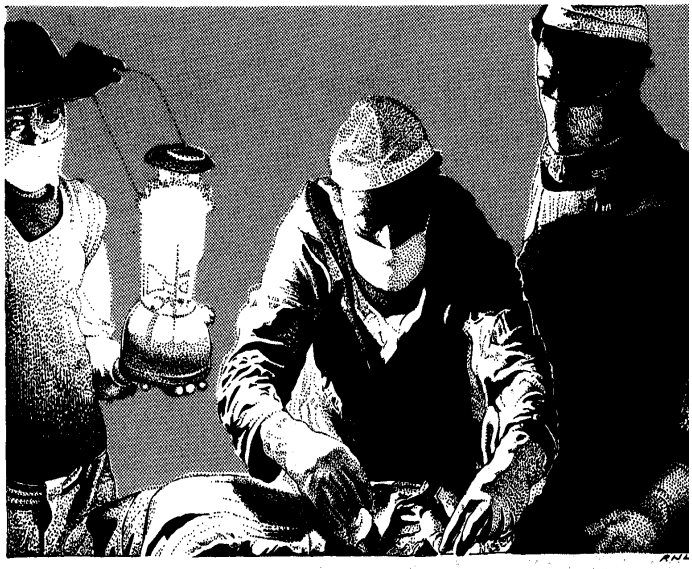
# 1 The background to surgery

*You have just arrived at your hospital and have not yet unpacked, when the ambulance arrives with a note from the sister-in-charge to say that there is a patient with a strangulated hernia waiting for you. You have never done one, because you were left doing the paperwork when you did your internship and your senior wanted to do as much operating as he could himself. So most of the time you assisted and were occasionally allowed to suture the skin. All your seniors have now left and have gone into private practice, so there is nobody to help you. If you refer this patient, he may die on the way.*

This manual is addressed to 'you'. The personal reminiscence above was contributed by Dr Michael Migue of AMREF, as describing the type of scenario for which the manual is needed.



ONE OF OUR READERS. You may have had very little surgical experience and yet have to operate on severely ill patients. In an emergency you may even have to operate by the light of a hurricane lantern. The light will attract insects, and these will fall into the wound, but even so they are unlikely to influence the patient's recovery. However, an LED head torch will be preferable in such situations, and ketamine anaesthesia is virtually always feasible! *Kindly contributed by WHO.*

## 1.1 The unmet need for surgical care

The attraction for patients and practitioners alike of surgical cures is that they are a 'once-only' phenomenon. For the patient, surgery is therefore something that can reasonably be borne stoically, and for the practitioner, surgery can be a source of intense satisfaction.

Both can witness an often dramatic transformation of a critical to a normal situation. Health planners are beginning to realize that surgery is socially and economically cost-effective. This is true for elective as well as emergency interventions, but especially so for trauma (the subject of Volume Two of this manual). Surgery need not be complicated, and should not be made unnecessarily expensive.

Surgically treatable diseases may not be as numerous as the great killers of small children in the developing world – malnutrition, pneumonia and diarrhoea – but are soon to overtake them! They represent 11% of the global burden of disease. Surveys suggest that in low- and middle-income countries (LMICs), 8% of all deaths, and almost 20% of deaths in young adults, are the result of conditions that would be amenable to surgery in the industrial world. If even very simple surgical services were available, two-thirds or more of these deaths would not have occurred. What is more, for every person who dies of an accident, there are at least eight who were permanently disabled. Estimates are that the maternal mortality rate (MMR) is >340,000 per year, and probably <10% of mothers who need a Caesarean section get one done. Only 1 in 10 who need an inguinal hernia repair get it done, and since a strangulated hernia is almost always fatal unless it is treated, this is a mortality rate of nearly 90%. For emergency laparotomies the situation is worse: of 50 who need such an intervention to save their life, only one gets it done!

These are just some statistics of the surgery that needs doing and is not done. It is estimated that <3.5% of all surgical interventions done worldwide are done in low-income countries. Since most of these procedures will be minor ones, it is probable that <½ million major operations are done per annum in these countries.

All this unmet need means that there are many unnecessary deaths from strangulated hernias and obstetric disasters, as well as from vesico-vaginal fistulae (VVF) and from foetal cerebral injury or anoxia at birth. They illustrate the fact that hospitals are only coping with a fraction of the burden of surgical disease in the communities around them. The result is that millions of people, whom surgery might help, get no help. Too many people still die from obstructed labour or obstructed bowel, or are disabled by untreated osteomyelitis, or burns contractures, much as they were in the industrial world a hundred years ago.

If we wait till services are available to prevent the killing diseases of childhood, the simple surgical services described here will not become available for a very long time. They can do much to improve the quality of life of the poor.

Although much of this manual has a rural orientation, 44% of the people of the developing world are now living in towns, so the surgical care of the urban poor is almost equally important. As at 2010, 9 nations in sub-Saharan Africa (Angola, Botswana, Cameroon, Congo, Gabon, Gambia, Ghana, Liberia, Nigeria) have >50% of their population living in towns. There were no such countries in Africa in 1950. Practically all South American and Far Eastern nations have a majority of people urbanized. There is therefore an urgent need for 'district hospitals' in towns, leaving only specialized care to the central institutions. Furthermore trauma presents an increasing burden of morbidity and mortality in the developing world, and as the success of its management depends mainly on early rapid appropriate surgical care, this onus falls on the district hospital in the first place.

Surgery has an importance in the public mind that medicine does not have. It is also the most technically demanding of the tasks of a district hospital doctor or clinical officer, and is thus a good measure of the quality of his medical education. If this has not been adequate, either because it never was adequate in the medical school, or because the quality of its teaching has fallen, he will be very loath to do much surgery, and may do none. This is why many rural hospitals and several district hospitals in some countries do little surgery. When this happens, patients soon realize that it is no use going to such hospitals, with the result that they soon have empty beds. So if you see a hospital with empty beds, one of the first questions to ask yourself is: "What is the quality of the surgery here?" There is thus a qualitative aspect to the unmet need for surgical care as well as a quantitative one.

The constraints on the provision of surgical care are formidable, but some hospitals have succeeded in increasing their workload and their operations tally despite rising costs and scarce manpower resources.

## 1.2 The surgical scene

The countries of the Third World and the surgical scene within them differ widely. Ethiopia and Paraguay, for example, are about as different as two countries could be. Typically, the people of low-income countries are poor, hungry, and rural, although they are rapidly migrating to the towns. The population of sub-Saharan Africa is increasing at an inexorable 3% annually, although in some countries there was a negative growth rate due to deaths from HIV disease. Meanwhile its *per capita* food production and its already meagre gross national product even if increasing remain hugely unevenly distributed, whilst costs on the military and socially dislocating wars multiply.

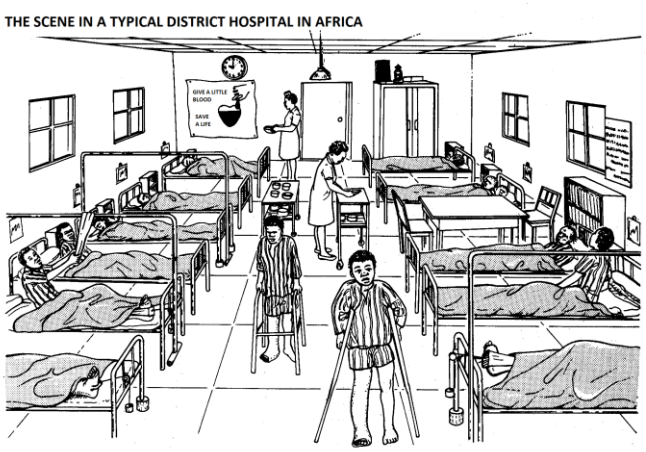



**Fig. 1-1 THE SCENE IN A TYPICAL DISTRICT HOSPITAL IN AFRICA. This is *somewhat better* than the average conditions for sub-Saharan Africa at the time of writing. Note the blood transfusion poster. You will see that there are several patients on traction, two with long leg casts, and that one of the beds contains 2 patients.**

It is obscene that the richest 1% own half the world's wealth. One feature developing countries do have in common is that much of the surgery should be done in 'district hospitals'. These typically have between 60 and 200 beds and are staffed by 2-4 doctors, assisted by nurses and auxiliaries. Fortunately, the 'one-doctor hospital', which was common until recently, is now unusual. Each hospital typically serves about 150-250,000 people living in an area which may be as large as 3,000 square miles.

Over the world as a whole these hospitals range from the excellent to the indescribable. At one end they provide care which anyone would be fortunate to have, at the other the few patients brave (or foolish) enough to enter them lie largely untended. Nonetheless these hospitals are the local focus of health care in the community and have an important place as such, as well as being a major employer of labour. How much your hospital is valued by the Government can be measured by whether the Minister of Health or his officials would be willing to be treated at your institution, or whether they will use scarce resources for treatment in a richer country with 'better' facilities.

If you work in a hospital in the middle or at the lower end of this spectrum, expect to find your wards overcrowded, with more than one patient in a bed. 'Clean' and infected cases may not be separated, so that a patient with an open fracture may lie next to one with a perforated typhoid ulcer. Your maternity ward is likely to be particularly overcrowded and resist all your attempts to decongest it. Cultural reasons may make it impossible to restrict the number of visitors to the wards. Defects in their construction will make keeping them clean and tidy a major task. Your equipment will be limited and poorly serviced. When it does break down, it may take years to replace. Trees may be so scarce that your staff have to go a long way to collect firewood.

If your hospital is at sea level on the equator, expect to operate at $30^0$C in 95% humidity, with your clothes wet, and everything which can go rusty or mouldy doing so. Only insects enjoy such conditions, and you will find plenty of them. If your hospital is at high altitudes, expect problems with sterilization (water boils at lower temperature) and with smoke from numerous fires.

You may have to rely on locally trained staff with only primary education who have not had training relating to the idea of sterility. Most of them will experience considerable hardship, and be so poorly paid that they will have to grow the food they need. Their ability to monitor a patient post-operatively on the wards may be so poor that you may be forced to assume that, once a patient has left the *theatre*, he is on his own as far as recovery is concerned.

Your anaesthetic facilities will vary greatly. If you are lucky you will have 2 or 3 anaesthetic assistants, trained to do most of the methods described in *Primary Anaesthesia.* You may have the services of well-trained surgical technicians who, without formal medical training, can carry out most of the surgical procedures required very adequately. You will rely on them more and more! Your laboratory facilities will usually be minimal.

Although HIV has made it much more dangerous in many areas, blood transfusion should always be possible, if you can put enough effort into organizing it. Often, relatives will give blood for a patient, but for nobody else, but *don't ignore the HIV risk just because the blood comes from a close relative!* You may have to try to make your own IV solutions or rely on relatives to purchase essentials outside the hospital.

So be prepared to find everything, or nothing. You may have expensive equipment given by charitable organizations: some of it may well be lying idle, because no one knows how to use it, what it's for, or how to maintain it. However, on occasion expect to find no water, no steam, no linen, no gauze, no bandages, no sutures, no local anaesthetics, no gloves (or only gloves with holes in them), no plaster (or only plaster that does not set) or no intravenous fluids. When you need to prepare for a laparotomy, expect that no instruments have been prepared beforehand. When you go into the maternity ward late one night, be prepared for the last sphygmomanometer to be missing. Try not to blame your staff too harshly, they may not be responsible; and even if they are, their families may be starving. Try to examine where things need to be changed and call meetings to get these things done. If you do have electricity, be prepared for it to fail at 3am, just when you are in the middle of a Caesarean section. Try not to blame cultural differences, and above all respect your patients' confidentiality.

Even when you have your 'normal' supplies, you will not have solutions for parenteral nutrition, or plasma, and probably no plasma expanders.

You may, however, have more than the teaching hospital: it too may be without water, electricity, spirit, or linen! You may be cherished, supported, praised, and congratulated by your Ministry of Health, or you may not. You may be in a health service which is steadily improving, or in one which seems to be getting steadily worse, if that were possible.

You may be in a culture which encourages you to be an entrepreneur, or you may be in a system ready to direct blame if you do something wrong, and ignore the truth if you do nothing! Expect that you may be cut off from the rest of the world for 4 months of the year. On top of everything else, HIV may now be endemic in your district. Finally, your greatest blow may be that your predecessor, who was promised that he would be posted to your hospital for only a short time, never ordered any stores.

But you have great blessings. In coping with all this, in creating and caring and leading and serving, you will have done something that your colleagues in the more comfortable circumstances of *private* practice will never have done. You are an all-rounder, and have one of the last remaining opportunities to practise the totality of medicine, rather than some infinitesimal corner of it. If you are one of few doctors, lack of continuity of patient care will not be an issue. *Sub specie aeternitatis* (in the mirror of eternity), you are a hero and will surely be recognized and remembered as such.

You will need:
(1) A willingness to learn from the culture of your patients, and learn their language. This will enrich you greatly, whether you are a national from the urban elite or a foreigner, and will greatly increase their trust in you.
(2) An almost pathological desire for hard work under conditions which are not conducive to it.
(3) An unfailing ability to improvise and make the best of things.
(4) The capacity to withstand prolonged periods of cultural and maybe financial isolation. If your morale is high, so soon will be that of your staff also. Your patients will be grateful for anything you can do for them, and it is likely they will not yet have learnt to litigate against you.

DIDIMALA (4 years) was severely burnt. You worked for hours to put up a reliable drip and took great care to ring up for a bed in the referral hospital. When you pass by the ward 2 hours later, you find that she has indeed been sent there by ambulance, but the drip is lying on the bed, and the vein is thrombosed. You ask, "Why is this?", to which you get the reply, "There was no hook in the ambulance."
MARIA (6 months) presented with intermittent vomiting and abdominal swelling and was diagnosed as having intussusception. Unfortunately, the first hospital she went to had run out of anaesthetic gases and so could not operate. Her mother had to take her through three states stopping at four hospitals before she found one which could anaesthetize her.
LESSONS (1) Anaesthesia is often the limiting factor in surgery. (2) There is no need to have to rely on a supply of nitrous oxide. (3) Some cases might not need anaesthesia if treated early (12.7).

If you serve your hospital and the community round it for >5yrs, you will earn a unique place in its affections. Just to prepare you, we describe the kind of situation you may have to cope with.

THE SCENE IN A TYPICAL POOR HOSPITAL

**Fig. 1-2 THE SCENE IN A TYPICAL POOR HOSPITAL.**
**An improvised ward in a small hospital in Madhya Pradesh, India, in the 1960s. Most patients are accompanied by members of their families or by friends. If they are away from their villages during the planting and harvesting season, they will go hungry.** *After Howard GR. Socio-economic factors affecting utilization of a rural Indian hospital. Tropical Doctor 1978;8(4):210-9 with kind permission.*

If you subsequently move to work in the hospitals of the affluent world, you may well miss the sense of purpose and achievement that you found when treating patients in low-resource settings. Your experience and your practical knowledge may not be highly esteemed, or at worst ignored. You will be shocked by the wastage of resources and the lack of a clinical acumen that you have tuned carefully over much time and painful experience but that seems to count for little in the corridors of modern high-technology hospitals.

However, no one will be able to take away the pride that you have done what so many of your colleagues wished they had done, and the gratitude of so many of your patients, who, without your help, would have suffered long or died.

## 1.3 Twenty surgeons in one & medical superintendent?

As a doctor in one of the hospitals we have just described, you are unlikely to find a fully qualified specialist surgeon with 6-8yrs of postgraduate training. But somehow you have to care for the sick in *all* of the 20 specialist fields shown in the frontispiece, into which surgery has fragmented in recent years. The chance of your being able to refer patients to specialists is remote. There may be no maxillofacial surgeon or hand surgeon in the country, and if it is a small one, there may not even be a specialist anaesthetist. Even your own teaching hospital may lack the complete range of specialists. Nor, despite present training programmes, is the situation in many countries likely to improve much in the near future. Even your nearest regional hospital may only have one or two general surgeons, or none at all! But surgery will be only part of your work; you may also have to be a physician, and a paediatrician, *and* manage the hospital as chief executive.

This will be especially true if you are an emergency surgeon flown in to help in a disaster situation, such as an earthquake; the first operation you are likely to have to do is a Caesarean section! *Try to set up a system of triage (even in non-emergency settings) so urgent patients don't wait.*

As a leader, or even district medical superintendent, you may have to deal with everything and everybody. When you arrive, make note of what you see (you easily forget your first impressions and fail to improve things which could have been altered). Beware of the subtle temptations of corruption: the bribes offered for preferential treatment, the back-handers for unnecessary or sub-standard equipment, the requests for unsecured financial advancements from hospital funds, the persuasive salesman for unrecognized drugs, the falsifying of records and so on…. *Don't get bogged down in an office and let clinical work take second place*: this should be your priority. Organize a regular timetable for yourself and stick to it.

The method of a good leader is to observe, listen, learn, discuss, decide, communicate, organize, encourage, facilitate and participate. It is necessary to have a critique of your activity: this is audit. Be sure to set goals, evaluate them, get feedback, coordinate efforts of others, recognize achievement and accept responsibility. Most problems will have as their root causes: poor leadership, poor relationships, poor pay, poor morale and working conditions, poor administration, and poor supervision. How you handle a crisis is the best test of your managerial skills; try to think beforehand what might go wrong, however, to avoid such a crisis in the first place.

Ordering supplies in advance and organizing repairs are most important. Keeping good records is essential, both of managerial decisions and patients. Don't forget aspects of hygiene, the use of toilets, disposal of garbage, the problems of overcrowding and relatives' accommodation within hospital premises, and the problem of excessive noise!

Inevitably you will have to hold meetings, usually as chairperson; set clear objectives and outcomes, set an agenda, keep a strict eye on time, and allow everyone to have their say, but keep folks to the point and avoid letting the subject drift. Afterwards make sure you get feedback.

You will inevitably have to write death certificates, and medical reports, and do much other paperwork. Get a secretary to help you, and limit this sort of activity to a particular short period in the day. Take care when disclosing medical information: it may be confidential.

Education is the key: daily morning reports, bedside teaching, grand rounds (especially for visitors), morbidity and mortality (M&M) meetings and rehearsing critical care practices should be the norm. Clinical audit is healthy: look at, for example, rates of wound infection, success of skin grafts, incidence of HIV+ve patients, mobility scores for femoral fractures, delays getting equipment repaired etc. Remember, though, that M&M should not be an occasion to apportion blame: it is a way to examine how you can avoid errors of omission or commission, or poor judgement or poor technique.

For you to keep up to date, *don't miss out on your own education*: try to encourage specialists to visit your hospital, subscribe to journals (especially *Tropical Doctor*), establish distance learning (by e-mail if possible), and promote a hospital library. However, beware of spending excessive time at workshops, which may leave your hospital stranded and be of little educational use to you. Try to visit your rural clinics and other hospitals in your district on a regular basis.

So you will have to do your best in *all* these fields simultaneously, as well as being 20 surgeons in one! To help you, we have collected from among the armamentarium of diverse experts:
(1) Some easier methods which you could use. Fortunately, many of them, despite the fact that they are normally only part of an expert's expertise, are not too difficult. For example, the position of safety in a hand injury is within the competence of any doctor or technician.
(2) Those methods, either easy or difficult, which you will have to use to save a patient's life.
(3) Those difficult, disability-preventing but non-urgent methods for which you should refer a patient, but may not be able to, such as sequestrectomy for osteomyelitis (7.6).
Many countries don't even have enough general duty doctors to do all the surgery that needs doing, let alone specialists.

Typically there is only one doctor for 50,000 people, and only 4% of a severely depleted gross national product is spent on health services. Many countries in the world have recognized that essential surgery could be done by specially trained medical assistants (clinical officers), and several have trained them to do this. Such surgical technicians are the backbone of surgical delivery in several countries.

How nice it was to see how well the Assistant Medical Officer (AMO) was managing his tasks; he seemed to be well in control. He had done several Caesarean sections, 2 laparotomies for intussusception, some hydrocoelectomies, and fracture reductions. He was treating 3 cases of fractured femur with skeletal traction in a very satisfactory way. His management of burns did not give cause for criticism. He had not had sufficient experience of hernia operations, so we operated on 5 collected cases together, after which he wishes to do them himself. To go to Kiomboi was an inspiration for our AMO training programme. *(Isaakson,G. Report of visit to Kilamanjaro Medical Centre)*

We quote this to emphasize that, not only must much surgery be done by non-specialists, but that it is often excellently done by surgical technicians. Perhaps there is no such teaching programme in your country, and yet you are hopelessly overworked. Try to train an auxiliary to do the simpler operations, such as hernias, Caesarean sections and exploratory laparotomies. Write out a simple-to-follow scheme so that they can follow a regular work-path. This will relieve your burden, and ensure the work carries on when you are not there!

Remember that there may be a large turnover of staff: don't resent this but be welcoming of new faces and new ideas!

Beware 'burnout', where you get so exhausted and irritable, you cannot function properly. Take a break, leave the place and go on a well-deserved holiday, so you can come back refreshed and revitalized (and bring some vital supplies back)!

## 1.4 Your surgical work

Of all your hospital admissions, 10-15% will probably be surgical, but because operating is time-consuming, and as some patients remain in bed for a long time, surgery may take 30% of your time, and fill half your beds. How much you will do will depend on how good you are. Patients will travel hundreds of kilometres to a doctor with a good surgical reputation. A bad one will soon do little surgery.

Look carefully at the ages and sexes of the patients in your wards. When modern medicine first reaches a community, the first patients to present are usually the men, followed by the women and children. Only when medicine is well established will you see a proportionate number of older women. You will see a few hypochondriacs, but some may just come to see you because of your novelty value, and there are likely to be comparatively few repeat visits to the outpatient department because travel is so difficult.

You will see many of the diseases that are common in the industrial world, but in different proportions, a major difference being that so many of them present late (1.6).

'Western diseases' such as aortic aneurysm, carcinoma of the colon, gallstones and varicose veins may not be very common at all in rural practice, but are diseases arriving in the cities. Urethral strictures, pelvic infections, fibroids and hernias are usually common, as are some diseases that are almost extinct in the industrial world: acute haematogenous osteomyelitis, for example.

You will probably see tuberculosis of the chest, lymph nodes, abdomen, and bones, many manifestations of HIV disease, amoebiasis and other 'tropical' illness. Sepsis is frequent.

But you may seldom see carcinoma of the bronchus, or the thromboembolic complications of surgery that are so common in the West; you may probably never see diverticulitis.

No branch of surgery will differ more starkly from that in the industrial world than orthopaedics, where contractures and deformities are commonplace.

You may be presented with many kinds of operation to do, but 50% of your workload is likely to be in obstetrics and gynaecology. The rest will be divided almost equally between sepsis and trauma, the nature of which will depend on where your hospital is situated.
*N.B. Trauma is discussed in Volume Two of this manual.*

Unfortunately many times you will *not* be able to refer a patient (1.6). *Never refer someone just to get him off your hands!* Always think what would, in the current circumstances (*not in the ideal world*), be the best for your patient.

This was a consecutive list of surgical cases seen over 3wks in a 50-bed mission hospital in Mandritsara, Madagascar:

(i) a 9yr-old girl with osteomyelitis of the tibia
(ii) 2 Caesarean sections for failure to progress
(iii) a 50yr-old lady with intestinal obstruction and carcinomatosis
(iv) a 24yr-old lady with an ectopic gestation
(v) an 18yr-old girl with gas gangrene of the uterus
(vi) a 48yr-old man with an unresectable cologastric mass
(vii) a 58yr-old man with a pertrochanteric femoral fracture
(viii) a 46yr-old woman with a large fibroid uterus
(ix) a 37yr-old man with Fournier's gangrene of the scrotum
(x) a 36yr-old man with necrotizing fasciitis of the whole right leg
(xi) a 16yr-old girl with septic arthritis of the left shoulder
(xii) a 15yr-old boy with a urethral fistula
(xiii) a 35yr-old G9 P5 woman with pelvic impaction of the fetal head
(xiv) a 45yr-old lady with pericardial tamponade
(xv) a 9yr-old girl with 5 distal ileal typhoid perforations
(xvi) an 8-month child with a huge 25cm-sized hydronephrosis
(xvii) a 93yr-old man with a right inguinoscrotal hernia
(xviii) a 31yr-old man with a plexiform shoulder neurofibroma
(xix) a 56yr-old lady with 3 days of adhesive small bowel obstruction
(xx) a 17yr-old girl with retained placenta for over 24h.

**Fig. 1-3 TABLE OF SURGICAL ADMISSIONS IN A RURAL HOSPITAL.**

Always think whether what you can do to a patient will probably benefit him; if you cannot refer him, or the distance is too great for him to reach the referral hospital alive, your choices are much clearer. Decide whether his problem is urgent (and therefore needs your intervention) or whether it can be alleviated by an operation within your scope (even if something else has to be done later), or whether it can wait for the specialist. Try to get a specialist to visit you to teach and advise: he may well enjoy a trip away from the daily grind!

KALPANA (46yrs) presented with mild abdominal pain for several days, severe for 4 days, and diarrhoea with two loose stools tinged with blood daily for a week. She had a tender, fluctuant mass in her right lower quadrant, and a marked leucocytosis. At laparotomy she had a patchy necrosis of her caecum with a localized perforation. A right hemicolectomy was done for suspected necrotizing amoebic colitis (14.5). The operation was a nightmare. Her colon came to pieces in the surgeon's hands and there was gross faecal contamination. She died. LESSONS (1) Expect a different spectrum of disease from what you might be used to where a fluctuant mass in the right lower quadrant may be most likely to be an appendix abscess. (2) Avoid doing a right hemicolectomy for amoebiasis if you can.

The late Imre J.P. Loefler, one of our editors, in a wide-ranging lecture on the failure of the medical profession to deliver surgical care in much of the developing world, stated: "You must be humble; surgery is a craft that makes use of the scientific method of Popperian falsification. The art of surgery consists of judgment and the beauty of an operation well done, done gently, with respect for living tissue, for every cell, with reverence for form and function, carried out with compassion, always remembering that the only justification for invading the body of another individual is the intent to restore homeostasis."
*Loefler IJP. Surgery in the Post-Colonial World (Rahima Dawood Oration). E & Centr Afr J Surg 2002;7(1):53-8.*

Remember, it is not only possible, but usually mandatory, to perform surgery without every modern convenience. Such surgery is by no means necessarily worse than that done in a high-technology centre with every available gadget.

BHEKUMUZI (10yrs) was lying in a district hospital with an obviously angulated fracture of the left forearm sustained when climbing a tree to fetch fruit. When a visiting doctor came to do a surgical round, he asked when he was admitted and was told, "Three days ago, just after it happened." The reason given as to why the fracture had not been reduced was that no radiograph could be taken because the X-ray machine was not working! LESSON It may seem obvious that you don't need a radiograph to tell you that an obviously angulated fracture needs reduction. Think whether you really need a laboratory to correct potassium loss in diarrhoea, or an abdominal radiograph for a gross sigmoid volvulus, or a CT scan for a head injury.

## 1.5 Your patients

In many of the villages of the developing world, the burdens of chronic disadvantage, poverty, ignorance, and insanitation are the background to life. A surgical disease on top of this may be the last straw.

As a result, patients often present late. If yours is a really disadvantaged community, tapping a hydrocoele may yield litres rather than mls of fluid. An elephantoid scrotum may have progressed so far that it hangs to the ground (27.34). If a patient has a urethral stricture, he may leave it until he has multiple fistulae or massive extravasation (27.11). If he has carcinoma of the penis (27.33), he may wait until much of it has been eaten away. Most carcinomas of the breast (24.4) and cervix (23.8) present too late for any hope of cure.

Too often, patients only present when complications have made their lives unbearable. When even the struggle to stay alive may be a losing battle, the fact that surgical disease is normally treatable is irrelevant.

There are usually good reasons why a patient presents late. The family may have had no money for the operation or for transport, or there may be no transport. Perhaps it is the planting season, or there is nobody to look after the children or the goats? Perhaps the disease is painless, and symptoms can be tolerated, so that illness remains unrecognized? Perhaps the tolerance to pain, disability, deformity, and misery is so high that help is only sought as a last resort? A patient may only come to you when he has exhausted local remedies and the services of traditional practitioners. He may not come to you because he doubts whether you can provide any assistance, or that he can afford it. Transport, which may have been difficult before the rainy season, can become an insurmountable problem when roads become quagmires, and rivers even more perilous. Acute surgical emergencies, in particular, may only come when patients are in the direst straits.

You are unlikely to be able to send patients for extensive series of investigations before you start treatment. In fact you should rely more and more on your clinical skills. Many patients will arrive with classic presentations or advanced disease, and the diagnosis may be obvious. However, we wish to present a guide on how to deal logically and effectively with patients *without* sophisticated technology. *Don't fail to treat a patient simply because you don't have the means you may be used to!*

Expect to find that the patient has other diseases also. Studies in Nepal, for example, showed only 15% of operations were done in otherwise healthy patients; in Zimbabwe over 30% of operations were done on patients with HIV. So expect your surgical patients to be poor, malnourished, immunosuppressed, anaemic, malarious, tuberculous, or worm-ridden, or all of these things. These illnesses make a patient weak, wasted and a poor operative risk. Anaemia increases the risks of surgery, and in some communities the *average* haemoglobin may be only 8g/dl. Some patients may still be walking around with 4g/dl or even lower. Apart from a little breathlessness on the hills of Nepal, one 12yr-old girl with an Hb of only 20g/l had no other complaints.

So try to prepare your patients for surgery before you operate, especially if the cause is readily treatable. *But beware the dangers of blood transfusion* (5.3).

Pain and disability are unlikely to rate highly when there is rice or maize to be planted, or when there are festivities and holidays. Although the local economy may be poor, certain obligations may be compelling.

Some cultural objections may exist, to orchidectomy, for example, and may be so firm that a patient is unlikely to agree. Mastectomy or colostomy may be similarly abhorrent.

**A PRIVATE WARD**

**Fig. 1-4 A PRIVATE WARD in a rural hospital. For a village family an illness is more than a biological disorder: it may be a social and economic crisis.** *After Howard GR. Socio-economic factors affecting utilization of a rural Indian hospital. Tropical Doctor 1978;8(4):210-9 with kind permission.*

Death is the great enemy of doctors and evidence of our failure. But a patient may have faced up to his own mortality long before you have, and may not always share your view. He may have learnt to live with death since childhood, and both his own attitude to it and that of his closest relatives may be very accepting. *Never lie to a patient when you know he is dying:* he probably knows it also, and realizes you know it too!

One of the greatest mistakes you can make is to offer a useless operation, which will use up much of his own resources and those of the hospital in an unsuccessful attempt to produce a cure. Theodor Billroth, a pioneer of surgery, famously commented, "To operate without having a chance of success is to prostitute the beautiful art and science of surgery." In some cultures it is important for a patient to be buried at home, so consider sending a terminally ill patient home early while he can still travel.

## 1.6 Referral is mostly a myth

A patient with a surgical disease has first to refer himself to you, and if you cannot care for him, you must consider referring him to someone else. Referral onwards from a community health worker (CHW) normally takes place at all the five steps (1-5). Although surgery is done in other parts of this system, we are concerned with the district (or mission) hospital, and the critical referral steps from C to D and from D to E.

Although 'referral systems' exist in all health services, the difficulties put in a patient's way are often insurmountable. Unfortunately, for many patients referral is a myth. In many resource-poor countries the possibilities for referral appear to have got worse during the last decades rather than better. Too often, there is just no petrol for the hospital's ambulance to take a patient to a referral hospital, or no money to buy it; furthermore the roads may be impassable; he may not have money to pay the referral hospital fees, or the bribes necessary to gain admission, and he may be very reluctant to travel so far away from home. Alas, in many countries the future does not seem any more hopeful.

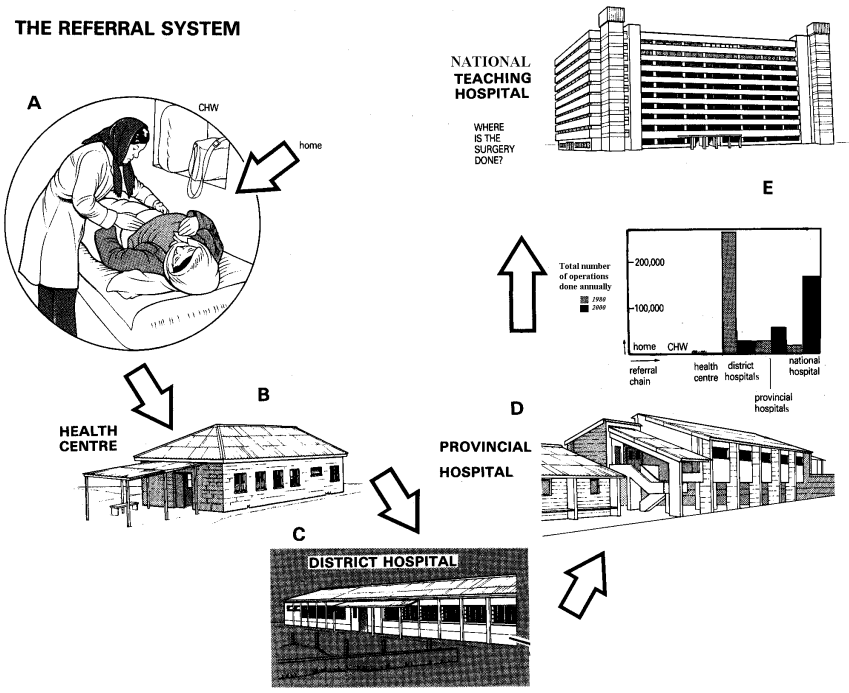



**Fig. 1-5 THE REFERRAL SYSTEM.**
**Each of these steps in the referral chain has its difficulties. A, from the patient's home to the community worker. B, from the community worker to the health centre. C, from the health centre to the district hospital. D, from the district to the provincial hospital. E, from the provincial to the teaching hospital. The histograms show a typical change in the total annual number of operations done at each stage in the referral chain in 1980 and 2000. Little surgery is now done in many of the district hospitals, but *it is often not being done in the provincial or national hospitals either.***

Only too often a patient reaches a referral hospital with great difficulty, only to return no better than before he went. Because there are so many uncertainties, assess the chances for each patient individually. Try to find out what happens to each of the patients you send. Just what cases is it useful to refer, how, when, and to whom? If there are referral services, be sure to use them, both to refer patients properly and to learn from yourself.

**In the following pages, we assume that you *usually can't* refer the patient.** There may be procedures you don't feel confident to do; obviously if you do have the opportunity for referral, use such help. Consider carefully if the patient may end up worse off than if you had not intervened. However, don't back out of a life-saving procedure through false modesty. This volume exists to help you in just such a situation.

*Don't overburden the referral hospital with minor cases*; take the opportunity to spend time there to learn surgical procedures if you need more experience. The important factor is the degree of urgency that exists: balance this against the feasibility of referral.

*N.B.* Some surgeons working in referral hospitals have a false idea of the practicalities of referral. They see only the 'tip of the iceberg' (or the 'ears of the hippopotamus'), the patients who reach them successfully: they may think that referral is easier than it is.

There are however certain cases which referral hospitals should accept without question, and district hospitals should know what they are. One example is the management of intestinal fistulae (11.15).

Remember, referral hospitals also have their problems:
(1) They may be overcrowded with simple cases that you could care for in your district hospital.
(2) When the time comes to discharge a referred patient, it may not be done because the bills have not been paid.
(3) Their system of communicating information may be very longwinded, so you may not get proper feedback unless you yourself enquire: that is why direct contact is so useful!

One of the purposes of this manual is *to make sure that any surgery that can be done in a district hospital is done there*, so that referral hospitals can fulfil their proper function, and life-saving surgery is not deferred till after a long journey to the referral centre. Another purpose is to train cadres (not necessarily doctors) to acquire special skills to deliver surgical services relevant to situations. A third reason is that referrals are expensive (to both the patient and the health system).

REFERRAL: IS IT WORTHWHILE?

The chances of being able to refer a patient vary greatly, and are apt to change. They depend on the answers to these questions:
(1) Does he have a disease for which the referral hospital has no effective treatment (*e.g*. hepatoma or advanced HIV disease) or equipment (*e.g*. advanced osteoarthrosis of the hip needing hip replacement)?
(2) Does he have a condition (*e.g*. cleft lip and palate) best left till a later date?
(3) Does he have a condition which will kill him before he gets there (*e.g*. ruptured spleen) or be untreatable by the time he gets there (gastroschisis)?
(4) Will he be able to get there and look after himself when there? What about his family?
(5) Will he be sure of getting any better treatment than yours? Try to contact the surgeon for advice before sending the patient, especially if distances are long and the case is not an emergency.

PATSON (49yrs) was in a Land Rover when it rolled over in deep sand, causing an open fracture of the right humerus and injuring the radial nerve. He was still able to walk, so he eventually reached a district hospital, where the wound was carefully toileted, and left open for delayed primary suture. The radial nerve injury was recognized, the arm was put in a collar-and-cuff sling, the wrist in a cock-up splint, and he was asked to return in 48h. The wound being clean, it was closed. So far he had received ideal treatment. It was decided to refer him to the provincial hospital 40km away, across a river and a flood plain, 8mins by air, a day by boat, or 2 days by Land Rover. There was no radio, and the telephone was not working, so there was no way of telling the provincial surgeon that he was coming. He was able to get a seat on a barge and was in the provincial capital 24h later. It was dark but he was able to find a relative who had a room for the night. The next day he sat in the outpatient queue and handed the slip to the medical assistant.
Unfortunately, the provincial surgeon had left the previous day to attend a planning meeting at the Ministry of Health. He would not be back for 2 days. The provincial surgeon returned and saw him, but decided that the training had not prepared him for posterior exploration of the humerus, plating the fracture and perhaps secondary suture of the radial nerve. Also, he had no 6/0 monofilament. So Patson was given a bus warrant, and a note to the orthopaedic surgeon in the teaching hospital in the capital city.
Unfortunately, he had no money, no food, and no clean clothes for the journey, so he went home. The Land Rover had been partly dismantled by thieves, but his partner had towed the wreck back to the village, and hired a lad to help him with the fishing. The family were already deeply in debt. They debated whether he should go 800km to the capital, but the limp wrist decided it for them. He started on the long journey with a pack of food, a few clean clothes, and a bus warrant, but very little money.
Four days later he arrived at the orthopaedic clinic on a Friday. He had no appointment, and the surgeon to whom the note was addressed had held the clinic on the previous day. The harassed sister, busy with another clinic, found that he had no relatives in the city, and no money, so she sent him to the orthopaedic ward in the hope that they might have a bed for him over the weekend. They did.
On Monday the surgeon saw him. The wound had healed and he was fit for surgery, and the necessary screws, plates, adhesive drapes, and sutures were in stock. But there was a three-month waiting list, so he had to wait 8 days, even for operation as a semi-emergency. A silent cheer went up from the hospital staphylococci, as they began to colonize the skin of this provincial patient.
His radial nerve was freed from compression in its spiral groove, and the fractured humerus was successfully plated. Two weeks later he returned to the provincial hospital with suggestions for physiotherapy (a 2-day journey for each session) and instructions to return in 1yr for removal of the plate.
He was lucky. He was one of the minority for whom the referral system 'worked'. The radial nerve palsy recovered. A friend paid for nearly 4wks in a teaching hospital, and 1600km in transport. He was in debt, and the family were hungry, but he did not have to sell the boat, or the remains of the Land Rover. It could have been much worse.

TOPNO (41yrs) fractured his ankle in a bus accident. The very competent doctor who saw him had learnt that difficult ankle fractures should be referred. He could manipulate fractures, but he thought that an expert would do better, so he sent the patient with a letter to the referral hospital 70km away. After a long journey, the patient arrived too late at the fracture clinic. He was able to reach the next fracture clinic in time, only to find that the surgeon was away at a conference. So he hung around hopefully for some days, but in the end he was advised to return to the original hospital. Meanwhile, he had had no treatment except the original 'first aid' plaster. When he eventually returned to the doctor who first saw him, the fracture had partly united in a very bad position. It was now too late to manipulate him, so he now has a stiff painful ankle and is waiting to have it fused.
LESSON A patient may be better in your hands, if you learn those procedures that you can reasonably do, in your own set-up.
*Jellis JE. Chairman's Address, Proc Assoc Surg E Africa 1981;**4** 53-6.*

**ASSESS EACH PATIENT'S CHANCES OF EFFECTIVE REFERRAL**

Make sure you know the specialist's timetable, and his contact details including mobile phone numbers. You can often use the messaging system on mobile phones better than the voice; with newer mobile phones, you can send pictures of a radiograph, histology slide, or even a patient's lesion. You can create a clinical WhatsApp group. *Beware, though, of possible leaks of confidentiality.*

Can the patient get himself to the referral centre? In some districts, for example, the roads and airstrips are closed for weeks at a time during the rainy season. Is he prepared to leave the family and the fields or the job? Has he or the hospital got money for transport and for lodging when he gets there? Often, neither of them does. If he does arrive, will he arrive on the right day, find the way to the right clinic, wait in the right queue and be seen and admitted? Will there be an empty bed? Will the surgeon you send him to actually be there when he arrives, or will he have gone on holiday, or to a conference in America?

Investigate him first if you can, and state the procedure that you think he needs. If a biopsy is necessary, do it, and refer him with the report. Often this takes time to obtain or may have to be sent to the referral hospital anyway. You might then send the patient with the biopsy specimen already taken. If referral is urgent, *don't wait for the report*, but give sufficient details so the report can be traced.

Inform the surgeon that the patient is coming. Make sure that the patient knows exactly what to do, and where to go when he arrives. Send a careful letter with him, including all necessary information. If there are any particularly good referral facilities, such as those for artificial limbs, for example, be sure to use them.

Finally, *don't refer patients unnecessarily*. No surgeon likes to be sent plantar warts.

## 1.7 The limits of this system of surgery

Detail, especially in surgery, is important, but you can get bogged down in details. The quotation "*Le bon Dieu est dans le detail*" (God is in the details), attributed to the French writer Gustave Flaubert (1820-1880), must be balanced by the German proverb "*Der Teufel steckt im Detail*" (The devil hides in the details)!

In view of the common impossibility of referral, we have tried to describe in this book everything that you, our readers *as a whole*, might have to do: both the emergency procedures and the less urgent elective cases.

As you will see in the next section, you *individually* should not necessarily do everything we describe. We take for granted that personal tuition from an expert is the best way to learn anything. But, what if there is no expert? *A manual is surely better than nothing.*

Somehow, we have had to find a balance, so we have considered each procedure on its merits. Our task has been made no easier by the wide range of the abilities of our readers. You may range from being a highly trained surgeon, doing unfamiliar operations for the first time, to an inexperienced technician doing your first job. We have tried to serve all your needs.

Although learning something from a book is not for many as good as learning it first-hand from a good teacher, the very *raison d'être* of this text is to provide relevant information in a situation where you have no such teacher. These books, though, are of no use if they are kept unused on the bookshelf!

As books are expensive, we have made this text available *gratis* electronically on the internet, which we hope will further disseminate the accumulated wisdom gathered herein.

It has not always been easy to distinguish the tasks which are obviously impossible for you (oesophageal atresia for example) from those which may be possible (duodenal or jejunoileal atresia). We have had to balance benefit, risk and urgency. This has led us to include methods for removing the prostate, for example, but not a meningioma.

We have tried to grade the difficulty of the operations described (Appendix A). If you can refer the more difficult cases and the patient is likely to obtain a better result if you do so, this is obviously preferable. We have stressed, though, that some operations are only for the *careful, caring operator*. These include Girdlestone's arthroplasty (7-21), closure of a Hartmann's procedure (12-15), Roux-en-Y anastomosis (15-14), and closure of a meningomyelocoele (33-15).

Although the common conditions may comprise perhaps 60% of your work, the rest will include many rarer ones.

*In aggregate, the rarities are common.* So we have tried to describe as many of the comparative rarities as we can, in the hope that you will find about 98% of the conditions you could hope to treat surgically described here. The edges of this large collection of appropriate methods are inevitably blurred, and it has not been easy to know which rare, or which difficult, procedures we should include. For example, you will find much on HIV-related pathology (5.6), and there is even mention of cystic hygroma (33.12).

We shall probably be criticized for including oesophagoscopy (30.2) and bronchoscopy (29.14), and some cancer chemotherapy. But it is better to include slightly too much rather than slightly too little – there is no obligation for you to do things you don't feel able to do, but a crisis may force your hand! Thyroidectomy (25.7) is our *tour de force*, and the great detail in which we have described it should enable our more experienced and caring readers to do it. Some methods, such as methods of haemostasis, are classical, in that no textbook of surgery would be complete without them. Inevitably, some parts of the 'system' are tidier than others.

We have excluded all procedures which appear too sophisticated, but the range of facilities available is always very wide. In some cases we may have made false assumptions. We have often assumed that you have an X-ray facility, and ultrasound for example.

Uncertain sterilizing procedures and limited nursing care have also guided our selection.

Although we write mostly for hospitals which are short of both money and skill, there are some, such as those run by mines and plantations, or supported generously by outside agencies, where money is less scarce. These might be able to procure even comparatively expensive drugs for cancer chemotherapy, for example. For them all the equipment we list (even bronchoscopes and oesophagoscopes) should not be a problem. *However, beware the notion that expensive methods are necessarily the best!*

Overall:
(1) We have tried to describe a system of practice which includes all the basics, but is *ahead of the practice of many district hospitals*, so that even comparatively advanced ones have something to aim for.
(2) We have tried to cover most of the range of the 'general surgeon' working in the districts.
(3) We have tried to describe this system in complete detail, and in doing so would agree with both the quotations with which this section started.
(4) We have in our mind's eye a concept of 'quality' at the district hospital level; even simple things can and should be done well.
(5) We have tried to give guidance when things go wrong.

This last is most important. Many texts tell you what you should do (in the author's view); few explain what to do with complications. If you can correct these, you will often avoid a catastrophe and gain much satisfaction. You will also build a base of great wisdom for the future.

## 1.8 Should you operate?

*Although the era of* 'furor operandi' *has passed, one still has almost daily evidence of the disastrous effects of major surgical procedures, attempted lightly by young, or even inexperienced older, surgeons. The author would in no way dampen the ardour of the neophyte, or check the ambition to acquire skill. Still, it is well to suppress the feelings of cocksureness and egotistic pride.* (Thorek M, Surgical Errors and Safeguards, JB Lipincott, 1932)

Whether or not you should operate on a given patient will be the most important question you will have to answer. Put yourself in the patient's place. What would *you* like to happen if you were the patient? Several factors will influence your decision. We have already discussed one of them: can you refer him?

Would his operation be better done elsewhere? On the whole we think that for every doctor who operates when he should not, there are many more who don't operate when they should. So one of our aims has been to get more surgery done, on the *correct* indications! The mature surgeon is one who knows when *not* to operate! On the other hand, if you are always too cautious, you will never learn and some of your patients will never benefit. Remember to keep records (2.12).

So beware of what Max Thorek describes as *furor operandi*, the furious urge to operate, and ask yourself:

**What will happen if you don't operate?** If a patient is likely to die or become disabled if he is not operated on quickly, you will have to operate. We have therefore included all the more practical emergency operations, whether difficult or not. For example, you must drill immediately for acute osteomyelitis, but a patient who needs a sequestrectomy for chronic osteomyelitis can wait.

**How difficult is the operation?**
At least three factors determine this:
(1) your technical knowledge,
(2) your experience,
(3) your skill.

We can provide you with the knowledge, and bring you some of the experience of other people, but only practice will improve your manual skill. A score is given for your guidance (Appendix A). Grades 1.1-1.5 describe simple procedures that you will definitely have to master. Grades 2.1-2.5 describe straightforward operations without serious difficulties or complications that would not pose much of a problem for basic surgical trainees. Grade 3 represents more difficult operations, with increasing complexity up to 3.5.

Those procedures of even greater difficulty may be mentioned in passing but not described, as they are thought to be unsuitable for the situations pertaining where this book will be useful.

**How good is your post-operative care?**
It may be a good idea to have a special ward for the serious post-operative cases: the advantages are concentrating staff where they are needed, giving them experience and training, and making it easier for you to visit and monitor these patients. If you can separate a section or unit for intensive care (ICU) for the really serious cases (11.9), so much the better.

**How safe is the operation? What disasters may happen?**
Little can go wrong with draining most abscesses, or manipulating most fractures, but disaster lurks if you decide to close an intestinal fistula, dilate a difficult urethral stricture or do a block dissection of the groin.

**Do you have the instruments, materials and staff needed?**
Even if you don't, you may be able to improvise. Check that the electricity is working, the blood can be cross-matched, the necessary staff are present. *Don't be over-ambitious initially with staff whose expertise you don't know*; assess the capability of the hospital to handle certain procedures. Try to build on your experience, and teach the staff (and yourself) accordingly. Check the instruments and equipment before you start. Discuss the case with your anaesthetist colleague (if any). Is he experienced enough to administer the GA you require? Is there an alternative?

**Are you yourself inclined to operate too readily, or not readily enough?**
Cultural attitudes to operating vary. In Indonesia, for example, the common failing is to be too timid, and not to operate when necessary. The reverse is true in some parts of Africa, where inexperienced operators are much too bold. So be aware of your own personal and cultural bias and try to correct for it. *Don't operate out of bravado!*

**Is the reason for operation unclear?**
If the indication is vague, wait! *Don't be dragooned into operating by enthusiastic nursing staff or insistent relatives*. Treat the lowliest patient the same as an important politician.

**What is the known or probable HIV status of the patient?**
Take a social and sexual history. Look for tell-tale signs of immune deficiency (5.6).
*N.B. You should try to move toward routine HIV testing especially if antiretroviral treatment is available.*

**What is the general condition of the patient like?**
(1) Check the Hb level (and sickle test if this is common in your area), and the level of malnutrition and dehydration.
(2) Assess the respiratory reserve (11.13).
(3) Measure the Peak Expiratory Flow if you can.
(4) Can you improve pre-op hydration or nutrition?

**Assess the risks of complications.** Remember you will cut, saw, burn, bruise, traumatize and violate your patient, exposing his tissues to the cold and hostile external environment, spilling his blood and body fluids, but the patient's own healing mechanisms need to repair the damage. You can only assist this process.

**Decision.** If you have difficulty knowing what to do and can contact anyone who might know, *don't hesitate to do so*. Try to invite a surgeon to your hospital for a period to give you instruction first-hand.

***Have this book available in theatre.***
***WRITE THESE RULES UP IN YOUR THEATRE:***

**RULES ABOUT DECIDING WHEN TO OPERATE**:
(1) You must be certain of the indication to operate, even if it is only exploratory.
(2) When life is in danger, take risks and act fast.
(3) If a case is hopeless, *be prepared to say "No!"*
(4) *Don't do difficult elective surgery*, especially if the expected outcome is likely to be of limited value to the patient.
(5) Take trouble to make sure the time is correct to operate, and all the preparations for surgery are in place.

**RULES BEFORE OPERATING**: Inform the theatre of your operation list well in advance, if possible. Book your children, clean cases and diabetics first.
(1) Go over the history, examination and investigations yourself to confirm it is the right patient: ask him his name yourself! Confirm the correct diagnosis, and that the need for surgery still exists.
(2) If there is a lump, make sure you can feel it. Mark it. Make sure the bladder is empty.
(3) Ask the patient what operation he expects to be done and explain the nature of this operation, its purpose and consequence to the patient: this is *informed consent*. You need not scare him or confuse him with medical jargon, but *don't keep him ignorant* and make sure he and the relatives understand. Use diagrams, stories or even cartoons. Mention alternative treatments, and possible complications.
(4) Mark the side to be operated upon with indelible ink.
(5) Make sure the patient bathes the night before surgery, and that especially the operative area has been cleaned. Trim his nails, clean the umbilicus, scrub the feet, remove studs and jewelry. (There is no need to remove all nail varnish or bangles and threads of religious or cultural significance, but take down an elaborate hairstyle which may prevent extension of the neck.) *Never use blunt razors to shave the skin:* do minimal shaving. Remove any loose or false teeth.
(6) Check for any allergies.
(7) Check that the patient is starved for 4h (less for babies), but warm, well-hydrated and fit for a GA, fluid-loaded for a spinal anaesthetic, and that diabetes, hypertension, asthma, epilepsy, and coagulation are controlled. *Don't starve patients for long periods waiting for theatre!* Make carbohydrate drinks available up to 2h pre-op to avoid hypoglycaemia. Remember deep vein thrombosis and antibiotic prophylaxis if indicated.
(8) Check that blood is cross-matched if required, and blood results available.
(9) Make sure especially that suction, laryngoscopes, airways, ambu-bags, masks, endotracheal and nasogastric tubes, stethoscope and diathermy are available. Make sure the patient comes to theatre with the notes, investigation results and radiographs, and properly signed consent for the proper procedure (with the correct side, if any, noted).
(10) Familiarize yourself with the operation to be performed if you are uncertain of any details.

SPECIAL CONSIDERATIONS
Some patients take routine medicines: *don't stop these just because they are starved before operation!* This applies especially to anti-hypertensives, bronchodilators, steroids, anticonvulsants, anti-Parkinsonian drugs, cardiac medication, anti-thyroid drugs and thyroxine.

**Steroid**-taking patients should get extra amounts: add 100mg hydrocortisone at the start of a major operation and then reduce slowly: 100mg tds on day 1, 50mg tds on day 2, 25mg tds on day 3.
*(N.B. 100mg Hydrocortisone = 20mg Prednisolone = 4mg Dexamethasone = 3mg Betamethasone = 16mg Methylprednisolone = 5mg Triamcinolone)*

**Oral contraceptives:** stop these *1 month before* a major operation, especially involving the pelvis, where she is not ambulant immediately post-operatively. Advise about alternative barrier methods or you may be blamed for an unwanted pregnancy!

**Anticoagulants:** stop these 3 days before a major operation; an INR <2 is ideal if you can measure it. *Avoid spinal anaesthesia and the use of tourniquets.*

**Antidepressants** can give problems (*e.g.* tricyclics) with anaesthesia: stop these 2wks before a major operation.

**Alcohol:** many people drink large quantities of alcohol. This may affect the liver, and cause slow metabolism of anaesthetic agents, bleeding disorders, and produce post-operative withdrawal symptoms.

**Diabetics** need careful handling. Check glucose levels regularly. Make sure dehydration is corrected.
***If control is not good***, start a sliding-scale regime of soluble insulin 6-hrly:

| Glucose Level | Soluble Insulin Needed |
|---|---|
| 0-4 mM | 0 IU |
| 4-8 mM | 0 IU |
| 8-12 mM | 4 IU |
| 12-16 mM | 8 IU |
| 16-20 mM | 12 IU |
| >20 mM | 16 IU |

*N.B.* It's best to err on the side of mild hyperglycaemia!

***If control is by oral hypoglycaemics***, omit them on the day of operation; if the operation is small, they can simply be restarted the next day. If the operation is major, convert to a sliding scale.

***If control is by insulin***, reduce the dose in the evening pre-operatively (if any) by 20%. Administer no insulin on the day of surgery and set up a 5% dextrose IV infusion; make sure the operation is done early in the day.

***If it is a minor operation and the patient is eating normally afterwards***, restart the insulin at the normal time. If he is not, start a sliding scale: you may need to adjust the sliding-scale insulin doses if these were previously high so that the total given per day for a level 4-8mM equals the normal total pre-operative dose, *viz.*:

*For a patient on 30 IU am and 18 IU pm (total 48 IU), start with 48 divided by 4 (number of times glucose is checked/day) = 12*

| *Glucose Level* | *Soluble Insulin Needed* |
|---|---|
| *0-4 mM* | *0 IU* |
| *4-8 mM* | *12 IU* |
| *8-12 mM* | *16 IU* |
| *12-16 mM* | *20 IU* |
| *16-20 mM* | *24 IU* |
| *>20 mM* | *28 IU* |

***If it is a major prolonged operation***, use 16 IU soluble insulin with 20mmol KCl IV in 1 litre of 5% dextrose at 100ml/hr during the operation provided the blood glucose level is >4mM and check it 2hrly. If it is >16mM, add another 16 IU soluble insulin to your infusion. After the operation, continue with a sliding scale.

***If ketoacidosis is present in an emergency***, administer 10 IU soluble insulin IV *and* 10 IU IM immediately, and then 6 IU IM hourly; infuse 5l normal saline, the 1st in 30min, the 2nd with 20mmol KCl in 1hr, and the 3rd to 5th with 20mmol KCl in 2h each. Then when the glucose level is <15mM, start a sliding-scale regime, and alternate normal saline with 5% dextrose.

You may need to sedate an alcoholic with large doses of diazepam, chlorpromazine or chlomethiazole, especially post-operatively.

**If you have not done any surgery before, or only very little**, start with the easier operations (Grade 1). You should at least be able to open abscesses (6.2). However, in an emergency, consider what you can do, and *don't be frightened to do it:* you may well save lives!
*N.B. Limited surgery, leaving advanced procedures to an expert, is now accepted practice in damage control* (11.3). In an emergency, do all you can to save lives: *you are not expected to make a perfect repair of everything!*

*Note that in many cultures, operative consent involves the whole family, and not just the individual patient!*

Johann Wolfgang von Goethe (1749-1832) in his *Maxims and Reflections* wrote: "The most fruitful lesson is the conquest of one's own error. Whoever refuses to admit error may be a great scholar but he is not a great learner. Whoever is ashamed of error will struggle against recognizing and admitting it, which means that he struggles against his greatest inward gain."

Winston Churchill (1874-1965) said, "Success is not final, failure is not fatal: it is the courage to continue that counts."

**(a) Rules about operating**
(1) You must be familiar with the anatomy; if necessary consult an anatomy book during the operation. *Don't be embarrassed to do so!*
(2) You must have someone familiar with anaesthesia giving the anaesthetic. If this is yourself, there must be someone else who can monitor its progress and record the patient's vital signs. You should also have someone available who can assist during complications, and have airway accessories to hand. Try by all means to get a pulse oximeter to monitor the patient.
(3) There must be a reliable system of sterilization, preferably an autoclave.
(4) You must have a good light, preferably adjustable. A headlamp is useful.
(5) You must have the necessary equipment and supplies for resuscitation (infusions, giving sets and cannulae, a laryngoscope, tracheal tubes, adrenaline, atropine etc) and haemostasis (swabs, suction, ligatures, clips).
(6) Have the highest regard for living tissue and be gentle and circumspect. Operate at your own speed. Use the technique you know best, *not one for which you don't actually have the experience.*
(7) Remember to give pre-operative antibiotics *before you start operating*, if indicated.
(8) Finally, *don't be too elated over your successes, or too despondent over your failures*. If you do fail, forgive yourself, *don't give up!* A bad spell during which 2 or 3 patients get complications may be followed by another in which none of them do.

*CAUTION!* Remember also that with elective operations, disasters are more difficult to justify than with emergency procedures, both to the hospital staff and to the general public, and that accusations that the doctor is experimenting on patients can do much harm.

**(b) WHO safety checklist**
Apart from having the above rules in your theatre, you should use the checklist recommended by the World Health Organization (WHO). You may have to adapt this according to your local conditions. One single person should be responsible for checking *verbally with the theatre team* each box on the list. The checklist is not something to be done by one individual alone, but openly with everyone involved present, much like checking procedures before take-off of an aeroplane.

There are 3 phases:
(1) **Sign In** before anaesthesia,
(2) **Time Out** before skin incision, and
(3) **Sign Out** before the patient and surgeon leave the theatre.
*(If a box cannot be ticked, leave it blank.)*

The anaesthetic safety check includes examination of airway equipment, breathing system (oxygen and gases available), suction, drugs and devices, and emergency medications and equipment, particularly for a difficult airway or aspiration risk, as well as the patient's fitness. Significant blood loss is >500ml in an adult or >7ml/kg in a child. *Don't be blasé about how little blood you are likely to lose!* Check if you need blood *at the start* of an operation!

The Time Out allows the team a moment to double-check the patient's identity and operation. You can then mention critical steps that you, as the surgeon, may encounter and so warn the rest of the team. The anaesthetist and nurse can do likewise.

The checker should complete Sign Out *before* you leave the theatre.

| **SIGN IN** | **TIME OUT** | **SIGN OUT** |
|---|---|---|
| | Confirm all OT staff introduced | |
| Patient has confirmed: | Surgeon, Anaesthetist and Nurse confirm: | Verbally confirm: |
| **IDENTITY** | **PATIENT NAME** | **PROCEDURE PERFORMED** |
| **SITE** | **SITE** | **COUNTS CORRECT** |
| **PROCEDURE** | **PROCEDURE** | **SPECIMEN LABELLED** |
| **CONSENT** | | |
| Site marked | Surgeon review of critical events | Review of equipment failures |
| Anaesthesia safety check done | Anaesthetic review of concerns | Recovery concerns review: Nurse, Surgeon Anaesthetist |
| Pulse oximeter OK and on | Nurses' review of equipment etc. | |
| Allergy: **YES/NO** | | |
| Difficult airway or aspiration risk: **YES/NO** | Antibiotic prophylaxis: **YES/NO** | |
| Severe blood loss risk (blood available?) **YES/NO** | Radiographs present: **YES/NO** | |

*Make sure you do this for emergency operations as well as elective procedures!*

**(c) Checks at the end of an operation**
You should be satisfied at the end of a surgical procedure that you have done everything that needs to be done. *Don't do things that don't need to be done:* often complications from those 'extra' jobs done will come back to haunt you!
Make sure you have:
(1) Secured haemostasis
(2) Washed the operative wound or cavity
(3) Checked any anastomosis
(4) In the abdomen,
 (a) made sure no hernia orifices remain open,
 (b) placed the small bowel carefully,
 (c) secured omentum between bowel and skin,
 (d) checked a nasogastric or jejunostomy tube is properly in place (if required)
(5) Secured a drain (if needed)
(6) Made sure the swab, needle and instrument counts are correct.

*None of these checks will guarantee that you avoid mistakes, but they go a long way to minimizing them.* Try to establish a 'no blame' culture amongst your staff, so that when something does go wrong, you can find out what happened, and take corrective measures.

**(d) Rules after operating**
***WRITE THESE RULES UP IN YOUR THEATRE!***
(1) Ask your staff if you've forgotten anything (see above).
(2) Make sure the patient is nursed semi-recumbent in the recovery position.
(3) Check the airway. Suction any secretions.
(4) Make sure there is a post-operative regime of monitoring vital signs, fluid balance, and drugs given.
(5) Write neat, concise operative notes, preferably with diagrams:
 Name of operation
 Persons present
 Incision
 Findings
 Procedure
 Closure; drains inserted
 Time taken
 Estimated blood loss
 Specimens properly labelled and removed
 Post-operative orders
(6) Make sure nurses looking after the patient understand your instructions, especially with regard to IV fluids, drains, and pain relief.
(7) Indicate how to deal with possible problems and complications.
(8) Visit your patient at the end of your operating list, or some time after an emergency case.
(9) Encourage breathing exercises and early mobilization*: this will often go against local culture.*
(10) Provide good nutrition, skin and oral care.
(11) Explain the nature of the operation to the patient.
(12) Organize appropriate follow-up.

**IT IS NOT THE AIM OF SCIENCE TO OPEN A DOOR FOR INFINITE WISDOM, BUT TO SET A LIMIT TO INFINITE ERROR**

Bertolt Brecht, *in The Life of Galileo, 1939, scene 9, l.74*

## 1.9 'Oh, never, never let us doubt what nobody is sure about'

Inevitably, such manuals contain a huge quantity of didactic detail with few reasons as to 'why' you should do anything, and few references to the original papers. We have tried to select the best methods for your needs. Even so, remember that accepted methods change, that few have been rigorously evaluated by controlled trials, and that some which were widely accepted only a few years ago have now been completely abandoned or reversed.

Here are some examples of how fallible medical practice can be:
(1) Tension sutures used to be used to close a difficult abdomen, but are now thought to make things worse.
(2) Complete immobilization was and often still is considered to be the ideal treatment for all long bone fractures. It is now increasingly realized that many of them benefit from early controlled movement.
(3) It used to be standard practice to separate mothers from their babies immediately after birth. Now, this is completely reversed and their close contact immediately after delivery is considered essential for bonding.
(4) Shaving a patient the day before an operation, which used to be standard practice, has now been shown to increase the incidence of infection.

This list could be expanded. So be prepared to 'doubt what nobody is sure about', even while you follow the didactic instructions we give. There is little justification for much of what is traditional practice in surgery. There is no justification for the 'arrogance, arbitrariness, stagnation, imitation, hypocrisy of political correctness, loss of sense of reality and resulting pretentiousness one finds among professionals in the universities, medical schools and departments of surgery.'
*Loefler IJP, Surgery in the Post-Colonial World (Rahima Dawood Oration). E & Centr Afr J Surg 2002;7(1):53-8.*

Remember 2 other Winston Churchill aphorisms:
"It is no use saying, 'We are doing our best.' You have got to succeed in doing what is necessary."
"Criticism may not be agreeable, but it is necessary. It fulfils the same function as pain in the human body. It calls attention to an unhealthy state of things."

## 1.10 Creating the surgical machine

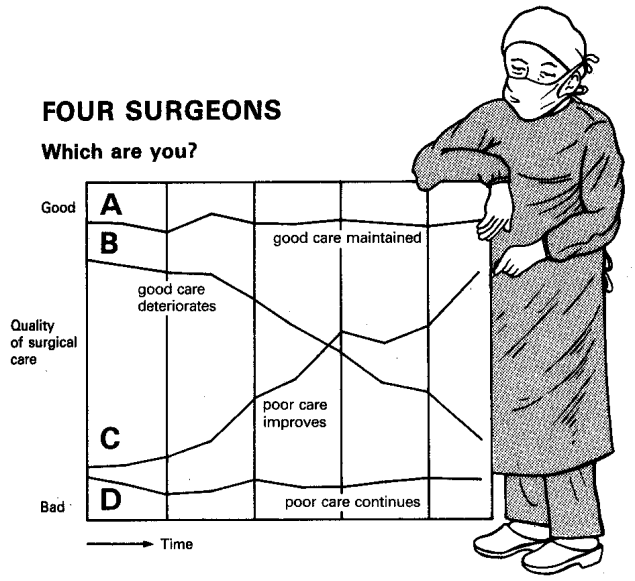



**Fig. 1-6 WHICH OF THESE SURGEONS ARE YOU?**
**Doctor A found a nearly perfect surgical system and stepped in and out of it without needing to change it. Doctor B found a moderately functioning system and slowly let it deteriorate. Doctor C found a poorly functioning system and with great effort was able to improve it considerably. Doctor D found and left chaos.**

If you are lucky, you will arrive at a hospital where your colleagues and your predecessors have created a smoothly running surgical system. Or, you may arrive and find almost nothing. More likely, you will arrive and find a system which is working somehow but which badly needs improvement.

The presence of pressure sores on the wards will tell you a lot, as will the frequency of wound complications after elective clean procedures. As well as actually treating the sick, you may have to try to make the hospital as a whole, and particularly its surgical services, more efficient.

To do this you will have to improve:
(1) The morale and training of the staff: congratulations are likely to be much more effective than reprimands. Explanation of the purpose and value of observations, history taking and examination is likely to be more effective than forceful teaching by rote.
(2) The fittings and equipment.
(3) The administrative arrangements.
(4) Your own skills. In doing this you must be prepared to do *any* task yourself, no matter how humble and how unfamiliar. There is no place for the attitude, "Oh, but it's not my job." Our jobs, wherever we are, are to create the 'machine' and make it work (1-6).

**ALL FOR A PIECE OF CHALK**. There was once a professor of surgery who found to his astonishment that the operating list had been cancelled. When he asked why, his junior assistant replied, "Because there is no chalk with which to list the cases." The professor was furious and dismissed the houseman on the spot. The District Medical Superintendent pleaded with him, "... such a nice boy..."; even the Minister pleaded, but the professor insisted that he could not have such a person as his junior. So he continued to clerk his own cases. Finally, weeks later the repentant houseman came to him and said, "About that chalk, Sir, I think I made a mistake..."
LESSON *Failure to improvise, where this is at all possible, is never an adequate reason for not doing something.*

When you arrive inexperienced in a new place, study it carefully and list the things that need changing. Then, cautiously and steadily, try to implement them during the next few months or years. If you don't note them when you first arrive, you will soon take them all for granted and do nothing. Beware of constant change, because the staff will not accept it. Get to know them and accept their advice before introducing 'improvements'. Identify keen and active members of staff, and communicate through them.

Above all, when you operate, start with familiar cases at first, and look out early for complications. *Don't blame others for your mistakes!*

Then, after 2-3 months, when you have the feel of the place and its problems, visit the nearest hospital where they do things well, stay a week or two and learn whatever they can teach you in a short time. Then come back and put what you have learnt into practice.

Remember the golden rules:
1. Use an aseptic technique.
2. Get adequate exposure.
3. Cut under tension and counter-tension.
4. Ensure adequate haemostasis.
5. Handle tissues gently.
6. Remove devitalized tissue and foreign bodies.
7. Obliterate any dead space.
8. Make sure the tissue blood supply is good.
9. Avoid excess tension on any suture line.
10. Check the swab and instrument count.

Many problems arise when patients are sedated but not properly observed: this is one of the most important things you can teach nurses in post-operative care.
Use the Ramsay scoring system:

| | |
|---|---|
| 1 | Anxious, agitated, restless |
| 2 | Cooperative, oriented, and tranquil |
| 3 | Sedated but responds to commands |
| 4 | Asleep; brisk response to glabellar tap or loud auditory stimulus |
| 5 | Asleep; sluggish response to light glabellar tap or loud auditory stimulus |
| 6 | Asleep; no response to deep painful stimulus |


**Fig. 1-7 DOCTOR 'C' TEACHING THE TEAM.**
**When Doctor 'C'** (1-6) **arrived, he found the obstetric wards in a deplorable state, and its beds so overcrowded that rupture of the uterus occurred in the corridors almost unnoticed. He soon got to work, and here you see him explaining how to put on gloves. Soon, the obstetric services were so efficient that he had empty beds.**
*Kindly contributed by Holly Quinton.*

It may all be summarized in the words of Denis Burkitt, the famous African epidemiologist, when asked for an autograph on his book: *"Attitudes are more important than ability, motives than methods, character than cleverness and perseverance than power, but above all, the heart takes precedence over the head."*

## 1.11 The surgical care of the poor

The purpose of surgery is to heal the sick. What is the use of surgery if the sick cannot afford it? The rapid growth of the populations of many countries requires that we care for ever more people every year, on a health budget which is not only low to begin with, but is *static*, or in some countries is *even declining in real terms.*

Despite this, many patients now know what surgery has to offer, so that their expectations increase steadily. It is deplorable how poor some are. Of the US$2-$6/yr per head that is available in many developing countries for all forms of health care, half or more is spent in the cities, so only US$1 a head or even only a few cents are available in the rural areas for both hospital and health centre care.

The *per capita* income in the rural areas in many places of the world where 80% of people live may be <US$50/yr; the cash income is even lower than that. Estimates as to how much an Indian villager can spend on health care range from US36c-$6/yr. It is however less the cost in cash which devastates the family, than the complete disruption of their earning power.

Fortunately, the kind of surgery we describe is remarkably cheap and cost-effective compared with the high-technology surgery of the industrial world. But it is not so cheap in terms of a villager's income. If you work in a government hospital, such funds as you have may be provided for you, but increasingly patients or their relatives have to source the wherewithal for their own treatment, often on the black market. The reliability and suitability of such practice is obviously small, and the opportunity for corruption great. If you work in a voluntary agency hospital, your patients probably have to pay, and if you really want to care for them, you will have to keep your costs low. Complicated methods can easily lead to rising costs, and so gradually drive the most needy away. Instead, your hospital may fill with richer patients, who could, if they wished, seek care in the towns. You may become too busy even to notice this! Your high standing in the community may cause you to befriend the elite, and you end up neglecting the poor.

**(a) Pulling a hospital 'out of the red'**

Here is some advice principally from Tumutumu PCEA Hospital in Kenya which was able to turn a substantial deficit in its accounts into a surplus in two years. Try to make the containment of costs, or their reduction, an activity which all your staff share. They and you should know how much everything costs. If you can make your financial decisions by mutual consensus, they will be implemented.

Form an action committee consisting of all the spending departments: the medical superintendent, the administrator, the matron, and the senior medical assistant. Meet weekly and pass all decisions involving money through this meeting. A good time to start holding such meetings is after some crisis has occurred, for example, being told to cut your budget by 40%. A crisis atmosphere makes people more cooperative and more willing to change their ways.

Examine all funds coming into the hospital and all funds going out of it, scrutinize all bills and orders. Discuss demands from each department, and reject any unnecessary ones. Scrutinize all expenditure and expect to make some savings on almost everything. No single item is decisive, but collectively they make the big difference. Look at the large items first: salaries, transport, drugs and food; even small percentage savings here will have a big overall effect. Rationalize the use of drugs, especially antibiotics. Look at your establishment figures. You may find that your hospital has got fat and that you should let it get a bit leaner by not recruiting after natural staff wastage. You may find that you have to return to the staffing ratios and technologies (such as making your own plaster bandages) of earlier years. For example, you will probably find that most patients with pneumonia can be treated without a radiograph and so can most extension fractures of the wrist. Economize with sutures, IV fluids, lubricant jelly, stationery and so on. Use IV drugs only when you have to; remember to use the rectal route (PR) if the oral route is impossible.

Hospital meetings may often be critical. They will ensure the cooperation of the leaders of all sections of the hospital, who will transmit the sense of urgency to everyone else. They will also help to create an awareness of the economic implications of a decision, to establish priorities, and to ensure the continuation and extension of your economy drive. Follow up your decisions; someone must check that the fire is extinguished once the water is hot, or that the right weight of the right cabbages has been supplied. Make sure that the staff know how much money is running through their hands, and that the viability of the hospital depends on how they use dressing materials, gas, and equipment. A public chart showing hospital income and expenditure monthly will give employees, and potential donors, an understanding of your situation.

Money coming in is no less important than money going out. So try to keep your beds full. Work out a policy to reduce costs to the patient, and to make your services affordable to as many people as you can. Think about what they can pay and be prepared to lower some charges. However, you may be able to offer special treatment, for example in a private ward, to paying patients, especially if they have medical insurance. Such patients may prefer to come to your hospital for more individual attention than a large teaching hospital in the city. Consider income-generating projects: a restaurant at the hospital, a vegetable garden, a dairy, a maintenance service, a garage, a hairdressing saloon etc.

You may find it financially more reliable and less stressful to lease such activities out to a local entrepreneur. Engage your long-stay patients in making handicrafts or using their skills for the hospital (*e.g.* carpentry, electrical work, or sewing). Persuade the major players in the community to invest in the hospital, *e.g.* the bank or post office; a branch at the hospital will be very popular with staff and a big time saver. This requires marketing and data collection: make a survey of local demands and needs. One hospital in India had considerable success producing CDs of elective operations and selling them to the patients concerned!

Try to twin your hospital with an institution you know in a richer part of the world: the benefits of such contacts are not just economic!

Your greatest asset is the pathology arriving at your door: use it! Even simple, but carefully carried out, research is valuable and will attract funding to your institution from outside agencies.

Valuable contributions to the surgical care of the poor have been made in South America. In Colombia, it was found that 75% of all the operations were simple enough to be done on outpatients with a single anaesthetist supervising 2 patients simultaneously in the same theatre, mostly using local and epidural methods, and adequately supported by assistants. Operating theatres were only used for 40% of working hours, surgeons only did 120 operations per year and 'physicians' only 18.

In most hospitals, services are limited less by resources than by motivation. So expect to be able to do much more, even with what little you think you have. The rest of this section shows what can be done even when resources seem to be already stretched to their limit. If you think that checking the stores is not your responsibility, remember that it is critically important for the financial viability of the hospital, on which your whole surgical endeavour depends.

**(b) Economical surgery**

STAFF. You may unfortunately have no control here, but your influence is great. If possible, try to reduce staff to the bare minimum by not replacing unnecessary personnel, and make sure they do a full day's work. Keep existing staff busy with additional duties. Junior staff are often willing to have more responsible jobs such as filing and typing, or even preparing IV fluids. Try to lay off consistently dishonest and inefficient staff. Encourage punctuality, tidiness and cleanliness. Employ inexpensive ungraded staff where you can, to relieve more expensive staff of routine tasks. Employ multipurpose workers, such as a laboratory technician who can take radiographs. Employ married couples where both partners are gainfully employed. *Don't forget training programmes*, and encourage success by certificates and ceremonies. Take advice across the board: anyone may have a good idea! This is a strong motivator for staff as they feel involved.

**(c) Savings on consumable materials**

**Dressings.** If necessary, you can treat most wounds without dressings. *Clean closed surgical wounds don't need them.* Use gauze and cotton wool economically. *Don't make dressings larger than is necessary*. Re-sterilize all dressings which have not been soiled.

*Avoid using strapping*, but if you do use it, use narrow strips and *don't allow it to be used anywhere except on the human body*.

Hold dressings on with bandages, socks, caps, bras, tight vests, pants etc.

Wash gauze sponges, immerse them in water to remove stains, dry them and re-sterilize them. If necessary, cut up an old polyurethane foam mattress or cushion into small squares and use these as swabs and sponges. They absorb blood well. Cut up and sterilize old linen. Sterile toilet paper can be used as an alternative to swabs for some purposes.

Make up laparotomy pads. Use a sewing machine to join enough pieces of gauze 20x25cm together to make a 5mm layer; attach a tape to one end, and when you operate attach a large haemostat to the tape and leave this hanging out of the wound. Laparotomy pads are a more convenient and economical way of washing and reusing gauze than using it as swabs, and can replace them for some purposes.

*Keep an open wound wet with water.* Keeping a wound dry uses many more dressings than treating it wet. The water need not be sterile, and need not contain salt (except where sodium loss is important as in burns). Use large quantities of water: soak, wash, shower or spray the wounds!

***If a wound is suitably sited to be immersed***, as with the arm, leg, or buttocks, immerse it in water for 3h bd. Put a leg in a bucket, an arm in a long arm bath, and let a patient with a buttock wound sit in a hip bath.

***If a wound is not suitably sited for immersion***, keep it wet all day.
*N.B. Dressings in these situations only serve to protect the environment.*

**Disinfectants.** *Don't fill gallipots to the brim*. Use cotton wool, not gauze, for scrubbing the skin. *Don't use disinfectant for the preliminary 'scrub' to remove dirt*; use soap and water. One gallipot of disinfectant will then be enough to prepare the skin. You can use it all day: it is self-sterilizing.

**Disposable items.** Avoid these and replace them with permanent equipment. If you buy plastic equipment which is intended to be thrown away, choose the kind which you can autoclave or boil. Recycle everything you possibly can, and try to throw nothing away.

Buy the kind of gloves you can re-sterilize 3-4 times. Re-use clean sterile gloves as disposable gloves. Re-use clean disposable gloves for general cleaning work.

Use nylon syringes, such as the French KIGLISS pattern, which you can sterilize indefinitely, and which have a rubber ring to seal the plunger which you can purchase separately.

*Don't use disposable urine bags*; instead, use bottles and tubing from old intravenous sets. Re-use endotracheal tubes after thorough washing and cleaning with 'Cidex' (2.5).

**Catheters.** Use simple Jacques catheters if they are less expensive than Foley catheters; if you want to leave them *in situ*, secure them with strapping. *Consider carefully if the catheter is necessary anyway.*

**IV fluids.** Make your own for 7% of the price of the

commercial ones. Where possible, use rectal rather than IV fluids. These are not suitable for rehydrating patients, but they may be adequate for maintenance. If IV fluids are scarce for post-operative patients who have had major gastrointestinal or other surgery, insert a nasogastric tube for drainage and a naso-jejunal tube for feeding. In this way you will greatly reduce your need for IV fluid.

**Oxygen** is only necessary for such indications as pulmonary oedema, asthma, shock, or coma, but *not* for moribund patients. If you use it for patients with no hope of survival, relatives may come to believe that when you switched it off, it killed them! Get hold of oxygen concentrators: the economy is well worth the initial expense.

**Drugs.** Use cheaper drugs instead of expensive ones. For curettage of the uterus use pethidine with diazepam instead of ketamine; use aminophylline instead of salbutamol, aspirin instead of paracetamol, nitrofurantoin instead of ampicillin for urinary tract infections, and morphine instead of pethidine for many applications. Look carefully at the prices you pay for drugs. One supplier may be 100 times cheaper than another, *but beware counterfeit products!* Always consider if antibiotics are really necessary: they are often overused! *Don't practise poly-pharmacy!*

**Sutures.** Where possible, use surgical suture material bought in bulk on reels, or use nylon fishing line (4.6). Only use atraumatic sutures when they are absolutely necessary. With more expensive suture materials, use continuous sutures rather than interrupted ones. The application of warm moist gauze packs (especially if soaked in dilute adrenaline) to a bleeding surface will drastically reduce the number of bleeding vessels that you need to tie. Use sewing cotton for simple ligatures.

**Scrubbing up.** Use ordinary soap not special fluids, if the first costs less.

**(d) Saving kitchen supplies**

Find the cheapest supplier and buy at the right season. Find out if buying in the market may be better. Watch tenders carefully, change suppliers when necessary, and insist on good quality. *Don't let them supply you with old, rotten, or small potatoes*. Buy boneless meat, especially offal (liver or heart). Adjust the number of meals cooked to the bed state. Provide high-protein diets only on genuine indications. Reduce waste. Fill plates moderately and vary helpings according to the appetites of both patients and staff. Keep your own livestock to feed on waste and run your own vegetable garden if possible.

**(e) Energy savings**

**Washing.** Use the timers to set minimum times for washing and spin drying carefully. Avoid tumble dryers unless the climate is very wet; they use much electricity.

**Petrol or diesel.** Diesel vehicles may be cheaper to run but need more careful maintenance. Use the smallest economical vehicle for a given job and avoid unnecessary trips. Keep logbooks and use vehicles for hospital journeys only. Drive at economical speeds and use moderate engine revolutions in all gears. Use public transport wherever possible. Encourage a style of driving that is considerate for the vehicle, especially when carrying heavy loads on bad roads.

**Gas.** Put lids on pots. Reduce the flames when the pot has boiled. Use pressure cookers. Control cooking times. You may be able to insert a system that utilizes gas from compost or sewage, which is very cost-effective, although expensive to install.

**Electricity.** Switch off lights when unnecessary (*e.g.* in daylight!). Use fluorescent tubes instead of bulbs. Heating is much more expensive than lighting, so make sure it is used only where really necessary. Make sure you have universal connectors so you don't waste time and expense on adaptors. LED lights (*e.g.* on a headband) are extremely effective and use minimal power, so are useful if you have to rely on solar energy.

**Air conditioning.** In hot humid climates, a cool air environment makes life and work much more comfortable. Electrically driven air conditioners are expensive and frequently break down, and heat up surrounding areas outside the room they are cooling down! If you insert a system of PVC pipes 3m below ground, where the earth temperature is virtually constant, and blow air through these pipes with a simple fan, you can cool the room temperature by about 10ºC and reduce humidity by 40%. This system also avoids the dust that regularly contaminates electrical air conditioners.

**Solar** lighting is practical, virtually maintenance- and cost-free and its initial installation is becoming less expensive. Solar heating, by allowing the sun to warm black pipes, is very effective for producing hot water. Solar refrigerators are available, but their initial cost is high. Invest in inverters to convert solar 12v to 240v, but *beware that you don't overuse your batteries*. Use solar or hand-cranked batteries.

**(f) Other savings**

Use the space fully on all case sheets, use paper on both sides. Make your own forms with a stencil. Minimize the use of paper for internal correspondence. Use scrap paper for messages. *Don't use so much detergent that it causes foaming in the laundry and when scrubbing floors*. Register and charge for private phone calls. Send letters with your hospital transport if possible. Use e-mail or electronic messaging if you can.

Control all items that could be used in private homes, including torch batteries, soap, matches, pens, toilet paper, female sanitary pads, food and medicines. Be firm on discipline when it comes to theft. Remember theft probably accounts for your greatest 'expenditure': inventories and

security are mandatory. Proper accounting systems are also essential: otherwise money will just 'disappear'! Also, *don't delegate ordering of stock or equipment to a junior*; not only will you get the wrong things but you will be conned into buying expensive varieties of cheap things. Beware offers of 'new' equipment from unknown dealers: it is probably stolen or cheaply repaired and will *not* last.

Practise regular maintenance. Keep an eye open for breakages and organize repairs early. Establish a climate of accountability. Remember to order stock with sufficient time to allow for delivery and delays: *don't wait till the last X-ray film is in the hospital before ordering new supplies!* Otherwise you will be forced to improvise with expensive items because the cheaper ones have run out (*e.g.* using 3-way catheters when ordinary ones are actually needed).

**THE PATIENTS ARE OURSELVES**

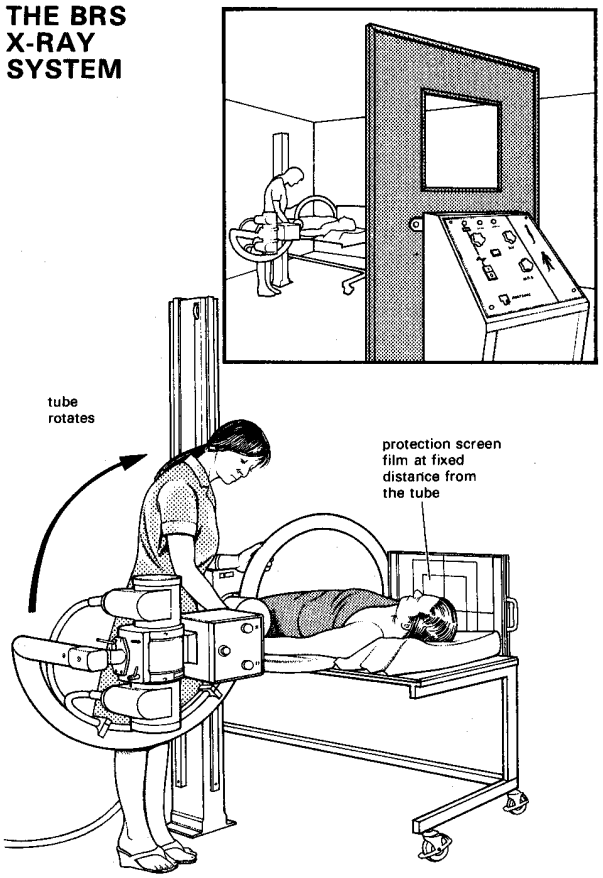



**Fig. 1-8 THE BRS X-RAY SYSTEM was developed by WHO to make essential cost-effective radiology available safely and reliably all over the world. If you want one of these machines, order one made to WHO specifications. Note the screen protecting the operator.**
*Kindly contributed by Philip Palmer.*

WHO has made a great advance in the X-ray departments of the world's district hospitals by developing the BRS (Basic Radiological System). The BRS machine shown (1-8) is made by several manufacturers to WHO specifications. If you are thinking of buying an X-ray machine, this is the one to get. If you don't have electricity all day, you can run it on a battery which you charge when you turn your generator on. It is so simple that a radiographic assistant can easily work it, but if you have a radiographer who has been trained to use a more sophisticated machine, he may not like this one because it does not give him enough freedom to adjust the settings.

The BRS machine is based on the assumptions that: (1) A good chest radiograph needs a short exposure, and a substantial distance between the patient and the tube. (2) A radiograph of the lumbar spine will be one of the heavier exposures required. It has therefore been designed to produce at least 80mA at 18kV, not one or the other, but both simultaneously. It has a fixed tube-to-film distance of 140cm, which gives satisfactory chest films and is the ideal distance for most other investigations. The tube is fixed so that it can use an accurately focused grid of high quality. The tube and the film are always accurately focused on one another and cannot be angled independently. This makes it easy to position the patient and makes routine views exactly repeatable. The supporting arm of the tube and the film can be rotated through at least 270º, so that horizontal and vertical projections are easy, and angled views are possible. Erect views of the skull, sinuses, shoulders, or abdomen are as easy as routine views of the chest. A radiographer's manual is available; so is a manual of radiography to go with the machine.

**ECONOMY IS ESSENTIAL TO SURGERY**

## 1.12 Primary care imaging

Radiology uses X-rays which provide much useful information, particularly about bones, but ultrasound (38.2) can replace radiographs for very many indications, especially in obstetrics except for X-ray pelvimetry. Think carefully if a radiograph is likely to give you essential information. Remember quite sophisticated interventional radiographs can be taken with simple means (38.1).

Ultrasound is an extremely useful modality, and you should really not be without this useful tool. Ideally, it should be portable, and must be suitable for obstetric evaluations. You don't need many types of probes, but it is almost essential to have a trolley where the probes can be safely placed so they are not damaged. You certainly don't need the extra gadgetry (freeze control) for taking still pictures, or on-screen measurements (though this is helpful). In fact, the fewer the knobs, the better and more consistent are the images you will obtain.

A computer attached and key console are not essential. The more features the system has, the less transportable it will be. If you intend to take it to distant clinics, make sure it is robust and comes with a specially padded case. Make sure it runs on rechargeable batteries.

A TALE OF FOUR PEOPLE, Everybody, Somebody, Anybody, and Nobody. There was an important job to be done and Everybody agreed that it could be done by Anybody. It was agreed that Somebody should be detailed off to do it, but although Anybody could have done it, it eventually got done by Nobody. Somebody got angry about it, after all (he said) it was Everybody's job. But, while Everybody thought that Anybody could do it, Nobody realized that Everybody was going to assume that Somebody was going to do it. It ended up that Everybody blamed Somebody when Nobody did what Anybody could have done.
LESSON This book is written to benefit Everybody, so that Anybody who is put in charge of surgical patients will know that Somebody cares enough to write down methods of surgery in a way that a 'Nobody' can find that he or she can do Something even if tucked away in the middle of 'Nowhere'.

## 1.13 How to use this manual

You will notice that after 5 chapters on 'the basics' there are 5 on draining pus. Then come chapters on the abdomen and hernias, followed by obstetrics, gynaecology, and the breast. After this there is the surgery of special areas (thyroid, proctology, urology, etc.) then finally terminal care and imaging.

After dealing with general principles of trauma management, Volume Two deals with various regions in turn.

In writing this manual, we have tried to make both language and the typography work for you. You will notice that we use the imperative, avoid the passive voice, and refer to 'the patient' and then mostly to 'him', which does in fact usually mean both 'him and her'. *Alas, English, unlike French, has no personal pronoun which includes both sexes and we have refused to use the grammatically awkward 'them'*. Our use of 'he' or 'him' to include both sexes improves clarity, and shortens the text, but we owe our apologies to our lady readers!

We have used 7 degrees of approximate commonness: very common, common, not uncommon, uncommon, unusual, rare and very rare. This is based on the experience of the authors and *may not apply exactly in your situation*.

Inevitably, we are mostly concerned with technology but *behind all this lies the patient himself.* The boy with the fractured radius and ulna waiting at the end of the queue might be your own son, that paraplegic your brother, that old lady with the fractured femur your mother. Tomorrow, you might yourself be that comatose patient with the extradural haematoma in the end bed. These patients are ourselves! Perhaps the thing that we most often miss is any explanation of what is going to happen to us, and any indication that anyone really cares. Believing the compassionate and devoted care of the sick to be one of the noblest human activities, and something of ultimate value for its own sake, we stress this!

We trust that this volume will enormously improve medical care as it did in St Francis Hospital, Ifakara, Tanzania. This showed that this manual had been put to good use. It contains much detailed factual information, and we have done our best to make it as easily understandable as we can. Feel free to disseminate this knowledge as you see fit: we make no restrictions on your keenness to photocopy the text. If, however, you would like to translate the text into your own language, please contact the editors, who will be happy to hear from you!

Take this book to the wards, clinics, and operating theatre. How does the treatment you see given differ from that described here? The methods of examination we give are summaries only; practise them on a fellow student.

We are all students, and should never give up learning new things. *Don't be overwhelmed by the mass of detail you find here. Don't panic,* and *don't think you need to read cover to cover!* These pages *differ enormously in importance.* Try to distinguish between what you should know, and what you can look up.

You will notice that much of the writing is didactic. This guidebook is a distillation of the cumulated experience of very many dedicated surgeons and physicians working in challenging environments. Also, there are very few references, because adding these would have hugely increased the volume of the text, and they cannot readily be looked up by our readership. Many references are old, but are still very relevant in low-income situations, again reflecting how advances made in the rich world are often not translatable to the poor world.

If, however, you find something really does not work in your set-up or you have good practical suggestions, please write and let us know.

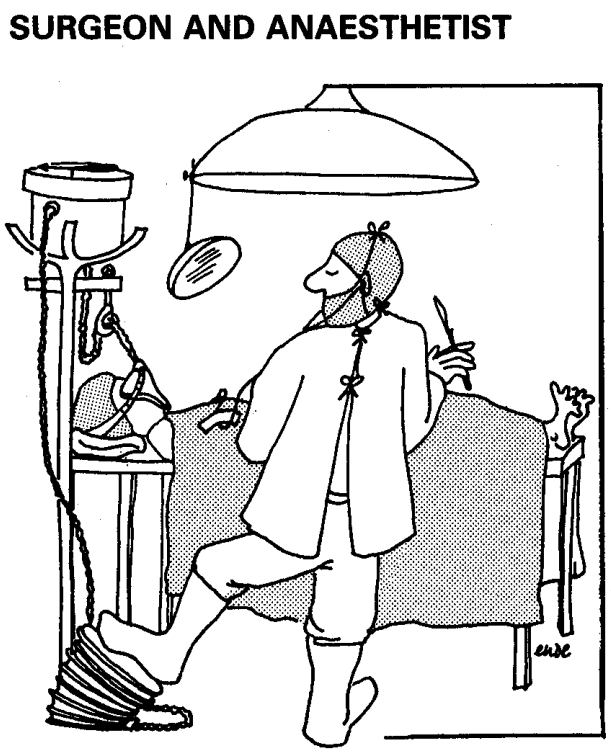



**Fig. 1-9 YOU MAY HAVE SIMULTANEOUSLY TO BE SURGEON AND ANAESTHETIST.**
*Kindly contributed by de Glanville N. Proc Assoc Surg E Afr.*
***N.B. This cartoon is no longer very up-to-date: now you are much more likely to use ketamine than inhalational anaesthesia; also we recommend that you train a nurse or clinical assistant to monitor the patient during the operation, to warn you if there is a problem.***

Certain drugs have been re-named in English usage according to European regulations; whilst generations of readers will probably still use and write the old names, the new ones are

given for correctness. Nonetheless, you should liaise with your pharmacy as to your own local usage! It goes without saying that prescriptions MUST be legible.

| New Name | Old Name |
|---|---|
| Amoxicillin | Amoxycillin |
| Cefalosporins (all types) | Cephalosporins |
| Chlorphenamine | Chlorpheniramine |
| Diethylstilbestrol | Stilboestrol |
| Furosemide | Frusemide |
| Indometacin | Indomethacin |
| Levothyroxine | L-Thyroxine |
| Lidocaine | Lignocaine |
| Procain Benzylpenicillin | Procaine Penicillin |

**(a) A suggested initial reading list**
Start by reading the whole of this chapter. In those which follow, read only the introductory passages, and merely glance at the detailed didactic instructions which follow. Read these carefully later when you need them to guide you in a specific situation. Start with the common things first.

Read particularly the first section of each chapter and the following: the major theatre (2.1), aseptic theatre technique (2.3), autoclaving (2.4), antibiotics in surgery (2.7 to 9), the control of bleeding (3.1 to 2), bloodless limb operations (3.4), the instruments (4.1 to 5), suture materials, sutures and needles (4.6 to 8), drains (4.9), instrument sets (4.13), 'pus' (6.1 to 24), pyomyositis (7.1), osteomyelitis (7.3), septic arthritis, especially the positions of rest and function (7.16), hand infections (8.1), empyemas (9.1), peritonitis (10.1), abdominal surgery (11.1 to 15), the acute abdomen and intestinal obstruction (12.1 to 16), appendicitis (14.1), inguinal and femoral hernias (18.1 to 8), and PID (23.1).

**(b) The main anatomical drawings** are the following: mandibular region (6-7), parotid (6-8), tongue (6-9), anorectum (6-13, 26-1), anterior thigh (7-18), hand and tendon sheaths (8-4,7), pleurae (9-1), peritoneal cavity (10-5), anterior abdominal wall (11-1), broncho-pulmonary segments (11-23), biliary tract (15-3), inguinal region (18-3,4), uterine blood vessels (22-14), relations of the ureter (23-20), pelvic ligaments pelvis (23-21), eye (28-1), auditory pathways (29-2), carotid artery (29-7), tonsil (29-10), ventricular system (33-18).
There are also the following transverse sections:
forearm (7-8), thigh (7-9, 35-18), calf (7-11), hand (8-1), ankle (32-18), wrist (32-35), lower leg (35-20).

**(c) If you are a general duty medical officer**, *don't be ashamed to refer to this manual*. A patient will be more grateful for being correctly treated than for being wrongly treated because you could not remember something and had to guess! For example, you cannot possibly remember all the steps in the general method for a spinal injury, or a hand injury, so why not refer to them in front of a patient until you have examined so many patients that the necessary clinical routines become automatic? If the condition is difficult to diagnose, ask to wait until the end of the clinic, and then use the routines we give here to try to reach a diagnosis.

*Keep this manual in the theatre.* If a procedure is long or difficult, sit in an armchair and study it in peace before you try to do it. Then study it again after you have done it. *Don't expect to be able to do everything we describe immediately*. Progressively extend your practice, little by little.

*Don't let things you cannot do, because you don't have the necessary equipment or drugs, prevent you from doing the things you can do*.

Whenever you refer a patient, try to learn from the person you refer him to. If possible, be there when he is examined. In the same way, if someone refers a patient to you, he should be there so that you can teach him.

What methods are your staff using? For example, if medical assistants treat fractures in your hospital, study the methods they use and encourage them to use those described here. If they might find this manual useful, see that they have a copy and go through it with them.

If a patient dies and you are not sure of the diagnosis, try to get permission for a postmortem examination.

*Make good use of the endpapers and charts you find in this manual:*
WHO safety checklist (1.8), endoscopy form (13-10), partogram (21-2), fundal height chart (22-15), baby head circumference chart (33-17), and foetal growth centiles (38-6,7,8).
Where convenient, photocopy them and stick them up on the wall, or have them printed.

**(d) If you are a surgical teacher**, try to integrate this manual into your teaching, and base your examination questions on it. Aim, less that the students should know this manual, than that they should know their way around it and be prepared to use it.

**(e) Hospital records**
In-patient hospital records often provide life-saving information which cannot be found elsewhere; they are a medico-legal obligation, and should contain all the important details of patients. *There is no real need for nurses and doctors to keep separate records*. Both could write in the same set of notes!

A proper hospital filing system is essential; notes are best stored by number (not name, as patients may use different names on occasion) using the last two digits, thus:

……236000, 237000, 238000….259100, 269100, 278100….243200, 252200, 255200….etc…..209800, 243800, 246800etc…..256001, 264001, 265001….201002, 222002, 265002….etc

A patient's ID number could be used if necessary.

Patients' social details should indicate: name, date of birth, address, next-of-kin, and mobile phone number.

If you can get your hospital records digitalized, so much the better, but remember that your hospital 'memory' will need constantly to be upgraded!

**(f) Medical notes** should be accurate, legible and comprehensible. There should be an admission note (with history and physical findings), continuation notes (with results of relevant investigations) commenting on progress and giving instructions, and finally a discharge note.

It is good practice to provide patients with their own outpatient cards: brief notes are made on clinic visits, and inpatient summaries are included:

(1) Hospital number,
(2) Date of admission,
(3) Diagnosis with relevant signs,
(4) Operation done,
(5) Complications,
(6) Lab results (especially histology),
(7) Date of discharge and review.

***Never ever be tempted to alter the notes of a patient.***
You may, however, add a comment later (with a date) if you feel it appropriate.

**IF YOU ARE A STUDENT, LEARN THE IMPORTANT THINGS FIRST**

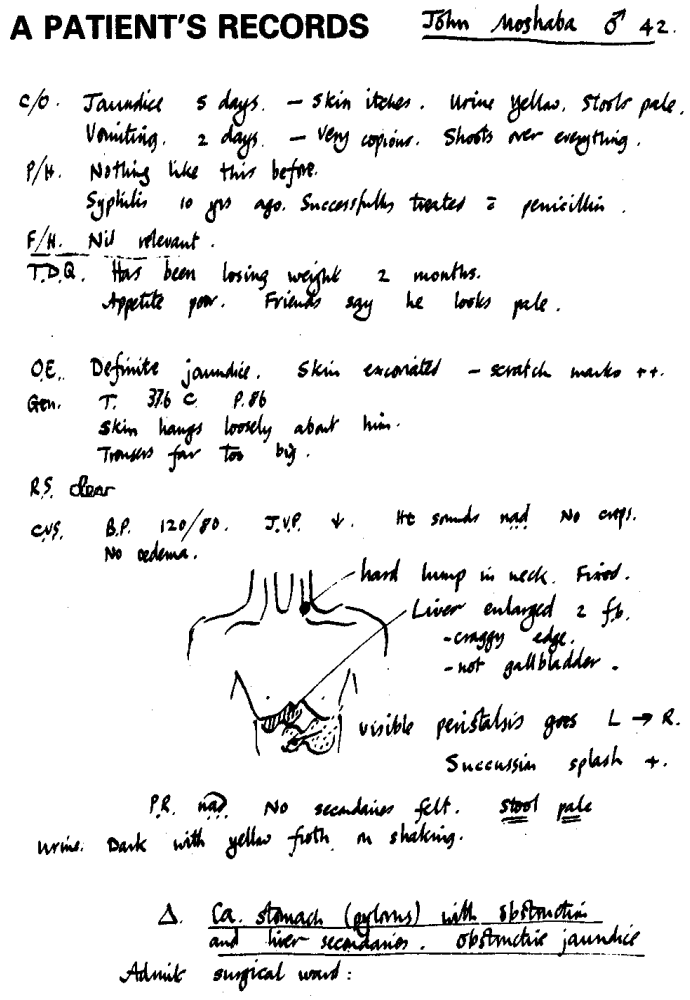



**Fig. 1-10 A PATIENT'S RECORDS,** *as kept by Peter Bewes (adapted).* **Good notes are an excellent indication of quality of care. You may like to indicate the reasons for admission and orders: in this case, *"Prepare for Gastrojejunostomy. Check Hb. Rehydrate IV N/Saline 1L 3hrly with 1 ampoule KCl with each litre. Pass NG tube. Check clotting time. Inj. Vit K 10mg IM. Discuss with relatives. Get consent."***