Medication in the perioperative period: stop or continue? A review.

I. Hollevoet (*), S. Herregods (*), H. Vereecke (**), E. Vandermeulen (***) and L. Herregods (*)

Abstract: Preoperative evaluation of medication is important as part of the anesthetic plan. The aim of this manuscript is to evaluate and compare through literature review the existing evidence to support optimal perioperative medication management.

Key words: Perioperative medication management; cardiovascular medication; antithrombotic medication; anticoagulants; thrombolytics; respiratory medication; psychotropic agents; hormonal medication; diabetic medication; glucocorticoids; analgetics; herbal medications and food supplements.

INTRODUCTION

The preoperative consultation is important to instruct the patient about the procedure, fasting time and medication. The anamnesis, the clinical examination combined with technical tests are the core of the preoperative anesthetic consultation.

The population is aging, and the number of patients taking multiple medications increasing. Patients often take herbal medications and food supplements without mentioning it. Over the years new medications were introduced, of which some need specific preoperative considerations. Good perioperative medication management improves postoperative outcome (1).

Most medications are continued in the perioperative period. Medication intake (orally with a little sip of water) is safe until 2 hours before induction of anesthesia (2).

This review tends to summarize the available literature to optimize perioperative medication management by proposing advises concerning which medications should be stopped pre-operatively or not, the time when they should be stopped and whether they should be replaced. Furthermore it points out at interactions which should be taken in consideration in the perioperative period.

MATERIALS AND METHODS

The search was performed online using the MEDLINE database. The following search terms and combinations were used: "perioperative medication", "cardiovascular medication", "beta blocker", "antithrombotics", "anticoagulants", "psychotropic agents", "antidiabetic drugs", "herbal medication", "food supplements".

The search was limited to human data. A large number of data were retrieved, mostly randomized controlled trials (RCT's), guidelines and reviews were included. Except for topics, such as psychotropic drugs and herbal medications (as data were rare) other literature was included. Additional reports were identified from reference lists of retrieved articles. Authors were not contacted for original data.

Background information was found in the Folia Pharmaceutica 2011, the Oxford Handbook of Anaesthesia (second edition) and UpToDate.

RESULTS

Cardiovascular medication

Table 1 gives an overview of the advises concerning preoperative cardiovascular medication management.
Central antihypertensives are continued to prevent rebound hypertension. Alpha-2 agonists have a beneficial anxiolytic, analgesic and antishivering effect and provide a reduction in pre- and afterload during surgery (3).

It is advisable to determine preoperative digitalis glycoside serum level. Depending on this level, one can consider to continue or stop the administration (4).

Chronic use of diuretics can induce electrolyte disturbances and/or hypovolemia (4).

Throughout the perioperative period it is advised to continue a chronic treatment with beta blockers. Beta blockers reduce myocardial ischemia by decreasing myocardial oxygen demand. An abrupt interruption of intake can provoke rebound hypertension, tachycardia, arrhythmias, angina pectoris and myocardial infarction (5).

Only in specific indications beta blockers should be started preoperatively (on the day of surgery). Indications are described in the guidelines of the American Heart Association and the European Society of Cardiology (6, 7). Summarized it concerns patients for vascular surgery and patients undergoing non-cardiac surgery with intermediate or high cardiac risk combined with one or more risk factors using the Revised cardiac risk index (RCRI) (8).

The use of calcium channel blocker is associated with reduced myocardial ischemia and atrial arrhythmias in patients undergoing non-cardiac surgery (9). Administration is continued perioperatively.

Angiotensin converting enzyme inhibitors (ACE-I) cause a decrease in afterload. They can cause intra- and postoperative diastolic hypotension and a decrease in coronary perfusion (4). Although the preoperative management of ACE-I remains controversial it is generally accepted that the treatment should be continued if the patients suffers from chronic heart failure (7). If their use is solely for the treatment of hypertension) ACE-I should be stopped the evening before surgery (10). If needed perioperative ACE-I-induced hypotension can be corrected using vasopressive agents.

Due to similar activity, for angiotensin II receptor inhibitors and renin-inhibitors the same advise is given (11).

Because the increased risk of rhabdomyolysis and myopathy lipid-lowering agents such as fibrates and statins were usually stopped preoperatively. Also, if fibrates are used in combination with statins the risk for rhabdomyolysis is even higher. However, because of their proven cardiovascular protection in the DECREASE III trial statins are now mostly continued (12). As for the beta-blockers, in patients undergoing vascular surgery or non-cardiac surgery with intermediate or high cardiac risk combined with one or more risk factors it is even recommended to start statins preoperatively (7). In patients with renal or hepatic insufficiency doses should be adjusted.

Anion exchangers interrupt the enteric-hepatic cycle and therefore can cause interference with the absorption of other medications.

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Table 1
Preoperative advise concerning cardiovascular medication

<table>
<thead>
<tr>
<th>Medication</th>
<th>Advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-1 blockers</td>
<td>continue</td>
</tr>
<tr>
<td>Central antihypertensives</td>
<td>continue</td>
</tr>
<tr>
<td>Nitrates (also transdermal)</td>
<td>continue</td>
</tr>
<tr>
<td>Molsidomines</td>
<td>continue</td>
</tr>
<tr>
<td>Digital glycosides</td>
<td>continue</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Last intake evening before surgery</td>
</tr>
<tr>
<td>Beta blockers</td>
<td>continue</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>continue</td>
</tr>
<tr>
<td>ACE-I, sartans, renin-inhibitors</td>
<td>Last intake evening before surgery</td>
</tr>
<tr>
<td>Combination preparations</td>
<td>Only continue beta blocker, calcium antagonist or diuretic as mentioned above</td>
</tr>
<tr>
<td>Anti-arrhythmics</td>
<td>Continue, unless for electrophysiological procedures, consult cardiologist</td>
</tr>
<tr>
<td>Statins</td>
<td>continue</td>
</tr>
<tr>
<td>Fibrates</td>
<td>Last intake evening before surgery</td>
</tr>
<tr>
<td>Anion-exchangers</td>
<td>Last intake evening before surgery</td>
</tr>
</tbody>
</table>

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Antithrombotic medication (Table 2)

To decide whether to continue preoperatively antithrombotic treatment, the thromboembolic risk should be balanced against the risk of bleeding by considering the type of surgery, the type of medication and the underlying pathology.

Antiplatelet therapy

Acetylsalicylic acid is frequently used in primary and secondary prevention. The trend is to continue the use of acetylsalicylic acid, except for surgery with high risk of bleeding, such as neurosurgery, amygdalectomy, intravitreal surgery and transurethral prostate resection. Stopping aspirin therapy in patients with underlying cardiovascular disease may increase the risk of an acute coronary syndrome or stroke (15, 18). If indicated acetylsalicylic acid should be stopped 5-7 days before surgery. It can be restarted when hemostasis is obtained, normally within 24 hours after surgery (13). If platelet count is normal, continuing aspirin therapy is no contraindication for neuraxial anesthesia (16).

Dipyridamole can be continued until the evening before surgery (4).

Thienopyridines are normally stopped before surgery, unless the patient has a high cardiac risk. They are continued in patients who have had an acute coronary syndrome less than 3 months before scheduled surgery, and in patients who underwent, less than 6 weeks before, a bare metal stent (BMS) implantation or, less than 12 months before, a drug eluting stent (DES) implantation. The risk of stopping antiplatelet therapy implies thrombosis (13), and postponing surgery whenever possible in that case should be considered. Thienopyridines substitution with low molecular weight heparins (LMWHs) is not supported by the American College of Chest Physicians. LMWHs aren’t protective against the risk of coronary thrombosis or stent thrombosis (13, 17, 18). If thienopyridines are stopped and in absence of contraindications, it is advised that acetylsalicylic acid should be continued or restarted (19). When postoperative hemostasis is achieved thienopyridines can be restarted as soon as possible.

Treatment with thienopyridines is an absolute contraindication for neuraxial anesthesia (21).

Anticoagulants

Depending on the type of surgery vitamin K-antagonists (VKAs) are preferentially stopped before surgery. In case of surgery with low risk of bleeding VKAs are continued in reduced dose to obtain an INR between 1,5-2 (international normalized ratio). If the patient is scheduled for surgery with high risk of bleeding, the VKAs are perioperatively substituted by LMWHs (13). Depending on the thromboembolic risk of the patient bridging therapy with LMWHs is given in therapeutic or prophylactic dose. Table 3 shows practical guidelines for substitution therapy. Thromboembolic risk is considered high in patients with mechanical valve replacement, atrial fibrillation combined with previous embolism or mitral/aorta valve pathology, previous embolism, deep venous thrombosis or pulmonary embolism less than 3 months ago.

Table 2

Preoperative recommendations concerning antithrombotics and anticoagulants (13, 14)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylsalicylic acid</td>
<td>Continue / stop 5-7d before surgery</td>
</tr>
<tr>
<td>Thienopyridines:</td>
<td>Stop unless exception (see text)</td>
</tr>
<tr>
<td>– Clopidogrel (Plavix®)</td>
<td>Stop 7 days before surgery</td>
</tr>
<tr>
<td>– Ticlopidin (Ticlid®)</td>
<td>Stop 10 days before surgery</td>
</tr>
<tr>
<td>– Prasugrel (Efient®)</td>
<td>Stop 10 days before surgery</td>
</tr>
<tr>
<td>Dipyridamole</td>
<td>Last intake evening before surgery</td>
</tr>
<tr>
<td>VKA:</td>
<td>Continue / stop depending on surgery</td>
</tr>
<tr>
<td>– Acenocoumarol (Sintrom®)</td>
<td>Stop 4 days before surgery</td>
</tr>
<tr>
<td>– Warfarine (Marevan®)</td>
<td>Stop 5-7 days before surgery</td>
</tr>
<tr>
<td>– Fenprocoumarol (Marcoumar®)</td>
<td>Stop 7-10 days before surgery</td>
</tr>
<tr>
<td>LMWH:</td>
<td></td>
</tr>
<tr>
<td>– Prophylactic dose</td>
<td>Stop 12 hours before surgery</td>
</tr>
<tr>
<td>– Half or full therapeutic dose</td>
<td>Stop 24 hours before surgery</td>
</tr>
<tr>
<td>Unfractionated heparin IV</td>
<td>Stop 4-6 hours before surgery / continue</td>
</tr>
</tbody>
</table>
If LMWHs are used in a prophylactic dose, the last administration should be given 12 hours before surgery. If half or full therapeutic dose is necessary, LMWHs should be stopped 24 hours before surgery. If LMWHs are preoperatively stopped as described above, epidural anesthesia is a possibility. Use of VKAs in therapeutic dose is an absolute contraindication for epidural anesthesia (16).

In patients receiving continuous intravenously unfractionated heparin, it is advised to stop 4-6 hours before surgery, unless the patient has an intra-aortic balloon pump, unstable angina or main coronary stenosis. The same time interval should be provided between heparin administration and puncture or catheter withdrawal (17).

Today the new oral anticoagulants are usually started postoperatively when used for thrombosis prophylaxis. In the near future they will also be used for patients with chronic atrial fibrillation or as treatment for deep venous thromboembolism/pulmonary embolism, or in secondary prevention after cardiovascular/neurological events. There is need for further research to investigate the optimal timing to stop these medications preoperatively. Some suggest perioperative bridging with the new parenteral direct thrombin inhibitor argatroban, which has a shorter half-life (18). The European Society of Anaesthesiology (ESA) provides recommendations on time intervals between neuraxial anesthesia or removal of catheters and anticoagulant administration. These are mainly based on pharmacokinetics and expert opinion (17).

Respiratory medication

In general, respiratory medication is continued perioperatively. Inhaled medications have been found to diminish the incidence of postoperative pulmonary complications. It is advised to continue puffs until just before surgery (4).

Theophylline should be discontinued the evening before surgery as its narrow therapeutic window. Theophylline metabolism is affected by many perioperative medications. High serum levels of theophylline may provoke arrhythmias and neurotoxicity.

Glucocorticoids are continued and if necessary a stress dose is given. Corticoids are discussed in the section about hormonal medication.

Gastrointestinal agents

H2 blockers and proton pump inhibitors can be continued perioperatively. There are no known adverse effects (2).

Psychotropic and neurologic agents

Literature about the topic of psychotropic agents is controversial. A patient-tailored management has to be pursued. Depending on the underlying physical condition, the type of medication, the possible interactions or withdrawal reactions and the psychiatric condition of the patient, it may be necessary to consult a psychiatrist to decide together whether to continue or to stop the medication (24). Abrupt interruption of antidepressants can cause a withdrawal syndrome and psychiatric recurrence or relapse, including the risk of suicidal behaviour.

Table 4 shows an overview of advises concerning preoperative use of psychotropic and neurologic agents.

Antidepressants

Most antidepressants inhibit reuptake of stimulating neurotransmitters, resulting in an increased concentration of these neurotransmitters. Use of sympathomimetic agents can result in severe hypertension because of fortification of its effect.

<table>
<thead>
<tr>
<th>TROMBOEMBOLIC RISK</th>
<th>SUBSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH RISK in mitral valve surgery, multiple valve surgery, old mechanical valves, atrial fibrillation with a CHADS2 score 5-6, thromboembolic incident less than 3 months ago</td>
<td>THERAPEUTIC DOSE of LMWHs until 24 hours before surgery. Start LMWH if INR less than 2. Continue LMWH postoperatively until 2 days of therapeutic INR. Restart VKA (usual dose) the day after surgery if hemostasis is sufficient</td>
</tr>
<tr>
<td>MODERATE RISK in bileaflet aortic valve surgery with other risk factors, atrial fibrillation with a CHADS2 score 3-4, thromboembolic event 3-12 months ago</td>
<td>HALF-THERAPEUTIC DOSE of LMWHs until 24 hours before surgery</td>
</tr>
<tr>
<td>LOW RISK in atrial fibrillation with a CHADS2-VASC score equal or less than 2, thromboembolic event more than 1 year ago</td>
<td>PROFYLACTIC DOSE of LMWHs until 12 hours before surgery</td>
</tr>
</tbody>
</table>

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Therefore indirect sympathicomimetics (ephedrine, cocaine) should be avoided.

On the other hand the anesthesiologist should be aware of the serotonin syndrome, a life-threatening condition caused by an increased serotonin stimulation. It is characterized by changes in autonomic, neuromotor and cognitive-behavioural function (25). The combined use of serotonin-reuptake inhibitors (SSRIs), tricyclic antidepressants (TCAs), monoamine oxidase A inhibitors (MAO-A-I) with tramadol, pethidine, triptane, dextromethorphan, erythromycin or atypical neuroleptics should be restricted. Chronic use of antidepressants affects the anesthetized patient: hypotension, arrhythmias, changed thermoregulation, altered postoperative pain, differences in surgical stress response and postoperative confusion (25).

Antidepressant discontinuation can cause withdrawal reactions, which occur frequently but are usually mild and short in duration. Symptoms usually emerge within 1-3 days after cessation of the antidepressant and can be relieved within 24 hours by restarting therapy. Symptoms can be grouped into psychiatric, gastrointestinal, neurologic and somatic symptoms (25).

If decided that MAO-A-I need to be continued, a MAO-safe anesthetic technique should be used including use of direct sympathomimetics and avoiding drugs which can result in increasing serotonin levels as mentioned above.

SSRIs decrease platelet aggregation and could increase surgical blood loss. This absolute risk is small, but the bleeding risk increases if SSRIs are combined with aspirin or NSAID use. Thus bleeding risk should be weighed against exacerbation of mood disorders. In some cases it is recommended to consult a psychiatrist to consider alternative therapy during the perioperative period. SSRIs are among the psychotropic drugs those with the highest risk of development of the syndrome of inappropriate secretion of ADH (SIADH) (24).

TCAs increase the risk of arrhythmias in combination with some volatile anesthetics or sympathomimetics. The seizure threshold is lowered. Most literature recommends to continue TCAs (25).

Lithium continuation may prolong the effect of muscle relaxants and due to nephrogenic diabetes insipidus, hypovolemia and hypernatremia can be induced. Therapy is to be continued with monitoring of lithium serum level, electrolytes and volume status.

Antipsychotics and benzodiazepines

The use of antipsychotics is associated with an increased risk of sudden death. They may prolong QT-interval and cause arrhythmias or hypotension, particularly when coadministered with volatile anesthetic drugs or erythromycin, quinolones, amiodarone and sotalol. Antipsychotics potentiate sedative and hypotensive effects of anesthetic drugs. Management of antipsychotics should be discussed with a psychiatrist. Preoperative evaluation of an electrocardiogram is mandatory. To prevent withdrawal (cholinergic) symptoms in the postoperative phase, long acting parenteral form of haloperidol or risperidone can be started.

Benzodiazepines are classic antianxiety adjuvants in anesthesia. Chronically used benzodiazepines should be continued perioperatively to prevent withdrawal reactions (2).

### Table 4

Preoperative advise concerning psychotropic and neurologic drugs

| Irreversible monoamine oxidase inhibitors (MAO-I) | Stop 2 weeks before surgery or continue |
| St. John’s wort | Stop 1 week before surgery |
| Noradrenalin- and serotonin-reuptake-inhibitors | Stop 24 h before surgery or continue |
| Reversible MAO-A-I | Stop 24 h before surgery or continue |
| SSRI (selective serotonin-reuptake-inhibitors) | (Last intake evening before surgery or) continue |
| TCA (tricyclic antidepressants) | (Stop 1 week before surgery or) continue |
| Lithium | Last intake evening before surgery or continue |
| Antipsychotics | Last intake evening before surgery or continue |
| Psychostimulant medication | Last intake evening before surgery |
| Benzodiazepines | Last intake evening before surgery or continue |
| Anti-Parkinson medication | Continue, except: selegiline (reversible MAO-I) last intake evening before surgery |
| Antiepileptics | Continue |
Neurologic medication

Anti-Parkinson medication, especially levodopa, must be continued. Acute cessation of these drugs worsens extrapyramidal symptoms, without considering the risk of pseudo-malignant neuroleptic syndrome (26). Selegiline and rasagiline are selective inhibitors of the MAO-B enzyme (MAO-B-I) that seem to cause less hypertension than the MAO-A-I in the presence of sympathomimetic agents. They are stopped the evening before surgery.

Antiepileptics are continued to prevent epileptic seizures. Enzyme induction must be considered. Their serum level should be checked preoperatively (1), whenever a routine lab test allows it. When antiepileptic medications are used in the context of chronic neuropathic pain, it is also recommended to maintain their administration, even on the day of surgery.

Hormonal medication

In general hormonal medication must be continued perioperatively (27).

Estrogens and estrogen receptor modulators

There is discussion concerning oral contraception. On one hand it increases the risk of perioperative thromboembolic complications, on the other hand the risk of (unwanted) pregnancy must be considered. If the risk of thromboembolism predominates, oral contraceptives should be stopped 4-6 weeks preoperatively and other forms of contraception can be considered. If oral contraceptives are continued, thromboembolic prophylaxis should be considered and/or provided perioperatively.

Postmenopausal hormone therapy should be stopped 4-6 weeks preoperatively for the same reason. The patient may experience temporary discomfort of menopausal symptoms. Treatment is resumed once the elevated risk of thromboembolism has resolved.

Selective estrogen receptor modulators are associated with increased risk of thromboembolism. If used for prevention of breast cancer or osteoporosis the same advise is given as for postmenopausal hormone therapy. If used for cancer treatment, consultation with an oncologist is recommended.

Diabetic medications (31, 32)

There is evidence that good perioperative control of glycemia can ameliorate outcome (28). Diabetes mellitus is associated with increased risk of perioperative cardiovascular morbidity and mortality, infection, renal insufficiency and hypoglycemia. Uncontrolled diabetes can lead to volume depletion due to osmotic diuresis, and life-threatening conditions such as ketoacidosis, nonketotic hyperosmolar coma or hypoglycemia.

Preferentially diabetics should be scheduled for surgery in the morning. If not possible, an infusion with glucose and insulin must be provided, to maintain normoglycemia. Alternatively, if scheduled for early morning and minor surgery, insulin-dependent diabetics may receive half of the total morning insulin dose (short-acting and intermediate-acting doses added up) as intermediate or long-acting insulin to prevent ketosis as replacement of intravenous insulin infusion. Glycemia should be checked preoperatively, intraoperatively and postoperatively regularly every 2-4 hours. Subcutaneous sliding scale using short-acting insulin should be implemented.

For patients in intensive care unit or patients who have had an acute myocard infarction (AMI) it is shown that achieving normoglycemia (80-110 mg/dl) may reduce mortality (29). Target levels of perioperative regulation of glycemia remain unclear in other populations. Most guidelines agree upon attempting to reach glycemia readings below 180-200 mg/dl.

An overview of preoperative management of diabetic medication is given in table 5.

Because of the risk of lactate acidosis and acute renal insufficiency, it is advised to stop metformin 24-48 h before surgery. Sulfonylureas are stopped the evening before surgery because they prevent ischemic preconditioning of the heart (30).

Patients who use insulin therapy are advised to continue the use of insulin in reduced dose even when not eating to prevent ketosis. The last subcutaneous injection of insulin in normal dose is the evening before surgery. The evening dose of intermediate-acting insulin may be reduced to prevent nocturnal hypoglycemia.

Some medications can alter glycemia, such as somatostatin and glucocorticoids. When used intraoperatively, it is indicated to check glycemia.

Diabetes treatment regimen may be restarted postoperatively once the patient is eating well. Restarting metformin should be delayed 48 hours after surgery, even longer in patients with renal insufficiency, dehydration or severe hepatic insufficiency because of the risk of lactate acidosis. Sulfonylureas should be restarted gradually because of the risk of hypoglycemia as they stimulate insulin secretion.
Glucocorticoids (30)

Patients on chronic glucocorticoid therapy are at risk for adrenal insufficiency. In stress circumstances this leads to an Addison crisis, including vomiting and hypotension. Adrenal insufficiency should be estimated preoperatively and a correct stress substitution must be provided.

A suppressed hypothalamic-pituitary-adrenal axis (HPA) is suspected in patients taking glucocorticoids for more than 3 weeks in a dose equivalent greater than 20 mg prednisone daily, and patients with a Cushingoid appearance. They should be given an increased dose of corticosteroids perioperatively. Patients who have taken corticoids less than 3 weeks, or have a chronic alternate day therapy, or take a dose equivalent less than 5 mg prednisone daily are unlikely to have HPA suppression. They should continue their usual dose of glucocorticoids perioperatively.

**Analgetics**

Often patients take analgetics preoperatively. There is no evidence to stop the administration of analgetics preoperatively. Patients taking opioids chronically will have developed opioid tolerance and will respond differently to a same dose of opioids than opioid-naïve patients. Abrupt discontinuation of chronic opioid use may result in withdrawal symptoms including abdominal cramps, nausea and vomiting, diarrhea, insomnia, anxiety, irritability, salivation.

NSAID’s can be continued on the day of surgery, but the increased risk of bleeding complications and renal insufficiency should always be considered. If the risk of perioperative hemorrhage is considered important, they are best stopped preoperatively. NSAID’s with a long half life, such as oxicams and naproxen, are stopped 7-10 days before surgery. NSAID’s with a short half life, for example ibuprofen, are stopped 24 hours before surgery (16).

**Herbal medications and food supplements**

This category of products is often forgotten nor mentioned by the patient. Some have interactions with other medications or with physiologic systems. It is advised to stop all these products at least one week before surgery. For example garlic, ginseng, ginger or ginkgo biloba can have an antithrombotic effect, though it is unclear if it is clinically significant. The ESA doesn’t consider these substances a contraindication for neuraxial puncture (33).

St. John’s Wort may induce cytochrome P450 enzymes overexpression, thereby enhancing the metabolism of many drugs. It may also interact with other drugs provoking the serotonin syndrome. Ginseng interferes with corticosteroids and digoxin, insulin, sulphonyurea and biguanides (25). Noteworthy, valeriane potentiates the effect of benzodiazepines.

**Conclusions**

Good perioperative medication management improves postoperative outcome. Most medications are to be continued perioperatively. Important categories of medication that need to be stopped preoperatively are diuretics, ACE-I and related medications, fibrates and oral antidiabetics.
To decide whether to continue preoperatively antithrombotic treatment, the thromboembolic risk should be balanced against the risk of bleeding by considering the type of surgery, the type of medication and the underlying pathology. The trend is to continue the use of acetylsalicylic acid, except for surgery with high risk of bleeding, such as neurosurgery, amygdallectomy, intravital surgery and transurethral prostate resection. Thienopyridines are continued in patients who have had an acute coronary syndrome less than 3 months before scheduled surgery. In patients who underwent, less than 6 weeks before, a bare metal stent (BMS) implantation or, less than 12 months before, a drug eluting stent (DES) implantation the same advise is given.

In case of surgery with low risk of bleeding VKAs are continued in reduced dose to obtain an INR between 1.5-2. Depending on the thromboembolic risk of the patient bridging therapy with LMWHs is given in therapeutic or prophylactic dose. Concerning the new oral anticoagulants there is need for further research to investigate the optimal timing to stop these medications preoperatively and to determine the need of a bridging therapy.

Patients taking psychotropic agents or antipsychotics need a patient-tailored management. Even MAO-I can be continued if using a MAO-safe anesthetic technique with use of direct sympathomimetics and avoiding drugs which can result in a serotonin syndrome.

There is evidence that good perioperative control of glycemia can ameliorate outcome.

Insulin-dependent patients always need a baseline insulin administration. In patients taking corticoids chronically adrenal insufficiency should be estimated preoperatively and a correct stress substitution must be provided.

Lack of evidence about certain medications is reflected by variation in management recommendations found in literature.

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