



Perioperative Management of Chronic Medications

Dimitriy Levin, MD

University of Colorado Hospital Medicine Group

Case

A 72-year-old female with multiple medical problems is scheduled for outpatient surgery in two weeks. How should her home medications be managed?

- Aspirin
- Carbidopa/Levodopa
- Celecoxib
- Clonidine
- Estradiol
- Ginkgo
- Lisinopril
- NPH insulin
- Prednisone 10 mg a day for years
- Sulfasalazine

Objectives

- Guiding principles
- Rationale behind continuing or discontinuing:
 - Antiplatelet drugs
 - Cardiovascular drugs
 - CNS-active drugs
 - Diabetic drugs
 - Hormones
 - Non-steroidal anti-inflammatory drugs (NSAIDs)
 - Corticosteroids
 - Disease-modifying antirheumatic drugs (DMARDs)
 - Biological response modifiers (BRMs)
 - Herbal medicines

Guiding Principles

- Avoid progression or decompensation of disease
- Avoid withdrawal
- Avoid interactions with anesthesia
- Avoid perioperative complications

Drugs to Continue

- Very long half-life or biologic effect
- Significant withdrawal symptoms
- No significant interactions with anesthesia
- No significant risk of perioperative complications

Antiplatelet Drugs to Continue

☑ Aspirin

- Continue if history of CAD, POBA, or PCI¹
- Irreversibly inhibits platelet aggregation
- Stop 7 days before surgery, if indicated²

☑ Clopidogrel

- Continue with aspirin if surgery within 30 days of bare-metal or 365 days of drug-eluting stent¹
- Irreversibly inhibits platelet aggregation
- Stop 7 days before surgery, if indicated²
- Consider a loading dose if stopped²

¹ *Circulation*. 2007;116:1971-1996.

² Micromedex.

CV Drugs to Continue

☑ Beta-blockers

- Continue if already taking for ACCF/AHA class I indication (Class I)¹
- Start and titrate to HR < 65 in high-risk patients (CAD, ischemia on cardiac stress testing, more than 1 clinical risk factor, surgical risk) (Class IIa)¹
- Usefulness is uncertain in patients with one or fewer risk factors (Class IIb)¹
- Do not administer if there is a contraindication (Class III)¹
- Do not start high-dose beta-blockers without dose titration (Class III)¹
 - POISE: metoprolol 100 mg pre-, 100 mg post-

¹ *J Am Coll Cardiol.* 2009;54:2102-2128.

CV Drugs to Continue

☑ Statins

- ACC/AHA 2007 perioperative guidelines:
 - Continue if already taking (Class I)¹
 - Reasonable if vascular surgery (Class IIa)¹
 - Consider if more than 1 clinical risk factor and intermediate-risk surgery (Class IIb)¹
- In vascular surgery patients, statin withdrawal was associated with a 4.6-fold increase in post-operative troponin release > 0.1 ng/ml and a 7.5-fold increase in post-operative MI and cardiovascular death²

¹ *Circulation*. 2007;116:1971-1996.

² *Am J Cardiol*. 2007;100:316-320.

CV Drugs to Continue

Amiodarone

- Elimination $t_{1/2}$ up to 142 days¹

Digoxin

- Elimination $t_{1/2}$ up to 48 hours¹

Calcium-channel blockers

- Caution if LVEF < 40%²

¹ Micromedex.

² *Am J Health-Syst Pharm.* 2004;61:899-914.

CV Drugs to Continue

☑ Clonidine

- Risk of severe rebound hypertension¹
- Convert to patch and taper off oral dose 48-72 hours in advance if anticipated extended NPO status¹

➤ ACC/AHA: Consider in patients with CAD or more than 1 clinical risk factor for perioperative control of hypertension (Class IIb)²

¹ *Med Clin N Am.* 2001;85:1117-1128.

² *Circulation.* 2007;116:1971-1996.

CNS Drugs to Continue

- ☑ Antiepileptics, antipsychotics, benzodiazepines, bupropion, gabapentin, lithium, mirtazapine, SSRIs, SNRIs, TCAs, valproic acid.
 - Risk of withdrawal and disease decompensation

- ☑ Carbidopa/Levodopa
 - Withdrawal with rapid worsening of Parkinsonian symptoms

- ☑ Monoamine oxidase inhibitors (MAOI)
 - Use MAOI-safe anesthesia without dextromethorphan, epinephrine, mepiridine, or norepinephrine¹

¹ *Am J Health-Syst Pharm.* 2004;61:899-914.

Diabetic Drugs to Continue

☑ Insulin

- Continue glargine without dose adjustment¹
- Continue usual basal rate with insulin pump¹
- No short-acting insulin or insulin mixes within 4 hours of surgery¹
- Give half the intermediate insulin (e.g. NPH) dose the day of surgery with D5 drip perioperatively¹

☑ Incretins (exenatide, sitagliptin)

- Do not cause hypoglycemia in the absence of insulin¹

☑ Thiazolidinediones (pioglitazone, rosiglitazone)

- Very long duration of biological action

¹ *Med Clin N Am.* 2009;93:1031-1047.

Hormones to Continue

- ☑ Antithyroid medications (methimazole, PTU)

- ☑ Levothyroxine
 - Elimination $t_{1/2}$ up to 7 days¹

¹ Micromedex.

Continuing Corticosteroids

- Prednisone 5 mg/day for 5 days within 30 days of surgery can result in adrenal insufficiency¹
- Normal cortisol release from surgery 50-150 mg¹
- ☑ Continue outpatient corticosteroid dose plus add a stress dose

¹ *Endocrinol Metab Clin N Am.* 2003;32:367-383.

Stress-Dose Corticosteroids

- Minor surgery (local anesthesia, duration less than one hour):
 - Hydrocortisone 25 mg IV or methylprednisolone 5 mg IV during surgery
- Moderate surgery (lower extremity vascular, joint replacement, open cholecystectomy):
 - Hydrocortisone 50-75 mg IV or methylprednisolone 10-15 mg IV during surgery, tapering to baseline dose over 1-2 days
- Major surgery (cardiothoracic, Whipple):
 - Methylprednisolone 10 mg IV every 8 hours, tapering to baseline dose over 2-3 days

Other Drugs to Continue

- ☑ Selective COX-2 inhibitors
 - No effect on platelet aggregation
 - Hold 2-3 days before surgery if concern for impaired renal function

- ☑ HIV therapy

- ☑ Hydroxychloroquine

- ☑ Inhaled beta-agonists, inhaled corticosteroids, ipratropium, theophylline, tiotropium.

- ☑ Myasthenia gravis therapy



Drugs to Stop

- Risk of significant interactions with anesthesia
- Risk of significant perioperative complications

CV Drugs to Stop

☒ ACEI and ARB

- Risk of hypotension requiring vasopressors during induction of anesthesia 50% higher in a systematic review¹
- Risk of post-operative acute renal failure after cardiothoracic surgery 28% higher in one recent study² but 52% lower in another³
- Consider stopping 1 day before surgery

☒ Diuretics

- Risk of dehydration and electrolyte imbalance due to NPO status

¹ *J Hosp Med.* 2008;3:319-325.

² *Clin J Am Soc Nephrol.* 2008;3:1266-1273.

³ *Ann Thorac Surg.* 2008;86:1160-1165.

Diabetic Drugs to Stop

☒ Metformin

- FDA Black Box Warning to discontinue before any intravascular radiocontrast study or surgical procedure¹
- Lactic acidosis is rare but carries a mortality of 50%¹
- Stop 24 hours before surgery, restart 48-72 hours after²
- Confirm normal renal function before restarting²

☒ Sulfonylureas (glimepiride, glipizide, glyburide)

- Risk of hypoglycemia
- Stop the night before surgery

¹ Micromedex.

² *Med Clin N Am.* 2009;93:1031-1047.

Hormones to Stop

- ☒ Oral contraceptives, hormone replacement therapy, raloxifene
 - In analysis of HERS trial, DVT risk was 4.9 times higher for 90 days after surgery in patients taking estrogen/progesterone hormone replacement therapy, although unclear if routine DVT prophylaxis was used
 - Non-surgical DVT risk remained 2.5 times higher for 30 days after cessation of HRT
- Consider stopping 4 weeks before surgery when prolonged immobilization is expected
- Consider longer and more intensive DVT prophylaxis

NSAIDs to Stop

- ☒ Non-selective COX inhibitors
 - Reversibly inhibit platelets only while drug is present in circulation¹
 - Stop 1-3 days before surgery

¹ Micromedex.

DMARDs to Stop

☒ Methotrexate

- Increased risk of wound infections and dehiscence
- Decreased risk of post-operative disease flare
- Stop 2 weeks before surgery if medical comorbidities, advanced age, or on prednisone over 10 mg/day¹

☒ Leflunomide

- Renally cleared with elimination $t_{1/2}$ of 2 weeks¹
- Risk of myelosuppression
- Stop 2 weeks before surgery, restart 3 days after

☒ Azathioprine, sulfasalazine

- Renally cleared with risk of myelosuppression¹
- Stop 1 day before surgery, resume 3 days after

¹ *Curr Opin Rheumatol.* 2004;16:192-198.

BRMs to Stop

- ☒ Anti-TNF- α (adalimumab, etanercept, infliximab)
- ☒ IL1 antagonists (anakinra)
- ☒ Anti-CD20 (rituximab)
 - Increased risk of wound infections and dehiscence
 - Decreased risk of post-operative disease flare
 - Stop 1 week before surgery, resume 1-2 weeks after

Herbal Medicines to Stop

- Used by up to a third of U.S. population
- Can have significant perioperative implications:
 - Cardiovascular instability (ginseng, ma huang)
 - Hypoglycemia (ginseng)
 - Immunosuppression (echinacea use for > 8 weeks)
 - Increased risk of bleeding (garlic, ginkgo, ginseng)
 - Prolongation of anesthesia (kava, St. John's wort, valerian)

☒ STOP 1-2 weeks before surgery

Case Revisited

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Summary

Balance risks vs. benefits of drugs in each patient

Continue

- Antiplatelet therapy
- Beta-blockers
- Statins
- Calcium channel blockers
- Clonidine
- Amiodarone
- Digoxin
- All CNS drugs
- Insulin, with adjustments
- TZDs and incretins
- Thyroid drugs
- Corticosteroids, with stress dose
- COX-2 inhibitors
- HIV drugs
- Hydroxychloroquine

Stop

- ACEI and ARBs
- Diuretics
- Metformin
- Sulfonylureas
- OCPs, HRT, SERMs
- Non-selective COX inhibitors
- DMARDs
- BRMs
- Herbal medicines

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