

Should I anaesthetise this patient?

Rational cardiovascular assessment

Cardiovascular disease is common in South Africa, and anaesthesia is commonly required in these patients.

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Cardiovascular disease is an important cause of morbidity in South Africa. Anaesthesia is commonly required in patients with coronary artery disease, hypertension and valvular heart disease. In South Africa, morbidity associated with coronary artery disease is now more common than that in the developed world. Hypertension is the second most important risk factor for death in South Africa.

Preoperative cardiovascular assessment for elective surgery

The assessment of patients with cardiovascular disease should focus on three broad categories that determine perioperative cardiac outcome (Table I).

Table I. Determinants of perioperative outcome¹

- The medical (or cardiac) condition of the patient
- The extent of the planned surgery
- The functional capacity of the patient

Patients who require preoperative cardiovascular evaluation

A thorough history, physical examination and selected investigations (ECG, serum creatinine) should identify patients who require further cardiovascular evaluation and optimisation prior to surgery (Table II).

Table II. Patients who need cardiovascular evaluation prior to surgery¹

Condition	Example
Unstable coronary syndromes	Recent myocardial infarction Unstable angina
Decompensated heart failure	Dyspnoeic at rest Worsening dyspnoea
Significant arrhythmias	Symptomatic arrhythmias High-grade bradycardias Ventricular tachycardias
Severe valvular heart disease	Particularly stenotic lesions

If there is no indication for immediate cardiac or medical optimisation, then attention to both the severity and the combination of the medical risk factors, functional capacity and surgical risk (as shown in Table I) may mandate further investigation.

Medical condition of the patient

Medical examination should identify the presence of established risk factors of perioperative cardiac risk (Table III). These risk factors form Lee's Revised Cardiac Risk Index,² which has now superseded Goldman's classification. These risk factors are additive in predicting perioperative cardiac morbidity.

Table III. Risk factors associated with perioperative cardiac morbidity²

- History of ischaemic heart disease
- History of heart failure
- History of stroke
- Diabetes
- Renal dysfunction (serum creatinine > 180 $\mu\text{mol.l}^{-1}$)

Surgical risk¹

Patients undergoing low-risk surgery rarely warrant further investigation prior to surgery if they have none of the conditions shown in Table II. Low-risk surgery includes procedures such as cataract surgery, superficial procedures and breast surgery.

Vascular surgery is high-risk surgery associated with significant cardiac risk. In addition, intermediate-risk surgery such as intra-abdominal, intra-thoracic, major orthopaedic and head and neck surgery may all pose a cardiac risk, if the surgery is prolonged and associated with significant fluid shifts.

Functional capacity¹

Patients who are asymptomatic with a good functional capacity are generally good surgical candidates. A history of being able to climb a flight of stairs is generally accepted as a marker of acceptable functional capacity. Patients who cannot do this or who get short of breath doing light work around the house should be considered to have poor functional capacity.

The decision whether to proceed with surgery

Postponement of surgery should only occur if it will potentially change the management (and hence hopefully improve the perioperative outcome) of the patient. Guidelines for whether it is appropriate to proceed to surgery are presented in Table IV.¹

As can be seen from Table IV, the appropriateness of deferring surgery in the intermediate-risk patient with established cardiac clinical risk factors remains controversial. In these patients, a risk-

Table IV. A step-wise approach to surgical decision making (based on the ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation)¹

Pre-operative assessment	Action
• Life-threatening conditions identified (Table II)	Defer
• Low-risk surgery	Proceed
• Good functional capacity	Proceed
• Intermediate-risk surgery with indeterminate or poor functional capacity	
• No cardiac risk factors (Table III)	Proceed
• 1 or 2 cardiac risk factors	Proceed*
• 3 or more cardiac risk factors	Proceed†
• Vascular surgery	Refer to a specialist anaesthetist

* Deferring surgery in these patients can only be advocated if it is believed that the results of a non-invasive investigation will change the medical or perioperative management of the patient.

benefit analysis is necessary. The potential benefit accrued by further investigation and subsequent medical therapy needs to be balanced against the morbidity associated with further investigation, and the morbidity associated with delaying the originally planned non-cardiac surgery (Table V).

Appropriate preoperative investigations

Further preoperative investigation is only appropriate if it provides:

- diagnostic information necessary to optimise or institute further medical therapy preoperatively
- diagnostic information necessary for appropriate perioperative management
- determination of baseline morbidity, which may be needed for further perioperative risk stratification.

Investigations that may be beneficial in determining further management are shown in Table VI.

Interventions that may improve perioperative cardiovascular outcome

The majority of patients presenting for elective non-cardiac surgery will proceed to surgery without the need for further preoperative evaluation or intervention. However, in patients who have cardiac risk factors and are undergoing intermediate-risk or vascular surgery, perioperative interventions may improve cardiac outcome (Table VII).¹ It is important to appreciate that the care of the cardiac patient starts in the preoperative period and continues through into the postoperative period.

Other medical considerations

Hypertension

Deferring surgery in patients with essential hypertension presenting for elective surgery is appropriate if there is a hypertensive emergency. Patients who present with cardiac clinical risk factors and associated grade 3 hypertension (SBP ≥180 mmHg and DBP ≥110 mmHg) need a risk-benefit analysis based on the risk associated with delaying surgery for 4 - 6 weeks, in order to establish an appropriate response to modification of hypertensive therapy.

Previous percutaneous coronary revascularisation¹

Patients who have had previous percutaneous coronary interventions are potentially at significant perioperative risk, as a result of haemorrhage (secondary to anti-platelet medication), thrombosis and myocardial infarction (associated with withdrawal of anti-platelet (thienopyridine) therapy) and late coronary restenosis. Perioperative considerations in these patients are presented in Table VIII. If surgery proceeds at an optimal time following a percutaneous coronary intervention, the patient should

Table V. Examples of risk-benefit considerations associated with preoperative cardiac interventions

Intervention	Risk-benefit considerations
Preoperative coronary revascularisation	Higher mortality before planned non-cardiac surgery ³ Only of benefit in patients with medical indications for coronary revascularisation
Perioperative beta-blockade ⁴	Increased perioperative all-cause mortality (POISE study data) Increased perioperative stroke Decreased perioperative myocardial infarction
Delay in planned non-cardiac surgery associated with intervention	Progression of surgical pathology, e.g. conversion of operable cancer to inoperable cancer

Table VI. Considerations for further appropriate preoperative investigations

Investigation	Patients in whom it may be informative	Considerations
Resting echocardiography	Dyspnoea of unknown aetiology Worsening dyspnoea Cardiac murmur	May identify aetiology of dyspnoea A low resting ejection fraction is not necessarily associated with an adverse perioperative outcome Diagnosis of a specific valvular heart lesion allows for appropriate perioperative management
ECG	Patients with cardiac clinical risk factors Vascular surgical patients	In patients without established CAD, an ECG may identify CAD A baseline ECG is useful for subsequent risk stratification in patients who develop perioperative myocardial ischaemia
Non-invasive stress testing or coronary angiography	Patients who fulfil current medical indications	Preoperative coronary revascularisation is only of benefit in patients with established medical indications

CAD = coronary artery disease.

Table VII. Interventions which may improve perioperative cardiovascular outcome¹

Intervention	In whom is it indicated	Appropriate anaesthetist for non-cardiac procedure
Preoperative interventions		
Coronary revascularisation	Only patients with medical indications for coronary revascularisation	All, provided 6 weeks have elapsed since coronary revascularisation
Perioperative beta-blockade	Expected major cardiac morbidity >10% ⁵	Specialist anaesthetist
Perioperative statin therapy	All patients with medical indications for statin therapy	All
Intraoperative interventions		
Effective pain management	All	All
Normothermia	All	All
Tight glucose control	Patients at high risk of perioperative myocardial ischaemia/vascular patients	Specialist anaesthetist
Haemodynamic optimisation	Expected perioperative mortality >20%	Specialist anaesthetist
Postoperative interventions		
Postoperative oxygen	All	All
Postoperative ECG	Any patient with possible perioperative ischaemia	All
Postoperative troponins	All patients with possible perioperative ischaemia or ECG changes	All

ideally receive perioperative aspirin, provided there is no contraindication.

Valvular heart disease

The management of patients with valvular heart disease is beyond the scope of this article. However, it must be appreciated that this group of patients require specific perioperative management of heart rate, preload, afterload and myocardial contractility according to the valvular lesion present.

Emergency surgery¹

The need for emergency surgery that does not allow adequate time for further medical investigation and optimisation in a patient

at cardiac risk ideally requires appropriate perioperative surveillance and management by a specialist anaesthetist. These patients would require further investigation and management of the cardiac condition in the postoperative period.

Considerations for the generalist practitioner

Unfortunately, not all patients with major clinical predictors requiring life- or limb-saving surgery have access to specialist anaesthetists. In this situation, the generalist should attempt to obtain specialist assistance. Transferral of the patient to a specialist anaesthetist or the procedure awaiting a

specialist visit is only appropriate if it can be achieved within a clinically acceptable time period after discussion with a specialist anaesthetist. In the event of the generalist needing to proceed with emergency surgery and anaesthesia, telephonic advice before, during and after the operation can be very useful. The most experienced doctors in the hospital should perform the anaesthesia and surgery.

Conclusion

Patients at cardiac risk presenting for non-cardiac surgery require a methodical approach to preoperative risk stratification. Deferring of elective non-cardiac surgery, other than in patients with established unstable cardiovascular conditions, should only be considered after an appropriate risk-benefit analysis. The importance of simple measures such as adequate pain relief, normothermia and postoperative oxygen should not be forgotten in the patient at perioperative cardiac risk.

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Table VIII. Managing patients with previous percutaneous coronary interventions¹

Percutaneous intervention	Optimal time to non-cardiac surgery	Risk associated with early surgery	Risk associated with late surgery
Angioplasty	>2 - 4 weeks <8 weeks	Vulnerable coronary plaque and MI	Restenosis of coronary artery
Bare-metal stent	>4 - 6 weeks	Stent thrombosis and MI	Restenosis of stent
Drug-eluting stent	>1 year	Stent thrombosis and MI	

MI = myocardial infarction.

In a nutshell

- Cardiovascular disease is a leading cause of perioperative morbidity in South Africa.
- Unstable cardiovascular conditions need to be identified preoperatively and further evaluated.
- Unstable cardiovascular conditions include unstable coronary syndromes, decompensated cardiac failure, significant arrhythmias and severe valvular heart disease.
- Perioperative cardiac morbidity is related to the medical condition and functional capacity of the patient, and the extent of the surgery.
- Cardiac clinical risk predictors include a history of ischaemic heart disease, heart failure, stroke, diabetes and renal dysfunction.
- Patients undergoing low-risk surgery and patients with good functional capacity are generally good surgical candidates.
- One should always first consider the risk versus benefit before deferring an intermediate-risk patient.
- Attention to simple perioperative factors such as analgesia, temperature and postoperative oxygen is important.
- In high-risk cases anaesthesia must be provided by the most experienced doctor possible within the limitation of the health service.

*Single suture****Surviving in an emergency***

A hazard in hospital casualty departments is that patients can deteriorate without busy staff noticing. But now the Scalable Medical Alert Response Technology (SMART) device can save the day. Developed by Dorothy Curtis and colleagues at the Massachusetts Institute of Technology, the device is an infrared blood oxygen sensor that clips onto a finger and chest electrodes that monitor heartbeat. Both are attached to a PDA that sits in a belt pack and runs software that monitors their readings and sounds the alarm if the two parameters change to a predetermined extent. The data are also linked to a PC that can be monitored by a paramedic.

The device was tested on 145 volunteers in the emergency room at Brigham and Women's Hospital in Boston. In the trial, SMART flagged 3 patients who were stable when admitted, but later developed dangerous arrhythmias.

New Scientist 5 January 2008: 19.

*Single suture****Just how useful are fish oils?***

Something that has worried me, with declining fish stocks worldwide, is the often given advice to eat oily fish for their omega-3 oils, or to take supplements that are derived from the same fish. Now an article in the *Canadian Medical Association Journal* suggests that the evidence for the use of omega-3 fatty acids is actually quite weak and that for preventing arrhythmia – where fish oil was originally considered the most beneficial – the evidence is particularly poor. A meta-analysis of three randomised controlled studies of fish oil supplementation in patients with implantable cardioverter defibrillators – the outcome measure was discharge of the defibrillator – found a wide variation in response.

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