Principles of Oral and Maxillofacial Surgery
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Preface to the Sixth Edition

Oral and maxillofacial surgery continues to develop, with new technologies being embraced. These developments have been incorporated into this new edition for the new generations of students; however, full attention is still paid to the fundamental basis of patient assessment and diagnosis, which form the cornerstone of any surgical specialty. Developing the decision-making process for the learner is one of the more difficult aspects of teaching and learning. We hope that this book still helps in this process.

Explanation of principles has remained the priority and this is still intended as an undergraduate and early postgraduate text.

Acknowledgements

This textbook had its inception in the early days of the specialty and much has changed within the discipline and the book since then. It is important to continue to acknowledge those who created the environment for these changes and influenced the contributions to this new edition.

I am grateful to Wiley-Blackwell, who have strongly supported the concept of developing a new edition. The process has been much facilitated by their steady yet insistent style of management and I can honestly say it has been a pleasure. It is invigorating to be part of something that feels very positive and my fellow contributors have been equally positive about the process. I would like to thank them for their prompt and relaxed style of authorship.

I am grateful also for any illustrations that have been permitted to be included, as they are essential to the understanding of the text.
Foreword to the First Edition

There is an increasing need for trained oral surgeons in the world today. An operative field that was a no-man’s-land partly controlled by the general surgeon, partly controlled by the dental surgeon, has now come to be the field of a specialised branch of dentistry.

In the past we have had to use books written and published in America, and, fine though these books are, it is refreshing to find a book produced by a British oral surgeon, because in the world today, British oral surgery has undoubtedly the highest general level of training and achievement in the oral surgical field.

Mr J. R. Moore has had considerable practical experience as an oral surgeon in a consultative capacity before devoting his talents to teaching, and he has produced a book of great practical use both to the student or trainee learning oral surgery and also a book of great interest to the established specialist.

I deplore the fragmentation of the dental profession by dividing it into so many specialities, but in the field of oral surgery there are procedures which the dental surgeon would not wish to carry out. Therefore a knowledge of the difficulties and hazards of an oral surgical procedure is essential for the general dental surgeon, who should include this book in his library.

It is with great pleasure that I commend this work of Mr J. R. Moore of University College Hospital to the profession.

T G Ward
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Chapter 1
The New Patient

- History
- Principles of examination
- Systematic procedure for examination of the oro-facial tissues
- Special investigation
- Diagnosis
- Treatment planning

It is difficult to overstress the importance of a good history and thorough clinical examination for every patient. It is on this that the diagnosis is made and the treatment plan based. A full, clearly written record of the original consultation is essential to assess progress following treatment. This is particularly true if a colleague should be called to see the patient in the practitioner’s absence. The medico-legal importance of accurate records cannot be overemphasised.

In hospital and specialist practice this procedure can seldom be relaxed, but the student and the busy practitioner may find it irksome to maintain a high standard when faced with a series of apparently straightforward dental conditions. Nevertheless, sufficient time must be allowed for an unhurried consultation at the first visit. This will help to avoid errors of omission, and may contribute much to the success of treatment and to the interest of the practitioner. With experience, only important facts need be noted, the dental surgeon considering and setting aside the irrelevant points. This technique can be used with safety only after a long apprenticeship during which many histories and examinations have been methodically completed and all the information recorded. In this chapter a system for interviewing and examining patients, and recording findings, is briefly suggested.

History

At the first meeting it is important for the clinician to establish a rapport with the patient and to assess attitudes to the clinical situation. Behavioural issues
must be addressed, attempting to put the patient at ease in what is for many a confrontational situation. The interview must be planned to facilitate the process, seating the patient comfortably, adjusting the chair as required to show care, as well as addressing them by the correct name and title. Even at this stage it should be possible to determine whether the patient is anxious or relaxed. The general details of age, sex, marital status, occupation and contact details, together with the names of their general medical and dental practitioner, should be available in the notes but can be checked. The history is then recorded under the headings shown in italics.

The patient will seldom tell their story well. Some will be verbose, others reticent, while the sequence is usually in inverse chronological order with the most recent events first. The art of the good history lies in avoiding leading questions, in eliciting all the essentials, in censoring verbosity and in arranging the facts in their true order, so that the written record is short and logical. Allowing the patient initially to give the history and subsequently writing notes in chronological order while rechecking and summarising the facts verbally, helps the clinician obtain a concise and accurate account of the patient’s symptoms.

**Patient referred by**

The name and professional status of the person referring is noted. This facilitates a reply to the referral in the form of a letter.

**Complains of (CO)**

The patient’s chief complaint told in their own words. Opinions, professional and otherwise, repeated in an effort to help must be gently set aside and the patient encouraged to describe the symptoms they want cured, and not their views on the diagnosis.

**History of present complaint (HPC)**

This is an account in chronological order of the presenting complaint. When and how it first started, the suspected cause, any exacerbating factors and the character of the local lesion, such as pain, swelling and discharge. This includes remissions and the effects of any treatment received. General symptoms such as fever, malaise and nausea are also noted.

**Previous dental history (PDH)**

This records how regularly the patient attends for dental care and the importance they attach to their teeth. Any past experience of oral surgery is included, especially where difficulty occurred in the administration of anaesthetics, the extraction of teeth and the control of bleeding.

**Medical history (MH)**

A summary in chronological order of the patient’s past illnesses. Details of prolonged illness or those requiring hospital admission are recorded. Current
The New Patient

medication, which can give insight into the severity of any underlying conditions, and allergies of any kind, particularly drugs that might be prescribed and latex, must be noted. The more important medical conditions are discussed in Chapter 3.

The family history (FH)
Occasionally this is of importance in oral surgery. Hereditary diseases such as the haemophilias and hypodontia together with autoimmune disease may be relevant in management of the patient.

The social history (SH)
This includes a brief comment on the patient’s occupation and social habits, such as exercise, smoking and drinking. The home circumstances are important when surgery is to be performed – that is, whether the patient has far to travel, lives alone or has someone to look after them. These factors may influence the decision to treat as an in- or outpatient.

Principles of examination

The basic principles of examination are the same in all fields of healthcare. It should be made according to a definite system, which in time becomes a ritual. In this way errors of omission are avoided.

From the moment the patient enters the surgery they should be carefully observed for signs of physical or of psychological disease which may show in the gait, the carriage, the general manner, or the relationship between parent and child. Too little time is often spent on visual inspection, both intra- and extraorally. Eyes first, then hands, should be the rule, not both together.

In palpation, all movements are purposeful and logical, and the touch firm but gentle. The tips of the fingers are used first to locate anatomical landmarks and then to determine the characteristics of the pathological condition. The patient’s co-operation is sought so that areas of tenderness may be recognised and the minimum discomfort caused. Wherever possible the normal side is examined simultaneously. Only by such comparison can minor degrees of asymmetry be detected. Swellings situated in the floor of the mouth or in the cheek are felt bimanually with one hand placed inside, and one outside, the mouth. Both positive and negative findings are written down as later one may wish to check that at the first visit no abnormality was found in certain structures.

Systematic procedure for examination of the oro-facial tissues

Extraoral examination
This commences with a general inspection and palpation of the face, including the mandible, maxillary and malar bones, noting the presence of any
abnormality, such as asymmetry or paralysis of the facial muscles. The eyes, their movements and pupil reactions are observed together with any difficulty in breathing.

*The temporomandibular joints*

(See also Chapter 17)

With the surgeon standing behind the patient, the site of the condyles are identified by palpation while the patient opens and closes their mouth. The joints are examined for tenderness and clicking or crepitus on opening and closing. The range of opening and left and right lateral excursion are checked and abnormalities noted.

*The muscles of mastication*

The muscles of mastication are palpated for tenderness. From extraoral, principally this means masseter and temporalis muscles, although medial pterygoid insertion can be palpated at the lower border.

*The maxillary sinuses*

In disease these may give rise to swellings, redness and tenderness over the cheek and canine fossa, nasal discharge and fistulae into the mouth, often through a tooth socket.

*The lymph nodes*

The operator stands behind the patient, who flexes their head forward to relax the neck muscles. Enlarged submental and submandibular nodes can be felt with the fingertips by placing these below the lower border of the mandible and rolling the nodes outwards. The upper deep cervical group can be found by identifying the anterior border of the sternocleidomastoid muscles at the mastoid process and rolling the skin and subcutaneous tissues between fingers and thumb. Working down this muscle to the clavicle and then ascending the neck to palpate the trachea and hyoid regions, the nodes may be felt against other structures such as muscles and underlying bones. With practice, tenderness, consistency and degrees of mobility will be recognised.

*The lips*

These are inspected for lesions such as fissuring at the angles of the mouth, or ulceration.

*The cranial nerves*

In some circumstances examination of all the cranial nerves is undertaken as part of the general examination. In particular this will be when neurological defects are noted and the possibility of intracranial lesions is suspected. The orofacial region encompasses the activity of the majority of the cranial nerves and a degree of familiarity with their action and testing is to be encouraged (Table 1.1). Facial trauma is often implicated in damage of the cranial nerves
either intracranially or more peripherally, and even the most superficial dental examination will test branches of the 5th, 7th and 12th cranial nerve.

### Table 1.1 Cranial nerves

The cranial nerves are listed with their area of activity in which testing must take place. The principal actions are indicated; S = sensory, M = motor (bold indicates main action of nerve, lower case indicates lesser action of nerve)

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Action</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Olfactory</td>
<td>S</td>
<td>Smell</td>
</tr>
<tr>
<td>2</td>
<td>Optic</td>
<td>S</td>
<td>Sight</td>
</tr>
<tr>
<td>3</td>
<td>Oculomotor</td>
<td>M</td>
<td>Extrinsic muscles of eye</td>
</tr>
<tr>
<td>4</td>
<td>Trochlear</td>
<td>M</td>
<td>Superior oblique muscle</td>
</tr>
<tr>
<td>5</td>
<td>Trigeminal</td>
<td>S + m</td>
<td>Sensory to face, mouth, teeth; motor to muscles of mastication</td>
</tr>
<tr>
<td>6</td>
<td>Abducent</td>
<td>M</td>
<td>Lateral rectus muscle</td>
</tr>
<tr>
<td>7</td>
<td>Facial</td>
<td>M + s</td>
<td>Motor to face; taste</td>
</tr>
<tr>
<td>8</td>
<td>Vestibular-cochlear</td>
<td>S</td>
<td>Hearing</td>
</tr>
<tr>
<td>9</td>
<td>Glossopharyngeal</td>
<td>S + M</td>
<td>Sensation to posterior tongue; motor for swallowing</td>
</tr>
<tr>
<td>10</td>
<td>Vagus</td>
<td>M + S</td>
<td>Motor to pharynx, larynx; sensory to viscera; autonomic to gastrointestinal tract</td>
</tr>
<tr>
<td>11</td>
<td>Accessory</td>
<td>M</td>
<td>Trapezius, sternocleidomastoid</td>
</tr>
<tr>
<td>12</td>
<td>Hypoglossal</td>
<td>M</td>
<td>Muscles of tongue</td>
</tr>
</tbody>
</table>

Intraoral examination

**Mirror examination**

An initial mirror examination of all the structures visible in the mouth, both soft tissues and hard, should be undertaken first to give a clear survey of the general state of the mouth.

**The mucous membranes**

The cheeks, lips, palate and floor of the mouth are examined for colour, texture and presence of swelling or ulceration. Comparison of both sides by palpation is essential to discover any abnormality.

**The tongue**

Movements, both intrinsic and extrinsic, are tested, as limitation is an important clinical sign in inflammation and early neoplasia. The dorsum is best seen by protruding the tongue over dental gauze with which it can be grasped, drawn forward and, with the aid of a mouth mirror, examined over its length for fissures, ulcers, etc.
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**The tonsils**

These are seen by depressing the tongue with a spatula and asking the patient to say ‘Ah’.

**The pharynx**

Again the tongue is depressed, the patient asked to say ‘Ah’. In good light, a small, warm mirror is passed over the dorsum of the tongue, past the uvula, and rotated to show the naso- and oropharynx. This can be demanding both for the surgeon and the patient, particularly those with a pronounced gag reflex.

**The salivary glands**

The examination of these is described in Chapter 16.

**The periodontal tissues**

The colour and texture of the gingivae are noted, and the standard of oral hygiene classified, including charting the presence of plaque and calculus. Recession, pocketing and hyperplasia of the gums are measured, and the mobility of the teeth assessed.

**The teeth**

These are charted for caries and fillings with a mirror and probe. Loose teeth, crowns or fillings are noted.

**Edentulous ridges**

These are examined for the form of the ridge, retained roots and soft tissue or bony abnormalities. Dentures worn should be inspected *in situ* before being removed to examine the underlying tissues.

**The occlusion**

This is best analysed by taking study models and mounting them on an anatomical articulator and is usual only for assessment of orthognathic cases. However, the occlusal function of natural teeth, bridges and dentures should be assessed at the same time as the teeth are charted.

**Presenting lesion**

This is the examination of the lesion for which the patient has sought treatment. It may have been included in the general examination mentioned above, but frequently there is a swelling, ulcer, fistula or other disease that requires special attention, the details of which are best recorded under one heading easily referred to throughout treatment.

It is important in examining such pathological entities to determine their site, size, shape, colour, the character of their margins and whether they are single
The New Patient

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or multiple. Tenderness, discharge and lymphatic involvement are also important. Swellings should be palpated to determine whether they are mobile or fixed to the skin or to the underlying tissues. They may be either fluctuant or solid. Solid swellings may be very hard (like bone) or firm (like contracted muscle), soft (like relaxed muscle) or very soft (like fat). Induration is a firmness particularly associated with neoplastic lesions. Where a collection of fluid is suspected, fluctuation is elicited by placing two fingers of one hand on each side of the swelling and pressing centrally with a finger of the other hand. Where the lesion is fluid a thrill will be felt. This must be elicited in two directions at right angles, as muscle fluctuates in the longitudinal but not the transverse plane. All pulsatile swellings must be checked to establish whether the pulsation is true or transmitted from an underlying artery.

Special investigation

The history taken and the examination of the patient having been completed, a differential or provisional diagnosis should be made. This should attempt to establish the disease process and relate it to the tissue involved. It is always useful to consider the main pathological categories (Table 1.2), rejecting those that do not fit the presenting situation. Similarly, the tissues in the area from which the lesion could arise should be identified. In this way a sensible argument may be sustained to support a definitive or differential diagnosis. Special investigations may be necessary to differentiate between these or to confirm a clinical finding. These are not indicated for every patient; indeed, their cost and the delay involved in completing them make it necessary to limit their use. Such investigations are an aid to diagnosis and may also be required for treatment planning. It is convenient to divide the more usual procedures into the four main categories shown in Box 1.1.

The oral surgeon must be quite clear about how the necessary specimens are collected and, even more important, understand the clinical significance of the results. These have been dealt with extensively in other works and the methods of collection of certain specimens are described later in this text in the appropriate chapters.

Diagnosis

When the special investigations have been completed the surgeon should be able to make a final diagnosis and it is important that this be clearly stated in the notes. Diagnosis is not a matter of intuition but is a ‘computer’ exercise in which all the information is sorted and analysed. Sometimes it is impossible to reach a decision because of lack of information or knowledge, in which case the
A surgeon will need to consult textbooks or papers and may need to seek the opinion of a colleague.

Treatment planning

Only when the diagnosis is established can a satisfactory treatment plan be made. This should be divided into preoperative, operative and postoperative care, each of which should be planned in a logical sequence, constantly bearing in mind that the ultimate aim is to cure the patient with the least risk and minimal inconvenience.
Box 1.1 Special investigations commonly used in oral surgery

Local dental investigations

A Performed in the surgery
1. Percussion of teeth for apical tenderness
2. Vitality tests on teeth
   (a) Thermal
   (b) Electrical
3. Radiography
4. Diagnostic injections of local anaesthetic solutions in facial pain
5. Study models for studying the occlusion
6. Photography as a comparative record

B Requiring special facilities
1. Bacteriological investigations, including sensitivity tests
2. Aspiration of cystic cavities
3. Biopsy of tissue

General investigations

A Performed in the surgery
1. Temperature of body
2. Pulse rate
3. Blood pressure
4. Respiration rate
5. Cranial nerve testing (see Table 1.1)

B Requiring special facilities
1. Urinalysis
   Physical examination for colour, specific gravity
   Chemical tests for sugar, acetone, albumen, chlorides, blood
   Microscopic examination for cells, bacteria, blood
   Bacteriological culture
2. Blood investigations
   Haemoglobin estimation
   Red cell, white cell and platelet count
   C-reactive protein (CRP)
   Bleeding and clotting mechanisms
   Grouping and cross-matching for transfusion
   Blood chemistry and electrolytes – calcium, inorganic phosphorus, alkaline phosphatase, serum potassium, chloride, albumen, globulin, urea, glucose (see appendix)
   Serology
3. Radiographs, CT, MRI scans
4. Electrocardiograph
5. Tests for allergy

Further reading

Chapter 2
General Patient Management

Surgical patients

The management of surgical patients can be considered under three headings: preoperative, operative and postoperative. These should form a programme planned to meet the patient’s therapeutic need. This chapter is concerned with the pre- and postoperative care, excluding the medically compromised patients, who are the subject of Chapter 3.

Once the treatment has been planned it must be decided whether the patient requires admission to hospital or can be treated on a day-case basis or as an outpatient. Admission as an inpatient ensures more comprehensive care, which can be extended both pre- and postoperatively until the patient is both fit for the procedure and able to be discharged home. Much of the responsibility for the provision of care is entrusted to the nursing staff. Optimal conditions can be maintained with administration of intravenous drugs and appropriate nutrition catering for the particular patient needs. This provides an environment that can seldom be achieved at home, although early discharge is to be encouraged to increase efficient bed use. With this in mind, day-stay facilities where the patient is admitted in the morning to return home postoperatively, some hours after recovery, are increasingly popular. The advantage of this is postoperative supervision by nursing staff during the period when complications related to surgery or anaesthesia may occur, while allowing the patient to return home as soon as possible. However, the home circumstances must allow the patient to be adequately looked after and the patient must be within reasonable distance of help postoperatively should unexpected complications occur. In oral surgery, the majority of outpatients are treated using local anaesthesia, sometimes in conjunction with sedation techniques. Inpatients usually have endotracheal
general anaesthesia of a longer duration than should be administered on a day-stay basis.

The indications for admitting patients to hospital are surgical, medical and social.

**Surgical**

The length of surgery – a day case should ideally be around 30 minutes in duration, anything longer than this may require overnight admission, although improvements in general anaesthetic agents have allowed more rapid recovery. If there is a risk of complications such as haemorrhage or fracture of the jaw, or if major surgery is being undertaken with consequent increased morbidity, the need for admission increases.

**Medical**

The patient requires collateral management by a physician (e.g. management of diabetes), needs special therapy or skilled nursing care.

**Social**

The patient’s home conditions are poor, they are living alone, live far away or are anxious to be treated as an inpatient.

Inpatient care demands a wider application of the general principles that underlie the management of surgical patients. It is therefore considered first, though no important difference is implied between the needs of in- and outpatients.

**Inpatient care**

The date of admission to hospital can be arranged at the time of consultation and waiting lists thereby avoided. Where a waiting list is used it is important to give adequate warning that a bed is available and also to recognise certain surgical priorities, such as the following.

**Emergency**

Conditions requiring instant admission, such as acute infections or traumatic injuries.

**Urgent**

Conditions that can progress to emergencies if treatment is long delayed, for example subacute infections and neoplasms.

**Routine**

Those of no urgency who may take their turn in chronological order.

A patient who is fit and only requires routine surgery is normally admitted the day before the operation, although pre-admission clinics (PAC) can usefully
highlight management issues that can be addressed prior to the actual admission date. Problems related to the administration of a general anaesthetic should be anticipated and an anaesthetic opinion sought (see below). Where special preparation is needed, such as blood investigation, or consultation with other specialists, the time of admission must be calculated to allow for these procedures to take place first.

The patient should be visited by the surgical team within a few hours of admission and findings made at the outpatient examination reviewed and revised if necessary. The pulse, temperature and blood pressure are recorded. Blood tests may be required and should be sent off in time to allow analysis before surgery. The mouth must be carefully examined and the area of surgery reassessed. If teeth are to be removed, any change to the dentition should be noted to enable those beyond conservation to be extracted under the same anaesthetic. Insecure dressings should be replaced to prevent their being dislodged into a socket or wound. Before a general anaesthetic, loose or crowned teeth are noted and the anaesthetist warned. Where extensive haemorrhage is anticipated blood is taken for grouping and cross-matching, and the necessary amount for replacement is ordered. Where grouping is done only as a precautionary measure the serum may be kept for cross-matching if required, but no blood ordered. The nature of the operation and likely complications should be explained to the patient and informed consent obtained in writing for both the anaesthetic and the operation.

It is the role of the surgeon not only to carry out the local treatment but also to supervise the day-to-day care.

Relations with the nursing staff

The surgeon must understand the routine of the wards and the way the patients are nursed. Though it is essential to make daily visits to assess progress and give treatment, these must be arranged to avoid awkward times when the wards are normally closed. The nursing staff spend much time with the patient and have opportunities to hear complaints and observe minor changes that the surgeon may overlook. Their role in motivating the patient during the postoperative period should not be underestimated and their comments can therefore be of great help. They are an essential member of the ward round and should be consulted about progress daily.

Informed consent

Before any procedure is undertaken the patient’s informed consent must be obtained. The proposed operation or investigation should be explained in simple language which can be understood by the lay person. The more common complications must be mentioned without causing undue distress. Where a
general anaesthetic or sedation is proposed the consent should be in writing. For those under 16 years of age, it must be given by their parent or guardian.

Major points on informed consent:

- It is required for any surgical procedure on children under 16.
- It is required for all patients undergoing general anaesthesia or sedation.
- It requires careful explanation by staff who fully understand the procedure.
- Full warnings of recognised complications must be noted.
- Nervous patients may have little recall of information given.

Diet

A knowledge of the principles of nutrition is essential to understand the dietetic problems of the patient, and the following summary is presented with this in mind. The diet can be broadly divided into its fluid and solid content.

Fluid intake and output

The water intake is approximately the sum of the weight, expressed in grammes, of fluid and of solid food ingested, because solid food when digested and metabolised yields three-fifths its own weight as water. The water intake should be about 2500 ml daily, half of which is taken as drinks.

Water is excreted as exhaled air (400 ml), evaporation including sweat (500–1000 ml), urine (1200 ml) and faeces (200 ml). Water lost by exhalation and evaporation is used for heat regulation and the quantity lost varies widely according to the circumstances. Insufficient fluid intake shows as a decrease in urine output. The absolute daily minimum of urine is the 600 ml required to carry the 50 g of urinary solids excreted daily; below this volume toxic metabolites are returned to the blood. At this concentration the specific gravity is raised from 1.015 to 1.030. All patients who have difficulty in feeding because of acute trismus or mouth injuries should have a fluid balance chart. This shows on the credit side all fluid taken in 24 hours, including metabolic water, and on the debit side the urine passed plus an estimate for water lost by evaporation, which may be very high in febrile states. For all practical purposes the urine output is a measure of the water balance.

In the adult, the daily output should be at least 1000–1500 ml. This simple but accurate criterion is satisfactory unless cardiovascular or renal disease is present, when overenthusiastic pressing of fluids beyond the power of the kidney to excrete may result in fluid overloading and excessive stress on the heart. Fluids may be administered by several routes, of which only the oral and intravenous are much used. The safest, most convenient and effective way of giving fluids is by mouth if not contraindicated, and should be preferred to all others. Up to three litres of water, flavoured attractively, can be taken each day. Where the intraoral route cannot be used, fluids may be given intravenously.
Solid food
A balanced diet includes carbohydrates, fats, proteins, vitamins and mineral salts. Fats, the highest calorie provider, are not easily digested by the sick and their intake may have to be markedly reduced. They are, however, important as a vehicle for the fat-soluble vitamins A, D, E and K. In starvation, the body’s fat reserves may be mobilised, but a certain minimum daily quantity of carbohydrate is needed for their physiological use and to prevent ketosis. Only 100 g of glycogen is stored in the liver, which is less than a one-day requirement. Protein is essential for the repair of tissues and for maintaining the circulation. A deficiency may occur after extensive haemorrhage or burns and may increase the susceptibility to shock, impede the healing of wounds, impair circulatory efficiency and lower resistance to infection. Patients in bed undergo protein wastage, which is best prevented by a high carbohydrate and protein diet. Vitamins and mineral salts are essential and are supplied therapeutically, if deficient.

Food must be attractively prepared, and even if sieved or in fluid form it should not lose its identity. Each meal should bear some resemblance to its usual form; most foods can easily be liquidised and baby foods, though expensive, are useful in this respect.

Special dietary requirements must be discussed with the dietitian and the ward sister. The total calories, the amount of water, protein and vitamins, together with proprietary preparations and the number and the kind of supplementary feeds, must be specified. The rule ‘a little and often’ will help to avoid indigestion and ensure an adequate intake, particularly when the jaws are wired together. Supplementary feeds should be considered so that the daily routine includes early morning tea, breakfast, ‘elevenes’, lunch, tea, dinner, supper and nightcap.

Certain patients may have to be fed through a nasogastric (Ryle’s) tube. This is a small-bore plastic tube passed through the nose so that about 5 cm lies in the stomach. The normal length of tube from the nose is 50 cm; any excess interferes with gastric peristalsis and may cause anorexia and nausea. Its presence in the stomach is confirmed by radiographs and by aspirating gastric contents up the tube before feeding is started. Feeding may be continued in this way indefinitely if the tube is brought out, cleaned and replaced through the other nostril every two or three days. Feed is pumped from a calibrated dispenser at a controlled rate to ensure that it is tolerated. This is initiated at 5 ml/hour and gradually increased to full strength over 24 to 48 hours. Before disconnecting the syringe the nasogastric tube must be clamped off. All patients on special diets should be weighed weekly as a check on their progress. For those patients unable to swallow, particularly those undergoing surgery for neoplasia, percutaneous endoscopic gastrostomy (PEG) feeding may be established to allow nutritional input to be controlled over the longer term.

Preoperative diet
Patients for operation under local anaesthesia may take their normal meals. If the patient has missed a meal they should be given a glucose drink before the local
anaesthetic is administered. Where a general anaesthetic is to be administered, a light meal, chiefly of protein and carbohydrate, is advised the night before. On the day of operation those on the morning list are starved, but those for the afternoon list may be given a small breakfast of tea and toast. No food must be taken for 4 hours nor clear fluids for 2 hours before operation. The patient’s normal medication should be maintained after consultation with the anaesthetist.

**Postoperative diet**
Each patient must be considered individually, but feeding should be started as soon as possible to avoid nausea. Many can manage the ordinary food provided, but others, because of tenderness or trismus, require specially prepared food. Where necessary, the patient should receive dietary advice before discharge home.

**Excretion**

**Micturition**
This reflex act occurs when the pressure in the bladder rises sufficiently to cause the sphincter to relax and the detrusor muscle to contract. The ability to delay micturition is the inhibition of the normal reflex response to distension. In patients with head injuries, the apparently insane desire to get out of bed is often for the purpose of emptying the bladder or bowel, as the wish to go to the right place is strongly imbued and may persist despite gross craniocerebral disturbance. Retention can be organic, as in men suffering from prostatic enlargement, or a functional disorder. It may occur after general anaesthesia but should cause no undue anxiety up to 24 hours, unless the bladder becomes distended or symptoms of overflow occur. Micturition can be encouraged by getting the patient up, but if this fails catheterisation may be necessary. Any urinary catheter, placed perioperatively for patients undergoing procedures of more than 4 hours’ duration, should be removed as soon as the patient is mobilised in order to avoid an ascending urinary infection.

**Sweat**
Sweat contains 0.5% of solids, chiefly sodium chloride. In fever or in hot weather sweating may be greatly increased and as much as 10 g of sodium chloride can be lost in an hour, and must be replaced in the diet.

**Defecation**
The bowels should be opened regularly and the fact noted, but too much attention can be paid to irregularity. In constipation one must first decide whether the cause is organic or functional. Organic irregularity is due to partial obstruction of the lumen, often by a tumour. Functional irregularity may be due to defective movements of the colonic musculature or a deficiency in the bulk of faeces due to feeding with fluid diets. It may arise in hospital as a result of a sudden change in routine and of diet.
It is treated either by feeding fruit, vegetables and wholemeal cereals or by giving laxatives. It is stressed that wherever there is doubt as to the cause a general surgeon’s opinion should be sought.

Sleep

Sleep is distinguished from other unconscious states by the ease with which the sleeper may be roused. Disturbed sleep may be due to pain, external stimuli, worry or change of habit. It is important to recognise the cause before considering treatment. Where the cause is pain, hypnotics must not be given until its source has been investigated, removed if possible, or analgesics prescribed. If these are effective the patient should sleep naturally. External stimuli should be reduced by keeping the wards dark at night, and by providing side wards for night admissions and for noisy or restless patients. Worry or change of habit, particularly dozing by day, can lead to insomnia in the convalescent or fit adult. Hypnotic drugs may be prescribed, but only if really necessary, because they are habit forming.

Hygiene

General and oral hygiene is the responsibility of the ward sister, but mouth hygiene is supervised by the surgical team. On admission the patient should have their oral hygiene assessed and appropriate instructions given. This might include rinsing the mouth preoperatively with 0.2% aqueous chlorhexidine. In the badly injured, the elderly and those recently operated on, a modified technique is necessary either to avoid causing pain or because they need assistance. No cleansing of the mouth is advised for the first 24 hours after operation and may indeed do harm by starting haemorrhage. Thereafter, mucous membranes and teeth may be cleansed with a soft toothbrush or foam pads attached to orange sticks, and the mouth irrigated with 0.2% aqueous chlorhexidine after every meal. Intraoral sutures also require care as they tend to trap food over the wound. Clinging debris should be removed by swabbing with cotton wool each day. A hypertonic saline mouth bath, as hot as the individual can bear without scalding, may be used and allowed to lie over the wound until cool, but unlike the mouthwashes used preoperatively, no violent flushing is advised. Mouth brushing is started on normal teeth and gingivae as soon as possible and the patient encouraged at an early stage to carry out their own oral hygiene. This not only occupies their time usefully, but the techniques may be supervised before discharge, ensuring satisfactory home care.

Arch bars

Arch bars may be cleaned with a toothbrush and paste, and chlorhexidine mouthwash can be employed with obturators.
Where gutta-percha moulds are used to hold skin grafts in position, the mouth is cleansed using only the blandest mouthwashes. After the first 10 days (by which time the graft should have taken) a syringe may be introduced between the graft and the mould to clean the dead space gently but thoroughly.

**Premedication and sedation**

See Chapter 5.

**Postoperative care**

On arriving in the recovery room after an operation the patient is immediately put into bed and laid on their side with a pillow behind the shoulders in the position of sleep in such a way that drainage may take place from the mouth. The arms are kept folded over the chest. Under no circumstances should the arms be elevated above the head for fear of damage to the brachial plexus.

During the uneasy period before complete consciousness is regained, and especially where the jaws are wired together, a trained recovery nurse must sit with the patient to watch the airway, suck out the mouth and oropharynx, and to ensure that no injury is suffered by pulling at sutures or splints. Cot sides should be raised to avoid falling out of bed. A careful watch for vomiting and haemorrhage is a priority, and the pulse, blood pressure, respirations and level of consciousness is recorded.

**Postoperative medication**

Analgesics should be given to reduce postoperative pain. Hypnotics should not be prescribed for semi-conscious patients where the jaws are wired together (see Chapter 5).

**Postoperative complications**

These can include fever, vomiting, conjunctivitis, sore throat, pharyngitis and pulmonary complications.

**Fever**

Raised temperature is a natural reaction to infection, but a slight fever is common for two to three days after an operation where a haematoma or necrotic material is present. A large haematoma may keep the temperature up for a week. After a general anaesthetic a chest complaint must be considered as a cause of fever and any sputum sent for culture. More rarely, a temporary upset of heat regulation does occur after an anaesthetic or a head injury.

The primary treatment must be that of the underlying cause, whether local or general. The symptomatic treatment includes confinement to bed, liberal
administration of fluids and a high carbohydrate diet, which has been found to prevent the breakdown of body proteins. At temperatures of 39.4°C and above, the body may be sponged down with tepid water at 27°C, which cools the patient. The use of paracetamol is indicated and attention to adequate fluid intake is also important.

**Vomiting**

This does occur following operation, usually due to the anaesthetic or swallowed blood, though the nervous disposition of the patient is a factor. Persistent vomiting for more than 8 hours is part of a vicious circle characterised by an upset of the acid–base equilibrium, in which the alkali reserve is reduced with increased urinary acidity and ketonuria. The anaesthetist should be consulted about the treatment for this. However, it can often be avoided by energetic treatment earlier. This consists of giving milk or alkaline drinks with glucose, which should be sipped very slowly but frequently. An antiemetic may be prescribed (see Chapter 5).

**Conjunctivitis**

Conjunctivitis can be caused by anaesthetic vapours, blood, antiseptics or towels entering the eye, or by the eye being open and drying up during the operation. This can be prevented by keeping the eyes closed with eyepads, but should contamination occur the eye can be gently irrigated with normal saline. Chloramphenicol eye drops will afford relief.

**Sore throat or pharyngitis**

This is usually caused by trauma from the endotracheal tube, excoriation from a dry pack or desiccation. It may be treated with gargles (see Chapter 5).

**Pulmonary complications**

Routine postoperative breathing exercises will reduce the incidence of pulmonary complications, but it must be borne in mind that these may occur. They may range from a minor inflammation of the trachea or bronchi to pulmonary collapse or postoperative pneumonia. Where they are suspected, a chest radiograph should be taken and the anaesthetist immediately informed. General management will include the use of antibiotics, physiotherapy, humidified oxygen, sedatives and mucolytic drugs. Frequent hot drinks help to relieve spasm and loosen secretions.

**Progress**

Routine monitoring of inpatients should include:

- **vital signs:**
  - temperature, pulse, blood pressure