfused
10 g/dL Trigger	2 (1,2)	1866
Symptomatic Trigger (or 8 g/dL)	0 (0,1)	652

FOCUS Trial Results

	In-hospital mortality	In-hospital mortality, cardiac complication	60-day mortality	60-day mortality + disability
10 g/dL Trigger	2.0%	4.3%	7.6%	35%
Symptom Triggered	1.4%	5.2%	6.5%	35%

Conclusion: No increased mortality or morbidity with a restrictive transfusion protocol.

Caveats to FOCUS Trial

- Small difference in hemoglobin levels may not be clinically significant
- Inadequate power to determine if presence of CV disease affects outcome
- Restrictive transfusion strategy leads to more symptomatic anemia (mostly ↑HR or ↓BP)



AABB Transfusion Guidelines



The society formerly known as the American Association of Blood Banks:

- “In postoperative surgical patients, transfusion should be considered at a hemoglobin concentration of **8 g/dL or less or for symptoms** (chest pain, orthostatic hypotension or tachycardia unresponsive to fluid resuscitation, or congestive heart failure).”
Strong recommendation
- Same recommendation if patient has pre-existing CV disease
Weak recommendation

Surgical Risk in Cirrhotic Patients

A 65-y.o. man with cirrhosis from HCV desires a hip arthroplasty. He feels well and has no current signs of ascites or encephalopathy on examination.

Labs: Creatinine = 1.6

Total Bilirubin = 1.9

Albumin = 3.5

INR = 1.6

How would you advise this patient about his postoperative mortality risk?

65-y.o. man with cirrhosis from HCV desires a hip arthroplasty. He's asymptomatic and has no signs of encephalopathy or ascites.

1. Patients with cirrhosis are not candidates for elective surgery
2. Your mild cirrhosis (Childs-Pugh class A) makes you an acceptable surgical candidate
3. Perioperative risk is acceptable, but long-term mortality risk makes surgery unappealing

Surgical Risk in Cirrhotic Patients

Question: How does his cirrhosis affect mortality risk?

Background:

- Risk traditionally assessed by Childs-Pugh classification (<http://www.mdcalc.com/child-pugh-score-for-cirrhosis-mortality>)
- Mortality after GI surgery: **Class A = 10%**
Class B = 30%
Class C = 70%
- **Limitations:** single time point, less known about non-GI surgery; sensitive to minor laboratory result differences

MELD Score as Risk Predictor

MELD Score (**M**odel for **E**ndstage **L**iver **D**isease):

- Main use in organ allocation
- Variables: INR, bilirubin, creatinine

Retrospective multivariate analysis of 772 cirrhotic patients undergoing GI, orthopedic, and CV surgery

- Independent predictors of mortality: Age & MELD Score
- Predicts mortality @ 1 wk, 1 mo, 3 mo, 1 yr, 5 yr

www.mayoclinic.org/medical-professionals/model-end-stage-liver-disease/post-operative-mortality-risk-patients-cirrhosis

65 y.o. man with stable HCV-related cirrhosis. He has no current signs of encephalopathy or ascites.

Labs: Creatinine = 1.6
Total Bilirubin = 1.9
Albumin = 3.5
INR = 1.6

Childs-Pugh Class A
MELD Score = 19

Mortality Prediction:

- Childs-Pugh: 10% in-hospital mortality
- MELD Score:
 - 6.5% 1 week mortality
 - 24% 1 month mortality
 - 36% 3 month mortality
 - 50% 1 year mortality

OSA & The Surgical Patient



Obstructive Sleep Apnea in Surgical Patients

A 55-y.o. morbidly obese man is scheduled to undergo knee arthroplasty. He has hypertension but no other medical history. He reports occasional fatigue and somnolence. He doesn't know if he snores or has apneic spells. Exam and recent lab tests are unremarkable.

What should be done?

1. Notify surgical team of suspected OSA
2. Notify surgical team & recommend empiric CPAP postop
3. Delay surgery for formal polysomnography

OSA and the Surgical Patient

OSA probably increases postoperative complications:

- Pulmonary complications (11 of 17 studies)
- Postop atrial fibrillation (5 of 6 studies)

Previously undiagnosed OSA may be associated with more complications than known OSA

Clinical screening tools have high + predictive value

Benefits of positive airway pressure (CPAP, BiPAP) for surgical patients with OSA uncertain

Society of Anesthesia and Sleep Medicine Guidelines for Preoperative Evaluation

1. Screen patients clinically for OSA risk

Snoring

Tired or sleepy

Observe apnea

Pressure (HTN)

BMI > 35 kg/m²

Age > 50 years

Neck > 17" (M)/16" (F)

Gender is male

STOP-BANG

High risk for OSA if either

- 5 or more total points
- or
- 2 STOP points + B, N, or G

Society of Anesthesia and Sleep Medicine Guidelines for Preoperative Evaluation

2. Patient and care team should be informed about known or suspected OSA
3. Insufficient evidence to recommend delaying surgery to perform advanced testing (polysomnography)

Exception: patients with evidence of severe or uncontrolled systemic complications of OSA or impaired gas exchange (e.g., severe pulm HTN, hypoventilation, resting hypoxia)

4. Continue PAP after surgery

Insufficient evidence to recommend empiric PAP

Are Curbside Consults Safe?

You're happily about to leave the hospital...

...when the orthopedic surgeon calls you with a "quick question about diabetes management for a stable patient. Maybe you could just do a curbside?"



Diabetes management?

**Tell your patient to
stop eating.**

Are Curbside Consults Safe?

What's your personal approach to requests for informal "curbside" advice?

1. I never do curbside consults
2. I ask questions to determine whether curbside is appropriate
3. I'm pretty open to giving curbside advice

Curbside Consults

Studied 47 requests for curbside advice to hospitalist

- Curbside consultant could ask questions ad lib
- Made recommendations without seeing patient or chart
- Different hospitalist performed formal, in-person evaluation

Questions:

- Did curbside consultant obtain accurate information?
- Did advice and management differ?

Curbside vs. Formal Medicine Consult

Compared to formal consultation, how often did curbside evaluation lead to:	
Incomplete clinical information	34%
Inaccurate clinical information	28%
Any difference in management	60%
Major difference in management	36%

Curbside with Caution

Be wary when giving (or requesting) informal advice:

- Only for basic, generic questions
- If you're asking a lot of questions, do a formal consult
- Avoid in unstable or critically ill patients
- Offer to perform formal consultation; insist on it if "curbsided" again on same patient
- Don't visit patient, write orders, review chart, or submit bill

Thank You

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