

# SURGICAL MANAGEMENT

Second Edition

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## Preface to the First Edition

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It is over fifty years since C. C. Choyce of University College Hospital in London edited a comprehensive work for the practising surgeon and there has been little that is comparable published since that time other than Souttar's *British Surgery*. Other broadly based books have been designed primarily to help senior students achieve qualifications to higher diplomas and we hope that this volume may do this.

The present work has, however, been undertaken for the benefit of the practising general surgeon, covering advances in diagnosis, principles of treatment, possible major complications and the available modern procedures in patient care. Thus our aim has been to cover the subjects that constitute the daily task of a general surgeon, for example, a district hospital; including paediatric and urological problems, chemotherapy and radiation in malignancy, head and neck surgery and much else.

Orthopaedics are omitted as being outside the scope of general surgery except for a discussion of the handling of disaster situations. On the other hand, some specialized subjects such as cardiovascular and brain surgery are included because a knowledge of the potential in these fields is necessary for the general surgeon who is so often involved, even if indirectly, with such situations. In this respect we are particularly indebted to Professor Bentall for his help with the cardiothoracic section. The management of fluid and electrolyte balance, nutritional support, blood replacement, the control of clotting and the avoidance of pulmonary embolism all have a place in total patient care and receive attention.

It is our wish that this book should prove a real friend to surgeons of all persuasions, including those in training, refreshing knowledge in their own fields and giving access to that in others, so that they can appreciate the scope of surgical practice as a whole; the generality of surgery.

It will be noted that the four editors are recruited from London, Merseyside, Scotland and Ireland; that they thus constitute a Board broadly based in the teaching of British general surgery.

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November, 1983

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## Preface to the Second Edition

Surgery has developed so dramatically since the First Edition of *Surgical Management* was published in 1984 that in our opinion nothing short of a major revision could bring the work totally up-to-date.

Today's surgical trainee, for whom the book is primarily intended, is expected to have a solid foundation of knowledge and experience of surgery-in-general, but attempts to define this concept have led to much debate. We have placed greater emphasis on the Principles of Surgical Practice which now comes to the forefront of the text, together with a special section devoted to that important and currently topical area of Trauma Management. We believe that these changes have given the new edition a very particular identity.

Three major subspecialties of general surgery—gastrointestinal, vascular and transplantation—have recently been agreed, and all three areas are fully covered. Nevertheless, the main focus remains on the alimentary tract and oncology. It is less easy to define the core knowledge of orthopaedic, urological and plastic surgery, but many general surgeons require guidance in these very topics and they, too, are comprehensively discussed. The emphasis in orthopaedics is directed mainly at the management of fractures; the emphasis in urology is on trends in management that a general surgeon should recognize.

The format of this Second Edition has been changed and now provides a compact and accessible entrée to the surgical literature. Up-to-date references have been substantially increased in number and grouped together, following major subsections rather than at the end of each chapter. As a result, they are readily available for further research, topic by topic.

We are particularly mindful that there are different levels of surgical training—from undergraduate to general postgraduate to postgraduate for the FRCS, as well as for continuing surgical education. Whatever the level, there is the need for a book that is absolutely up-to-date, easy to read and well referenced. These objectives are very demanding, but we feel quite confident that this Second Edition meets them in good measure.

January, 1991.

Niall J. O'Higgins, Dublin  
Geoffrey D. Chisholm, Edinburgh  
Robin C. N. Williamson, London



# Contents

## Section 1 Principles of Surgical Care

1	Preoperative Assessment	1
	T. DIAMOND and B. J. ROWLANDS	
2	Postoperative Intensive Care	14
	P. H. B. BLAIR and B. J. ROWLANDS	
3	Fluid and Electrolyte Replacement	29
	RONALD G. CLARK	
4	Blood and Colloid Replacement	38
	V. J. MARTLEW and H. H. GUNSON	
5	Nutritional Support	53
	RONALD G. CLARK	
6	Haemostasis and Surgery	65
	LEON POLLER and DAVID TABERNER	
7	Infection in Surgery	81
	D. J. LEAPER and J. F. LANCASTER	
8	Oncology	102
	NIALL J. O'HIGGINS	
9	Principles of Transplantation	127
	R. F. M. WOOD	
10	Wound Healing	134
	A. V. POLLOCK	
11	Principles of Plastic and Reconstructive Surgery	143
	J. H. GOLDIN	
12	Surgery in Tropical Countries	166
	DOUGLAS ROY	

## Section 2 Trauma

13	Emergencies and Catastrophes	183
	D. W. YATES	
14	Head Injury	215
	R. M. KALBAG	
15	High Velocity Missile Injuries	236
	J. M. RYAN and R. SCOTT	
16	Chest Trauma	249
	STEPHEN WESTABY	
17	Abdominal Trauma	267
	T. G. PARKS	
18	Urological Trauma	279
	GEOFFREY D. CHISHOLM	

- 19 Hand Injury and Infection  
R. A. DICKSON and S. P. KAY

- 20 Burns  
JOHN A. D. SETTLE

- 21 Management of Fractures  
DAVID I. ROWLEY

### Section 3 Alimentary Tract

- 22 Acute Abdomen: Peritonitis  
PETER F. JONES

- 23 Acute Abdomen: Obstruction and Haemorrhage  
PETER F. JONES

- 24 Oesophagus  
A. WATSON

- 25 Stomach and Duodenum  
C. WASTELL

- 26 Liver  
OSCAR TRAYNOR

- 27 Biliary Tract  
A. G. JOHNSON

- 28 Pancreas  
ROBIN C. N. WILLIAMSON

- 29 Portal Hypertension  
ROBERT SHIELDS

- 30 Spleen  
M. J. COOPER

- 31 Small Intestine  
ROBIN C. N. WILLIAMSON

- 32 Appendix  
HAROLD ELLIS

- 33 Large Intestine  
R. K. S. PHILLIPS

- 34 Paediatric Abdominal Surgery  
E. R. HOWARD

- 35 Hernia  
NIALL J. O'HIGGINS

### Section 4 Urogenital Tract

- 36 Evaluation of Renal Disease

1. Assessment of Renal Function  
C. P. SWAINSON

2. Radiology  
THOMAS SHERWOOD

3. Investigation of Urinary Calculi  
GEOFFREY D. CHISHOLM

287

303

326

340

356

383

429

454

475

505

539

552

562

594

605

628

655

674

674

678

690

# INDEX

Kidney transplantation (Continued)		
hyperparathyroidism in, 365		
kidney transplant artery anastomosis in, 366		
1607		
lymphoedema in, 367		
4. Uroynamics		
ERIC S. GLEN		693
37 Urological Instrumentation and Procedures		
R. A. MILLER		702
38 Urinary Tract Infection		
CLIVE A. C. CHARLTON		708
39 Obstruction		
D. A. TOLLEY		714
40 Malignancy		
JOHN M. FITZPATRICK		728
41 Penis and Scrotum		
GEOFFREY D. CHISHOLM		744
42 Incontinence		
J. R. HINDMARSH		749
43 Infertility, Fertility and Sexual Dysfunction		
T. B. HARGREAVE		755
44 Renal Transplantation		
P. R. F. BELL		765
Section 5		
Thoracic and Cardiovascular Surgery		
45 Congenital Heart Disease		
MARTIN J. ELLIOTT		778
46 Valvular Heart Disease		
K. M. TAYLOR		794
47 Ischaemic Heart Disease		
STEVEN A. LIVESEY and TOM TREASURE		807
48 Cardiac Transplantation		
J. R. PEPPER		821
49 Arterial Surgery		
ROGER N. BAIRD		827
50 Veins		
A. N. NICOLAIDES		841
Section 6		
Breast and Endocrine Surgery		
51 Thyroid		
NIALL J. O'HIGGINS and SELWYN TAYLOR		854
52 Parathyroids		
J. R. FARNDON		866
53 Adrenal Glands		
J. R. FARNDON		873
54 Breast and Breast Reconstruction		
1. Breast		
NIALL J. O'HIGGINS		895
2. Breast Reconstruction		
L. E. HUGHES		927

## Section 7 Head, Neck and Skin

55	Neck, Pharynx, Larynx, Oral Cavity A. G. D. MARAN	931
56	Salivary Glands J. D. MAYNARD	952
57	Upper and Lower Jaws DONALD F. N. HARRISON	966
58	Tumours of the Skin G. W. MILTON and ANNE O'NEILL	977
	Index	988



# Section 1

## Principles of Surgical Care

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### 1 Preoperative Assessment

T. DIAMOND and B.J. ROWLANDS

#### *General health assessment*

- History
- Examination
- Laboratory investigations
- Radiology and other investigations

#### *Specific factors affecting operative risk*

- Cardiovascular system
- Respiratory system
- Genitourinary system
- Nutritional status
- Obesity
- Diabetes
- Jaundice
- Coagulation status
- Immunological status
- Drugs
- Pregnancy
- Overall assessment of operative risk

#### *Prophylaxis*

- Deep vein thrombosis
- Antibiotics
- Renal failure
- Gastrointestinal preparation

#### *Special considerations in emergency cases*

- Haemorrhage and hypovolaemia
- Intestinal obstruction
- Intra-abdominal sepsis
- Trauma

#### *Psychological assessment*

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The treatment of a patient involving an operative procedure can be regarded as a continuum of surgical care, consisting of the preoperative, operative and postoperative phases. These phases may overlap and vary in relative importance depending on the individual patient and the particular surgical procedure. The overall result depends on good management in each succeeding phase and lack of diligence in the early phase may result in the emergence of potential problems at a later stage. The successful outcome of an operation, therefore, depends to a large extent on accurate assessment in the preoperative period. The major aim of preoperative assessment is to determine the operative risk and fitness for general anaesthesia, but other factors such as identification of specific

potential problems and institution of appropriate prophylactic measures, detection of coincidental disease and establishment of a good rapport between the patient, surgeon, anaesthetist and nursing staff are also important.

#### GENERAL HEALTH ASSESSMENT

The primary aim of preoperative assessment is to identify factors that may influence the operative risk or affect the overall result of the operation. In addition, hospitalization provides the opportunity to identify other hidden or coincidental health problems and allows a review of other aspects of the patient's health care. This includes screening procedures such as cervical smears or mammography, and aspects of health education such as exercise, smoking, alcohol and dietary habits.

Preoperative assessment, therefore, involves a comprehensive review and should include a complete history, physical examination, laboratory investigations and appropriate X-rays. The extent of this will depend on the individual patient, the disease process and the proposed surgical procedure, and may take days or weeks in a complicated elective procedure or involve a rapid assessment in the emergency situation. However, the majority of cases will involve assessment of apparently healthy patients undergoing routine elective procedures, and the assessment programme must be carefully structured so that a disciplined routine is followed in each case and the risk of complacency and failure to detect an important potential problem is reduced.

#### History

A detailed history should be obtained from all surgical patients and specific aspects emphasized so that they can be quickly reviewed during a preoperative ward round or in the operating theatre. A good starting point is a concise documentation of *Biographic Data* including age, sex, nationality, occupation, marital status and number of previous admissions. The *History of the Present Illness* should then be elucidated and the principal symptoms should be developed and characterized.

The symptom complexes of most surgical conditions are not excessively complicated, and individual symptoms and their duration should be enumerated and documented on a separate line. For example:

1. Rectal bleeding—4 months
2. Tenesmus—2 months
3. Constipation—1 week

Other aspects of the presenting symptoms and relevant negative points in the system affected should also be noted. After this, it is useful to include the *Past History*, as in many surgical conditions (e.g. recurrent peptic ulceration) this is relevant to overall assessment and the decision to operate. Any previous surgical procedures should be detailed and recorded in chronological sequence, as this may affect the technique or approach of reoperation. The information obtained so far should be outlined in no more than half a page, so that from the notes, the clinician can very quickly develop a good mental image of the patient and the presenting illness.

*Systematic Questioning* is designed to detect any factors which could affect the anaesthetic risk or overall result and, like any check-list system, it is susceptible to complacency, especially in a busy surgical unit. The surgeon's major concern is the integrity of the four main organ systems: cardiovascular, respiratory, genitourinary and gastrointestinal. Systematic questioning should, therefore, concentrate on these, and a series of standard questions should be asked for each with particular reference to factors which may alter the surgical or anaesthetic risk. Examples are a history of chest pain, claudication, orthopnoea, oedema (CVS); cough, haemoptysis, dyspnoea (RS); haematuria, dysuria, flank pain (GUS); abdominal pain, vomiting, diarrhoea and weight loss (GIT). Detection of symptomatology in other systems such as neurological, musculoskeletal or gynaecological is part of a complete review. These are more important in each particular specialty, but the four major organ support systems should be covered thoroughly in all cases.

The history is concluded with details of the *Family History*, *Drug History* including allergies, and *Social History* including smoking, alcohol and drug use or abuse.

## Examination

The chief purpose of the physical examination is to detect any abnormalities of the *Vital Signs* in the main organ support systems. These are primarily of interest to the anaesthetist and form a preoperative baseline for the anaesthetic and postoperative management. The two most important systems in this respect are the cardiovascular and

respiratory systems and a detailed examination of each is most important. The primary observations to be recorded are the pulse, blood pressure and respiratory rate, and other indices of cardiovascular and respiratory function such as distended neck veins, arrhythmias, carotid or renal bruits, aortic aneurysm, peripheral pulses, dyspnoea, purse-lip breathing, cyanosis, hyperinflation of the chest and finger clubbing should also be checked.

The physical examination, more than the history, provides the possibility of detection of unsuspected disease. A generalized *Inspection* of the patient for anaemia, dehydration, cachexia, pigmentation, ascites, oedema and jaundice may suggest the presence of occult disease. This should be followed by a systematic examination. Some clinicians prefer to do this by systems, but most prefer an organized examination starting with the head and neck and proceeding downwards.

Examination of the *Head and Neck* may reveal localized lesions of the oral cavity or pharynx. Cervical lymphadenopathy may be secondary to disease in the mouth, pharynx, larynx or gastrointestinal tract, or it may be a manifestation of generalized neoplasia of the lymphatic system. Oral, ocular and facial skin changes occur in generalized conditions such as hypo- or hyperthyroidism, liver disease, nephritis and collagen vascular disorders. Dentition and neck mobility should be assessed with reference to endotracheal intubation.

Examination of the *Thorax* is concerned principally with the vital signs of the cardiovascular and respiratory systems, but the axillae should be checked for lymphadenopathy and, in the female, a careful examination of the breasts is mandatory.

Examination of the *Abdomen* is usually of specific interest to the general surgeon. General inspection may reveal an abnormal contour, absence of respiratory movement, dilated veins, visible peristalsis or abnormal distribution of body hair. Palpation is usually carried out in all four quadrants, commencing in the region furthest from the suspected pathology. Palpation should initially be gentle or superficial to assess tenderness. Once this has been localized or excluded, deep palpation is performed to detect abnormal masses. Percussion will confirm the outline of the liver, spleen or abnormal masses and may distinguish between fluid and gas. Auscultation involves characterization of the bowel sounds and detection of vascular bruits. Examination of the *Scrotum* and *Rectum* and bimanual examination of the *Vagina* are part of every complete abdominal examination.

Examination of the *Extremities* is necessary to detect orthopaedic, neurological or peripheral vascular problems as well as peripheral manifestations of gastrointestinal or systemic disease, such as erythema nodosum, pyoderma gangrenosum or skin pigmentation.

## Laboratory investigations

### *Haematology*

A full blood picture (FBP), including white cell count and platelets, is essential in all patients. The erythrocyte sedimentation rate (ESR) is a useful simple check for inflammatory and some neoplastic conditions, and is useful in some conditions as an indicator of disease activity and effectiveness of therapy. Tests of coagulation status are used routinely in some centres, but these are probably not necessary unless indicated by the history or physical examination (*see below*). Sick cell status (Sickledex test) should be checked in Negroes.

### *Biochemistry*

Blood biochemistry is now screened in most large hospitals by automated multichannel analysers. While this may detect biochemical abnormalities such as hypercalcaemia, hyperuricaemia, liver disease or myocardial ischaemia, the cost effectiveness is doubtful and it should be reserved for cases where the history or examination suggest that it may be helpful. All patients should have blood sugar, urea and electrolytes checked before operation.

### *Bacteriology and immunology*

All patients should have routine urinalysis. Immunological screening for hepatitis or acquired immune deficiency syndrome (AIDS) is relevant in particular patient groups (e.g. drug addicts and homosexuals).

## Radiology and other investigations

A chest X-ray and electrocardiograph (ECG) should be obtained in all patients over 40 years and in others where indicated from the history or examination (e.g. smokers and hypertensives). Cervical smears, mammography and faecal occult blood tests are worthwhile screening procedures in appropriate patients.

## SPECIFIC FACTORS AFFECTING OPERATIVE RISK

### Cardiovascular system

A history of myocardial ischaemia or signs of atherosclerosis on examination should be thoroughly investigated. An ECG should be performed in all such patients. If this shows significant signs of ischaemia (T wave inversion, ST elevation or depression, Q waves), cardiac enzyme estimation, treadmill testing and assessment by a cardiologist should be obtained. In cases of severe ischaemia,

coronary angioplasty or coronary artery bypass may be necessary before a major procedure can be undertaken. Within the 6 months following a myocardial infarction, the risk of reinfarction during elective procedures is increased by 30%. Elective procedures should, therefore, be postponed for approximately 9 months if possible, or even longer in cases involving a risk of hypoxia or hypotension.

Hypertensive patients should be carefully assessed, not only because hypertension significantly increases the anaesthetic risk, but also because antihypertensive drugs may produce harmful side-effects, which should be excluded prior to surgery. Most patients with a diastolic pressure greater than 100 mmHg are on some form of drug therapy. In the younger patient, this usually consists of a peripheral  $\beta$ -blocker, with or without a diuretic, while in older patients a diuretic alone is usually sufficient. The adverse effects of  $\beta$ -blockers include congestive cardiac failure, bradycardia, heart block and bronchoconstriction. Diuretics may cause electrolyte imbalance, but this is not as severe with the potassium sparing agents such as spironolactone, amiloride or triamterene. Blood pressure should, therefore, be carefully controlled, and this may require hospitalization, alteration of drugs, strict bed rest and sedation for several days before operation. In most cases, antihypertensive drugs will be continued up to the time of operation. A chest X-ray and ECG should be obtained, and urea and electrolytes should be checked.

Congestive cardiac failure may be detected in older patients, especially in emergency cases, and this requires assessment with a chest X-ray, ECG, blood gas analysis and urea and electrolyte estimation. Correction with loop diuretics, digoxin, morphine sulphate and aminophylline is necessary before anaesthesia or surgery can be contemplated.

Arrhythmias such as atrial fibrillation, heart block or ventricular ectopics may be detected by routine examination or by ECG. Temporary electrical pacing may be necessary.

### Respiratory system

The surgeon should be alerted to the possibility of respiratory problems in the operative or post-operative period by factors in the history, such as heavy smoking, cough or sputum; and physical signs, such as central cyanosis, wheezing, prolonged expiration, hyperinflation of the chest or obesity. The site of operation is also important—operations on the thorax or upper abdomen associated with severe pain may decrease pulmonary ventilation and lead to respiratory failure.

Assessment of respiratory function begins with



the history and examination and much information can be obtained by good clinical examination and judgement of lung ventilation. Initial investigations include a chest X-ray, ECG and blood gas analysis. Respiratory failure occurs when the arterial oxygen tension ( $P_{aO_2}$ ) falls below 50 mmHg. The arterial carbon dioxide tension ( $P_{aCO_2}$ ) is used to subdivide respiratory failure into Type 1;  $P_{aCO_2}$  is less than 50 mmHg and Type 2;  $P_{aCO_2}$  is above this level. Type 2 failure denotes the presence of  $CO_2$  retention, which occurs in severe pulmonary dysfunction.

Some simple spirometric tests (vitalograph and peak flow recordings) can be carried out in the surgical ward. The most helpful indices are the forced vital capacity (FVC), the forced expiratory volume in 1 second ( $FEV_1$ ) and the peak flow rate (PFR). These help distinguish between obstructive and restrictive lung disease, and an  $FEV_1/FVC$  ratio of less than 70% indicates significant pulmonary dysfunction. In cases such as this, or in Type 2 respiratory failure, complete pulmonary function tests and the assistance of a respiratory physician should be obtained.

Preoperative preparation involves intensive physiotherapy with postural drainage and bronchodilators to help clear inspissated secretions from the airways. Abstinence from smoking significantly reduces sputum production. The use of an incentive spirometer, such as a Bennett respirator, and instruction in techniques of deep breathing and coughing improve pulmonary function. This should be assessed regularly by spirometry and blood gas analysis during the preoperative period.

When procedures involving severe postoperative thoracic or upper abdominal pain are contemplated in a patient with reduced respiratory function, it is useful to insert an epidural catheter at the time of surgery, so that adequate pain relief can be obtained without the respiratory depressant effects of narcotic analgesics. In some cases, where respiratory function may be so compromised that a general anaesthetic is dangerous, regional anaesthetic techniques, such as local nerve block, brachial block or spinal anaesthetic, should be considered. Elective procedures should be postponed in patients with an acute upper or lower respiratory tract infection.

### Genitourinary system

The risks for patients with renal disease are related principally to disturbances of fluid, electrolyte and acid-base balance. The surgeon must also be aware of the risks of infective complications or gastrointestinal perforation, associated with immunosuppressive agents (e.g. corticosteroids,

azathioprine) which are commonly used to treat patients with renal disease.

In severe cases of renal failure, anaemia, oedema, leuconychia and skin pigmentation may be present, but milder forms are often difficult to detect on routine history and physical examination. All patients should have routine urinalysis, FBP and urea and electrolytes checked before operation. In cases where the presence of renal disease is indicated by albuminuria, uraemia or electrolyte imbalance, more detailed assessment of renal function is indicated. This involves measurement of serum creatinine, serum albumin, serum and urinary osmolality, urinary specific gravity, acid-base balance and 24 h collection of urine for calculation of creatinine clearance.

An intravenous urogram will give some indication of urinary tract anatomy, but it is not a useful investigation if impaired renal function is due to an obstructive uropathy. In this situation, ultrasound reveals the presence of upper tract dilatation. A more quantitative assessment of glomerular excretory function in each kidney can be obtained from a DTPA (diethylene tetramine pentacetic acid) scan. A DMSA (dimercaptosuccinic acid) scan, which images functioning renal parenchyma, provides an indication of function in each kidney and reveals anatomical abnormalities such as the presence of scarring.

In critically ill patients, urinary output should be measured every hour. Normal urinary output is 60 ml/h (1 ml/min; 1.5 L/24 h). A urine output of less than 20 ml/h is known as oliguria and acute renal failure occurs when the output is less than 16 ml/h (400 ml/24 h). In severe cases, peritoneal or haemodialysis may be necessary. Dialysis is indicated when the serum urea is greater than 35 mmol/l, serum creatinine is greater than 900  $\mu$ mol/l, serum potassium is greater than 6.5 mmol/l or there is severe metabolic acidosis (pH less than 7.1).

A urinary catheter should be inserted preoperatively in all patients undergoing pelvic surgery, in patients with renal disease where accurate fluid balance is necessary and in patients undergoing extensive procedures involving prolonged intravenous fluid therapy.

### Nutritional status

It is commonly assumed that malnutrition is rare in Western societies with high living standards. However, surveys of nutritional status in general surgical patients have revealed a 50% incidence of nutritional deficits. This high incidence, plus the advent of effective therapy, emphasizes the importance of identifying patients who would benefit from enteral or parenteral nutritional support. Unfortunately, there is no single diagnostic test



and nutritional assessment involves determination of several indices (Table 1), interpretation of which must take into account the overall medical status of the patient.

**Table 1**  
**Measurements Used for Assessment of Nutritional Status**

Body compartment	Measurement
Skeletal muscle	Arm muscle circumference Creatinine-height index
Visceral protein	Plasma proteins Immune function
Fat	Triceps skin fold thickness

#### *Dietary history and body weight*

A complete dietary history should be obtained, including past dietary intake, number of meals and type of food usually eaten, recent changes in dietary habit, food allergies and food fadism. The patient's height, usual weight and present weight are also recorded. Using these data, the percentage weight loss can be calculated from the formula:

$$\% \text{ Weight loss} = \frac{\text{Usual body weight (UBW)} - \text{actual body weight (ABW)} \times 100}{\text{Usual body weight (UBW)}}$$

A percentage weight loss of 20% or greater is associated with a tenfold increase in operative mortality and a threefold increase in postoperative septic complications.

#### *Anthropometry*

Measurements from the patient's body are called anthropometric indices. These include the triceps skin fold thickness (TST), the midarm circumference (MAC) and the midarm muscle circumference (MAMC). MAMC reflects the skeletal muscle mass. The TST and MAC are measured at the midpoint between the acromion and the olecranon of the non-dominant arm. TST is measured by grasping the skin and adipose tissue over the triceps muscle and calculating the thickness using Langes calipers. Three readings are taken and the average value is recorded. The MAMC is calculated from the MAC and the TST using the formula:

$$\text{MAMC (cm)} = \text{MAC (cm)} - [0.314 \times \text{TST (mm)}]$$

The anthropometric indices are compared with normal standards. Values falling below the 5th percentile are taken as evidence of severe nutri-

tional depletion; values between the 5th and the 15th percentiles indicate moderate nutritional depletion.

#### *Biochemistry*

Biochemical measurements used to assess nutritional status are the plasma proteins and the creatinine-height index. The plasma proteins reflect the visceral protein compartment and the proteins usually measured are albumin, transferrin, thyroxine-binding prealbumin and retinol-binding protein. Non-nutritional factors, such as liver disease or renal failure, may affect the levels of the plasma proteins. In the absence of non-nutritional factors, a serum albumin less than 3g/dl or a serum transferrin less than 150 mg/dl indicate deficiency in the visceral protein mass and are associated with an increased morbidity and mortality.

Creatinine production from creatine is directly related to skeletal muscle mass. An estimate of the lean body mass can, therefore, be made from the urinary excretion of creatinine. The creatinine-height index (CHI) is calculated from the formula:

$$\text{CHI (\%)} = \frac{\text{Measured urinary creatinine} \times 100}{\text{Ideal urinary creatinine}}$$

CHI values of 60–80% are said to represent moderate skeletal muscle depletion, while values of 40–60% represent severe depletion.

#### *Immune function*

This is influenced by nutritional status and is therefore useful in nutritional assessment. Total lymphocyte count and reactivity to skin test antigens are the immune responses most commonly measured. A total lymphocyte count of 1200–1500/mm<sup>3</sup> is associated with mild nutritional deficiency, a count of 800–1200 with moderate deficiency and a count less than 800 with severe deficiency. The skin test antigens most frequently used are *Trichophyton*, *Candida*, mumps, streptokinase and purified protein derivative (PPD). Each antigen is injected intradermally on the volar aspect of the forearm and the diameters of the areas of erythema and induration are recorded at 24 and 48 h. A positive result is defined as 5 mm of induration at either time of observation. The patient's reactivity to the five tests is defined as normal (two or more positive responses), relatively anergic (one positive response) or anergic (no positive responses). Anergy is associated with a poor prognosis in surgical patients, but there may be non-nutritional causes for this, such as disorders of cell mediated immunity, drugs (corticosteroids), burns, malignancy and severe sepsis.