

Preoperative Recommendations / Guidelines

Fairview Health Services 6/2009

The following recommendations are the product of a multidisciplinary group* charged with coming up with standardized recommendations to guide the preoperative evaluation of patients before surgery. These recommendations are made to help establish systems to aid in appropriate preparation of patients for surgery. They may be used to set up EHR reminders or clinic and hospital work flows. However, clinical judgment supersedes these recommendations (e.g. No mention is made, but clearly severe COPD may call for ABGs prior to surgery, or sleep study if severe sleep apnea suspected but not diagnosed, or BB may not improve risk if relatively low risk surgery and only one lower level risk factor such as HTN).

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~ Reviewed by the System Clinical Pharmacy Committee

I. CARDIOVASCULAR RISK MODIFICATION

A. Preoperative Beta Blockers Recommendations* (Thatcher, 2006, Fleisher, 2007, ICSI, 2008)

- 1 Patients on chronic beta-blocker therapy should continue taking their beta-blocker medication** up to and including the day of surgery.
- 2 Beta-Blockers are recommended to be started** for patients who have DM, HTN, IVD, (cerebrovascular disease, CAD, PVD) AF, CHF for intermediate and high risk surgeries. May be indicated for other patients with high risk of cardiac disease (i.e. combination of age, smoker, high cholesterol, family history).
- 3 Start Beta-blockers** as soon as possible as outpatient and titrate dose to resting **target pulse 55-65**. If time does not allow additional follow-up or titration, start Beta-blocker and communicate the initiation to anesthesia/surgery. It should not be necessary to cancel or postpone surgery solely for the institution of Beta-Blocker.
 - For patients starting a beta-blocker prior to surgery we recommend using Metoprolol succinate XR 100mg daily. (Consider ½ the dose if patient is small, frail, elderly or resting heart rate of < 65 or systolic BP of < 110)
 - Instruct patient to take pulse or have them come in for nurse pulse check and advise to increase dose if pulse >70.
 - **Continue the Beta-Blocker for 2-4 weeks after surgery.**
- If heart rate is not controlled with current dose, **maximizing heart rate control** should be attempted if on it for the above indications.
- 5 Considerations:**
 - Start at the above recommended dose and instruct patient to take pulse or have them come in for nurse pulse check and advise to increase dose if pulse >70.

6 Potential contraindications or not recommended in patients who:

- Need emergent surgery
- Have an allergy to beta-blockers
- Have bradycardia (HR < 50)
- Advanced heart block (greater than one first-degree AV block) unless treated by pacemaker
- Severe bronchospasms/COPD/asthma/reactive airway disease
- For patients undergoing only Low Risk Procedures: see grid below

Cardiac Risk* Stratification for Noncardiac Surgical Procedures

High (Reported cardiac risk often greater than 5%)	Intermediate (Reported cardiac risk generally less than 5%)	Low† (Reported cardiac risk generally less than 1%)
<ul style="list-style-type: none"> ▪ Emergent major operations, particularly in the elderly ▪ Aortic and other major vascular surgery ▪ Peripheral vascular surgery ▪ Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss 	<ul style="list-style-type: none"> ▪ Carotid endarterectomy ▪ Head and neck surgery ▪ Intraoperative and intrathoracic surgery ▪ Orthopedic surgery ▪ Prostate surgery 	<ul style="list-style-type: none"> ▪ Endoscopic procedures ▪ Superficial procedure ▪ Cataract surgery, most Ophthalmologic procedures ▪ Breast biopsy ▪ Removal of minor skin or subcutaneous lesion ▪ Myringotomy tubes ▪ Hysteroscopy ▪ Cystoscopy ▪ Fiberoptic bronchoscopy

*Combined incidence of cardiac death and nonfatal myocardial

7 Beta-Blockade and Heart Failure:

- Two beta-blockers have demonstrated efficacy in heart failure patients: Metoprolol (MERIT-HF) and Carvedilol (COPERNICUS). (Bisoprolol has also shown benefit but it not widely available in the United States)
 - Patients with systolic dysfunction (EF < 40%) should be on Metoprolol succinate (Toprol) or Carvedilol (Coreg) preoperatively, provided they do not have a contraindication.
 - Atenolol is a suitable alternative for patients with diastolic heart failure (EF> 40%)
 - Recommended dose would be Metoprolol succinate 100mg daily

**The workgroup recognized that there are many divergent recommendations regarding the best inclusion protocol for beta-blocker therapy, but that we needed to come to a definitive recommendation in order to facilitate EHR reminders, work flows and standards to support the use of Heart Rate control for risk reduction across Fairview sites. .*

B. Active Cardiac Conditions (see algorithm below) Cardiology Consultation

Recommended: (Thatcher, 2005, Fleisher, 2007, ICSI, 2008)

- 1 Unstable coronary disease: Unstable or severe angina, Recent MI (≤ 1 month)
- 2 Decompensated HF: NYHA class IV, worsening or new onset HF
- 3 Certain arrhythmias: High-grade AV block, Mobitz II, 3rd degree AV block, Symptomatic ventricular arrhythmias, SVT or A-fib with uncontrolled rate, symptomatic bradycardia, new V-tach
- 4 Severe valvular disease: Severe AS (mean pressure gradient >40 mm, valve area <1.0 cm, or symptomatic) Symptomatic mitral stenosis (increasing SOB, presyncope or HF)

C. Stress Testing Guideline: (Thatcher, 2006, Fleisher, 2007, ICSI, 2008)

- 1 Stress testing may be considered if:
 - clinical evaluation suggests need for stress testing independent of impending surgery (e.g. undiagnosed chest pain, long history of poorly controlled DM, or in some instances monitoring of patients after recent revascularization)
 - vascular or high risk surgery plus 3 or more risk factors, which include:
 - DM
 - CHF
 - IVD (CAD, PVD, Thrombotic Cerebrovascular disease)
 - Cr >2
 - Poor functional capacity (<4 METs)
- 2 Current evidence does not support a strategy of routine revascularization in stable patients as a strategy to reduce morbidity/mortality (McFalls, et al., 2004, Poldermans, et al., 2006). Stress testing is therefore primarily recommended for indications that would be valid independent of the proposed surgery. Stress testing may however be indicated, especially for high risk but elective surgeries (i.e., major spine surgery), to assist in the determination of risks vs. benefits, as well as determining perioperative monitoring strategies.
- 3 Functional status < 4 METs should be seen as a primary risk factor (see table 3 below). If a patient has an impending high risk surgery with prolonged procedure or significant fluid shifts, this can be seen as a significant aerobic challenge. Stress testing can help determine the patient's ability to tolerate that kind of stress. If the decision is made to proceed to preoperative stress testing, consensus of the committee recommended stress imaging (Stress echo, dobutamine stress echo, stress cardiolyte, or adenosine cardiolyte) to improve sensitivity and specificity.

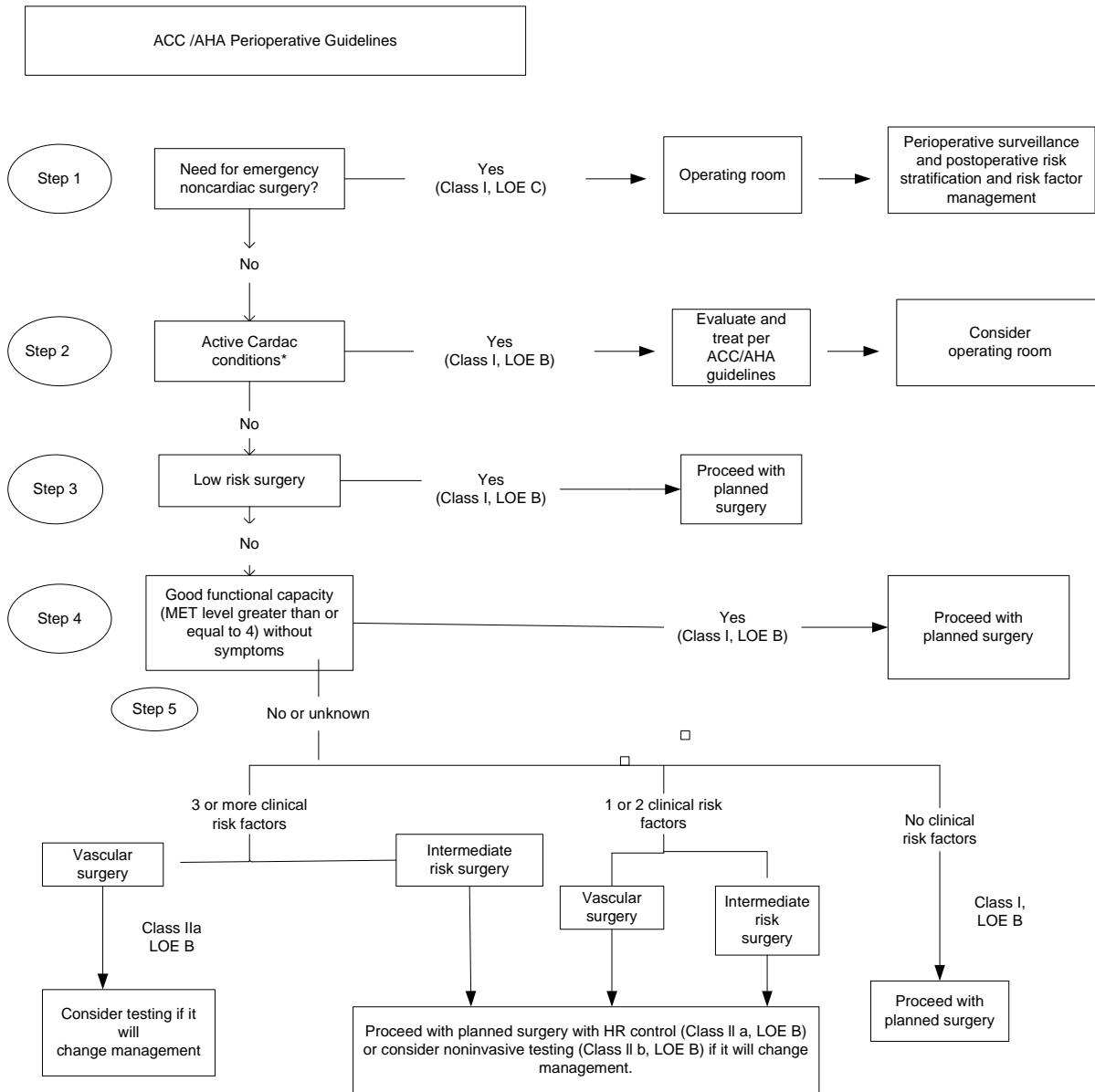
Table 3. Estimated Energy Requirements for Various Activities

1 MET	Can you.... Take care of yourself? Eat, dress, or use the toilet?	4 METs	Can you.... Climb a flight of stairs or walk up a hill? Walk on level ground at 4 mps (6.4 kph)?
↓	Walk indoors around the house?	↓	Run a short distance?
↓	Walk a block or 2 on level ground at 2 to 3 mph (3.2 to 4.8 kph)?	↓	Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?
4 METs	Do light work around the house like dusting or washing dishes?	↓	Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?
		Greater than 10 METs	Participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?

Kph indicates kilometers per hour: MET, metabolic equivalent and mph, miles per hour.

*Modified from Hlatky et al. (10) copyright 1989, with permission from Elsevier, and adapted from Fletcher, et al. (11).

1. ACC/AHA perioperative guidelines:



Risk factors include history of CAD, CHF, IVD, DM, Renal insufficiency.

Figure 1. Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 yrs of age or greater. Clinical risk factors include ischemic heart disease, compensated or prior heart failure, diabetes mellitus, renal insufficiency, and cerebrovascular disease. Consider perioperative beta blockade for populations in which this has been shown to reduce cardiac morbidity/mortality. ACC/AHA indicates American College of Cardiology/American Heart Association; HR, heart rate; LOE, level of evidence; and MET, metabolic equivalent.

D. Echocardiogram recommendations

- 1 For evaluation of LV function;
 - Dyspnea of unknown origin to evaluate LV function.
 - Pts with current or prior heart failure with worsening dyspnea or other change in clinical status – if not done within 12 months to undergo preoperative evaluation of LV
 - Reassessment of LV function in clinically stable patients with previously documented cardiomyopathy is not well established.
- 2 For evaluation of cardiac murmurs:
 - For the following murmurs in asymptomatic patients
 - Diastolic murmurs
 - Continuous murmurs
 - Late systolic murmurs
 - Murmurs associated with ejection clicks
 - Murmurs that radiate to the neck or back
 - Grade 3 or louder midpeaking systolic murmurs
 - For symptomatic patient with murmurs
 - Murmurs associated with other abnormal physical findings on cardiac examination
 - Murmurs associated with an abnormal electrocardiogram or chest x-ray
 - Echocardiograms are not indicated for asymptomatic 2/6 midsystolic murmurs considered innocent or functional.

II. PULMONARY RISK MODIFICATION (Qaseem, et al.,2006, Smethana, et al., 2006)

- 1 Maximize COPD treatment
- 2 Treat acute lung disease before surgery
- 3 Use stress dose steroids when appropriate
- 4 Maximize nutrition
- 5 Utilize Pulmonary Rehab when available
- 6 Advise smoking cessation to improve COPD outcomes (but literature suggests no evidence of change of surgical outcome)
- 7 Consider measuring serum albumin if the need to define pulmonary risk is high. Values below 35 grams / liter are the most predictive marker of pulmonary risk
- 8 Consider not having surgery when risk is high

Risk Calculations:

- a. Determine presence of risk factors for pulmonary complications (numbers in parentheses refer to pooled odds ratios)
 - COPD (not Asthma) (2.3)
 - Age over 60 (2.28-5.63)
 - ASA class II or greater (a patient with at least mild systemic disease) (4.87)
 - Congestive heart failure (2.93)
 - Need for assistance with activities of daily living (including use of assistive devices) (1.65-2.51)
 - Minor risk factors (impaired sensorium, abnormal x-ray, alcohol use, unexplained weight loss) (<1.5)
- b. Determine the surgical risk for pulmonary complications
 - Prolonged surgery (>3 hours) (2.26)
 - Abdominal Surgery (3.09)
 - Thoracic surgery (4.24)
 - Neurosurgery (2.53)
 - Head and Neck Surgery (2.21)
 - Vascular surgery (2.10)
 - Aortic Aneurysm repair (6.9)
 - Emergency surgery (2.52)
 - General Anesthesia (2.35)

III. OBSTRUCTIVE SLEEP APNEA (Kaw, et al., 2006)

- A. Few definitive data exist to guide the perioperative management of patients with known sleep apnea and those suspected of having this condition. Heightened awareness and the close monitoring of high risk patients is recommended. Anesthetic, sedative and analgesic drugs should be used with extreme caution in patients with OSAS or in those suspected of having OSAS who are to undergo surgery. Nasal CPAP therapy before and after surgery may improve outcomes in these patients, though further study is needed.
- B. Patients with sleep apnea should be encouraged to bring their CPAP machine with them to surgery, in case this is required for a hospital stay.

IV. PREOPERATIVE LAB TESTING (ICSI, 2008, Fletcher, et al., 2007)

A. Pre-op Lab, EKG and X-ray recommendations

General recommendations for Pre-op testing

- 1 Unless high risk procedure (cardiac, aortic, peripheral vascular, prolonged or high blood loss procedures (i.e. Whipple, major spine surgery, bariatric surgery), routine lab screening is generally not recommended, except as determined by H&P.
- 2 Labs / procedures need to be obtained to follow the disease processes identified in the history:
 - **Hgb**—Hgb or CBC indicated if history of anemia or significant blood loss a possibility with the intended surgery (Tonsillectomy, major intraperitoneal surgery, vascular surgery, major spine surgery)
 - **K+**—If on diuretics or Digitalis, HTN, CKD, etc.
 - **Cr**—If CKD, DM, HTN, CHF, etc.
 - **A1c** – On diabetics if not done in the last 60-90 days
 - **Coags**—if on anticoagulants or clinical suspicion of coagulopathy. Preop Coags are not necessary for routine use of short term anticoagulation post op. “There is no evidence to support routine checking of coagulations studies unless clinical circumstance suggests a potential bleeding problem.”
 - **CXR**—If signs or symptoms of unstable cardiopulmonary disease (otherwise not covered by insurance)
 - **EKG**
 - Any patient having vascular surgery.
 - If not done in last year and DM, HTN, CHF, smoking, IVD, morbid obesity or chest pain
 - If not done in the last year and age > 55
 - If not done in the last 30 days and history of CAD, or any vascular surgery
- 3 No labs for Cataract surgery unless needed for monitoring of other diseases
- 4 Lab Recommendations
 - Labs should be drawn early enough to effectively identify modifiable risks. These may be done at the time of the pre-op evaluation or surgical consult, generally within 2 weeks of the surgery

V. MANAGEMENT OF ANITPLATELET AND ANTICOAGULATION

MEDS DURING SURGERY (Geerts, et al., 2008, Holger, et al., 2008, American Society of Anesthesiologists, 2009)

Aspirin – can be continued before and after surgery for patients with a high thrombosis risk...such as a recent stent or heart attack. It also should be continued for procedures with a low risk of bleeding...such as minor dental, dermatologic, or cataract surgeries.

~ If aspirin is held, stop it 7 to 10 days prior to surgery instead of just 5 days...to minimize antiplatelet effects.

Clopidogrel / Plavix – if used in post stent patients, especially drug eluting stents, should NOT be stopped until okayed by cardiology (see figure 2 below). If used for other indications and deemed necessary to stop, should be stopped 7 to 10 days before surgery.

Cilostazol (Pletal) – would need to be stopped two to three days prior to surgery.

NSAIDs – should be stopped about 5 half-lives before surgery. (e.g. one day for ibuprofen and 10 days for nabumetone)

NSAID	Time to hold before surgery
Diclofenac (e.g., <i>Voltaren</i>) Ibuprofen (e.g., <i>Motrin</i>) Indomethacin (e.g., <i>Indocin</i>) Ketoprofen (e.g., <i>Orudis, Oruvail</i>)	One day
Celecoxib (<i>Celebrex</i>) Diflunisal (<i>Dolobid; Novo-Diflunisal</i> [Canada]) Naproxen (e.g., <i>Naprosyn</i>) Sulindac (<i>Clinoril; Novo-Sundac</i> [Canada])	Two to three days before surgery
Meloxicam (<i>Mobic</i>) Nabumetone (<i>Relafen</i>) Piroxicam (<i>Feldene; Pexicam</i> [Canada])	Ten days before surgery

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ACC/AHA 2007 Perioperative Guidelines

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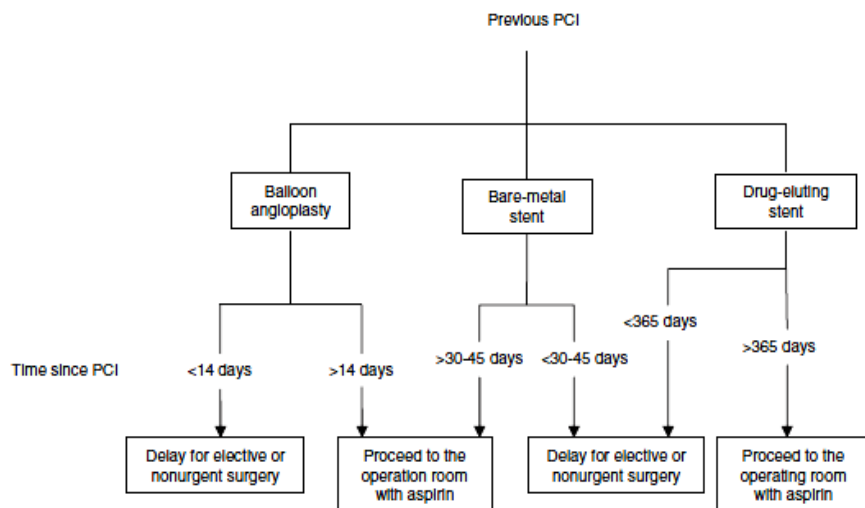


Figure 2. Proposed approach to the management of patients with previous percutaneous coronary intervention (PCI) who require noncardiac surgery, based on expert opinion.

Place holder for final document **WARFARIN** Management of these patients depends on the risk of stopping warfarin vs the bleeding risk of the specific surgery. See the table below for general guidelines. Fairview Anticoagulation Clinics will help in determining the appropriate management of these patients if needed.

Fairview Health Services Anticoagulation Bridging Guide 2008

KEY:

VI. MEDICATION RECOMMENDATIONS IN PREOP PERIOD

Take all prescription meds prior to surgery as regularly scheduled EXCEPT:

- 1 **Glycemic control:** For most patients the following guidelines are recommended by the workgroup.
 - Hold all Regular, Lispro (Humalog), Aspart (Novolog) and Glulisine (Apidra) insulin the morning of the procedure
 - Hold Byetta and Symlin AM of surgery (and similar injectables)
 - Hold A.M. dose of ORAL hypoglycemic drug
 - Give 80% of dose of LONG-ACTING insulin, which is Glargine (Lantus) or Detemir (Levemir),
 - Give 66% (2/3) of the usual morning dose of INTERMEDIATE insulin (NPH)
 - Give 0 (none) of mixed insulins (70/30, 75/25, 50/50) to avoid the rapid component of these insulins. May consider giving the patient some NPH and having them take 2/3 of their NPH dose in AM
 - Insulin pump patients: should continue their basal rate up until the time of surgery. Anesthesia will guide from there. Patients should be reminded to bring extra pump supplies to surgery.
 - For patients on insulin, while fasting for procedures and tests, patients should be reminded to:
 - Monitor their BS every 4 hours
 - If BS high, take corrective dose (not meal dose) sliding scale insulin if that is what they are used to doing
 - IF BS is <100 or symptoms of hypoglycemia follow the following guidelines:
 - Drink 4oz of fruit juice without pulp or 4oz of regular soda
 - Eat 3 glucose gels or 5 sugar cubes or packets
 - Monitor BS q15min until stable BS
 - Repeat the treatment as needed and monitor BS until >100.
- 2 Antiplatelet and anticoagulants as recommended in the section above.
- 3 Consult rheumatology for disease modifying rheumatologic meds (e.g. Remicaid, Humera) There is some emerging evidence that these drugs may impede healing and increase infection risk.
 - See table below

Table 1: Suggestions for Perioperative Management of Disease Modifying Antirheumatic Drugs (DMARDs, unpublished) for Elective Orthopedic Surgery

Drug	Usual dose	Perioperative dosing
Nonbiologic DMARDs		
Gold	(oral) 6 to 9 mg per day in 1 or 2 doses (i.m.) 10 to 50 mg every 1 to 4 weeks	Continue usual dose*
Minocycline	200 mg per day in 2 to 4 doses	Continue usual dose*
Sulfasalazine	500 to 3,000 mg per day in 2 to 4 doses	Continue usual dose*
Antimetabolite/antiproliferative Nonbiologic DMARDs		
Azathioprine	50 to 150 mg per day in 1 to 3 doses	Suspend 1-7 days preoperatively, and up to 7 days postoperatively**
Chlorambucil	2 to 8 mg per day in 1 to 2 doses	Suspend 1-7 days preoperatively, and up to 7 days postoperatively**
Cyclophosphamide	50 to 150 mg per day in 1 dose	Suspend 1-7 days preoperatively, and up to 7 days postoperatively**
Leflunomide	10 to 20 mg per day in 1 dose	Suspend 2 weeks preoperatively, and up to 14 days postoperatively
Methotrexate	7.5 to 20 mg per week in 1 dose	Suspend 2 weeks preoperatively, and up to 14 days postoperatively
Mycophenolate mofetil	500 to 2,000 mg per day in 1 to 2 doses	Suspend 1-7 days preoperatively, and up to 7 days postoperatively**

Biologic Response Modifiers		
<i>Anti-tumor necrosis factor-α agents</i>		
Adalimumab	40 mg i.m. every 14 days in 1 dose	Suspend 2 weeks preoperatively, and 1 to 2 weeks postoperatively
Certolizumab	NOT YET APPROVED	
Etanercept	50 mg s.c. once every 7 days in 1 dose.	Suspend 1 week preoperatively, and 1 to 2 weeks postoperatively
Infliximab	3 to 5 mg/kilogram i.v. body weight every 6 to 8 weeks in 1 dose	Suspend 2 to 4 weeks preoperatively, and 2 to 4 weeks postoperatively
<i>Anti-Interleukin 1 agent</i>		
Anakinra	100 mg s.c. per day in 1 dose	Suspend 1-7 days preoperatively, and 1 to 2 weeks postoperatively
<i>Anti-Interleukin 6 agent</i>		
Tocilizumab	NOT YET APPROVED	
<i>Selective T-cell costimulation modulator inhibitor</i>		
Abatacept	500 to 1,000 mg i.v. every 4 weeks in one dose	Suspend 2 weeks preoperatively, and 2 weeks postoperatively
<i>Selective B-cell inhibitor</i>		
Rituximab	1,000 mg i.v. given at two week interval; subsequent dose 16-26 weeks following the initial dose	Elective surgery no sooner than 4 weeks following last dose, and at least 4 weeks preceding next dose of the drug

*It is not necessary to suspend these agents in the perioperative period, but they may be held for some days in the immediate postoperative period according to patient and physician preference.

**These drugs may be used to manage and control serious extraarticular manifestations of rheumatic disease such as vasculitis. In such cases, the decision to suspend their use perioperatively should be carefully weighed against the risk of loss of disease control and end organ damage.
i.m.= intramuscular i.v.= intravenous s.c.=subcutaneous

VII. STRESS DOSE STEROIDS (Cousin, 2002)

Table 1: Perioperative Glucocorticosteroid Supplementation

Glucocorticosteroids*	
Surgical stress	Glucocorticosteroid dose
Minor, not requiring sedation	25 mg of hydrocortisone or 5 mg of methylprednisolone IV on day of surgery
Moderate, including sedation	50-75 mg hydrocortisone, or 10-15 mg methylprednisolone IV on day of procedure. Taper to baseline preoperative dose over 1-2 days
Severe, including sedation and major trauma	100-150 mg of hydrocortisone or 20-30 mg methylprednisolone IV on day of procedure. Taper over 1-3 days to baseline preoperative dose
Critically ill, including septic shock and sepsis-induced hypotension	50 mg of hydrocortisone IV every 6 hours with 50 mcg fludrocortisones daily for 7 days

*To be considered for all patients on chronic preoperative glucocorticosteroid therapy within 3-12 months of surgery. **Chronic steroids should be considered to include those patients on greater than 3 weeks of 20 mg or above in the last 3 months or continuous Prednisone greater than 5 mg ongoing.** Consider assessing adrenal stress response with cosyntropin testing for elective surgery if adrenal function uncertain.

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