



DEPARTMENT OF ANESTHESIOLOGY
Preoperative Medication Management Guidelines

Purpose: To provide recommendations regarding medication management for patients in the preoperative setting.

The following medications **SHOULD BE CONTINUED** up to and including the day of surgery (Instruct patients to take with a small sip of water):

1. Alzheimer’s medications

2. Anti-anxiety, Antidepressants and psychiatric medications

- Be aware that with short acting SSRIs, SNRIs [e.g. paroxetine (e.g. Paxil), sertraline (Zoloft), fluvoxamine (Luvox), venlafaxine (Effexor)] withdrawal symptoms may manifest even with one omitted dose.
- **EXCEPTION**--MAO inhibitors (MAOI): Patients taking MAO inhibitors may need special instructions, consider High Risk Anesthesia Consultation

3. Anti-hypertensive medications – Beta blockers (anything ending in-*olol*)

(EXCEPTION—Patients going for Stage 1 Deep brain stimulation (DBS) for treatment of tremor and who are taking beta blockers for the treatment of tremor should **DISCONTINUE** on day of surgery, if any questions regarding these instructions contact Neurosurgeon and prescribing physician)

Cardioselective beta blockers (more likely to block beta-1 than beta-2 receptors)		Beta blockers that also block alpha receptors	
Generic name	Brand name examples	Generic name	Brand name examples
Acebutolol	Sectral	Carvedilol	Coreg, Coreg CR
Atenolol	Tenormin	Labetalol	Generic only
Betaxolol	Kerlone	Beta blockers that are non-selective, do not have ISA, and do not block alpha receptors	
Bisoprolol	Zebeta	Generic name	Brand name examples
Esmolol	Brevibloc	Nadolol	Corgard, Corzide
Metoprolol	Lopressor, Toprol XL	Propranolol	Inderal, Inderal LA, Innopran XL
Nebivolol	Bystolic	Sotalol	Betapace, Sorine
Beta blockers with intrinsic sympathomimetic activity (ISA)		Timolol	Generic only
Generic name	Brand name examples		
Acebutolol	Sectral		
Penbutolol	Levatol		
Pindolol	Generic only		

3A. Other Anti-Hypertensive Agents and Cardiac Medications. (e.g. hydralazine, nitrates, calcium channel blockers, digoxin, alpha antagonists)

The following medications **SHOULD BE CONTINUED** up to and including the day of surgery
(Instruct patients to take with a small sip of water):

4. Anti-seizure medications

5. Antivirals and antiretrovirals

6. Asthma medications (inhalers and nebulizers please USE on the morning prior to arrival)

7. Birth control pills

8. COX-2 inhibitors (check with surgeon if there is concern about new bone growth/healing)

9. Eye drops

10. Heartburn or anti-reflux medications [e.g. esomeprazole (Nexium), lansoprazole (Prevacid), omeprazole (Prilosec), ranitidine (Zantac)]

11. Immunosuppressants and Rheumatologic medications [e.g. allopurinol, azathioprine, cyclosporine, tacrolimus (Prograf), sirolimus (Rapamune), methotrexate, infliximab (Remicade), adalimumab (Humira), etanercept (Enbrel)] - **Do not stop any immunosuppressant medications without speaking with the prescribing physician.** Patients with organ transplants should be continued on immunosuppressants. Patients taking these medications for other diseases (i.e. rheumatoid arthritis, crohn's) may have them discontinued perioperatively only AFTER a discussion of risks/benefits between the surgeon and the prescribing physician has taken place.

12. Opioids (e.g. morphine (e.g. MS Contin), oxycodone (e.g. Oxycontin), fentanyl patch)

13. Parkinson's medications (e.g. levodopa, levodopa/carbidopa)

(**EXCEPTION**—Patients going for Stage 1 DBS should DISCONTINUE these medications on day of surgery)

14. Statins (e.g. fluvastatin, lovastatin, pitavastatin, pravastatin, rosuvastatin, simvastatin)

15. Steroids (oral and inhaled)

16. Thyroid medications (e.g. levothyroxine)

The following medications should be **DISCONTINUED prior to surgery**:

1. **ACE inhibitors** (angiotensin converting enzyme inhibitors, anything ending in *-pril*) – hold on day of surgery
(**EXCEPTION**—patients going for Stage 1 DBS should CONTINUE ACE inhibitors)
2. **ARBs (angiotensin II receptor blockers)**, anything ending in *-artan*) – hold on day of surgery
(**EXCEPTION**—patients going for Stage 1 DBS should CONTINUE ARBs)

ACE Inhibitors		ARBs	
Generic name	Brand name examples	Generic name	Brand name examples
Benazepril	Lotensin, Lotensin HCT*, Lotrel ^{&}	Candesartan	Atacand, Atacand HCT*
Captopril	Generic only (+/- HCTZ)	Eprosartan	Teveten, Teveten HCT*
Enalapril	Vasotec, Vaseretic*	Irbesartan	Avapro, Avalide*
Fosinopril	Generic only (+/- HCTZ)	Losartan	Cozaar, Hyzaar*
Lisinopril	Prinivil, Zestril, Zestoretic*	Olmesartan	Benicar, Benicar HCT*, Azor ^{&} , Tribenzor* ^{&}
Quinapril	Accupril, Accuretic*	Telmisartan	Micardis, Micardis HCT*, Twynsta ^{&}
Ramipril	Altace	Valsartan	Diovan, Diovan HCT*, Exforge ^{&} , Exforge HCT* ^{&}
Trandolapril	Mavik, Tarka ⁺		

*Combination with hydrochlorothiazide (HCTZ), ⁺Combination with verapamil, [&]Combination with amlodipine

3. **Direct Renin Inhibitor, Aliskiren (Tekturna, Tekturna HCT, Amturnide, Tekamlo)** – Hold on day of surgery.
 4. **Diuretics** – Hold on day of surgery.
 5. **Antiplatelet agents** [e.g. clopidogrel (Plavix), ticlopidine (Ticlid), prasugrel (Effient), ticagrelor (Brilinta)] – Please refer to FMLH Algorithm for Management of Perioperative Antiplatelet Therapy. Discuss with prescribing physician.
- Aspirin**-See SPECIAL SITUATIONS at the end of the document. If patient does not have cardiac or carotid stents, stop 7 days prior to surgery.
6. **Warfarin (Coumadin)** – If normal coagulation is required, discontinue 5 days before surgery – will need to check PT and PT/INR preoperatively. Discuss with prescribing physician and consider bridging therapy.
 7. **Dabigatran (Pradaxa)** – Length to hold **depends** on renal function and risk of bleeding. If possible, discontinue 1 to 2 days (CrCl ≥ 50 mL/min) or 3 to 5 days (CrCl <50 mL/min) before invasive or surgical procedures because of the increased risk of bleeding. Consider longer times for patients undergoing major surgery, spinal puncture, or placement of a spinal or epidural catheter or port, in whom complete hemostasis may be required. Discuss with prescribing physician and consider bridging therapy.
 8. **Rivaroxaban (Xarelto)** – Hold minimum 24 hours prior to surgical procedure. Discuss with prescribing physician and consider bridging therapy.
 9. **Apixaban (Eliquis)** – Discontinue at least 48 hours prior to elective surgery or invasive procedures with moderate or high risk of unacceptable bleeding; discontinue at least 24 hours prior to elective surgery or invasive procedures with low risk of bleeding or where bleeding would be non-critical or easily controlled. Discuss with prescribing physician and consider bridging therapy.

The following medications should be **DISCONTINUED prior to surgery**:

10. Heparin, Low molecular weight heparins [e.g. dalteparin (Fragmin), enoxaparin (Lovenox)] – Patients receiving either UFH or LMWH should have their doses held for 12 hours preoperatively if prophylactic dosing and 24 hours if therapeutic dosing.

11. Non-steroidal anti-inflammatory drugs (NSAIDs) – Discontinue 7 days prior to surgery.

12. Herbal supplements and Vitamin E-containing multivitamins– Discontinue 7 days prior to surgery.

13. Bisphosphonates – Hold on day of surgery

14. Insulin – Please refer to FMLH protocol for insulin management (see below). Order finger stick on arrival on day of surgery. Please note that if the surgical start time is delayed, the anesthesiologist assigned to the case needs to be contacted regarding blood sugar monitoring and IV placement.

Patient with insulin pumps should continue their basal rate **ONLY**.

FMLH protocol for pre-procedure insulin management:

1. **Short acting insulins (e.g. Humalog, Novolog, Regular):** Hold
2. **NPH insulin:** give ½ of usual dose
3. **Pre-mixed insulins (eg. Humulin or Novolog mix 70/30):** give 1/3 of usual dose
4. **Insulin glargine (Lantus):** give usual dose.
5. **Insulin detemir (Levemir):** give usual dose.

15. Oral Diabetic agents – Hold on day of surgery.

16. Iron – Hold on day of surgery.

17. Premarin – Hold on day of surgery.

18. Sildenafil (Viagra), Tadalafil (Cialis), Vardenafil (Levitra) – Hold 24 hours preoperatively.

19. MAO inhibitors – Patient may need special instructions – consider Anesthesiology Consultation preoperatively
See table on following page for MAO inhibitor medications and alternative medicines

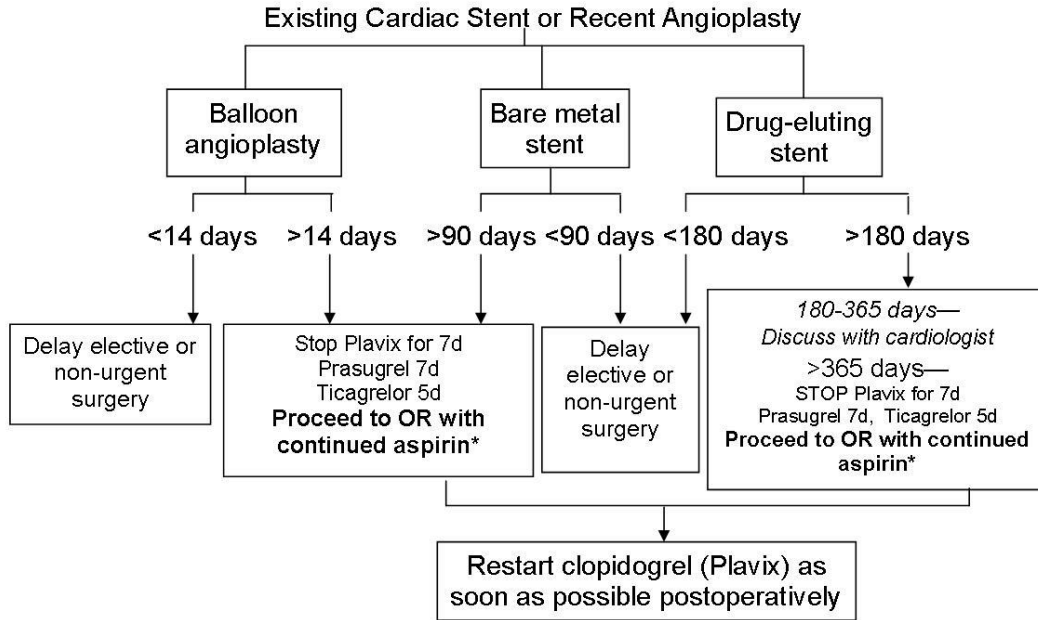
MAOI Medications – Non-selective MAO-A and MAO-B inhibitors		Selected Herbal/Alternative Medicine Products – Selective MAO-A inhibitors	
Generic name	Brand name examples	Generic name	Comment
Hydralazine	Generic only	Resveratrol	Found in skin of red grapes
Isocarboxazid	Marplan	Berberine	Found in many herbs (e.g. goldenseal)
Isoniazid	Generic only	Selected Herbal/Alternative Medicine Products – Non-selective MAO-A and MAO-B inhibitors	
Linezolid	Zyvox	Generic name	Comment
Phenelzine	Nardil	Curcumin	Found in turmeric
Procarbazine	Matulane	Harmala alkaloids	Found in tobacco, Syrian rue, passion flower, ayahausca, Tribulus terrestris
Tranylcypromine	Parnate	Rhodiola Rosea	Active constituents unknown
MAOI Medications – Selective MAO-B inhibitors		Selected Herbal/Alternative Medicine Products – Selective MAO-B inhibitors	
Generic name	Brand name examples	Generic name	Comment
Rasagiline	Azilect	Catechin	Found in tea plant, cocoa, cat's claw
Selegiline	Eldepryl, Emsam (patch), Zelapar	Desmethoxyyangonin	Found in kava
		Epicatechin	Found in tea plant, cocoa, cat's claw
		Fo-Ti	Active constituents unknown
		Hydroxytyrosol	Found in olive oil
		Piperine	Found in pepper
		Selected Herbal/Alternative Medicine Products – Selectivity unknown	
		Generic name	Comment
		Myristicin	Found in nutmeg, parsley, dill
		Siberian ginseng	Active constituents unknown
		Yerba mate	Active constituents unknown
		Yohimbe	Active constituents unknown

Various tryptamine and phenethylamine/amphetamine derivatives such as amphetamine and methamphetamine may also have weak to strong MAOI effects at high doses.

SPECIAL SITUATIONS – ASPIRIN



FMLH Algorithm for Management of Perioperative Antiplatelet Therapy



**Routine preoperative medication instructions given to patients with cardiac stents will include instructions to continue aspirin throughout the surgical period, with the exception of intracranial neurosurgeries and special exceptions requested by the attending surgeon*

**Patients who have discontinued all antiplatelet therapy preoperatively may be given 325 mg chewable aspirin before surgery, after discussion between the anesthesiologist and surgeon.*

Background

Dual antiplatelet therapy, including aspirin and clopidogrel (Plavix), is routinely given to prevent thrombosis of cardiac stents. Stent thrombosis causes major morbidity and mortality, with myocardial infarction in 40-60% of cases and death in 15-45% of patients. When considering surgical procedures, the risk of bleeding needs to be weighed against the risk of discontinuing antiplatelet therapy. There is no evidence that substituting other anticoagulants such as heparins, warfarin or glycoprotein IIb/IIIa agents reduce the risk of stent thrombosis when antiplatelet agents are discontinued.

Based on available literature and the recommendations of the American Heart Association/American College of Cardiology, the above recommendations are made for management of antiplatelet agents in patients undergoing non-cardiac invasive procedures at Froedtert Hospital.

Adapted from JACC Vol 50, No 17, 2007
Slawski, Cinquegrani, Kersten, Marks, Pfeifer

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