

European Society of Cardiology 2009 guidelines for preoperative cardiac risk assessment and perioperative cardiac management in noncardiac surgery

Key messages for clinical practice

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KEY WORDS

guidelines,
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ABSTRACT

Patients undergoing noncardiac surgery are at risk of adverse perioperative and long-term outcome. When considering a patient for noncardiac surgery, a careful preoperative clinical risk evaluation and subsequent risk-reduction strategies are essential to reduce postoperative complications. To assist physicians with decision making, clinical guidelines are developed. The aim of clinical guidelines is to improve patient care by providing recommendations about appropriate healthcare in specific circumstances. Development of clinical guidelines is an important component in improving the quality of care. By translating the best available scientific evidence into specific recommendations, guidelines can serve as a useful tool to achieve effective and efficient patient care. In 2009, the first European Society of Cardiology guidelines on perioperative care were developed. This decision-making process integrates clinical markers, early coronary evaluation, functional capacity, and the type of surgery involved.

In Europe, with an overall population of approximately 490 million, crude estimates of 7 million major surgical procedures are conducted annually. Cardiac events, such as myocardial infarction (MI) and cardiac death, are a major cause of perioperative morbidity and mortality in these patients. After major surgery, the incidence of cardiac death varies between 0.5% and 1.5%, with nonfatal cardiac complications ranging between 2% and 3.5%. Although the perioperative event rate has declined over the past decades as a result of achievements in anesthesiological and surgical techniques, perioperative cardiovascular complications remain a significant problem. Therefore, appropriate preoperative cardiac risk assessment and implementation of proper risk reduction strategies are of imminent importance in the perioperative setting. The recently published new guidelines of the European Society of Cardiology

(ESC) on perioperative cardiac care provide valuable tools for daily clinical practice for the physicians.¹ In this review, the most important recommendations for preoperative cardiac risk assessment and perioperative cardiac management in noncardiac surgery are highlighted.

In general, the risk of perioperative complications depends on the condition of the patient prior to surgery, the prevalence of comorbidities, and the severity, type, and duration of the surgical procedure. Especially patients with documented or hidden coronary artery disease (CAD) undergoing procedures that are associated with prolonged hemodynamic and cardiac stress are prone to cardiac complications. Perioperative MI (PMI) is one of the most important predictors of short- and long-term morbidity and mortality associated with noncardiac surgery. The highest incidence of PMI is within the first 3 days after

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TABLE 1 Unstable cardiac conditions

unstable angina pectoris
acute heart failure
significant cardiac arrhythmias
symptomatic valvular heart disease
recent MI ^a and residual myocardial ischemia

a an MI within 30 days, according to the universal definition of MI²

Abbreviations: MI – myocardial infarction

surgery ($\pm 5\%$). Unfortunately, the exact underlying mechanism of PMI is still not clear, but it seems to be the same as in other settings. Coronary plaque rupture, leading to thrombus formation and subsequent vessel occlusion, is considered to be an important cause of acute perioperative coronary syndromes. Surgery itself is a significant stress factor leading to an increased risk of plaque rupture. Two retrospective studies investigated the coronary pathology of fatal PMI and found that half of PMIs are related to plaque rupture. It is thought that the other half of PMIs are related to a sustained myocardial supply/demand imbalance due to tachycardia and increased myocardial contractility in patients with significant CAD.

Step 1 The first step is the assessment of the urgency of the surgical procedure. If urgent surgery is the case, patients will go directly for surgery.

Step 2: active cardiac disease The next step is the identification of active cardiac disease. This includes recent (within the previous 30 days) MI and residual ischemia, unstable angina pectoris, acute heart failure, significant cardiac arrhythmias, and symptomatic valvular heart disease (**TABLE 1**). In case of active or unstable cardiac conditions, the patient should be referred immediately for evaluation and treatment prior to surgery.

Step 3: surgical risk Surgical procedures can be classified to be associated with a low ($<1\%$), intermediate ($1\%–5\%$), or high risk ($>5\%$) for the development of perioperative adverse cardiac events (cardiac death and MI) within 30 days after surgery (**TABLE 2**). Patients undergoing vascular surgery are generally at a greater cardiac risk than patients undergoing any other type of surgery. If the estimated cardiac risk of the procedure is low, it is recommended to proceed with the planned surgical procedure and provide recommendations on lifestyle and medical therapy according to the guidelines to improve a long-term outcome.

Step 4: functional capacity The new guidelines recommend the assessment of functional capacity as a pivotal step in preoperative cardiac risk assessment. Functional capacity is measured in metabolic equivalents (METs). Poor functional

TABLE 2 Surgical risk estimate

low ($<1\%$)
breast
dental
endocrine
eye
gynecological
reconstructive
orthopedic – minor (knee surgery)
urological – minor
intermediate ($1\%–5\%$)
abdominal
carotid
peripheral arterial angioplasty
endovascular aneurysm repair
head and neck surgery
neurological/orthopedic – major (hip and spine surgery)
pulmonary renal/liver transplant
urological – major
high ($>5\%$)
aortic and major vascular surgery
peripheral vascular surgery

capacity, i.e., a MET <4 , is equivalent to the inability to climb 2 flights of stairs or run a short distance. Patients with a good functional capacity (MET >4) might be scheduled for surgery, providing that patients with CAD or risk factor(s) receive statin therapy and a titrated low-dose β -blocker regimen prior to surgery. Patients with a moderate or low functional capacity are at an increased risk of postoperative events. In these patients, the presence and number of cardiac risk factors in combination with the risk of the procedure should be considered for further risk stratification and management. Intermediate-risk patients might be scheduled for the procedure after an electrocardiogram is performed, and appropriate medical therapy (i.e., statins, low-dose titration of β -blockers, and angiotensin-converting enzyme [ACE] inhibitors for those with systolic dysfunction) is initiated. For those patients with a moderate or poor functional capacity (MET <4) scheduled for a high-risk procedure, the identification of cardiac risk factors is the next step.

Step 5: clinical cardiac risk factors In patients with a moderate or poor functional capacity and undergoing high-risk surgery, risk factors that should be taken into consideration are a history of MI, angina pectoris, diabetes mellitus, renal dysfunction, a history of transient ischemic attack or cerebrovascular accident, and congestive heart failure (**TABLE 3**). In patients with up to 2 clinical cardiac risk factors (intermediate clinical cardiac risk), statins and low-dose titration of β -blockers are recommended prior to surgery,

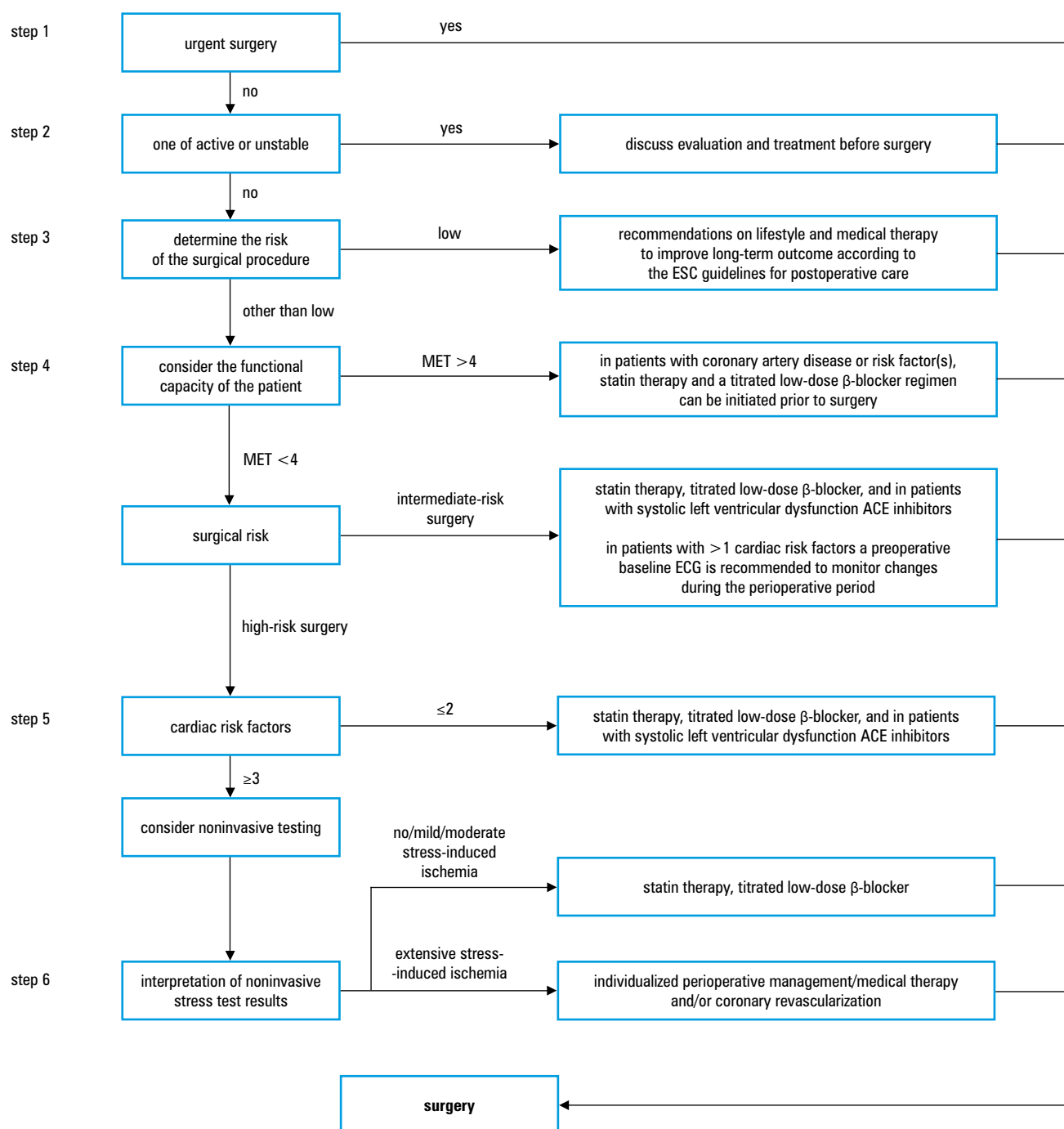


FIGURE Cardiac risk assessment and perioperative cardiac management in noncardiac surgery on the basis of the European Society of Cardiology (ESC) guidelines. Abbreviations: ACE – angiotensin-converting enzyme, ECG – electrocardiogram, MET – metabolic equivalent

TABLE 3 Clinical risk factors

angina pectoris
prior MI ^a
heart failure
stroke/transient ischemic attack
renal dysfunction (serum creatinine > 170 μmol/l)
diabetes mellitus requiring insulin therapy

^a according to the universal definition of MI²

Abbreviations: see TABLE 1

and ACE inhibitors for those with systolic dysfunction. Additional cardiac stress testing is not recommended in this patient group.

Step 6: additional noninvasive testing The need for additional noninvasive testing depends on the sum of clinical cardiac risk factors and the type of surgery the patient is scheduled for. If patients have 3 or more clinical risk factors and are scheduled for high-risk surgery, noninvasive stress testing is recommended. In selected cases, one might also consider additional cardiac testing as means of patient counseling. If cardiac stress testing shows no or only mild stress-inducible myocardial ischemia, additional invasive testing is not recommended, and patients can proceed with the planned surgical procedure. Again, it is recommended that patients should be prescribed statins, low-dose titration of β-blockers prior to surgery, and those with systolic dysfunction should have additional ACE inhibitors.

In patients with extensive stress-inducible myocardial ischemia, the very high cardiac risk of the planned surgical procedure and the possible harms of not performing a surgery (i.e., risk of rupture in patients with abdominal aortic aneurysm) have to be individually considered. Optimal medical treatment including β -blockers and statins may not provide sufficient cardioprotection. If preoperative revascularization is considered after multidisciplinary consultation, it must be taken into account that the surgical procedure must be postponed at least 2 weeks for balloon angioplasty, 3 months for bare-metal coronary stent placement, and 12 months for drug-eluting coronary stent placement.

Perioperative cardiovascular medication recommendations β -blockers

The classic idea of the benefit of β -blocking agents in the perioperative period is their effect on restoring the oxygen supply/demand mismatch. Additional cardioprotective effects are redistribution of coronary blood flow to the subendocardium, plaque stabilization, and an increase in the threshold for ventricular fibrillation. β -adrenergic receptor antagonists (β -blockers) are divided into β_1 -selective and nonselective (β_1 and β_2) adreno-receptor blockers. Atenolol, metoprolol, and bisoprolol, all β_1 -selective blockers, are commonly used for perioperative care.

The specific issue of whether to use β -blockers perioperatively in patients undergoing noncardiac surgery has raised controversies in the past few years. Especially since the publication of the POISE study and the subsequent meta-analysis by Bangalore et al., there has been ongoing debate on the usefulness and safety of perioperative β -blocker therapy.^{3,4} Current ESC guidelines have comparable recommendations for perioperative β -blockers use compared with the American Society of Cardiology/American Heart Association guidelines.^{5,6} β -blockers are recommended for patients with high cardiac risk based on multiple clinical cardiac risk factors and stress-induced myocardial ischemia. Furthermore, β -blocker therapy is probably reasonable for patients at intermediate risk, scheduled for high- and intermediate-risk surgery. Acute initiation of high-dose β -blocker therapy should be avoided. Importantly, the guidelines strongly recommend dose titration of β -blockers, which requires treatment initiation optimally 30 days and at least 1 week before surgery. It is recommended to start with a daily dose of 2.5 mg of bisoprolol or 50 mg of metoprolol succinate, and if necessary, adjust the dose before surgery to achieve a resting heart rate between 60 and 70 beats per minute with systolic blood pressure >100 mmHg.

Recommendations

1 β -blockers are recommended in patients who have known ischemic heart disease or myocardial ischemia according to preoperative testing (IB).

2 β -blockers are recommended in high-risk surgery (IB).

3 Continuation of β -blockers is recommended in patients previously treated with β -blockers because of ischemic heart disease, arrhythmias, or hypertension (IC).

4 β -blockers should be considered in patients scheduled for intermediate-risk surgery (IIaB).

5 Continuation in patients previously treated with β -blockers because of chronic heart failure with systolic dysfunction is recommended (IIaC).

6 β -blockers may be considered in patients scheduled for low-risk surgery with risk factor(s) (IIbB).

7 β -blockers are not recommended in patients scheduled for low-risk surgery without risk factor(s) (IIIB).

Statins Statins are widely prescribed in patients with or at risk for CAD because of their effectiveness in lowering serum cholesterol concentrations through 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibition. Beyond the lipid-lowering effect of statins alone, evidence suggests that the more immediate benefits are related to the so called pleiotropic effects of statins. These pleiotropic effects are thought to include improved endothelial function, enhanced stability of atherosclerotic plaques, decreased oxidative stress, and decreased vascular inflammation.⁷ These effects of statins may consequently prevent plaque rupture and subsequent MI in the proinflammatory and prothrombotic environment of the perioperative period. The new ESC guidelines give statins the key role in the prevention of perioperative cardiac events. Therefore, a preoperative screening visit should be considered an excellent opportunity not only for perioperative cardiac risk reduction with statins but also a long-term cardiac risk reduction.

Recommendations

1 It is recommended that statins be started in high-risk surgery, optimally between 30 days and at least 1 week before surgery (IB).

2 It is recommended that statins be continued perioperatively (IC).

Acetylsalicylic acid The role of antiplatelet therapy for the prevention of perioperative cardiac events remains controversial. The possible antithrombotic benefits of antiplatelet therapy on perioperative cardiac outcome should be weighed against the possibly increased bleeding risk of its use. However, in general, it is recommended to continue antiplatelet therapy throughout the perioperative period.

Recommendations

1 Continuation of acetylsalicylic acid (ASA) in patients previously treated with ASA should be considered in the perioperative period (IIaB).

2 Discontinuation of ASA therapy in patients previously treated with ASA should be considered only in those in whom hemostasis is difficult to control during surgery (IIaB).

Angiotensin-converting enzyme inhibitors Perioperative treatment with ACE inhibitors seem to have beneficial effects on postoperative outcome. In patients with left ventricular dysfunction, who are in stable clinical condition, it seems reasonable to continue ACE inhibitors during the perioperative period.

Recommendations

- 1** ACE inhibitors are recommended in cardiac stable patients with left ventricular dysfunction scheduled for intermediate or high-risk surgery (IC).
- 2** ACE-inhibitors should be considered in cardiac stable patients with left ventricular dysfunction scheduled for low-risk surgery (IIaC).
- 3** Transient discontinuation of ACE inhibitors before noncardiac surgery in hypertensive patients should be considered (IIaC).

Conclusions This review is a summary of the most important points of the new ESC guidelines for perioperative cardiac risk reduction. Patients undergoing noncardiac surgery have an increased risk of cardiovascular perioperative morbidity and mortality. Preoperative management aims at optimizing the patient's condition by identification and modification of underlying cardiac risk factors and diseases. Systemic medical therapy with β -blockers and statins is currently one of the cornerstones of individualized perioperative management. It should be realized that the preoperative screening of patients does not only offer a unique opportunity to modify the perioperative cardiac risk but also provides a golden opportunity to modify the long-term cardiac risk.

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Przedoperacyjna ocena ryzyka sercowego i zasady opieki kardiologicznej w okresie okołooperacyjnym u chorych poddawanych operacjom niekardiochirurgicznym

Główne przesłania dla praktyki klinicznej z wytycznych Europejskiego Towarzystwa Kardiologicznego 2009

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SŁOWA KLUCZOWE

operacje niekardiochirurgiczne, opieka okołooperacyjna, wytyczne

STRESZCZENIE

Chorzy poddawani operacjom niekardiochirurgicznym są obciążeni ryzykiem wystąpienia powikłań sercowo-naczyniowych w okresie około- i pooperacyjnym. Aby uniknąć powikłań pooperacyjnych, podczas kwalifikacji do zabiegu niekardiochirurgicznego podstawowe znaczenie ma staranna przedoperacyjna ocena ryzyka, a następnie wdrożenie strategii jego zmniejszania. Opracowano wytyczne praktyki klinicznej pomocne lekarzom w podejmowaniu decyzji. Celem tych wytycznych jest poprawa opieki nad pacjentami dzięki sformułowaniu zaleceń opisujących zasady postępowania odpowiedniego w różnych sytuacjach klinicznych. Opracowywanie wytycznych praktyki klinicznej jest ważną składową ulepszenia jakości opieki. Wytyczne, będące przełożeniem najlepszych dostępnych danych naukowych na język konkretnych zaleceń, mogą być użytecznym narzędziem realizacji skutecznej i wydajnej opieki nad pacjentem. W 2009 r. opracowano pierwsze wytyczne Europejskiego Towarzystwa Kardiologicznego na temat opieki okołooperacyjnej. Proces podejmowania decyzji obejmuje analizę wskaźników klinicznych, wczesną ocenę tętnic wieńcowych, wydolności czynnościowej i rodzaj planowanej operacji.

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