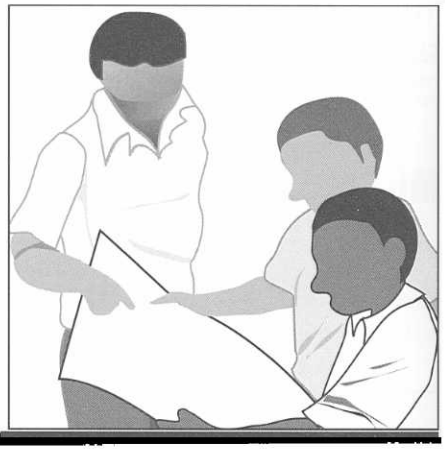


8. PLANNING OF HEALTH EQUIPMENT

Careful planning for equipment enhances the efficiency and effectiveness of the whole health sector. Health equipment includes medical equipment and general equipment to support the functioning of a health facility, such as generators, laundry machines, and kitchen apparatus. In the planning for equipment, as part of health planning, three steps come immediately to mind.

As the first step, the sector has to decide which health services it wants to provide, and at which level of the health system it wants to provide these services.

As a second step, the human resources who will use this equipment must be considered. Rational planning for equipment requires an assessment of the likelihood that the equipment will be properly used. Is the necessary staff available? Can staff be trained in its proper use, once the equipment is provided? The most common reason for break-down of equipment is improper use. This improper use is often traceable to lack of training.

Thirdly, one has to verify that the capacity is available to maintain the equipment. Maintenance requires staff, infrastructure, such as workshops, vehicles and tools, and it requires a budget for recurrent costs. Many investments in maintenance are wasted because no recurrent budget was provided with the investment. Unwillingness of donors to provide for the sometimes large recurrent cost implications of their investment projects often adds to this problem.

THE STATUS OF HEALTH EQUIPMENT

Most facilities are full of equipment which is not functioning or functioning only poorly. These reasons are often given:

- the equipment is too sophisticated
- no-one knows how to use it
- (inadvertent) misuse
- over-utilisation
- no-one knows how to install it
- the equipment was broken when it arrived
- no spare parts available in the country
- no proper utilities available (electrical power, water supply)
- no proper space for the equipment
- no maintenance plan
- insufficient budget for maintenance
- equipment is not resistant to dust, humidity, or high temperatures

- no-one needs it
- equipment is not appropriate for the local context

Each hospital has two mortuaries, one for patients and another for equipment

The reasons for this situation fall into several categories:

Lack of training, experience and awareness among decisionmakers regarding the management of modern technology. Too often, decision-makers see equipment in the same way as drugs or buildings. Equipment needs continuous care, maintenance and a reliable supply of spare parts. It often requires relatively sophisticated users and well-trained service personnel.

Equipment is often primarily considered a status symbol. Instead of purchasing items that would adequately meet the needs of patients, many doctors insist on equipment that is superficially the most impressive, regardless of price, performance, even efficacy and safety. Computers, which are being used as typewriters (or not used at all) are the prime example. Procurement is often handled by administrators or physicians with little knowledge of technology management.

Greed and short-sightedness of manufacturers and suppliers. The industry often pushes the sale of excessively sophisticated equipment to a health system, which lacks the technical and financial resources necessary to operate, maintain and update it.

Some programmes and donations are motivated by donor self-interest. This has resulted in large donations of costly equipment, but no commitment to dealing with problems of operation and maintenance. Short-term benefit for the donor nation rather than long-term development of the receiving nation may motivate the donor. The receiving nation or the health facility will find it extremely difficult to refuse a seemingly attractive gift

Shortage of funds. All these problems are greatly exacerbated by shortage of present financial resources and uncertainty of future resources.

TASKS OF A HEALTH CARE TECHNICAL SERVICE

Proper planning and management of equipment can only be done through a team effort, involving staff from different departments of the health sector. Such a Health Care Technical Service (HCTS) needs a multi-disciplinary staff, including planners, users and engineers.

Proper management of equipment requires a health equipment policy, which outlines the goals and objectives of the sub- sector. A country needs a Board for medical equipment technology, which can help decide policy and develop an action plan for equipment management. Such a HCTS action plan involves a manpower development plan, training programs, standard lists of equipment for each level of care, requirements of infrastructure for equipment (workshops, tools, vehicles), and a plan for the procurement and maintenance of equipment. All these aspects are interrelated. Fortunately, the literature on this is not as scanty as it was only a few years ago.

Careful planning is necessary for sustainable delivery of good-quality care. It entails assessment of the recurrent cost and future investment implications of the equipment investments decisions. Health planners often ignore the costs of maintenance and replacement of equipment. The costs of maintenance may be 5-10% of the investment costs. One has to plan for a piece of equipment's replacement on the day of purchase. If the life of a piece of equipment is 5 years and the annual maintenance costs are 10% of the purchasing price, the total annual costs to keep that equipment in running order would be 30% of the capital costs. In fact, the figures will be even higher since prices always rise. Careful planning balances what is needed with what can be afforded.

Rationalisation of procurement can result in enormous short-term and long-term gains for the health sector. In procurement one has to weigh many issues, including:

- *the method.* International competitive bidding (ICB) can result in the best price for a piece of equipment. But ICB may be too cumbersome, if the quantities or the costs of the goods are low. Reasonable alternatives are local shopping or national competitive bidding. Whatever the method, there should always be space for competition to guarantee good value-for-money,

- *Standardisation.* This will have enormous implications for staff training, availability of spare parts and efficient planning for maintenance. However, too much emphasis on standardisation may lead to inefficient procurement or poor value-for-money. It is unwise to become too dependent on a few suppliers Overemphasising standardisation may also lead to lack of innovation.

- *Installation and maintenance.* For future use of the purchased piece of equipment, it can make all the difference if its installation and standard maintenance is included as a requirement in the tender document. At the same time as one procures a piece of equipment one should procure the tools and spare parts which are necessary for its maintenance. One can ask to include the price of maintenance contracts for standard regular maintenance in the bid price of the equipment. Inclusion of training in the proper use should be standard in the tender document when procuring a major piece of equipment If the equipment requires specialised maintenance by the supplier, the supplier should have a representative in the country or at least in the region.

DEVELOPMENT OF A MAINTENANCE PLAN

Rather like general health care, maintenance can be divided into preventive or regular standard maintenance and repairs. After an inventory of the available equipment and its regular maintenance requirements (time and spare parts) it will be possible to develop stock requirements and efficient maintenance schedules for each health facility. These are lists for estimating the maintenance requirements for many pieces of standard health equipment. Most equipment will be best maintained on-site. Some equipment which need specific testing may have to be transported to a workshop or laboratory. Always remember that maintenance costs are a substantial percentage of the capital costs of equipment. Establishing maintenance contracts with specialised firms may deliver the services more efficiently and with a higher quality than the health system itself can do. In smaller facilities it may be advisable to combine care for maintenance of the civil works with maintenance of the equipment in one unit. Well-organised planning for maintenance requires good management, since many entities are involved: the health facility, the district, the province and the national level. For most pieces of equipment, contracting of maintenance will not be the most efficient choice.

Maintenance is like general health care: there is preventive care and curative care

A key task of the HCTS team is **manpower planning and training.** The extreme variety of health equipment and its sophistication require qualified staff, from technicians, who operate and repair equipment, to managers who are responsible for planning and procurement. If the general education system does not provide the necessary training, the health sector will have to train its own equipment staff. It may be necessary to send some HCTS staff abroad for specialised training. WHO has stimulated the creation of national, regional and inter-regional networks of training institutes to provide the necessary training capacity, especially in TOT (training of trainers).

The HCTS organogram is a pyramid, with few staff at the top and large numbers of craftsmen at the base. In general a HCTS team consists of the following 3 categories (A, B, C) of staff, each group with increasing technical and managerial skills.

A. Staff with only primary education, or some secondary education and a few years technical training or experience, such as craftsmen (carpenter, plumber) and polyvalent technicians.

B. Staff with specialised technical training in a polytechnic school or university, such as specialised technicians for maintaining basic medical equipment and cold chain equipment, or engineering technicians such as managers of a district workshop.
C. Staff with advanced training in management or engineering such as clinical engineers for advanced technical work in provincial or national workshops This category also includes clinical engineer-managers for policy development at provincial and central levels.

Training in management of health equipment should be included in the curricula of health workers, such as nurses and laboratory technicians. There are two good reasons for this: minor preventive and curative maintenance can often easily be done by the user of the equipment, and misuse of equipment is the most important and frequent cause of malfunction.

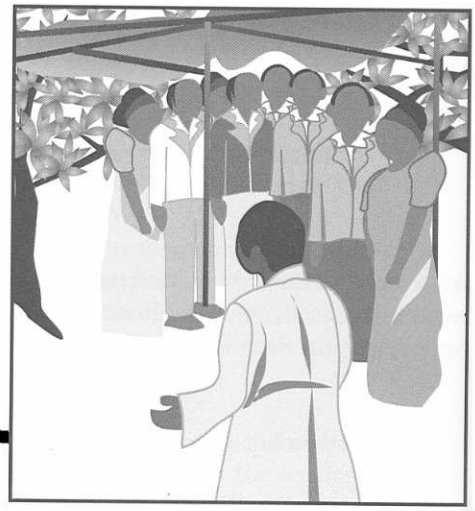
The following reference material has been used for this chapter on equipment:

Manpower Development for a Health Care Technical Service, WHO 1990, Report Nr. WHO/ SHS/NHP/90.4.

Bloom G. and others, The Right Equipment...In Working Order, World Health Forum, Vol. 10, 1, pages 3–27.

WHO Global Action Plan on Management, Maintenance and Repair of Health Care Equipment.

Bloom G., and Temple-Bird C., Medical Equipment in Sub-Saharan Africa, IDS, Research Report, WHO (Rr 19)



9. COMMISSIONING

Throughout the design and construction stages it is important to be aware of all the tasks which have to be undertaken to commission and take into use the completed buildings. The King's Fund for London has published two very good reports on the subject and the following check list is based on those publications.

FUNCTIONAL CONTENT OF THE PROJECT

This includes considering the implications of the new development on existing services; on their organisation and management, and the implications of the Brief and schedule of accommodation. Minimal requirements call for·

- Description of services to be provided compared with existing services
- Data on present and anticipated numbers of patients, staff, out-patients, operations, x-rays, in-patients, patient days, lengths of stay, rates of admissions.

MANAGEMENT OF THE COMMISSIONING PROGRAMME

This requires establishing the commissioning team at both central and local levels by

- Appointing team members
- Drawing-up Terms of Reference and Job Descriptions for the members of the commissioning teams
- Nominating team leaders and team secretaries
- Drawing-up a list of tasks for all departmental managers, medical, nursing and other staff, including information required for planning, procurement and training, as well as a programme for occupation of completed facilities
- Describing the task of the Project Co-ordinator and the project implementation unit. Circulating a time schedule of activities and a list of information which will be available
- Helping the finance department to liaise with co-ordinators and departmental managers and draw-up budgets for the revenue consequences of the project
- Reviewing the programme of activities, ensuring implementation of activities in due time, including procurement of equipment, recruitment of staff, approval of budgets, procurement of supplies and consumables including uniforms and stationery. Ensuring that everyone is aware of the most critical factors (usually staff and finance) and that these are properly dealt with

- Drawing-up final check lists for the commissioning programme. Separate lists are required for managers, clinical staff and other members of the team
- Paying particular attention to commissioning those departments which are completed early in the construction programme (often so that other buildings can be emptied prior to refurbishment). Here there will be particular questions concerning the early procurement of equipment (which is usually difficult), status regarding insurances, the contractor's liability period, and security.

OPERATIONAL PLANNING

Drawing-up comprehensive descriptions of the functions of the new departments and the activities which will go on in them. This will essentially involve the review and reissue of the operational policy documents described in chapter 4 THE BRIEF.

EQUIPMENT AND SUPPLIES

A specialist team should be involved (from early in the design process) in planning the procurement and installation of the equipment and supplies which will be required. On a recent project in Botswana the commissioning team had the following members.

Project Co-ordinator:	in charge of the overall management of the project
Commissioning Officer:	chairman of the Equipment Committee (with representatives from different disciplines in the hospital / MOH also representing the hospital in the construction process)
Equipment Specialist:	responsible for all project and tendering documentation
Commissioning Nurse:	most active during the actual commissioning process
Commissioning Engineer (civil works):	liaison in earlier stages with design team
Commissioning Engineer (equipment):	liaison in later stages with the contractor, supplier, and others
Supplies Officer (MOH) :	responsible for ordering and tendering procedures

The Equipment Specialist liaised with the Project Architect, and submitted proposals directly to the Equipment Committee, which then instructed the Supplies Officer MOH.

In addition to drawing-up the documents required for procuring equipment, the Equipment Committee is responsible for managing the receiving and installation of new equipment.

PERSONNEL MANAGEMENT

This key function will include drawing-up and agreeing policies for the organisational structure of the completed facilities and for the recruitment, training and deployment of staff. The number of new staff required should be assessed and the revenue required for their employment should be negotiated with the authorities.

The proposals made are also discussed with staff groups. A programme is drawn-up and implemented for the induction, orientation and training of existing and new staff. This may include a programme for transferring staff from the old facility to the new one.

COMMUNICATION STRATEGY

Providing information is an important task of the commissioning organisation. This includes providing information to the public by means of press announcements and meetings, and conveying information to hospital staff and others affected by the project (such as residents of adjacent properties, patient groups and organisations) by means of circulars and group meetings.

PRE-HAND-OVER ACTIVITIES

As the buildings near completion, the activities of the commissioning team become more intense. Plans to be initiated for co-ordinating the final effort will involve meetings with architects and the contractor to agree the final date of handing-over and to finalise handing-over procedures. At the same time the process of commissioning engineering services must be implemented. Although the responsibility for this is the technical consultant's the client (through the commissioning team) will need to be fully Briefed on any problems observed.

HAND-OVER

The taking-over procedure which has been agreed must be implemented and carried out at a formal meeting. All questions regarding the liability of the client and the contractor will have been cleared and arrangements should have been made for handing-over responsibility for security. The staff who will work at the facility must be kept informed and be invited to visit the new facility as part of an orientation process.

THE TASKS IMMEDIATELY AFTER TAKE-OVER

After the client has taken-over the buildings, programmes for staff training and trial runs can be initiated. Staff must be fully aware of how the new buildings work and how they should be used; the client must be very sympathetic to comments made by the staff. At the same time the public must be kept fully informed of the taking-over activities and the date of the opening the facility. Arrangements for the opening ceremony should by this stage be well advanced and invitations should have been sent out.

IMPLICATIONS OF THE DEFECTS LIABILITY PERIOD

After handing-over the completed project, the contractor is usually held responsible for an agreed period for all defects which may be found in the buildings and installations. Staff must be encouraged to report any defects which they observe. At an agreed time after handing-over, a formal meeting is held at the new facility: this is usually attended by the contractor, architectural and engineering consultants and the client. At this meeting, any defects are pointed out to the contractor and agreements are made regarding their rectification. Once all defects have been corrected, a final inspection is made and the last payment (which has been retained by the client), is handed-over to the contractor In every stage of this process it is most important that the client is actively involved and competently represented.

INTRODUCING THE NEW SERVICES: IMPLEMENTATION OF OPERATIONAL SYSTEMS

In the first months of operating the new facilities a number of small (and sometimes not so small) problems will appear.

Items of equipment may not have been delivered and commissioned on time; consumables which are required may not be available; mains services may be erratic, floors may be slippery if not treated with the correct cleaning material, and so on.

Such problems, if not attended to promptly and competently, can disrupt the services being provided. For this reason it is important that the members of the commissioning team at both central and local level are available and ready to assist with helping to solve the problems.

It is often difficult to open all new wards and departments at once. some phasing may be required. Here again it is important for the commissioning teams to work closely with local staff to make sure that services provided are fully operational, even though some activities are not in place. This is particularly important in phased schemes where selected departments are completed early so that existing buildings and departments can be renovated or demolished.

The process and result of commissioning activities will have long-lasting financial consequences for the institution,- in staff time, increased requirement for consumables and increased use of energy and services. It is essential that these requirements are planned for and that the finance is in place when required.

OPENING CEREMONIES

This most important activity should be planned well in advance. Presidents, ambassadors and pop stars are not usually willing to appear at opening ceremonies at a moment's notice, but without these personages in place, it will be difficult to give the Government, the donors and the local community the full public recognition they deserve.

The commissioning team, in collaboration with donors, consultants, contractors and local officials, should plan the opening ceremonies from an early stage.

REVIEW OF THE WORK OF THE COMMISSIONING TEAM

The main aim of a civil works project is usually to have a new or refurbished building completed on time and within costs limits and for this building to be fully and satisfactorily operational. This always requires the successful collaboration of a large number of individuals and organisations.

The members of the commissioning team are usually staff working for the Ministry of Health at local or central level: in most instances they have not been trained for this work. Outside their knowledge of the health sector, the personalities working within it and the activities which take place there, they are often poorly equipped to negotiate with technical consultants and contractors, or to issue reports and directives, or to visit sites. Important members of the commissioning team may have other demanding responsibilities to discharge.

In every instance, it is vitally important that the client give the commissioning team the tools, the time and the recognition needed to perform optimally.

After completion of the commissioning process, the experiences gained should be reviewed. Many members of the commissioning team, particularly at local level may do this only once in their careers and they should be encouraged to pass on to others working in the Ministry of Health, the important insights which they have developed.