was to emphasise an important principle in the care of patients.

Finally, I welcome Chris Butler's point about using clinical skills to avoid the inappropriate use of expensive resources. Also, as I pointed out, failure to conduct a proper clinical assessment can lead to inappropriate investigations that can miss the diagnosis completely.

JOHN F GOODWIN

Emeritus professor of clinical cardiology

Royal Postgraduate Medical School,
London W12 0NN

Infarcts after surgery

Authors overlooked prospective trial of incidence of perioperative infarction

EDITOR,—It is unfortunate that N Mamode and colleagues are "not aware of any prospective trial in Britain intended to measure the incidence of perioperative infarction."¹ They have overlooked the prospective trial carried out at the University of Southampton by Seegobin *et al*, in which the Goldman and Cooperman risk indices were compared as a method of predicting perioperative infarction after non-cardiac surgery.² They have also overlooked a large anaesthetic literature on perioperative myocardial ischaemia. Three references are particularly pertinent.³⁻⁵

D P DOB

Senior registrar

S YENTIS

Consultant

Magill Department of Anaesthesia,
Chelsea and Westminster Hospital,
London SW10 9NH

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Identifying risks is futile without evaluations of risk reduction

EDITOR,—N Mamode and colleagues conclude that all surgeons should have a protocol for investigating patients who seem to be at risk of a myocardial infarction perioperatively.¹ Even if it was possible to identify or quantify the risk accurately, however, there is little point in the exercise unless effective strategies exist for managing patients at risk. Many of the measures that can be undertaken to minimise risk—for example, control of hypertension and diabetes; weight loss; cessation of smoking; and, in particular, the avoidance of perioperative hypoxia and hypotension—should be routine in the management of all patients. Similarly, invasive monitoring of arterial and central venous pressure is routine in major operations, while insertion of pulmonary artery catheters has not been proved to have a beneficial effect on outcome.² Intensive care should be provided for all patients undergoing repair of an aortic aneurysm or operation of similar magnitude but, given the excess of demand, is unlikely to be available for patients undergoing a lesser procedure if their condition is stable during the operation. The authors suggest that coronary angiography may be indicated in some patients after preliminary thallium scanning. If a patient's symptoms do not justify rigorous cardiac investiga-

tion with a view to cardiac revascularisation, however, it remains to be proved that the risks of a subsequent non-cardiac operation are reduced by either coronary bypass grafting or angioplasty.³

Undoubtedly, further research is needed on the identification and quantification of risk, but this is worthless without evaluation of strategies to reduce risk. In particular, we need to know whether intensive care units or high dependency units will benefit patients at moderate risk—that is, patients who at present may be sent to a normal ward and monitored with a pulse oximeter. In the meantime, however, it seems to be a waste of resources for most surgeons outside well designed trials to initiate an expensive chain of investigations of unproved value for patients who seem to be at high risk on clinical grounds, as their management is unlikely to be altered. Of course, patients should be investigated if their symptoms justify it, regardless of a planned operation.

A J MCCLEARY

Vascular research fellow

Vascular Surgery Unit,
General Infirmary at Leeds,
Leeds LS1 3EX

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Symptoms of coronary artery disease predict risks of surgery

EDITOR,—N Mamode and colleagues' editorial on the assessment of patients before surgery is a reminder of the lack of reliable algorithms for the non-invasive assessment of operative risk.¹ Even with patients at high risk, such as those with peripheral vascular disease, there is no uniform strategy to predict the risk of perioperative cardiac events. Approaches ranging from invasive pre-operative cardiac catheterisation to merely 12 lead electrocardiography have been advocated to assess the risk.

In attempts to predict the risk of surgery in patients with peripheral vascular disease, patients with symptomatic coronary artery disease must be clearly distinguished from those with no clinical features of coronary artery disease. In an analysis of six series totalling about 4500 patients undergoing operation for vascular disease, perioperative cardiac events occurred in a mean of 11% of patients with clinical evidence of coronary artery disease and in only 1.7% of patients without it.²

These data are in keeping with our observations in a prospective study of 84 patients who presented with symptoms of peripheral vascular disease but had no history or symptoms suggesting coronary artery disease.³ Each patient underwent coronary angiography, dipyridamole thallium scintigraphy, and radionuclide ventriculography before intervention. Vascular reconstructive surgery was performed in 42 patients, 34 of whom had angiographically proved coronary artery disease. No perioperative deaths and only one non-fatal myocardial infarction occurred. This suggests that patients with peripheral vascular disease are at low risk of perioperative death if there is no clinical suspicion of coronary artery disease. None the less, occult coronary artery disease in patients with peripheral vascular disease is not benign, and cardiovascular events are the main source of long term morbidity and death in this group.⁴

Preoperative stress testing should therefore be considered in patients with peripheral vascular disease with symptomatic coronary artery disease as a perioperative event is more likely in these patients. In patients with no clinical evidence of coronary artery disease, however, preoperative stress testing is not necessary if the sole objective of

the test is to evaluate the perioperative risk. Nevertheless, the powerful impact of coronary artery disease on the late prognosis of patients with peripheral vascular disease, with a five year mortality of up to 40%, reinforces the need for a cardiac assessment in these patients. Ideally, this should be performed when the patient first presents with intermittent claudication, but it may be delayed even until after vascular reconstructive surgery. In this setting, dipyridamole thallium scanning provides not only prognostic information but also a baseline for comparison at regular intervals during the follow up period.⁵

NEIL GILLESPIE

Research fellow

Department of Cardiology,
Ninewells Hospital and Medical School,
Dundee DD2 1UB

DAWOOD DARBAR

Research fellow

Division of Clinical Pharmacology,
Vanderbilt University School of Medicine,
Nashville, TN,
USA

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Author's reply

EDITOR,—My colleagues and I are grateful to D P Dob and S Yentis for drawing our attention to a British study on perioperative myocardial infarction, published in a Canadian journal. The small number of patients (50) and exceptionally high incidence of perioperative infarctions (44%) do not, however, permit the fundamental questions concerning perioperative cardiac morbidity to be addressed—namely, is the incidence of perioperative myocardial infarction among selected patients in Britain significant, and is the occurrence of an event in an individual patient predictable? The first question is important since some authors have found rates of perioperative myocardial infarction to be so low (1.7%) that they did not consider further attempts at stratification to be justified.¹ Similarly, if events occur only in those who are clearly at high risk, such as those with a ruptured aortic aneurysm, routine pre-operative investigations will be unjustified. Pre-operative risk factors and outcome will vary in different populations of patients,² and information is urgently needed on the incidence of perioperative myocardial infarction in Britain.

We are aware of the literature that Dob and Yentis quote, which concerns perioperative myocardial ischaemia, not infarction. Our article was not intended as a review of all pertinent papers; indeed, a recent paper in the same anaesthetic journal has tackled this job admirably.³

A J McCleary supports our call for further studies to test strategies for evaluating and lowering the risk of perioperative myocardial infarction. We discussed the fact that some interventions, such as coronary artery revascularisation, are not proved in the prevention of perioperative cardiac morbidity. Some authors have suggested that the risk in those undergoing aortic surgery is not dissimilar from that in other vascular procedures,⁴ and if intensive care or high dependency units do improve outcome we are then faced with the same