Cardiology series — 6

Preoperative cardiac evaluation and management of patients undergoing elective non-cardiac surgery

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MJA 2013; 199: 667–673
doi: 10.5694/mja13.11066

Summary

- Perioperative cardiac complications are a common cause of death and major morbidity in patients undergoing non-cardiac surgery.
- Preoperative evaluation and medical optimisation can improve outcomes, although the evidence base is limited.
- Evidence of effectiveness is strongest for prophylactic use of β-blockers in high-risk patients and aspirin in patients with coronary artery disease.
- Particular challenges arise among patients with heart failure or valvular heart disease or those receiving antithrombotic therapy for coronary artery stents or atrial fibrillation.
- Close liaison between general practitioners, surgeons, anaesthetists and cardiologists is needed for optimising preoperative management and subsequent clinical outcomes in high-risk patients.

In the 2010–11 financial year, 2.4 million surgical operations were performed in Australian hospitals, most (80%) being elective non-cardiac surgery.[1] Cardiac complications — myocardial infarction (MI), cardiac arrest and other serious arrhythmias, and acute heart failure — occur in about 5% of patients aged 70 years or older undergoing non-cardiac surgery.[2,3] Such complications carry 30-day mortality rates between 15% and 20% and account for a third of all postoperative deaths.[2,3] They also prolong hospital length of stay, increase illness burden and reduce long-term survival.[4,5] Some are potentially preventable: the Australian Incident Monitoring Study found that 3.1% of adverse events in hospital resulted from inadequate or incorrect preoperative assessment or preparation of patients.[6] Inadequate preoperative assessment and medical optimisation of patients also causes delays or cancellations in surgery.

In this article, we supplement evidence presented in previous guidelines[7,8] relating to preoperative evaluation and management of cardiac risk in patients undergoing elective non-cardiac surgery.

Preoperative cardiac risk stratification

Clinical assessment

Risk stratification starts with simple bedside evaluation that integrates clinical risk factors, functional capacity and type of surgery. Patients at low risk could be offered early surgery after assessment by their general practitioner, while complex patients may need more detailed assessment by a perioperative physician or cardiologist, in liaison with anaesthetists, surgeons and GPs. This approach facilitates more efficient professional decision making, better communication with primary care-based teams, more rapid optimisation of a patient's medical fitness for surgery, and more targeted postoperative management. It also allows patients to be better informed of both the potential benefits and risks of surgery when giving consent.

Clinical risk factors

The Revised Cardiac Risk Index (RCRI) is a multivariable predictive index for major perioperative cardiac complications (Box 1).[9] All clinical variables contribute equally to the index (1 point each), with scores of 0, 1, 2 and ⩾ 3 points corresponding to estimated risks of major cardiac complications of 0.4%, 0.9%, 7% and 11%, respectively. Low-risk patients have an RCRI score of 0, intermediate-risk patients have a score of 1 or 2, and high-risk patients have a score of 3 or more. A systematic review has shown the RCRI to discriminate well (concordance index, 0.75) between high- and low-risk patients undergoing non-cardiac surgery, but less well (concordance index, 0.64) among patients undergoing vascular surgery.[10] The RCRI also does not account for age or history of hypertension; these have been included in an adapted index that better predicts cardiovascular complications in older patients.[11]

Functional capacity

Functional capacity, as measured in metabolic equivalents (METs) on the basis of history or exercise testing, ranges from poor (< 4 METs) to excellent (> 10 METs). The inability to walk four blocks or climb two flights of stairs (4 METs) carries an increased perioperative cardiac risk.[12]

Type of surgery

Surgically induced stress can predispose to coronary thrombosis and myocardial ischaemia. Surgical interventions can be divided into low-, intermediate- and high-risk groups, with estimated 30-day death or MI rates of < 1%, 1%–5%, and > 5%, respectively (Box 2).[13] While laparoscopic surgery and regional anaesthesia confer better pain relief and earlier functional recovery than open surgery and general anaesthesia, it remains unclear whether they significantly reduce cardiac risk.[14,15]

1 Revised Cardiac Risk Index[9]

One point for each feature:

- High-risk type of surgery (see Box 2)
- Ischaemic heart disease (any of: history of myocardial infarction, history of a positive exercise test, current complaint of chest pain considered to be secondary to myocardial ischaemia, use of nitrate therapy, or electrocardiogram with pathological Q waves)
- History of congestive heart failure
- History of cerebrovascular disease
- Preoperative treatment with insulin
- Preoperative serum creatinine level > 177 μmol/L ◆

Previously in this series
"Cardiology series — 5" in MJA 2013; 199: 592-597

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An algorithm integrating the considerations discussed above in assessing cardiac fitness for surgery is outlined in Box 3,[8] and a clinical case study is presented in Box 4.

Role of cardiac investigations

Investigations should only be performed if: a) the results are expected to accurately and significantly change clinical estimates of risk; b) these altered risk estimates consistently lead to changed management decisions; and c) the resultant management changes have been shown in clinical trials to improve clinical outcomes. As situations that satisfy all three of these criteria are rare in perioperative medicine, the value of investigations, apart from a routine 12-lead electrocardiogram (ECG), is limited in preoperative cardiac management. The most useful applications may be in reclassifying intermediate-risk patients to either low-risk (surgery can safely proceed without further intervention) or high-risk (needing more detailed evaluation and use of prophylaxis), or in determining unacceptable surgical risk in high-risk patients undergoing high-risk surgery (Box 3).[8]

Rest echocardiography

Rest echocardiography has little value in preoperative evaluation of cardiac structure and function in patients lacking clinical features of heart failure or valvular heart disease because of its inability to accurately predict perioperative events.[18] A recent population-based retrospective cohort study of 264 823 patients showed no benefit in survival or hospital length of stay from rest echocardiography performed within the 6 months before surgery.[19]

Non-invasive stress testing

Treadmill stress testing, dobutamine stress echocardiography (DSE) and myocardial perfusion imaging (MPI) have limited value in predicting perioperative cardiac events and are not indicated in low- or intermediate-risk patients or those undergoing low-risk surgery.[20] High-risk patients (those with an RCRI score ⩾3) or those undergoing intermediate- or high-risk surgery may be eligible for testing if the results are likely to change management. In patients unable to exercise, DSE and MPI can detect moderate to large ischaemic burden with similar accuracy.[20]

Cardiopulmonary exercise testing

This assesses functional capacity more accurately than patient self-report, and measures of total oxygen consumption and anaerobic threshold (if above certain threshold values) seem to identify individuals at very low surgical risk.[21] While cardiopulmonary exercise testing may provide additional prognostic information in older patients with cardiopulmonary disease or patients undergoing major thoracic or abdominal operations, there are currently insufficient data to show its routine use alters perioperative care or outcomes compared with bedside risk stratification methods.[22]

Biomarkers

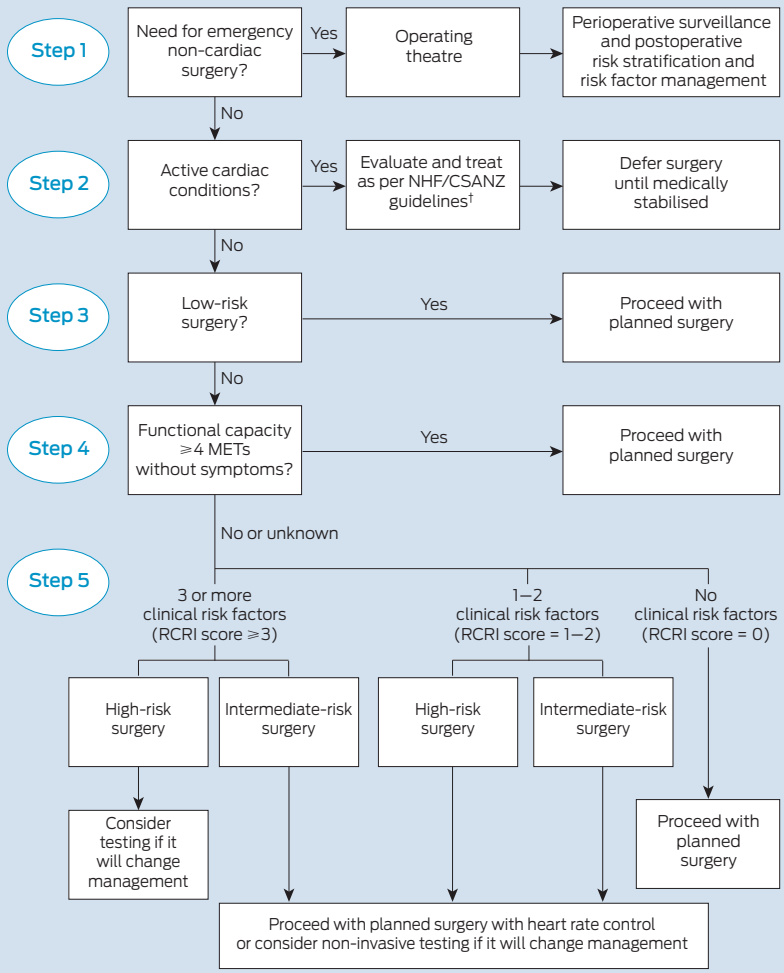
Biomarkers such as high-sensitivity troponin and B-type natriuretic peptide (BNP) appear to add incremental prognostic information to the RCRI.[23,24] However, until adequately powered trials show such revised risk estimates change management and improve patient outcomes, biomarker tests should not be used routinely.

2 Estimated cardiac risk* of types of surgery[13]

Low risk (< 1%)	Intermediate risk (1%–5%)	High risk (> 5%)
• Breast • Dental • Endocrine • Eye • Gynaecological • Plastic and reconstructive (skin grafts and flaps) • Orthopaedic — minor (knee) • Urological — minor	• Abdominal • Carotid • Peripheral arterial angioplasty • Endovascular aneurysm repair • Head and neck • Neurological or orthopaedic — major (hip and spine) • Lung, renal or liver transplant • Urological — major	• Aortic and major vascular • Peripheral vascular

* Risk of death or myocardial infarction within 30 days of surgery. ◆

3 Algorithm for evaluating cardiac risk before non-cardiac surgery*



NHF/CSANZ = National Heart Foundation and Cardiac Society of Australia and New Zealand. RCRI = Revised Cardiac Risk Index. METs = metabolic equivalents. * Adapted with permission from the American College of Cardiology/American Heart Association *ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery*.[7] † The 2006 guidelines for acute coronary syndromes[16] and the 2011 update to the guidelines for heart failure.[17] ◆

Computed tomography coronary angiography

This imaging procedure for coronary artery anatomy may provide additive value to the RCRI in assessing patients undergoing intermediate-risk surgery,[25] but its impact on decision making and clinical outcomes remains unclear.

4 Clinical case study

Mrs C is a 65-year-old woman referred to a hospital perioperative service for preoperative evaluation and optimisation. She is booked for an elective left hemicolectomy for localised, well differentiated carcinoma of the sigmoid colon. Her preoperative evaluation finds significant functional impairment (metabolic equivalents [METs] < 4) and elevated jugular venous pressure, on a background of past myocardial infarction, lifelong smoking (50 pack-year history), hypertension, dyslipidaemia and chronic renal failure with a serum creatinine level of 190 μmol/L. A 12-lead electrocardiogram shows sinus rhythm, with Q waves in the inferior leads and T-wave inversion in the lateral leads. An echocardiogram shows severe systolic dysfunction with a left ventricular ejection fraction of 20% and akinetic scar in the inferior wall. Spirometry demonstrates moderate obstructive airway disease (forced expiratory volume in 1 second [FEV_1], 51% predicted). Her Revised Cardiac Risk Index (RCRI) score is 3, with a predicted perioperative cardiac event rate of 9%–12%.

Key management questions to consider for this patient are:

- Would you request any other investigations to refine your estimates of her cardiac risk?
- How would you advise her in regard to the risks and benefits of surgery?
- Would you be in favour of, or against, surgery at this time?
- What steps would you take to optimise her medical fitness for surgery?

You and Mrs C both consider her cardiac risk — as assessed by her RCRI score, functional capacity and signs of uncontrolled congestive heart failure (CHF) — to be too great for surgery to proceed immediately. Given the prognostically favourable stage and histology of her carcinoma, you opt for an 8-week period to optimise her current therapies before surgery. As the patient reports no angina, has no other clinical stigmata of vascular disease, does not have diabetes and is not undergoing high-risk surgery, you decide against stress echocardiography or cardiopulmonary exercise testing, as you feel their results will not materially alter your estimate of her cardiac risk or suggest additional methods for medical optimisation. You prescribe spironolactone and extended-release metoprolol succinate and uptitrate the dose of her angiotensin-converting enzyme inhibitor. You also initiate a long-acting β-agonist bronchodilator and steroid inhaler and refer her to a respiratory rehabilitation program for 6 weeks of total abstinence from smoking. With this treatment, her exercise capacity improves significantly, such that she can walk 200 m on the flat without difficulty (METs = 4). Her signs of CHF abate and her spirometry results improve to an FEV_1 of 66% predicted. She undergoes surgery and recovers without complication. ◆

Perioperative cardiac prophylaxis

Several preventive strategies may be considered in intermediate- and high-risk patients undergoing intermediate- or high-risk surgery. Medications patients are already receiving for known coronary artery disease (CAD) should be continued throughout the perioperative period unless specific contraindications supervene.

β-Blockers

β-Blockers are potentially useful in lowering cardiac risk by antagonising the effects of adrenaline and other stress hormones and exerting negative chronotropic and inotropic actions. However, results of randomised trials and meta-analyses suggest mixed effects, with further uncertainty resulting from the recent disclosure of several potentially fraudulent or negligent Dutch trials.[26] The large Perioperative Ischemic Evaluation Study (POISE) showed a 31% reduction in the risk of non-fatal MI with β-blockers, at the expense of a 34% increased risk of all-cause mortality and 89% increased risk of non-fatal stroke.[27] A recent meta-analysis of nine well conducted "secure" trials (including POISE, and excluding the "non-secure" Dutch trials) found initiation of β-blockers before surgery caused a 27% increase in 30-day all-cause mortality and a 73% increase in non-fatal stroke, while decreasing risk of non-fatal MI by 27%.[28] The updated 2009 American College of Cardiology and American Heart Association guidelines give a Class 1 recommendation only for continuing β-blockers in patients with a pre-existing cardiac condition for which there is a strong indication.[29]

However, two large retrospective observational studies using propensity-based risk adjustment suggest that β-blockers reduce all-cause inhospital deaths proportionally to increasing cardiac risk, as measured by an RCRI score ≥ 2, while increasing deaths in those with an RCRI score < 2 (Box 5).[30,31] In the former patients, one of the studies showed that, while β-blockers reduced risk of non-fatal MI and cardiac arrest, stratified analyses indicated these benefits were limited to patients undergoing non-vascular surgery.[31]

It thus remains unclear which patients benefit from β-blockers. If β-blockers are to be initiated, observational data suggest they be restricted to high-cardiac-risk patients,[30,31] and should be commenced some weeks before surgery and haemodynamically titrated to a tolerable dose that lowers resting heart rate to 70 beats/min.[32] Longer-acting agents such as atenolol appear to be safer than short-acting agents such as metoprolol.[33]

Statins

Statins improve endothelial function, reduce vascular inflammation and stabilise atherosclerotic plaque. Evidence of benefit of perioperative treatment in statin-naive patients is of limited quality and is dominated by observational studies[34] or trials in cardiac surgery.[35] The few secure randomised trials involving patients undergoing non-cardiac vascular surgery are underpowered and inconclusive.[36] Patients already prescribed statins as chronic therapy should continue treatment in the perioperative period.

Angiotensin-converting enzyme inhibitors or angiotensin receptor blockers

Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) have not been shown to improve outcomes in the absence of left ventricular systolic dysfunction. Indeed, observational studies suggest they predispose to severe intraoperative hypotension (generally responsive to fluid loading and vasopressors), especially if combined with β-blockers or diuretics, and may increase 30-day mortality in patients undergoing major vascular surgery.[37] There is debate about whether these agents should be withheld one half-life before anaesthesia induction if their indication is purely for hypertension (unless blood pressure is uncontrolled) or, given the preponderance of day-of-surgery admissions, to recommend continuation with adequate hydration.[38] A prospective randomised trial is required to clarify the safety of perioperative use of these agents.

Aspirin

Aspirin interacts with the cyclo-oxygenase enzyme system and irreversibly inhibits platelet aggregation, theoretically

lessening risk of coronary thrombosis but increasing risk of perioperative bleeding. No adequately powered trial has assessed benefits of aspirin prophylaxis in aspirin-naive patients. In patients with known CAD, excluding those with recent coronary artery stent insertion (discussed below), risk of subsequent death or MI is increased two- to threefold if aspirin is ceased before surgery.[39] While the risk of major postoperative bleeding may offset this cardiac risk for certain procedures, such as extensive skin grafting, a recent meta-analysis of 41 studies involving 49 590 surgical patients shows that, overall, the cardiac risk exceeds bleeding risk for most surgical patients with known CAD whose aspirin is withheld.[40]

Coronary artery revascularisation

Percutaneous coronary intervention (PCI) or coronary artery bypass grafting is only indicated before non-cardiac surgery in clinically unstable patients (those with unstable angina, recent MI or ventricular arrhythmias) with significant left main or three-vessel (or two-vessel if this includes the proximal left anterior descending artery) CAD. A large trial failed to show any perioperative or long-term benefit of prophylactic revascularisation, compared with optimal medical treatment alone, in stable patients undergoing high-risk surgery.[41]

Other challenging scenarios

Congestive heart failure

Large observational studies show that symptomatic congestive heart failure (CHF) increases the absolute risk of perioperative death to 8% — more than twice the risk seen in established CAD without CHF.[42] Other studies suggest stable, well controlled CHF does not necessarily increase risk.[43] Current guidelines are uncertain about when left ventricular function should be reassessed using echocardiography in clinically stable patients with known CHF.[7,18] The ability of BNP and N-terminal proBNP to discriminate cardiac risk among patients with CHF, who may have chronically elevated levels, has yet to be examined.[18] It is also unknown whether optimising CHF management before surgery — including using a BNP-guided strategy to titrate therapy, correcting coexisting anaemia and strictly controlling ventricular rate in patients with atrial fibrillation — improves postoperative outcomes.[44] What is agreed is the need to defer surgery in patients with decompensated or severe chronic CHF (worsening or new-onset CHF; New York Heart Association Class IV symptoms) until they are medically optimised and euvolaemic. In patients with newly diagnosed CHF, elective surgery should be delayed 3 months or more to allow adequate time for antifailure therapies to improve left ventricular function and remodelling.[44] β-Blockers with proven mortality benefit (bisoprolol, carvedilol or metoprolol succinate) and ACE inhibitors or ARBs should be continued during the perioperative period unless precluded by hypotension or symptomatic bradycardia.

5 Relation of absolute cardiac risk to β-blocker-associated reduction in all-cause inhospital death in two large observational studies*

RCRI score	London et al[31]		Lindenauer et al[30]	
	Relative risk for inhospital death	NNT to reduce inhospital death	Odds ratio for inhospital death	NNT to reduce inhospital death
0	1.26 (0.88–1.81)	na	1.43 (1.29–1.58)	na
1	0.89 (0.72–1.10)	na	1.13 (0.99–1.30)	na
2	0.63 (0.50–0.80)	105 (69–212)	0.90 (0.75–1.08)	227 (132–1091)
3	0.54 (0.39–0.73)	41 (28–80)	0.71 (0.56–0.91)	62 (48–92)
⩾ 4	0.40 (0.25–0.64)	18 (12–34)	0.57 (0.42–0.76)	33 (28–42)

RCRI = Revised Cardiac Risk Index. NNT = number needed to treat. na = not applicable. * Data relate to propensity-adjusted analyses in both studies, except for NNT in Lindenauer et al,[30] for which only results of whole-study analyses were published. Numbers in parentheses are 95% confidence intervals. ◆

Severe valvular heart disease

In all patients with clinical features consistent with severe valvular heart disease, preoperative echocardiography and a 12-lead ECG are mandatory in assessing valve and left ventricular dysfunction. These are also important to screen for conduction system defects caused by perivalvular fibrosis that may predispose to bradyarrhythmias requiring perioperative pacing. Ideally, patients eligible for valve reconstruction or replacement, or transcutaneous valvuloplasty or valve implantation, should undergo these procedures before elective surgery. This is particularly pertinent in patients with symptomatic or critical calcific aortic stenosis with a valve area $< 0.8\ cm^2$, which carries a 10%–28% risk of perioperative sudden cardiac death.[45] Patients with severe mitral regurgitation should be medically optimised before surgery, including rate control of chronic atrial fibrillation. ACE inhibitors or ARBs prescribed for afterload reduction should be continued despite a risk of anaesthesia-induced hypotension. In the absence of prior history of infective endocarditis, mechanical prosthetic heart valves, congenital heart defects, cardiac transplantation with valvulopathy, or rheumatic heart disease in Indigenous Australians, prophylactic antibiotics are usually not required. Exceptions to this are operations associated with a high risk of bacteraemia (dental procedures and periodontal disease; genitourinary procedures; surgery involving the oropharynx, respiratory tract, sinuses, nose or ear; incision and drainage of local abscesses; or surgery through infected skin).[8,46]

Recent percutaneous coronary intervention with stent insertion and dual antiplatelet therapy

Australian guidelines from 2009 recommend that elective surgery requiring cessation of dual antiplatelet therapy should be postponed for at least 6 weeks after insertion of bare-metal stents and 12 months after insertion of drug-eluting stents (DES).[47] However, more recent American guidelines reflecting additional new evidence and experience with later-generation DES suggest a minimum period of 6 months after insertion of DES.[48] A recent retrospective cohort study of more than 28 000 patients who underwent non-cardiac surgery within 2 years after stent insertion showed that major adverse cardiac events at 30 days were associated with emergency surgery, history of MI in the 6 months before surgery and an RCRI score greater than 2,

6 Suggested risk stratification for perioperative thromboembolism and bleeding*

Risk level	Mechanical heart valve	Atrial fibrillation	Venous thromboembolism
Risk of thromboembolism			
High	• Any mitral valve prosthesis • Any caged-ball or tilting disc aortic valve prosthesis • Recent (< 6 months) stroke or TIA • Prior stroke or TIA during temporary interruption of anticoagulants	• $CHADS_2$ score of 5–6 • Recent (< 3 months) stroke or TIA • Rheumatic valvular heart disease • Prior stroke or TIA during temporary interruption of anticoagulants	• Recent (< 3 months) VTE • Severe thrombophilia (eg, deficiency of protein C, protein S, or antithrombin; antiphospholipid antibodies; multiple abnormalities) • Prior VTE during temporary interruption of anticoagulants • VTE > 12 months previously associated with pulmonary hypertension
Moderate	• Bileaflet aortic valve prosthesis and one or more of the following risk factors: atrial fibrillation, prior stroke or TIA, hypertension, diabetes, congestive heart failure, age >75 years	• $CHADS_2$ score of 3–4	• VTE within past 3–12 months • Non-severe thrombophilia (eg, heterozygous factor V Leiden or prothrombin gene mutation) • Recurrent VTE • Active cancer (treated within 6 months or palliative)
Low	• Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke	• $CHADS_2$ score of 0–2 (assuming no prior stroke or TIA)	• VTE > 12 months previously and no other risk factors
Risk of major bleeding			
High	• Urological surgery and procedures comprising transurethral resection of prostate, bladder resection or tumour ablation; nephrectomy; kidney biopsy • Implantation of pacemaker or implantable cardioverter defibrillator device (risk of pocket haematoma) • Colonic polyp resection, typically of large (> 1–2 cm) sessile polyps • Surgery or procedures in highly vascular organs such as kidney, liver and spleen • Bowel resection (with risk of bleeding at anastomosis site) • Major surgery with extensive tissue injury (eg, cancer surgery, joint arthroplasty, reconstructive plastic surgery) • Intracranial or spinal surgery		
Low	• Cataract surgery, arthrocentesis, dental procedures, diagnostic endoscopic procedures • Excisional skin surgery and superficial surgery with easily compressible wounds		

TIA = transient ischaemic attack. $CHADS_2$ = congestive heart failure, hypertension, age ⩾ 75 years, diabetes mellitus, stroke or TIA. VTE = venous thromboembolism. * Adapted from Douketis et al[48] with permission from the American College of Chest Physicians, with additional data from Dunn and Turpie.[51] ◆

but not with stent type or timing of surgery beyond 6 months after stent insertion.[49] Ceasing dual therapy earlier than stipulated above carries a very high risk of stent thrombosis, with mortality rates up to 20%.[50] Continuation of dual therapy confers little risk of major bleeding in most minor surgery (Box 6). In patients requiring urgent surgery associated with high bleeding risk within the recommended minimum time frames, aspirin should be continued and clopidogrel (or prasugrel or ticagrelor) withdrawn at least 5 to 7 days before surgery, depending on the agent.[8,47] This should be coupled with consideration of bridging anticoagulation (heparin–tirofiban or heparin–eptifibatide) in selected highest-risk patients (although there are limited data in support of such treatments).[47] Any discussion about postponing surgery or continuing, modifying or discontinuing antiplatelet therapy must involve close liaison between a patient's GP, interventional cardiologist, anaesthetist, surgeon and haematologist to balance the risk and benefit of such decisions. Patients scheduled for PCI and requiring non-cardiac surgery in the foreseeable future should preferably receive bare-metal stents.

Oral anticoagulant therapy for thromboembolic disease

Whether and when to withhold anticoagulants depends on the balance between risk of thromboembolic events if interrupted and risk of major bleeding if continued (Box 6). Patients at low thromboembolic risk can cease taking anticoagulants with no need for bridging heparin, while those undergoing minor procedures with low bleeding risk do not require their cessation.[51] In high-risk patients, bridging heparin is required after oral anticoagulants are ceased 5 days (for warfarin)[51] or between 24 hours and 4 days (for the newer oral agents dabigatran, rivaroxaban and apixaban, as per manufacturer's product information for each) before surgery. Bridging anticoagulation with subcutaneous low-molecular-weight heparin, if there are no contraindications, obviates the need for hospitalisation to administer intravenous unfractionated heparin. Bleeding risk with the newer anticoagulant agents is of concern, given the lack of both an antidote and reliable assays of anticoagulation effects. Early, effective and ongoing communication between GPs and specialists, combined with reference to detailed, up-to-date protocols, is required to maximise patient safety during perioperative transitions of anticoagulation.[52]

Obstructive sleep apnoea

Obstructive sleep apnoea (OSA) affects up to 25% of adult general surgical patients and up to 77% of those undergoing bariatric surgery.[53] As many as 70% of cases are undiagnosed before patients present for preoperative evaluation. In a recent meta-analysis of case–controlled and cohort studies of patients diagnosed with OSA and undergoing elective surgery, postoperative cardiorespiratory events were twice those seen in patients without OSA (3.8% v 1.7%).[53] Various screening questionnaires with equivalent predictive value in identifying patients with moderate to severe OSA are easy to administer.[54] In cases

where known OSA is mild or screening risk is low, surgery is low risk and there are no associated comorbidities, surgery can proceed without further intervention. In all other cases, formal evaluation by a sleep physician, initiation or titration of continuous positive airway pressure (CPAP) therapy where indicated, and close liaison with anaesthetists should be undertaken. The optimal duration of CPAP therapy in newly diagnosed patients awaiting surgery and how patients with known OSA who are non-compliant with CPAP therapy should be treated remain uncertain.

Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) frequently coexists in patients with CAD or CHF who are, or have been, smokers. COPD is an independent risk factor for major cardiopulmonary complications and can complicate assessment of functional capacity and administration of prophylactic β-blockers. Clinical history and simple bedside spirometry are sufficient to gauge disease severity in otherwise stable patients. Routine chest x-rays and formal lung function tests add little value. In the absence of moderate to severe bronchospasm, a meta-analysis supports the safety of cardioselective β-blockers in most patients with stable COPD.[55] Patients with combined bronchospastic disease and CAD who are undergoing high-risk surgery might derive cardioprotective benefit from α-2 adrenergic agonists (such as clonidine).[56] Before surgery, patients with unstable COPD or asthma should receive oral steroids, which do not compromise wound healing, and all patients with COPD should totally abstain from smoking for at least 6 weeks.

Cardiac implantable electronic devices

For patients with these devices, especially implantable cardioverter defibrillators (ICDs), GPs or anaesthetists should ideally contact the relevant cardiologist to ascertain the type of device, its indications, current settings and mode of magnetic inactivation (if applicable). Such information allows appropriate safeguards to be organised, if required, before surgery.[57] Surgical diathermy, particularly in chest, head or neck surgery, can cause electrical interference that may inhibit pacemakers or trigger shocks from ICDs.

Conclusion

High-quality evidence underpinning preoperative cardiac assessment and management is limited, and more research is required. GPs, working in liaison with perioperative physicians, cardiologists and anaesthetists, have important roles in stratifying patient risk using clinical risk assessment and selective use of investigations, implementing appropriate prophylaxis and optimisation regimens, and consulting with surgeons regarding if and when surgery should proceed after weighing up potential benefits and harm of surgery.

Competing interests: Michael Jelinek has received fees from Cardioscan for reporting ECGs and from insurance companies and law firms for medicolegal services, and transport and accommodation costs from Servier to attend the annual scientific meeting of the Cardiac Society of Australia and New Zealand.

Provenance: Commissioned; externally peer reviewed.

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