Preoperative Administration Of Medicines for Elective Surgery

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1. Overview

Purpose

Surgery and anaesthesia present risks for all patients but particularly for those on medications for acute or chronic health conditions. Clearly documented medication advice allows both patients and medical staff to minimise risk of medication errors that can significantly impact a patient's care.

Considerations

1. Medications can directly influence the risks of surgery and anaesthesia. Equally the stress of surgery and anaesthesia results in physiological changes which may affect drug pharmacokinetics and consequently patients' pre-existing disease states.
2. The unnecessary omission of regular drugs due to pre-operative fasting needs to be minimised. NBM means "nothing but medicines"
3. Different routes of drug administration may need to be considered in view of patients' surgery and disease states.

Scope

- Clinicians prescribing for patients presenting for ELECTIVE surgery.
- Nursing, midwifery and medical staff preparing adult patients for elective surgery.
- This document is NOT A PROTOCOL but a guideline and by preference individualised medication advice should be provided by the medical /surgical teams caring for patients. Where there is doubt about a medication specialist advice should be sought.
- For acute surgical patients individualised medication advice should be provided by the surgical teams caring for that patient. Where there is doubt about a medication specialist advice should be sought.
- Advice can also be obtained from the Anaesthetic Co-ordinator (phone ext. 43540). The management of diabetic and anticoagulant / antiplatelet drugs falls outside the scope of this document. Please refer to the relevant guidelines.

2. Management of elective surgical patients

- It is essential that comprehensive medicines reconciliation is performed, including details of allergies, adverse drug reactions and herbal/complementary medicines.
- Instructions given to patients concerning the continuation or withholding of medicines prior to surgery should be clearly documented. The "pre-procedure medication advice" document available

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on concerto is the best place to document advice as it is visible to hospital staff and is automatically emailed to the patients GP. It is recommended that a copy is printed and given to patients.

- Patients should be instructed to bring all their medications / medical devices (e.g. CPAP) with them when arriving for surgery. This allows for prompt administration of any medications /therapy that the patient has been instructed to withhold, but the medical team deems necessary.
- Unless documented otherwise, patients will be advised by nursing staff to withhold the following medicines on the day of surgery (a quick reference summary version is available in appendix A):

Therapeutic Category	Class	Drugs
Cardiovascular drugs	ACE inhibitors (alone or in combination with diuretics)	• Captopril • Cilazapril • Enalapril • Lisinopril • Quinapril
	Angiotensin II antagonists	• Candesartan • Losartan
	Anticoagulants These drug should always be discussed with a doctor prior to surgery (see 'Anticoagulation – Perioperative Guideline')	• Apixaban • Dabigatran • Rivaroxaban • Warfarin • LMWH - Enoxaparin
	Antiplatelet drugs These drug should always be discussed with a doctor prior to surgery (see 'Anticoagulation – Perioperative Guideline')	• Aspirin • Clopidogrel • Dipyridamole • Prasugrel • Ticagrelor • Ticlodipine
	PDE inhibitors	• Sildenafil (Viagra) omit if used for erectile dysfunction. See main text below.
Gastro-intestinal drugs	• Diet pills • Digestive supplements	• Phentermine (Duromine) • Orlistat (Xenical) • Pancreatin (Pancrex, Creon) • Ursodeoxycholic acid
CNS drugs	Stimulants	• Methylphenidate
	Reversible MAOI	• Moclobemide
Rheumatoid & immune suppressant drugs	Biological DMARDS	• Adalimumab • Anakinra • Etanercept • Infliximab • Rituximab • Tocilizumab

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Analgesics and related drugs	Non-steroidal anti-inflammatory drugs (NSAIDs) including Selective COX2 inhibitors ("Coxibs") Oral Naltrexone	• Diclofenac • Ibuprofen • Indomethacin • Ketoprofen • Mefenamic acid • Meloxicam/ Piroxicam/ Tenoxicam • Naproxen • Etoricoxib • Celecoxib Withhold oral naltrexone 72 hrs pre-op
Diabetes drugs	• Oral hypoglycaemic agents • Insulin • Continuous Subcutaneous Insulin (CSI) pumps	Refer to current Peri-operative Management of Diabetes guideline
Non-prescription, Herbal & Complementary medicines	All • non-prescription vitamins • dietary and exercise supplements • herbal and complementary medicines • erectile dysfunction medicines should be withheld for 2 weeks pre-op	Examples include, but are not limited to: • Ayurvedic medicines • Chinese traditional medicines • Colloidal silver • Echinacea • Ephedra (Ma Huang) • Garlic capsules • Gingko biloba • Glucosamine/chondroitin • Grape seed extract • Kava • Milk thistle extract • Omega-3 oil (fish/krill/linseed) • Resveratrol • St John's Wort • Valerian • Viagra - sildenafil

3. Medicines and preoperative fasting

Oral medications should be given with up to 50ml water (if the patient is capable of receiving this). It is preferable that regular meds are given 2 hours pre-op but may be given within two hours if necessary.

NBM = Nothing But Medicines

4. Guidance on specific drugs and drug classes

These guidelines concerning the management of specific medicines listed below are offered in the hope that they cover the majority of cases found in practice. Nonetheless, it is still the responsibility of the clinician to determine the applicability of these guidelines for any given case. If a drug is not listed here seek specialist advice from list anaesthetist / Anaesthetic Coordinator or the prescriber of that drug.

- The management of diabetic and anticoagulant / antiplatelet drugs falls outside the scope of this document. Please refer to the relevant guidelines (links in relevant section).
- Anticoagulant /antiplatelet drugs should always be discussed with a doctor pre-operatively

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4.1 Cardiovascular drugs

- The management of anticoagulant / antiplatelet drugs falls outside the scope of this document. Please refer to: Anticoagulation Peri-operative Management guideline.

Drug/Class	Continue or withhold day of surgery?	Comments
Alpha-blockers (e.g. doxazosin, prazosin, tamsulosin, terazosin)	Continue	• Unless having cataract surgery. Risk intraoperative floppy iris syndrome.
Anti-arrhythmics (e.g. Amiodarone / Flecainide)	Continue	• Unless having an electrophysiological procedure where arrhythmia induction required
Angiotensin II antagonists (e.g. candesartan, losartan)	Withhold	• Continuing may increase peri-op hypotension Withhold but discuss with list anaesthetist on day of surgery
ACE inhibitors (e.g. captopril, cilazapril, enalapril, lisinopril, quinapril)	Withhold	• Continuing may increase peri-op hypotension Withhold but discuss with list anaesthetist on day of surgery
Beta-blockers (e.g. atenolol, bisoprolol, carvedilol, metoprolol, nadalol, pindolol, sotalol)	Continue	• Withdrawal may increase risk of myocardial ischaemia if used for IHD • Seek specialist advice if patient bradycardic/ hypotensive or if IV beta-blocker use is required
Calcium Channel Blockers (e.g. amlodipine, diltiazem, felodipine, nifedipine, verapamil)	Continue	• Seek specialist advice if patient bradycardic / hypotensive
Centrally acting anti-hypertensives (e.g. clonidine, methyldopa)	Continue	• Seek specialist advice if patient bradycardic / hypotensive. • Consider use of clonidine transdermal patches if oral/enteral route is unavailable (withdrawal HTN may occur)
Digoxin	Continue	• Monitor digoxin levels if there is a change in renal function or hyperkalaemia
Diuretics (e.g. bendrofluazide, chlorthalidone, frusemide, hydrochlorothiazide, metolazone, spironolactone, bumetanide	Continue	
Nitrates (e.g. glyceryl trinitrate, isosorbide mononitrate)	Continue	• GTN transdermal patches can be used if the oral/enteral route is unavailable.
Phosphodiesterase inhibitors (e.g. sildenafil, tadalafil, vardenafil)	Continue / withhold	• Continue if used for pulmonary HTN • Withhold two weeks pre-op if used for erectile dysfunction (possible link to Anterior Ischaemic Optic Neuropathy)

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Statins (e.g. atorvastatin, simvastatin)	Continue	• Hepatic or renal impairment may increase risk of myopathy
Other Cholesterol lowering agents (e.g. bezafibrate /nicotinic acid)	Continue	

4.2 Gastrointestinal drugs

Drug/Class	Continue or withhold day of surgery?	Comments
H_2-receptor antagonists (e.g. cimetidine, ranitidine)	Continue	• Prevents stress related ulceration • May reduce risk of aspiration pneumonia
Proton pump inhibitors (e.g. omeprazole, pantoprazole)	Continue	• Prevents stress related ulceration • May reduce risk of aspiration pneumonia
Pro-kinetic agents (e.g. domperidone, metoclopramide)	Continue	
5-HT_3 antagonists (e.g. granisetron, ondansetron)	Continue	
Diet pills and dietary supplements	Withhold	• Phentermine / Orlistat – stop two weeks pre-op • Orlistat – check coagulation screen as reduces vitamin ADEK absorption • Pancreatin e.g. Pancrex/Creon & Ursodeoxycholic acid – omit day of surgery (DOS)
Drugs for Inflammatory Bowel Disease (e.g. Mesalazine preparations (Rowasa/Pentasa/Asacol) and Sulfasalazine)	Continue	

4.3 CNS drugs

Drug/Class	Continue or withhold day of surgery?	Comments
Acetylcholinesterase inhibitors Peripheral acting: used in myasthenia gravis (e.g. pyridostigmine) Centrally acting: used in Parkinson's (e.g. galantamine/ donepezil/rivastigmine)	Continue	• Consider IV preparations if the oral/enteral route is unavailable post op. • Rivastigmine is available as a patch • May prolong response to suxamethonium • May antagonize non depolarizing muscle relaxants
Anticonvulsants (e.g. carbamazepine, clobazam, gabapentin, lamotrigine, levetiracetam, phenobarbital, phenytoin, primidone, sodium valproate, topiramate)	Continue	• Consider using IV preparations when oral/enteral route in unavailable

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Antipsychotics and Lithium (e.g. aripiprazole, chlorpromazine, clozapine, haloperidol, lithium carbonate, olanzapine, quetiapine, zuclopenthixol)	Continue	• Renal function, fluid status and serum drug levels should be closely monitored for patients taking lithium
Anxiolytics/Hypnotics (e.g. diazepam, lorazepam, temazepam, clobazam, clonazepam, triazolam, zopiclone)	Continue	• Patients who take significant amounts of benzodiazepines may require less medication for anaesthesia induction and maintenance • Abrupt cessation of benzodiazepines after chronic use can cause withdrawal syndrome in <24 hours and so should be continued in a modest dose peri-operatively • Chronic benzodiazepine use may lead to higher requirements for postoperative opiates
Baclofen	Continue	• Sudden withdrawal may result in hallucinations, spasticity and rarely rhabdomyolysis
Drugs used in Parkinson's disease (e.g. entacapone, tolcapone, levodopa, Madopar®, selegiline, Sinemet®,)	Continue	• LFTs should be monitored closely in patients taking entacapone or tolcapone • Avoid pethidine with selegeline • Avoid antidopaminergic anti-emetics and atropine in Parkinson's
Anticholinergic drugs (Oral e.g. benztropine, procyclidine, oxybutinin) (For Inhaled anticholinergics e.g. ipratropium/ tiotropium see respiratory drugs)	Continue	• Abrupt discontinuation may result in rebound parkinsonian symptoms • Anticholinergic drugs may increase the risk of post-operative delirium
CNS Stimulants (e.g. Methylphenidate: Ritalin® or Rubifen®)	Withhold	• Abrupt withdrawal is usually well tolerated • May precipitate tachycardia, hypertension and arrhythmias during surgery
Noradrenergic and specific serotinergic antidepressant (e. g. Mirtazepine)	Continue	• Continuation may alleviate postoperative insomnia, anxiety, nausea and vomiting • Abrupt withdrawal generally well tolerated
Irreversible Monoamine Oxidase Inhibitors (e.g. phenelzine, isocarboxazid, tranylcypromine)	Continue	• **A. Risk of hypertensive crises.** Options include: o 1. Ensure MAOI-safe anaesthetic techniques are employed including avoidance of ketamine, indirect acting vasopressors and vasopressors in local anaesthetics. o 2. Irreversible MAOIs can be withheld 2 weeks prior to surgery to resume normal catecholamine metabolism. • 3. Switch to a reversible MAOI (e.g. moclobemide) o Any benefits of withholding /switching need to be weighed against the worsening of depression.

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		Discuss with GP/ psychiatry • **B. Risk of serotonin syndrome ("type 1 reaction")** o Avoid pethidine, tramadol and dextromethorphan. o Use fentanyl with caution • **C. Other risks** o CNS depression with opioids ("type 2 reaction") o Seizures with tramadol o Suxamethonium prolongation with phenelzine via inhibition plasma cholinesterase
Reversible monoamine oxidase inhibitors (e.g. moclobemide)	Withhold	• Withhold on the day of surgery • Avoid pethidine
Selective Serotonin Reuptake Inhibitors (SSRIs) and Serotonin and Noradrenaline Reuptake Inhibitors (SNRIs) (e.g. fluoxetine, paroxetine, sertraline, venlafaxine)	Continue	• Abrupt discontinuation of SSRIs/SNRIs risk development of withdrawal syndrome • Discontinuation should be considered if patient has a known problem with haemostasis or is bleeding. Consult haematologist and psychiatrist for advice. • Risk serotoninergic syndrome in combination with tramadol / pethidine. • Risk SIADH in elderly
Tricyclic antidepressants (e.g. amitriptyline, clomipramine, imipramine, nortriptyline)	Continue	• Abrupt discontinuation may lead to transient dizziness, nausea, headache, sweating, insomnia and malaise.
Eye drops	Continue	Continue all as normal

4.4 Drugs used in rheumatoid/autoimmune diseases

Contact prescriber for specialist advice especially if patient is on immunosuppression for organ transplant

Drug/Class	Continue or withhold day of surgery?	Comments
Azathioprine	Continue	• Seek specialist advice if sepsis occurs.
Biological DMARD's (e.g. anakinra, etanercept, abatacept infliximab, adalimumab, rituximab, tocilizumab)	Withhold 2 weeks	• Withhold during the perioperative period or schedule elective surgery around DMARD dosing • Cease drug 2 weeks pre-op and do not restart till minimum 2 weeks post op (assuming wound healing)
Ciclosporin	Continue	• Consult the prescribing team prior to surgery.
Corticosteroids (e.g. fludrocortisone, hydrocortisone, prednisone)	Continue	• Continue at stable dose peri-operatively • Every patient should have a clear plan documented for the day of surgery • Some patients will require a higher-than-normal dose to cover the stresses of surgery • Use intravenous corticosteroids if required

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Gold (e.g. sodium aurothiomalate, auranofin)	Continue	• Seek specialist advice if sepsis occurs
Drugs used for gout (e.g. allopurinol, colchicine)	Continue	• Abrupt withdrawal may precipitate acute gout attacks (as does surgery) • Risk renal toxicity with allopurinol /colchicine if renal impairment related to surgery
Hydroxychloroquine	Continue	• Seek specialist advice if sepsis occurs
Leflunomide (Arava®)	Continue	• Seek specialist advice if sepsis occurs
Mesalazine/Sulphasalazine	Continue	• May need to withhold postoperatively until normal renal and bowel function resumes
Methotrexate	Continue	• Seek specialist advice if sepsis occurs
Mycophenolate	Continue	• Consult rheumatology team prior to surgery

4.5 Analgesics

Drug/Class	Continue or withhold day of surgery?	Comments
Paracetamol	Continue	
Non-selective Non-steroidal Anti-inflammatory Drugs (e.g. diclofenac, ibuprofen, naproxen)	Withhold	• Consider discontinuing 3 days before surgery, especially if concerned with a deterioration of renal function / fracture non union • In patients with a chronic inflammatory disorder (e.g. rheumatoid arthritis), consider risk of worsening symptoms if NSAIDs are stopped.
Selective COX II inhibitors (e.g. celecoxib, etoricoxib)	Withhold	• Negligible effect on platelet /GIT function • Consider discontinuing 3 days before surgery, especially if concerned with a deterioration of renal function / fracture non union • In patients with a chronic inflammatory disorder (e.g. rheumatoid arthritis), consider risk of worsening symptoms if NSAIDs are stopped.
Opioids (e.g. codeine, methadone, morphine, oxycodone)	Continue	• Abrupt discontinuation risks development of withdrawal syndrome. Consider IV therapy if NBM
Gabapentinoids (e.g. gabapentin, pregabalin)	Continue	
Naltrexone	Oral - Withhold 72 hours pre-op IM – withhold 1 month (switch to oral)	• Used for alcohol and opiate dependence • Competitive antagonist at opioid receptors thus reducing opioid sensitivity but may also cause receptor up regulation increasing sensitivity

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Buprenorphine	Always discuss with anaesthetist	• Alone ("Subutex") or in combination with naloxone ("Suboxone") • Partial mu agonist / 1000x morphine affinity • T1/2 20-70hrs • Minor surgery – suggest continue • Major surgery – suggest stop

4.6 Drugs used in diabetes

For the perioperative management of oral hypoglycaemic agents, insulin and continuous subcutaneous insulin (CSI) pumps, consult guideline entitled 'Peri-operative Management of Diabetes'.

4.7 Endocrine drugs and hormonal drugs

Drug/Class	Continue or withhold day of surgery?	Comments
Aromatase Inhibitors (e.g. anastrozole, exemestane, letrozole)	Continue	• Considered less thrombogenic than the SERMs
Combined Oral Contraceptive/Progestogen-only contraception ('Mini-pill') (e.g. Premarin®)	Continue / withhold	• Continue peri-operatively alongside antithrombotic measures (e.g. TED stocking, prophylactic heparin/LMWH) where appropriate • Discontinue 4-6 weeks prior to surgery in patients with prior VTE / high risk of VTE • Discuss alternative contraception
Hormone Replacement Therapy	Continue / withhold	• Continue peri-operatively alongside antithrombotic measures (e.g. TED stocking, prophylactic heparin/LMWH) where appropriate • Discontinue 4-6 weeks prior to surgery in patients with prior VTE / high risk of VTE
Selective Estrogen Receptor Modulators (SERMs) (e.g. clomifene, raloxifene, tamoxifen)	Continue / withhold	• Continue peri-operatively alongside antithrombotic measures (e.g. TED stocking, prophylactic heparin/LMWH) where appropriate • Discontinue 4-6 weeks prior to surgery in patients with prior VTE / high risk of VTE. • Consult oncologist before discontinuing if being used for cancer treatment
Finasteride	Continue	
Thyroid/Anti-thyroid drugs (e.g. thyroxine /carbimazole / propylthiouracil)	Continue	• Consider checking thyroid function preoperatively

4.8 Respiratory medicines

Drug/Class	Continue or withhold day of surgery?	Comments
Inhaled bronchodilators (e.g. eformoterol, ipratropium, salbutamol, salmeterol, terbutaline, tiotropium)	Continue	• Reduces incidence of postoperative respiratory complications
Inhaled corticosteroids (e.g. beclomethasone, budesonide, fluticasone)	Continue	

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Montelukast	Continue	
Theophylline	Continue	• If concerned check aminophylline levels pre-op

4.9 Antibiotics

Drug/Class	Continue or withhold day of surgery?	Comments
Antibiotics	Continue	• Ensure Surgical/Anaesthetic team aware
Antivirals (e.g. Aciclovir)	Continue	
Anti-retrovirals	Continue	• Beware protease inhibitors potentiate midazolam and have potential for many drug-drug interactions
Antifungals (e.g. fluconazole, ketoconazole, itraconazole)	Continue	• CYP2C9 and CYP3A4 inhibitors increase serum concentration of opioids, benzodiazepines and NSAIDs • "Azoles" may prolong QT interval

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Appendix A – Medicines to be withheld on day of surgery

	Class	Drugs
Cardiovascular drugs	ACE inhibitors	• Captopril • Cilazapril • Enalapril • Lisinopril • Quinapril
	Angiotensin II antagonists	• Candesartan • Losartan
	Anticoagulants (These drugs should always be discussed with a doctor pre-operatively)	• Apixaban • Dabigatran • Rivaroxaban • Warfarin
	Antiplatelet drugs (These drugs should always be discussed with a doctor pre-operatively)	• Aspirin • Clopidogrel • Dipyridamole • Prasugrel • Ticagrelor • Ticlodipine
Gastro-intestinal drugs	Diet pills and dietary supplements	• Phentermine / Orlistat • Pancreatin (Pancrex/creon) • Ursodeoxycholic acid
CNS drugs	Stimulants	• Methylphenidate
	Reversible MAOI	• Moclobemide
Diabetes drugs	• Oral hypoglycaemic agents • Insulin • Continuous subcutaneous Insulin (CSI) pump	Refer to current Peri-operative Management of Diabetes guideline
Rheumatoid & autoimmune drugs	Biological DMARDS	• Adalimumab • Anakinra • Etanercept • Infliximab • Rituximab • Tocilizumab
Analgesics	Non-steroidal anti-inflammatory drugs (NSAIDs) including Selective COX2 inhibitors ("Coxibs") + Naltrexone	• Diclofenac • Ibuprofen • Indomethacin • Ketoprofen • Mefenamic acid • Meloxicam • Naproxen • Piroxicam • Tenoxicam • Etoricoxib • Celecoxib
Herbal & Complementary medicines	All non-prescription vitamins, dietary and exercise supplements herbal and complementary medicines and erectile dysfunction medicines should be withheld for 2 weeks pre-op	Including but limited to: • Ayurvedic medicines • Chinese traditional medicines • Colloidal silver • Garlic capsules • Gingko biloba • Glucosamine • Grape seed extract • Kava • Milk thistle extract • Omega-3 oil (fish/krill/linseed) • Resveratrol • St John's Wort • Valerian • Viagra - sildenafil

Notes:

- The management of diabetic and anticoagulant / antiplatelet drugs falls outside the scope of this document. Please refer to the relevant guidelines.
- Anticoagulant /antiplatelet drugs should always be discussed with a doctor pre-operatively
- This table is only to be used when no prior instructions concerning specific medicines have been given to the patient. All patients are requested to bring all their medicines with them when presenting for surgery. This gives the medical teams the ability to promptly administer any withheld medicines if necessary.