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REVIEW

Preoperative patient assessment: a review of the literature and recommendations

Neal A Barnard FDSRCPS FRCS
Consultant Oral & Maxillofacial Surgeon
Department of Oral-facial Surgery, Worcester Royal Infirmary NHS Trust, Worcester

Rhodri W Williams BDS
Senior House Officer
Department of Oral and Maxillofacial Surgery, Frenchay Hospital, Bristol

Elizabeth M Spencer DM FRCA
Consultant Anaesthetist
Gloucestershire Royal Hospital, Gloucester

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The aims of preoperative assessment of patients are outlined, and the role of clinical and laboratory testing is defined. Following a review of the literature, guidelines for requesting such investigations are suggested.

Before any operation, be it elective or emergency, all patients should be assessed. The aim of this assessment is to obtain the relevant medical and social information about the patient, to educate the patient and diminish anxiety, and to obtain an informed consent for the operative procedure. Traditionally the first aim is achieved by obtaining a thorough medical history, carrying out a physical examination including measurement of blood pressure and urinalysis and performing laboratory tests. When requesting laboratory tests the questions of importance are:

1 Does the investigation detect conditions not found on history taking and physical examination which will affect perioperative management?
2 Do the investigations give a useful baseline for comparison in the postoperative phase?
3 What are the specificities and sensitivities of the investigation?
4 Are there medicolegal considerations for performing the investigations?
5 If the result is not available, will the operation be cancelled?

Sandler *(1)*, in his prospective study, showed that the history decided 56% of all diagnoses and 46% of all management in medical outpatients. Examination accounted for a further 17% and routine haematological and urine testing accounted for only 1%. Delahunt and Turnbull *(2)* found abnormal tests in 8% of patients admitted for minor surgery under general anaesthesia which were not predictable from the history and examination, and none of these abnormalities led to any change in management. Other studies also question the benefit of preoperative screening in asymptomatic healthy patients *(3–7)*. Domoto *et al. (8)* reviewed the routine screening of active elderly patients (average age 82.6 years) and found that only 0.1% of all tests led to a change in management.

Laboratory tests can aid in clarifying a patient's preoperative condition once a disease is suspected or diagnosed, but they frequently fail to uncover pathological conditions and are inefficient in screening for

Correspondence to: Mr Neal A Barnard, Department of Oral-facial Surgery, Worcester Royal Infirmary NHS Trust, Castle Street Branch, Worcester WR1 3AS

asymptomatic disease *(9)*. If tests do detect abnormalities, they may not necessarily improve patient care or outcome, and indeed may lead to further investigations *(7,9)*. Furthermore, false-positive findings may lead to invasive and dangerous evaluations *(10)*, and the whole process may direct scarce resources to patients who do not, and may never require treatment *(11)*.

Most abnormalities discovered on preoperative screening, are not recorded, except in the laboratory report, and are frequently ignored by the physician *(9,12–15)*. Ignoring a result can be considered an appropriate judgement, but overlooking an abnormal result may suggest medical negligence *(5,9)*. With this in mind, together with the limited benefit to the patient and the inconvenience such testing produces, there is little justification for routine screening for medicolegal reasons.

Attempts to decrease the number of investigations by educating the junior medical and surgical staff has had limited success *(16,17)*. Changes in practice require more intervention, such as departmental regulations, frequent seminars, individual feedback and enforcement *(18–20)*. MacPherson *et al. (10)* found that 47% of preoperative tests performed on 1109 elderly males were duplicates of tests performed in the previous year, and only 0.4% of these were outside a range acceptable for surgery. Most of the abnormalities detected were predictable from the patient's history. He recommended that tests taken up to 4 months previously could be used safely for preoperative assessment. Thus, with reduced waiting list times and the policy of providing patients with an operation date, any necessary tests could safely be performed at the outpatient visit.

Self-assessment questionnaires or protocols have been used to determine those patients likely to benefit from preoperative investigations. However, many patients who completed these questionnaires never received the recommended investigation; fortunately with no adverse morbidity *(21,22)*. Indeed, questionnaires appear to be more useful for identifying the low-risk patients suitable for day case surgery *(23)*. Protocols are not perfect and should never be a substitute for clinical judgement *(21)*.

There is a great deal of inconsistency in ordering laboratory investigations, with recommendations for testing being largely empirical, and thus varying from one hospital to the next. Requests are often made routinely with no consideration for the patient or whether they are actually clinically indicated, and are often not requested when indicated *(24)*. Of such preoperative tests, 60% could be eliminated without adversely affecting the patient care *(9,25)*. In today's environment of economy, efficiency and consumer satisfaction, unnecessary investigations are a drain on financial resources and an inconvenience to patients *(5,9,25,26)*.

General considerations

Anaesthesia is remarkably safe but there are a few specific hazards which should be searched for. These can be detected by a full general medical history with particular reference to smoking, drug history, any allergies or previous anaesthetic complications. The most common general assessment of fitness used by anaesthetists is the American Society of Anesthesiologists' (ASA) Physical Status Classification *(27)*. Approximately 50% of patients undergoing elective surgery fall into ASA Group 1 *(25)* and surgical mortality for this group is reported as between 1 in 6000 and 1 in 10 000 *(28–30)*. This classification, although useful, is scientifically imprecise *(31)*. It was originally designed to facilitate the collection of 'statistical data in anaesthesia' and not to estimate operative risk. However, it is the only indicator of preoperative status that has been consistently recorded in large numbers of patients and correlates well with surgical morbidity *(32)*.

Chest radiography

Reasons for taking a preoperative chest radiograph (POCR) are to confirm or establish a diagnosis and evaluate the extent of pathology; to detect conditions previously unsuspected and to establish a baseline for comparison with postoperative films. However, unexpected abnormalities are rare *(33)*, and seldom lead to modification of management *(34)*. A national study by the Royal College of Radiologists *(35)* found the radiologist's report was not available until after the operation in 27.5% of those patients who had a POCR; and the chances of the patient receiving an inhalation anaesthetic were the same whether he had a POCR or not. The baseline value of the POCR could not be proved, nor could it be correlated with postoperative pulmonary complications *(35)*. Furthermore, Roberts *et al. (36)* found a decrease in preoperative ordering was not followed by an increase in perioperative morbidity.

Half of all radiological procedures world-wide are chest radiographs, many being performed preoperatively *(37)*. Roberts *et al. (36)* estimated that malignancy induced by diagnostic radiation in the UK is of the order of 5 per million (300 fatal cancers per year). McKee and Scott *(23)* recommend a POCR in patients older than 60 years undergoing major surgery. This was based on the number in this age group requiring postoperative films and they did not correlate age with the patient's preoperative respiratory status. Charpak *et al. (38)* used a protocol for ordering a POCR and found that, although use of this protocol varied among physicians, no adverse morbidity resulted. Providing an adequate history and examination is obtained there is no evidence for requesting a POCR, unless clinically indicated.

Electrocardiography

No consensus has yet been reached about the need for a routine electrocardiogram (ECG) before regional or general anaesthesia *(39)*. Several studies on the yield of the routine preoperative ECG have indicated that

abnormalities are relatively common, between 47% and 52% *(40,41)*, and correlate with increasing age, male gender and physical status score (ASA). According to Gold *et al. (40)*, of the patients with abnormal preoperative ECGs, only 1.6% experienced a perioperative adverse cardiovascular event, and in only half of these was the preoperative ECG helpful. In only one case (from 751) was surgery cancelled because of the findings on the preoperative ECG. It is important to note that a resting ECG has a low sensitivity as a detector of ischaemic heart disease.

ECGs may provide the major, and perhaps sole, clue to the diagnosis of the previously unrecognised myocardial infarction, which if occurring within the preceding 6 months is a major risk factor for life-threatening cardiac complications in the perioperative period *(39)*. However, the ECG gives no indication of the timing of the infarction. Rabkin and Horne *(42)* found that 165 'new' abnormalities were detected in 812 patients with a previous ECG. In only two cases was the management altered solely as a result of the ECG and not because of information gained from the history and examination.

In conclusion, the preoperative ECG is of limited value for relatively healthy ambulatory patients younger than 60 years.

Biochemistry

These tests are performed as indicated by the patient's condition, or as a screening procedure to detect clinically inapparent abnormalities. Serum sodium and potassium concentrations are the most frequently requested preoperative biochemical investigations. Potassium concentrations are important, as hyperkalaemia can predispose to cardiac arrest, particularly if suxamethonium is given, and hypokalaemia can lead to cardiac arrhythmias.

Campbell and Gosling *(43)* cite four studies which looked at preoperative biochemical screening *(5,12,23, 44)*. In three studies unsuspected abnormalities were found in 1% or less of cases *(5,21,23)*. In the fourth study 10% of patients over 40 years of age had biochemical abnormalities *(44)*, but none of these affected management. Unexpected abnormalities in urea, creatinine or electrolyte concentrations are rare in patients under 60 years of age (less than 1%), and only 3–5% in those over 60 years *(43)*. Unfortunately, these results are gleaned from studies which give few clinical details, thus the clinical significance of such results are not clear. The incidence of diabetes mellitus makes preoperative assessment of glucose metabolism essential. This can easily be done by routine urine testing and/or BM stix. Urine testing may also detect undiagnosed renal disease. Disease of the liver severe enough to cause defects in clotting, abnormal drug metabolism or hepatic failure is likely to be evident clinically.

Kaplan *et al. (5)* recommend biochemical screening where medically indicated. McKee and Scott *(23)* suggest testing patients older than 60 years for major surgery. This latter recommendation is based on the number of patients over 60 years who required biochemical investigations after major surgery, and not on the number or significance of abnormal preoperative tests. Blery *et al. (21)* used a simple protocol based on the history and examination to omit those tests not clinically indicated. Moreover, in only 10% of those cases where a test could, in retrospect, have been informative, would management have been changed. Regardless of what guidelines are followed, all patients should have a dipstick urinalysis to measure glucose, bilirubin, protein and ketones. In patients aged under 60 years, this simple test will be all that is required.

Haematological screening

Full blood count

A full blood count (FBC) is generally requested to detect anaemia, which may place the individual at risk from a general anaesthetic *(45)*. However, routine screening of FBC contributes little to the patient's management *(1–3,5,7,23,46,47)*. Most cases of anaemia, which may alter patient management, can be detected by a full history and examination. Routine FBCs for ambulatory patients undergoing minor surgery are thus unnecessary. For those procedures involving a significant amount of blood loss, a preoperative FBC can act as a baseline for transfusion requirement and postoperative comparison. It has been suggested that when requesting a FBC preoperatively the group and save request should also be made *(5)*.

Sickle cell anaemia affects people of African, Afro-Caribbean, Middle Eastern, Indian and Mediterranean descent. In Britain approximately 5000 people have been reported as having the disease *(48)* and many more have the sickle cell carrier trait. The racial background, together with the clinical information, should be sufficient to make the diagnosis of sickle cell disease relatively straightforward. However, there are genetic variations which influence the severity of the clinical course. Furthermore, the carrier trait rarely gives rise to clinical problems *(49)*. Defining the specific at risk group who require screening preoperatively should, therefore, be clarified with the local haematology department.

Coagulation screening

Routine preoperative coagulation screening might be useful to identify patients at risk from excessive bleeding, but studies have shown that routine coagulation screening is unreliable and produces a large number of false-positive results *(50)*. This, in conjunction with the relative rarity in inherited and acquired coagulopathies, raises doubts as to the usefulness of these screening procedures in patients without any clinical indication of a bleeding disorder. In Rohrer's *et al's* study *(51)*, 7.4% of patients with a clinical suspicion of coagulopathy and none of the patients without any clinical indications had abnormal coagulation. It would seem wise only to request coagulation screening when a coagulopathy is clinically suspected.

Recommendations for preoperative investigations of patients for elective surgery

Chest radiograph
1 Cardiorespiratory disease.
2 Possible pulmonary malignancy (primary or secondary).
3 Severe trauma.
4 Immigrants from countries with endemic TB.
(1 and 4 only if no radiograph within the last 12 months)

Electrocardiograph
1 Patients older than 60 years undergoing major surgery.
2 Symptoms and signs of cardiovascular disease, including ischaemic heart disease or hypertension.
3 Symptomatic respiratory disease.

Urea and electrolytes
1 Clinical evidence of renal disease.
2 Symptomatic cardiovascular disease.
3 Diabetes.
4 Drugs—Diuretics, digoxin, steroids, others causing electrolyte disturbances.

Liver function tests
1 Clinical evidence of liver disease.
2 Chronic liver disease, including a history of hepatitis.

Full blood count
1 Major surgery.
2 Chronic bleeding.
3 History of anaemia.
4 Renal disease.

Clotting screen
1 Clinical evidence of liver disease including a history of hepatitis.
2 Bleeding disorder.
3 Anticoagulants.

Conclusion

With such a vast array of investigations available, the surgical house officer is faced with the difficult decision of which tests, if any, are required before operation. These recommendations must be used with the clinical information obtained from an accurate history and examination. If a relevant investigation has been performed in the preceding 4 months a repeat investigation is not warranted, unless there is a significant change in the patient's condition. If, for any reason, there is doubt regarding these tests then advice should be sought. This encourages communication between the surgeon and the anaesthetist which is essential for the well-being of the patient.

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IMPORTANT

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Owing to a computer error with address labels some Fellows did not receive the July issue of the *Annals* and *Bulletin*.

Please inform the office if you were affected and copies will be sent by return.