K ANO TOWNSHIP GENERAL HOSPITAL

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TO MY PARENTS

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Mohammed Ahmed.

SYNOPSIS

It is the intention of the author to prepare an architectural contribution in the field of hospital architecture. This made it necessary to prepare a documentary study of the existing data on hospital architecture and planning; and to undertake a community survey to identify the existing problems and need for medical care facilities.

The author has approached the problem by first undertaking a short study of the history of hospital development to present day. This is discussed in the first chapter of this writing. The second chapter deals with hospital planning including siting, flow of traffic within and outside the complex, etc. _____

_____ A study of patient care methods and the design of such spaces as the nursing unit and other diagnostic, therapeutic and supporting facilities has been discussed in chapters C to F.

The second part is a case study intended for an area in urban Kano.

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INTRODUCTION

The General hospital is a social institution utilizing combinations of different Scientific equipment and functions in collaboration with a team of trained medical, para-medical and non-professional staff to provide a service to the patient.

The spaces within the hospital complex and their climatic requirement are the concern of the architect. He deals with the design and planning aspects of the whole complex in order to produce a hospital that utilizes effectively the talents and time of the employees and provide an efficient and safe service to the patient.

Hospitals can be categorized into the following:

1. Medical Teaching Hospital which provide all the necessary medical needs of an entire state, normally situated in the capital town of the state. It brings up medical and para-medical personnel who will serve in the smaller health care institutions.
2. District General Hospital - smaller and less complex than a teaching hospital. It refers cases beyong its scope to the more advanced teaching hospital.
3. Rural hospitals are also provided to serve a group of towns where health centres, clinics or dispensaries will not suffice.
4. Special Hospitals - these are hospitals specialized in certain medical fields like opthalmology, otolaryngology, maternity, etc.

In view of the health situation in the country and the low standard of our medical institutions in terms of patient care techniques and asepsis, the writer of this paper feels it is a duty upon the Nigerian architects and medical personnel to collaborate and make a contribution to improve the situation. The architect should make research into hospital architecture in order to understand the functions and relations of the various elements of the complex so as to prepare an architectural contribution in the field of health facilities design.

It is the intention of the present Government to tackle the neglected health facilities planning in order to provide the various communities in the country with their basic health requirements. The provision of a medical institution is usually based on the population and degree of complexity of the area. With this taken into consideration an integrated health facilities plan can be established for both the urban and rural population of the nation. To make such a plan a community survey of the whole state or region is necessary. This will provide data on existing population and degree of urbanization of the various communities. The data will further enable the planner to locate the right medical institution in the right area to serve the right type of community it is required to serve.

CHAPTER A

THE GENERAL HOSPITAL THROUGH HISTORY

Before the first civilization, a medicine derived from instinct existed, and this was the origin of the art of medicine.

The ancient Greeks and Egyptians were in the habit of laying the sick by highways and streets so that passersby could see them and give advice as to how they could get cured. The advice was usually based on experience and what they once did in similar cases.

Medicine and the art of healing were later linked with gods, so temples built for religious duties were used as hospitals.

> "that the ancients, Greeks as well as Egyptians, were in the habit of laying the sick in the temple is known to every one. In Egypt this was done especially in the temple of Serapis, in the large Serapeum of Alexandria and at Memphis."[1]

Archology has shown that there was surprising degree of medical knowledge in very early times. Plastic surgery was known in India in ancient Hindu Societies. This art was developed to cover up the amputation of the nose - the contemporary punishment for adultery. The need for area wide planning of medical facilities was appreciated as early as the third century B.C by Kind Ashok of India (226 BC) and Duthagamini of Ceylon in 137 B.C. Kind Ashok built eighteen institutions and assigned attendants to each. The attendants were ordered to give gentle care to the sick people and to furnish them with food and medicin

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1 - Massoud A.A. The General Hospital as an Architectural Organism page 3.

They were required to keep themselves clean, keep their hair and finger nails short and wear white clothes. These Hindu institutions were built purposely for the care of the sick and not as temples. Therefore the actual development of hospitals started from here.

Hippocrates, the father of medicine, was born in the year 460 B.C and was believed to have decended in a direct line from Aesculapius and Hercules. Before him medical practice was attributed to the Aesculapians, Aesculapius being the King of Thessaly (figure 1). In the third Century B.C the hippocratic collections of medical writings were compiled. This data teaches the moral and obligations which the members of medical practice took to themselves in their relationship with their patients, among themselves and the community in general.

The temples of Aesculapius became the centres of medical practice. They were built alongside mineral waters and were made places of peaceful lanscape. Adjacent to the temples were gymacia and rooms for patients (figure 2).

Later "iateria" or medical clinics were built in which Greek physicians held consultations and treat their private patients (figure 3). This development was the beginning of outpatient services now extensively used in general hospitals.

Institutions of this nature were built in Rome. Customarily, sick and worn out slaves were sent to this island and on their recovery they become free men. The temple developed as an infirmary and was termed "Valetudinaria" and were established in the Roman army. This "Valetudianaria

FIGURE 1 - ASCULAPIUS TEMPLE

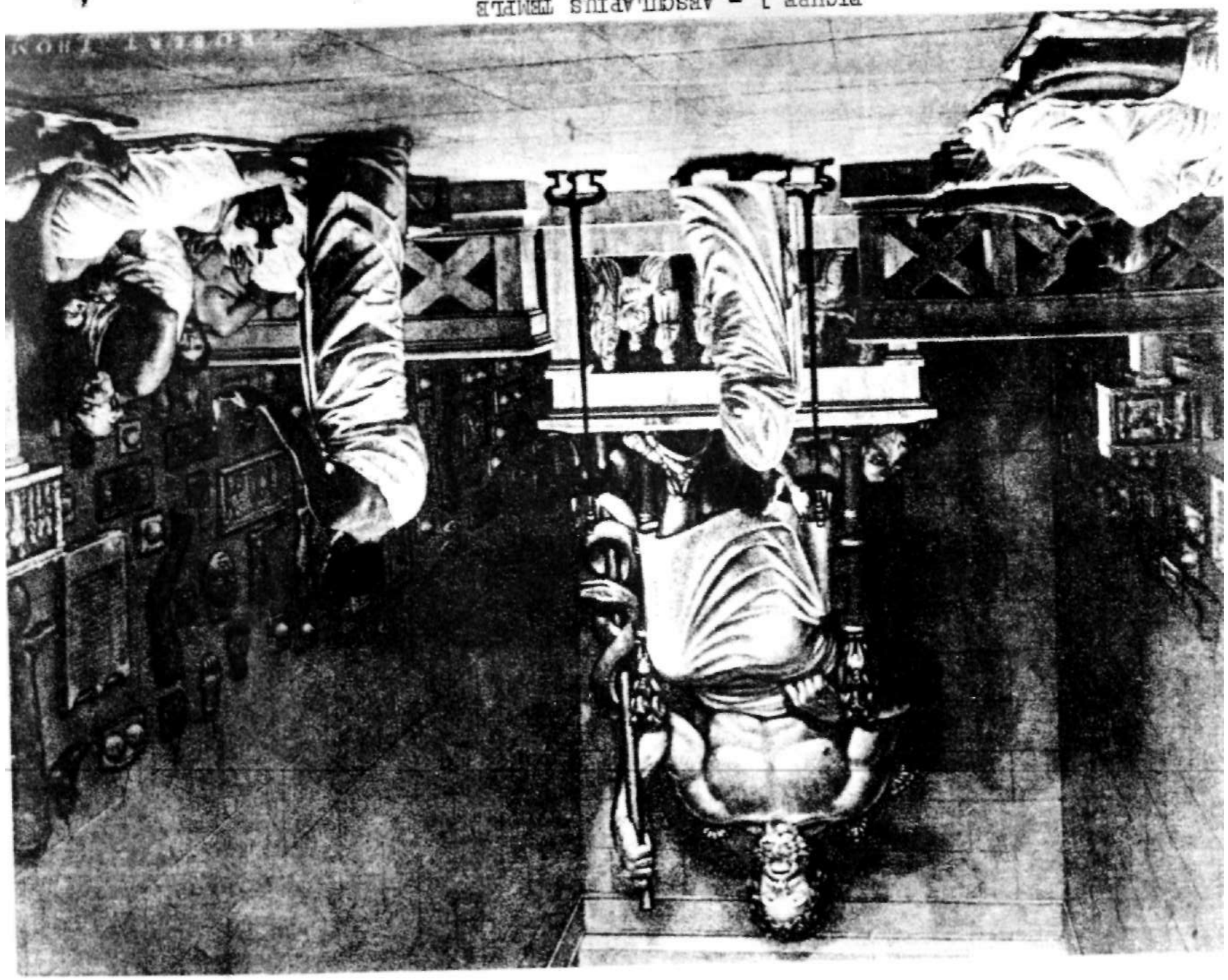


FIGURE 3 HIPPOCRATES AT WORK



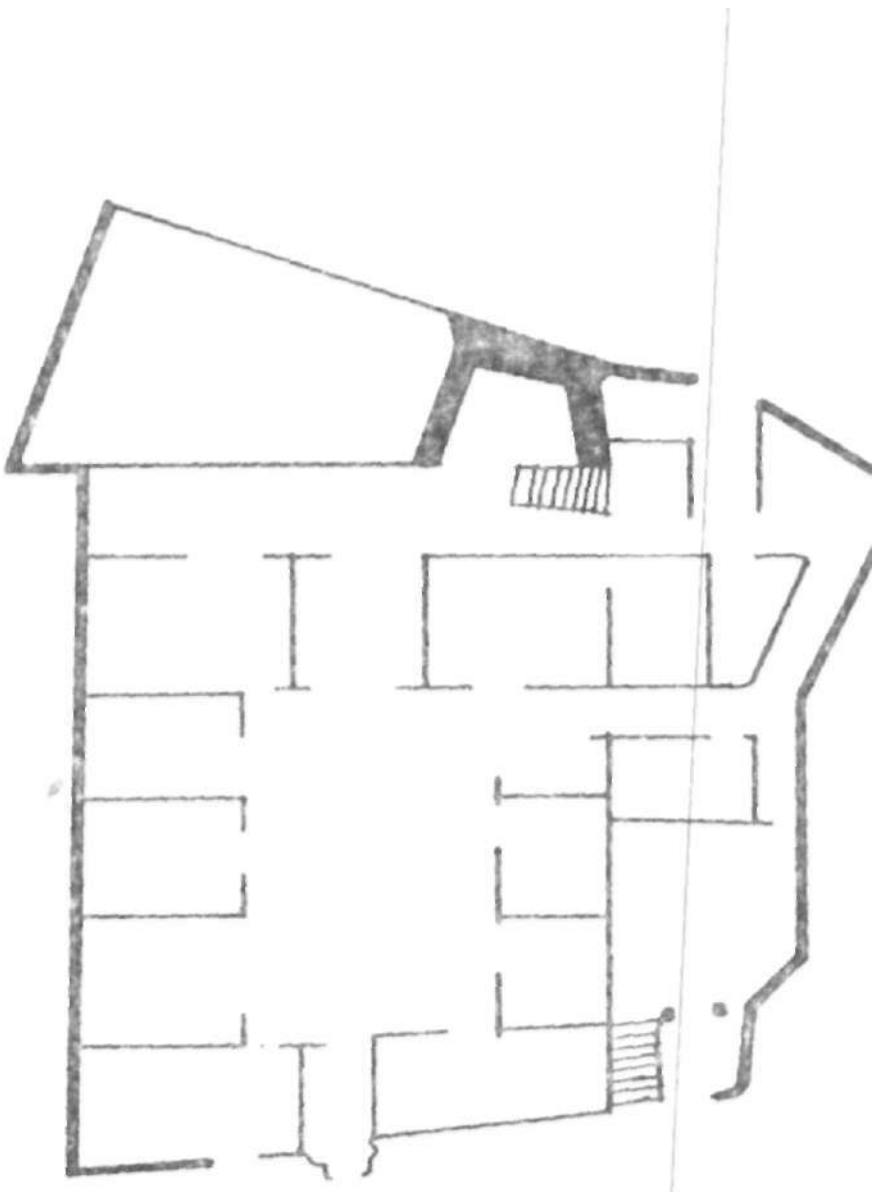


FIGURE 3

GREEK ROMAN IATREIA [clinic] 3 B.C.

was the direct ancestor of the hospital in Medieval times and the hospital of today.

> "The "Valetudinaria" took the form of a court on to which rooms for the sick opened and as such a distinct architectural form was emerging."[2]

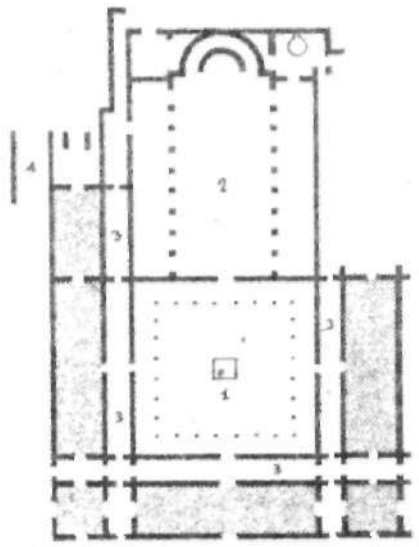
During the Christian era, the Roman Empire opened many charitable institutions called "Xenodochium" where sick pilgrims were cared. They were opened in all major towns to care for the sick travellers (AD 325). An example built in 398 AD was escavated at Ostia in 1875 (figure 4). There is a defined sense of organisation in the separation of the rooms around the courtyard. The linking corridors are clearly expressing the pattern of circulation while the internal court creates a pleasing internal space flanked by the basilica to one side and patient rooms on the remaining sides.

A later example from the sixth Century AD is the hospital Turmania in Cyria. It was believed to have been built by the early pilgrims and later used to serve the Crusades' casualty - (figure 5). Here the basilica is no more the dominant element. A large hall was built for patients surrounded by a portico, while at the rear were placed the service elements adjacent to pure water cisterns.

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2. Isadore Rosenfield - Hospital Architecture and Beyond page 22.

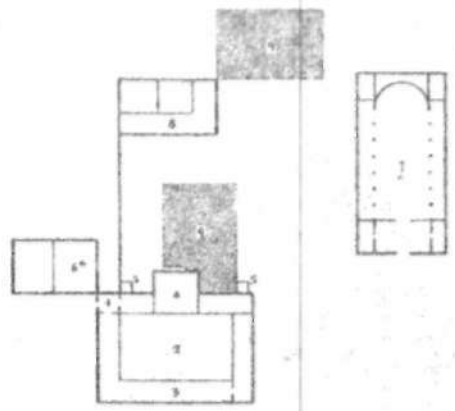
Fig. 4 Romano-Christian Xenodochium at Ostia, Italy.



Patient Areas

1 Courtyard with water cistern
2 Basilica
3 Traffic corridors with adjoining patient room
4 Street

Fig.5 Sixth Century Xenodochium at Turmanin Syria.



1 Entrance
2 Hall for sick
3 Portico and corridor
4 Service building
5 Stair
6 Mortuary
7 Basilica
8 Barns and stables
9 P re water cistern

Another hospital complex was at Abbey at St. Gallen in Switzerland - figure 6 - built in 820 AD.

> "... This complex of buildings is singular in that its architects have brilliantly solved not only the problem of a multi-functional complex but set up a form that could be supplimented at different times according to need and financial means..."[3]

The Hotel Dieu of Paris was built in 829 AD but later moved to a new site. It had four wards for patients in various stages of diseases, one ward for convalescents and a sixth one for maternity women. By 17th Century, the hospital contained about 5000 patients housed in large halls with several patients to a bed (figure 7), with no attention paid to hygiene, sanitation or ventilation (figure 8). Later the problem of improving the situation was taken up by the Academy of Sciences, among whose members was Le Corbusier.

In 1456 the Grand Hospital of Milan was built and partially completed in 1465 (figure 9).

> "The plan is basically a cruciform with large patient wards in each of the four segments arranged so that each patient might have a view of the central court (altar); subsidiary rooms containing

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3. Isadore Rosenfield - Hospital Architecture and Beyond page 23.

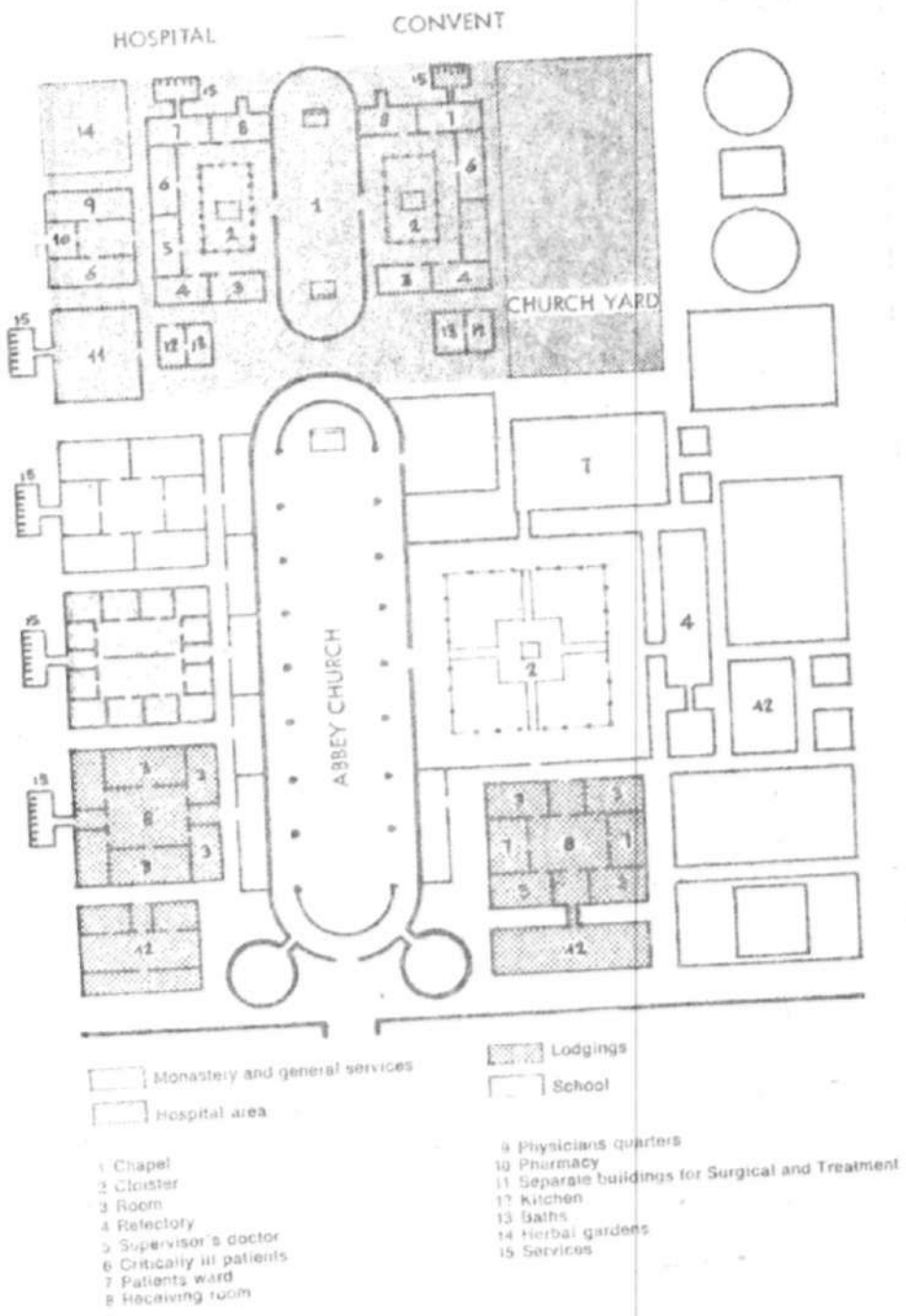


FIGURE 6 ABBEY HOSPITAL SWITZERLAND



Figure 7 Hotel Dieu, Paris, France, patient ward.



Figure 8 Hotel Dieu, Paris, France, site plan

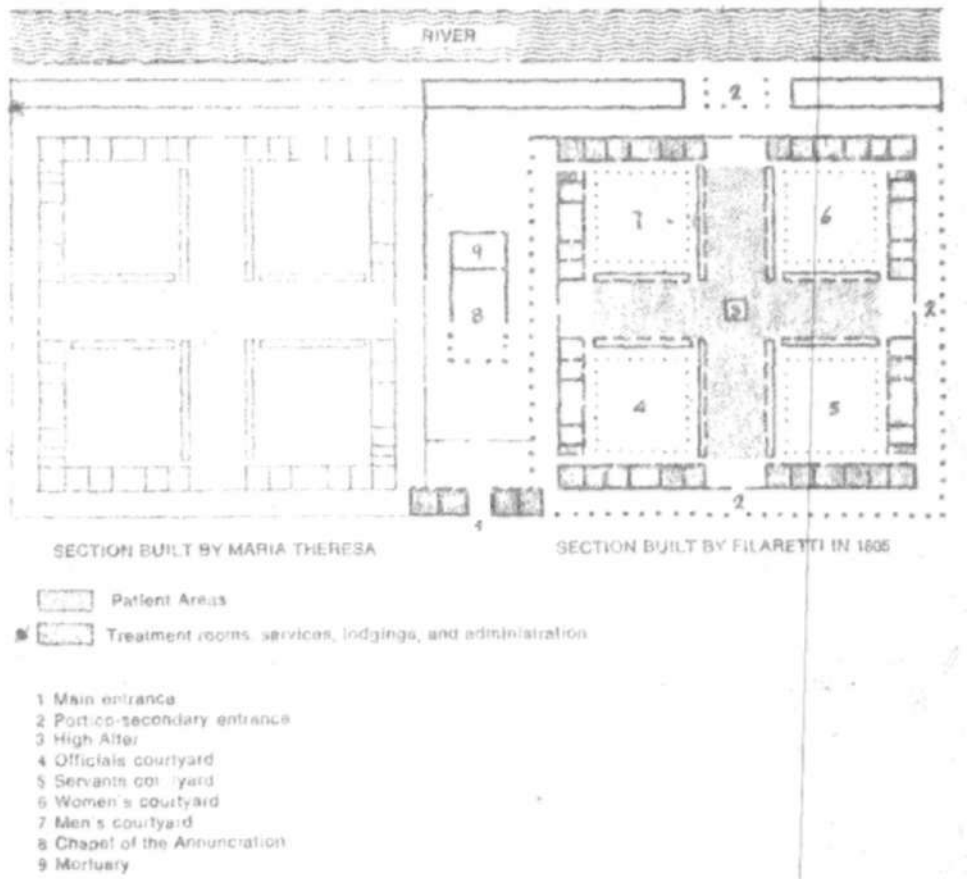


FIGURE 9 - GRAND HOSPITAL OF MILAN (1456)

> service facilities, treatment and administrative areas form the periphery of the square and connections to the wards and to each other are through collonated porticoes."

In the 19th Century, a number of developments contributed to the development of hospitals and their planning. A one time experienced and outstanding nurse, Florence Nightingale, wrote in her book, Notes on Nursing, that bad nursing situation is not brought by the nurses themselves, but by bad sanitation, bad architecture and bad administrative arrangement. These situations often make it impossible to nurse. Her rule of nursing is to keep the air within as pure as the air without. The discoveries that revolutionize the general hospital architecture and planning include

- the discovery of anesthesia
- the principle of antisepsis
- the declaration that an alarming number of deaths from fueperal fever occuring was due to infection transmitted by students who came from the dissecting room to take care of naternity patients.

Others include the use of X-ray diagnosis and Radium Therapy; introduction of steam sterilization. The use of X-ray necessitated large and elaborate equipment which the average practitioner could not afford to install in their private offices; therefore the result was the founding of community hospitals in which these doctors could use such apparatus. These discoveries of new diagnostic and therapeutic methods necessitated building new hospital departments capable of accommodating their apparatus and a conducive room climate for undertaking the new diagnostic and other procedures.

CHAPTER B

PLANNING A NEW GENERAL HOSPITAL

The General Hospital is acomplex workshop where sophisticated and complex assemblage of specialists, working as a team can apply their skill and techniques to the service of the patient.

The goal of hospital planning is therefore to promote the individual or team work of the specialized professional staff so as to make the most productive use of their time and talents. It is also the duty of the hospital planner and designer to consider the safety and confort of the patient for whom the hospital is being planned. The various departments and pattern of circulation should be assembled in a way as to reduce the spread of infection and promote an effective nursing care.

The subject will be further discussed under the following headings:

1. Community Need:-

A community survey should be conducted to determine the community's hospital requirements. The provision of a medical care facility (Teaching hospitals to dispensary) is dependent on the population and degree of complexity of the community; and the attitude of the people towards seeking for medical care. The adequacy of existing medical services in the area should be considered.

2. Hospital Size:-

The number of beds in a hospital determines its size and the provision of other supporting services.

The American Commission on Hospital Care deviced a method of calculating bed needs from utilization. The commission used a bed-death ratio, based on the relationship between predictability of death rate and an estination of the proportion of deaths that will occur in the hospital. The most common ratios ranged between 4.5 and 5.0 beds per 1000 inhabitants.

Generally bed needs vary as a result of community differences such as age distribution, marital status, sex distribution, degree of urbanization etc.

Some countries, with the above factors taken into account, establish a standard with which hospital planning is done. In Egypt, the Governmen had in 1965 made 3 beds/1000 of its population as its standard planning guide. America uses 10 beds/1000 while Nigeria has recently recommended 5 beds/1000 for its current development period. The Nigerian Medical Association, after considering our local problems of lack of enough medical personnel and low technology as well as people's response to medical care recommends the use of 2 beds/1000 people and 3 beds/1000 people in the urban areas.

In the case of General Hospital, bed requirement for medical-surgical, obstetric and paediatric are separately determined and then added to get the gross bed requirement. The World Health Organization recommends the following distribution of hospital beds:

Medical	24%
Surgical	33%
Obstetric	19%
Paediatric	15%
Others	9%
Total	100%

3. Circulation:-

It is essential for the hospital planner to understand thoroughly the various hospital traffic movements. Any passage should involve crossing the paths of as few people as possible, because passers-by are a source of possible cross infection in the hospital.

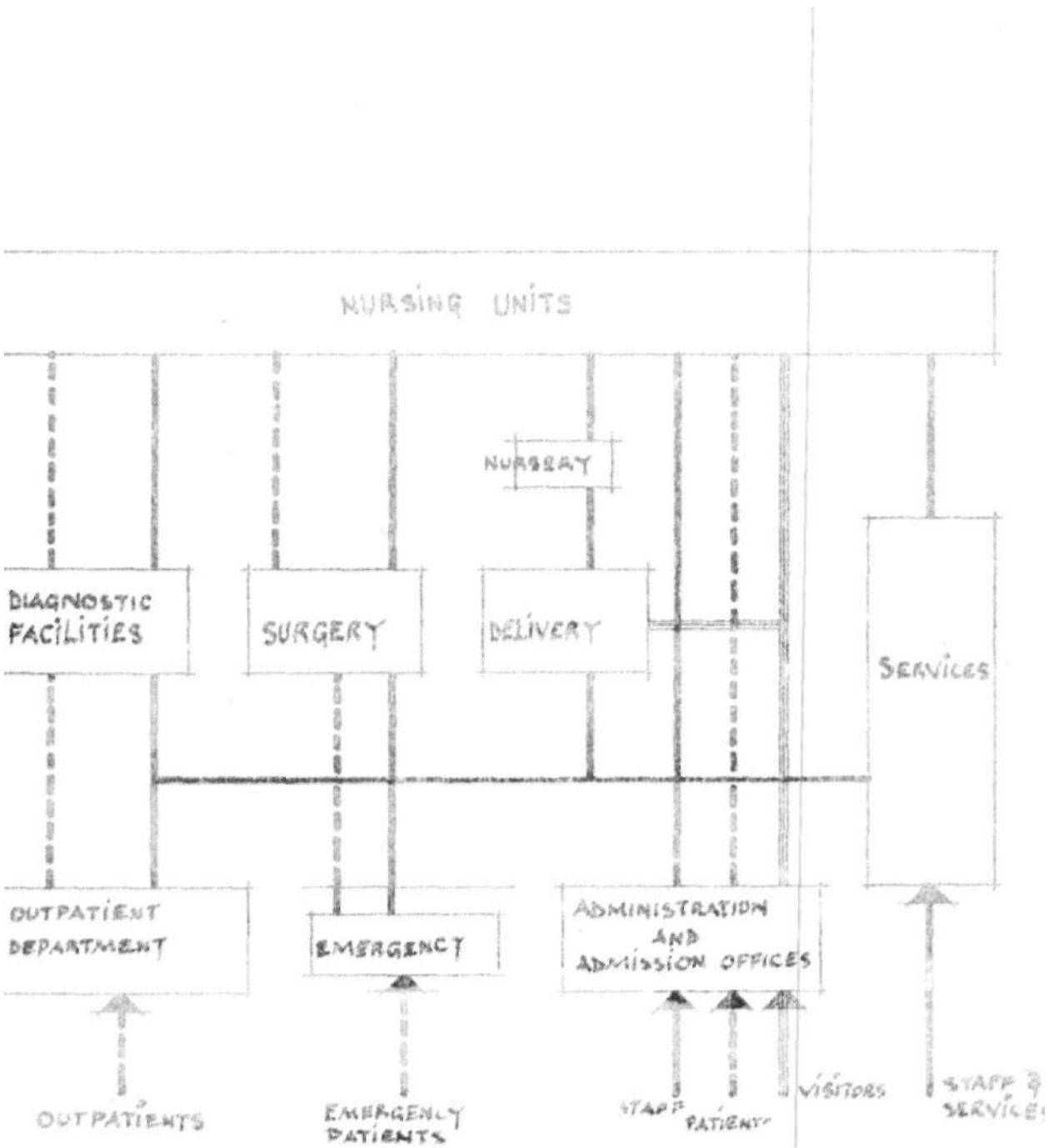
> "Separate all departments, yet keep them all close together; separate types of traffic, yet save steps for everybody: that is all there is to hospital planning."[1]

Traffic separation should start from the outside before it gets within the building (figure 10). Separate entrances should be provided for out-patients, Emergency patients, services, staff and visitors. This will ensure the avoidance of conflicting traffic streams.

Figure 10 shows the flow of different traffic within the hospital building to and from the different departments. Departmental flow Charts

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1. Emerson Goble. "Hospital Planning Starts with Circulation"



FLOW CHART ACUTE GENERAL HOSPITAL

FIGURE 10

should be studied to understand in detail the movement of staff, patients and services. Inpatients traffic should be separated from that of outpatients - (figure 11).

4. Site Selection:-

The location of a hospital should be as near as possible to the geographic and population centre of the community. Hospitals must be easily reached not only by patients, but also by doctors, visitors, nurses, supplies, etc. The site should be free from noise, odours and dust. Building orientation in the tropics should avoid direct sun exposure and should allow fresh air into the spaces.

Provision for Growth:

The General Hospital is a growing institution. Changes arise as hospital patient care techniques, change. Diagnostic, therapeutic and supportive care methods change rapidly to become more effective and sofisticated. To meet these changes, the hospital should have a planning module that can allow changes ranging from small modification to major shift in space allocation. This should take place without major disruption of existing hospital operation. The hospital should also allow for expansion of various departments independent of each other. Expansion need arises due to community need and introduction of a new diagnostic or therapeutic technique.

PATIENTS' RELATIONSHIP TO HOSPITAL DEPARTMENTS

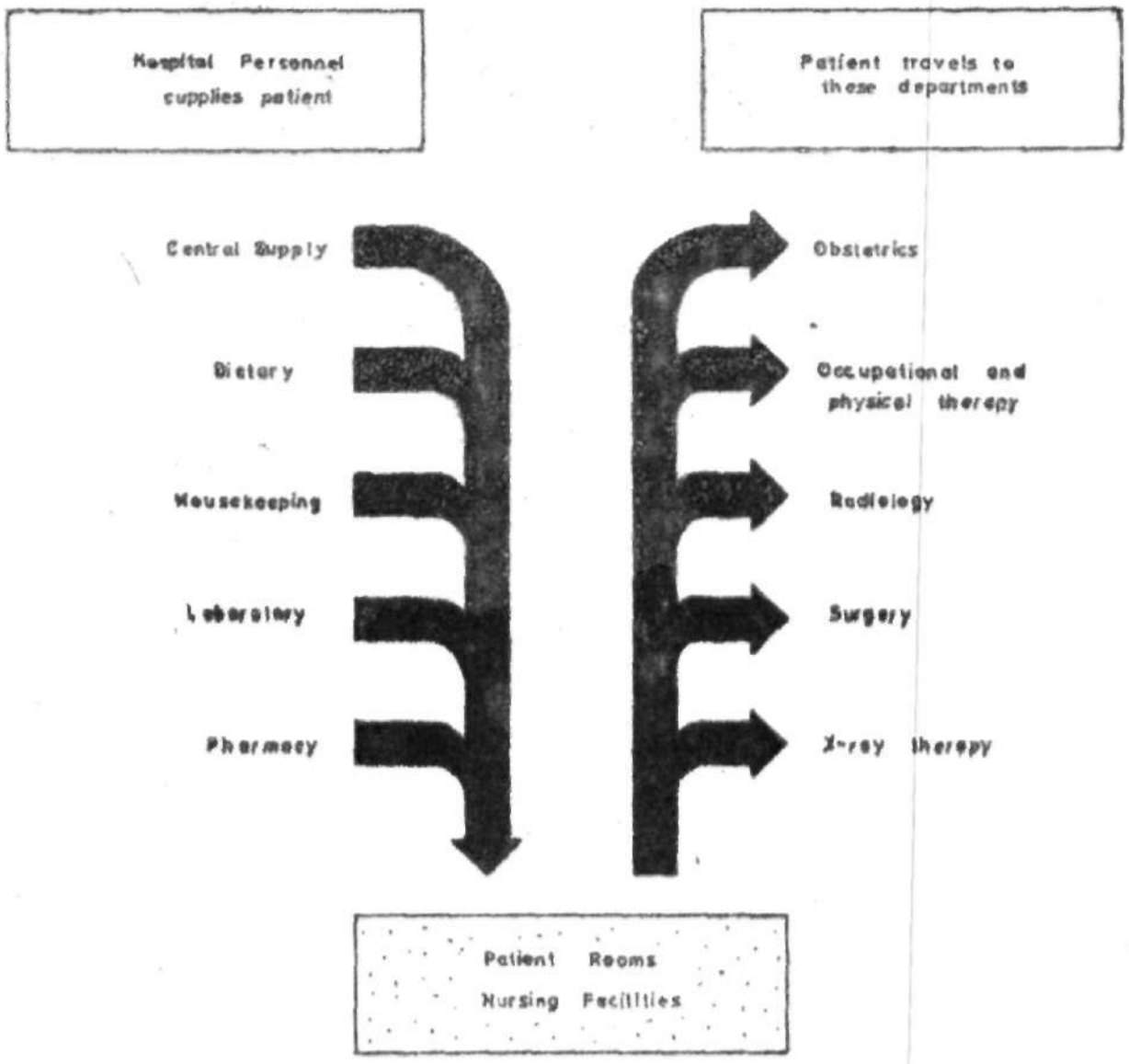


FIGURE 11

CHAPTER C

METHODS IN PATIENT CARE

The primary function of the General Hospital is to care for the sick and the injured. Thus the understanding of the methods of transfering this hospital care to the sick is of vital importance to the architect who takes the task of planning medical facilities.

During the patient's stay in the hospital he spends his time within the nursing unit he is assigned to. He may make occasional visits to other diagnostic or therapeutic departments for certain invesgitations or therapy. He later returns to the nursing unit for further treatment.

Patients are traditionally grouped according to the services provided by the hospital. Patients needing a surgical service are thus assigned to a surgical nursing unit under the care of a number of nurses who will be responsible for their basic human needs as well as their hospital treatment and observation. They are from time to time visited by a resident surgeon who examines the patients and make further medication or treatment recommendation. The nursing unit also separates patients according to sex and age. It is logical to note that the patients in a nursing unit do not need the same level of care. Some will need more nursing attension and treatment than others according to their degree of sickness. It is therefore wasteful for a patient in a convalescent state to accupy a bed which is surrounded with expensive equipment and personnel needed for a critically sick patient.

F. Abdelah states that a nursing technique based on the total "patient needs" may be helpful to both acutely and chronically ill patients[1]. The approach to "Total Patient Needs" is expressed in terms of PROGRESSIVE PATIENT CARE.

Thus to see to the difficiencies of the conventional nursing unit, the Progressive Patient care concept is developed. The concept aims at tailoring all hospital services to meet the patient's needs; and to place the right patient in the right bed with the right services at the right time in order to

* satisfy the patient of his human needs and the needs due to his condition
* organise staff movement which will result in their being more productive.
* economically run the institution in terms of space and equipment usage.

It is the view of the writer that the separation of patients by services should be maintained for the following reasons:-

1. The patients are brought closer to the professional staff trained in that field.
2. It makes the hospital operation more economical and orderly.

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1. Ekistics Journal Volume 31 number 186, May 1971 page 372 - 375.

The classification of patient care according to progressive patient care makes the General Hospital a sort of Community Health Centre consisting of[2]

1. Intensive Care Unit
2. Intermediate Care Unit
3. Long Term Care
4. Self Care
5. Home Care.

Having classified patients into above categories of care, let us now consider each of those elements and see how the architect can contribute to achieve the concept's objectives.

1. INTENSIVE CARE UNIT

The Intensive Care Unit is meant for those patients who require skilled nursing care and continuous observation for what-ever period is necessary. Patients in this category of care may not be able to communicate their needs to the nurses. The requirements of such a unit include a highly trained nursing staff, a nursing unit designed for maximum observability and the availability of all necessary life saving equipment and supplies that may be required at any one time.

Mr. Craig James S. in his study on the intensive care Unit in General Hospitals; in Canadian Hospital Jan 1962 suggests three locations of this Unit:

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2. Gainsborough H and Gainsborough J - Principles of Hospital Design - page 63.

1. As part of the active Nursing Unit.
2. As a separate nursing unit with separate staff nursing station.
3. As an adjunct to the surgical suite recovery room.

Except in special cases of burns, pneumonia or special surgery who may need isolation to prevent infection of wounded areas or their infecting others, both surgical and medical cases could be treated here. Patients should be moved to intermediate care unit as soon as intensive care is not needed.

Massaoud A.A. suggests the location of this unit adjacent to emergency and recovery room of the surgical suite[3].

In the author's opinion the location of this unit should be on a separate nursing unit close to the surgical recovery room for these obvious reasons:-

* Ease in transforing patients from the post operative recovery room to the intensive care unit if required.
* Most emergency patients come into the nursing unit through surgery so location near emergency is not necessary.

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3. Massoud, A.A. - The General Hospital as an Architectural Organism - page 29.

> "..... the Intensive Care Unit can be joined flexibly with the section of pre- and post-operative care...."[5]

The beds here should be placed in relation to the nurses station. The nurses should be able to observe the patients properly. This calls for an open ward system for this class of patients. However, there should also be some isolation rooms.for isolating patients liable to infect others or those liable to being infected by others.

2 - INTERMEDIATE CARE

This section of the progressive patient care for patients who are beginnir to recover from their illness. The patients here are semi-ambulatory and therefore require a moderate amount of care from the nurses. They do not need most of the sofisticated equipment needed by those in the intensive care unit. A patient in this unit may be admitted either directly from the admission office or as a transfer from an intensive care unit.

Since patients here are beginning to be convalescent and are beginning to participate in caring for themselves, the design of the unit should as much as possible give them the opportunity to care for themselves at least of their basic human needs. The patients are semi-ambulatory. They may need to move about but due to their condition may fear the risk of rising up from their beds. With the provision of

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5. Gainsborough H, Gainsborough J - Principles of Hospital Design - page 75.

handrails near the beds and along the walls of this unit, the patient may attempt to move from his bed ridden position so as to regain his motor abilities and to become acquanted with his new environment. Walking is needed by the body and the mind, for it produces a feeling of autonomy and the illusion of a normal life.

The percentage of ambulant, semi-ambulant and bed-fast patients as recorded by Whightman from a sample of 521 patients in 21 surgical, medical and obstetrical wards was 50% ambul, 16 - 26 - semiambulant and the rest bedfast[6].

3. SELF CARE

The patients here are ambulatory and physiologically able to look after themselves but they often need nursing care in respect of medication, observation, special diets or other treatments, or investigations requiring close control by nurses. The patients in this unit should be encouraged to do all they are capable of doing for themselves. The patient should be instructed by the nursing or other appropriate staff on how to meet most of his needs including, taking medication, selecting his diet, etc. Such helps give the patient emotional support for the return to his normal home environment. Ambulatory patients wish to experience an increasingly active life, but they disturb the bedridden patients by moving up and down. A day space should be provided for

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6. Ekistics Journal Vol. 31 No. 164 July 1969 Page 372 - 375.

these patients at the rate of $0.75M^2$ per patient[7]

> "The USPHS estimates the required day space per-patient at $1.11\ M^2$; the American Psychiatric Association at $0.46 - 2.5M^2$; while E. Neufert estimates at $0.93\ M^2$ [8]

4. LONG TERM CARE

The long term care category of patients include those requiring constant medical or nursing care. They normally require the services of physical medicine or rehabilitation. In the physical medicine department, the long term care patients are instructed on how to learn to adjust themselve to their illness or disability. Such patients include diabetic amputee patients who need diabetic regulation, fitting of Prosthesis and learning how to use it.

When the patients condition improves, he may be transfered to a self care or home care program after discharge.

Beds in this unit should be kept at least 1.2M apart with a minimum clearance of at least 90cm between the beds and adjacent walls. Space between bed ends should be 1.5M.[9]

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7. Neufert - Atchitects data - page 176 - 177
8. Ekistics Journal Vol. 31 Number 164 July 1969.
9. Massoud, A.A. The General Hospital as an Architentural Organism - Page 33.

5 - HOME CARE

This is a program organised for patients who can be cared for in the home through visits to the hospital departments by the extension of certain hospital services. In most cases, the extended care reaches the patient while at home. The hospital provides equipment and personnel who go round the homes to attend to the sick.

To be eligible for acceptance by a coordinated home care programme a patient should have the following:-

a) A home situation in which primary care can be given by a member of the family or by someone occupying a similar position

b) The type of illness or disability that does not require the intensity or immediacy of services provided in a hospital; and

c) A need for the kind of supportive services available through the home care programme.[10]

This type of care compares favourably with the high cost of keeping a patient in the hospital. However its implimentation greatly depends on the home environment and whether those at home can successfully contribute to varing of the patient while at home.

The atchitectural physical provision for such a care in the General hospital is nothing more than an office for the coordinator and a storage space for supplies. The equipment required will be provided by the departments involved.

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10. Massaoud - The G.H. as an Architectural organism, Page 33 extracted from the American Hospital Association Principles.

CHAPTER D

THE PATIENT CARE UNITS

The Patient Care Unit, being the building where the hospitalized patient is accommodated fron his admission to discharge day, is considered the most important unit in the General Hospital, seconded only by the diagnostic and therapertic facilities. The General Hospital patient care unit is, by services, divided into

- Medical nursing unit
- Surgical nursing unit
- Obstetrical nursing unit
- Paediatrics nursing unit

Some General Háspitals who care for psychiatric patients provide a unit for sychiatric nursing services.

Planning Considerations

1. SIZE

The size of the nursing unit is determined by the nurses ability of care and observation and the head nurse's ability to supervise the nurses working in the unit and the number of patients under her control. Planning specialists put the census of patients that can be accommodated in any nursing unit at between 30 - 45 or less[1].

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1. USPHS publication - Extracted by Massoud A.A. in his - The General Hospital as an Architectural Organism, page 37.

- "Some nursing authorities reason that the smaller the unit the more intimate the nursing service, others argue that the size of the nursing unit has nothing to do with the quality of the nursing..."[2]

The United States Public Health Service, however, stressed this census limit for the following reasons

- When the census exceeds this, staff morale and quality of care decreases.
- At a higher figure, the headnurse loses her observation concentration and fails to provide the kind of information and observation desired by a physician
- Relationships between medical and nursing staffs are strained when the volume of work is compounded by a large census.
- The orientation of new and temporary personnel is more difficult with large census due to increased 'busyness' of the unit.

The author believes that the size of the nursing unit should be limited and that because of the above reasons and the following the number of patients should be a maximum of 30 - 35.

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2. Isadore Rosenfield - Hospitals Integrated Design, Page 58.

- Possibility of cross infection is more likely in a larger group of patients
- A larger figure may generate noise problem which will add to the discomfort of the patients.

Plan Shape.

The prime consideration here is the distance from the most remote bed in the unit to the nurses station for reasons of observability and travel. This distance should not exceed 30.00M and a better design figure is 25M to reduce the nurses travel distance. In connection with this, tests were made at Yale University, School of Public Health to determine the relative nursing efficiency of various plan shapes by measuring the distance from the nurses station to the patient rooms and the frequency of nursing trips for each plan[3]. See figure 12.

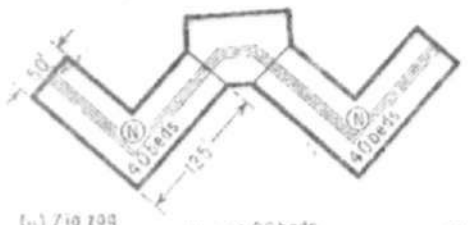
Various forms have been tried and some have been used in many hospitals in the World. Each Plan shape has its advantages and disadvantages therefore they should be studied before being adopted.

The structure of the nursing Unit or any other facility should be determined with the follwoing considerations in mind

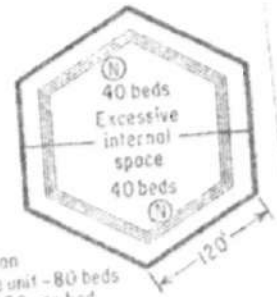
- Climate
- Cost of construction and maintainance

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3. E Todd Wheeler - Hospital Design and Function, 1964, page 72.

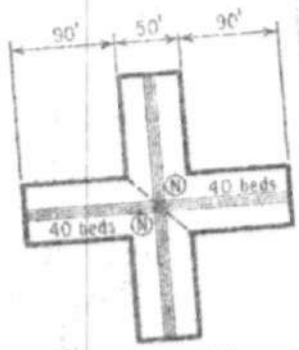


(a) Zig zag
Double unit - end to end 80 beds
320 SFG per bed - odd corners and angles cause some difficulties

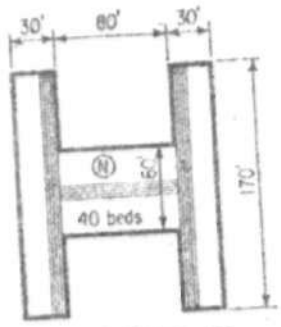


(b) Hexagon
Double unit - 80 beds
450 SFG per bed
Undesirable

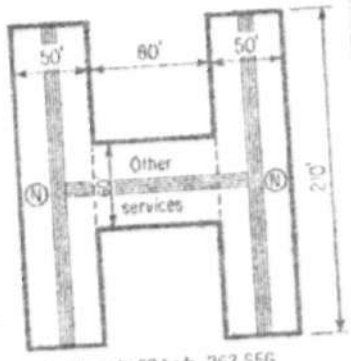
Odd shapes.



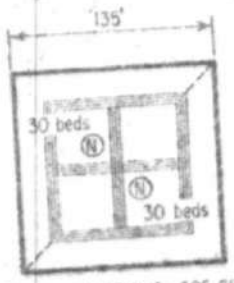
Double unit - 80 beds
256 SFG per bed
Economical to operate



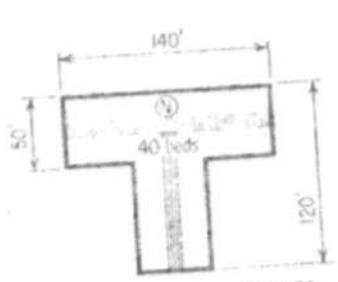
Single unit - 40 beds - 375 SFG per bed. Uneconomical



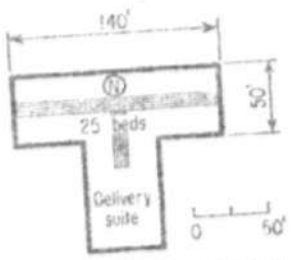
Double unit - 80 beds - 262 SFG per bed. Economical



Double unit - 60 beds - 305 SFG per bed. Core satisfactory. The square plan is not easily expanded



(a) Single unit - 40 beds - 263 SFG per bed - circulation good



(b) Single unit - 25 beds plus delivery 280 SFG per bed

The T-shaped plan.

FIGURE 12
PLAN SHAPES OF NURSING UNITS

- Architectural aesthetics
- Site topography
- Expansion possibilities
- Relationship with other departments.

NURSING UNIT DISTRIBUTION BY SERVICES

1. MEDICAL NURSING UNIT

The Medical Nursing Unit is where patients with cases of medical nature are accommodated. Medical cases include: cardiology, pulmonary, metabolism, Dermatology, etc. A patient in this unit uses the diagnostic aids of laboratory, X-ray; and therapeutic aids of physical medicine, and X-ray therapy, more often than the patient in other nursing units. The patient is often admitted without a complete knowledge of his disease. It is while he is in the hospital bed that tests and other investigations are made to identify the nature of his disease. Thus the location of this unit near the diagnostic and therapeutic facilities is very important in order to reduce the distance of travel for staff and patients.

The patients here have a longer stay in the hospital because of the time required for tests or medical examinations. This affects the number of beds allocation to the unit. Apart from normal nursing beds there is need for two or more single rooms each with separate toilet and access to a sub-utility room where all dishes, basins, linen etc, can be cleaned before they are returned to central sterile supply or general circulation within the unit. Special attention should be given to medicatio space in this unit.

Surgical Nursing Unit

Here the case is different in that the patient is diagnosed before admission. The nature of his infirmity or disease is usually established, therefore treatment can commence immediately after admission.

In the case of patients requiring surgical operation of a conplex nature, there may be a series of radiology and pathology tests before operation. The operating suite or emergency department come in use. Therefore the unit has strong relationship with

- Surgical suite
- Emergency suite
- Central sterile supplies
- Diagnostic and Therapeutic Facilities

Other contacts are with the physical medicine, pharmacy, kitchen, laundry and General stores.

Apart from basic supporting service rooms, this unit requires

1. a surgical treatment room
2. a storage space for orthopaedic frames

Maternity or Obstetricts Nursing Unit

This unit accommodates pre-delivery women, mothers and their new borne babies. The unit is most related to

- obstetrical delivery suite and
- surgical operating suite.

The unit also requires the services of the pathology and radiology departments. Its relation to the surgical suite depends on where oesarean sections involving surgery are to be done.

The design of the unit is not different from other patient care units if a central nursery provision is adopted.

The Unit requires

* an instruction class for mothers
* a formula room to serve the nurseries.

There are two types of nursery layouts, centralized and decentralized.

- Centralized Nursery:-

In the Centralized Nursery all infants are accommodated centrally away from their mothers. The infants may be taken from time to time to the mothers in their bassinets.

The provision is that each nursery shall have 2.3 to 2.8 M^2 space per bassinet and that no more than 8 - 10 infants be placed in one nursery for the following reasons:-[4]

* To discourage spread of infection

and

* A nurse can only effectively care for 8 infants

To avoid cross infection only one nurse should take care of a nursery. She should be the only one to enter the unit. An infant can be passed to a doctor in the exam room through a window made for the purpose. See figure 13.

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4. E. Todd Wheeler - Hospital Design and Function, page 108

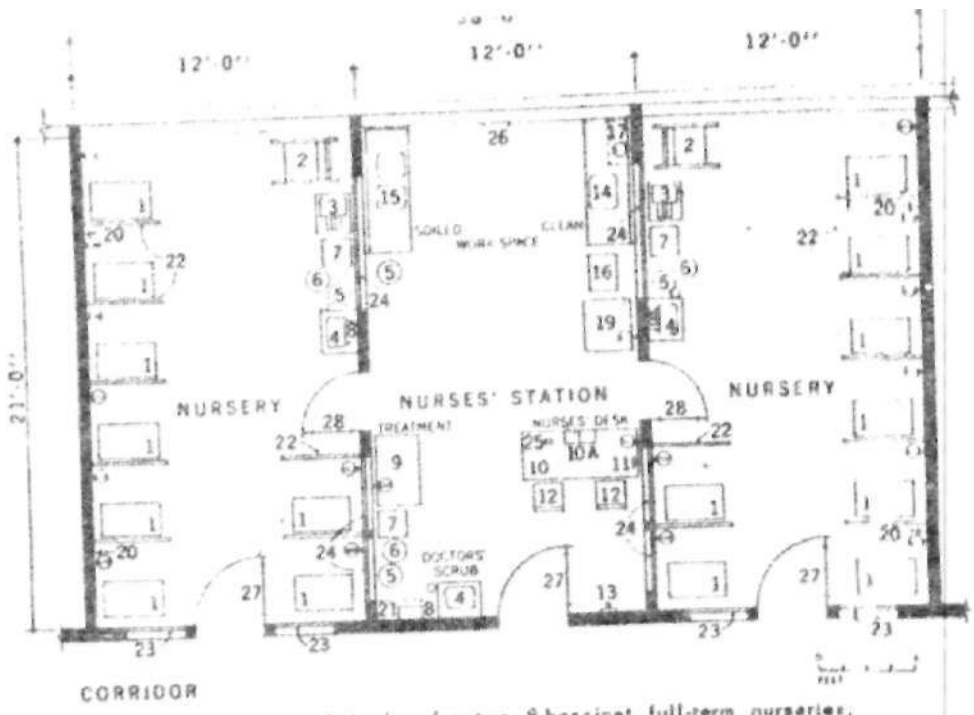


Figure 6. Detailed plan for two 8-bassinet full-term nurseries, with nurses' station between.

LEGEND

1. Bassinet with cabinet and pull-out shelf below, on 3-inch ball-bearing casters, with wheel lock.
2. Rocking chair with armrests and washable finish.
3. Utility table, 16" x 20", with top drawer to hold infant scales.
4. Lavatory, 18" x 22", with gooseneck spout and knee or foot controls, shelf over.
5. Waste receptacle, foot-controlled cover, removable waxed liner.
6. Soiled diaper receptacle, foot-controlled cover, removable waxed liner.
7. Soiled linen hamper on 3-inch ball-bearing casters, removable waxed liner, foot-controlled cover.
8. Paper towel dispenser, enclosed type.
9. Treatment table, 24" x 36" x 36" high, on 3-inch ball-bearing casters with wheel lock.
10. Nurse's desk, 30" high.
10A. Chart rack
11. Telephone outlet
12. Office chair, swivel, without arms.
13. Bookstrip.
15. Double compartment sink with gooseneck spout and knee or foot controls, in counter 36 inches high.
16. Bottle warmer on portable carriage.
17. Wall cabinet.
18. Incubator, on 3-inch ball-bearing casters with wheel lock.
19. Refrigerator, with built-in thermometer.
20. Double oxygen outlet.
21. Shelves (three), starting 42 inches above floor, for clean gowns, supplies.
22. Cubicle partition, starting 30 inches above floor, with 2-foot high clear glass or lucite panel, wall- and ceiling-hung metal frame.
23. Clear wire-glass view panel in steel frame, 1296 square inch maximum, bottom 42 inches above floor.
24. Clear plate-glass or lucite view panel, bottom 42 inches above floor.
25. Hand-wind clock, desk type.
26. Electric clock
27. Door with upper panel of wire glass.
28. Door with upper panel of clear glass.

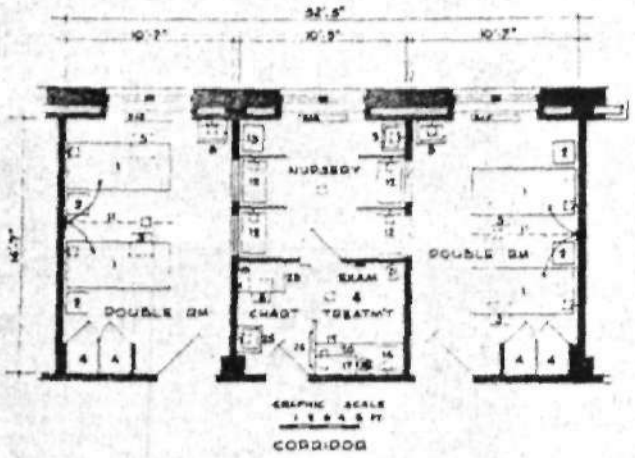
FIGURE 13 CENTRALIZED NURSERY UNIT

The United States Public Health Service recommends:

* The number of infants in each normal nursery should be 4 - 8
* Minimum space between bassinets should not be less than 600 mm
* Separate nurseries for premature infants and for observing infants suspected of having infections consitions should be provided
* Washing facilities should be provided.
* Fixed viewing windows should be provided between nurseries and nurses station to facilitate observation of all infants in the nursery unit.
* * Nurseries should be located in maternity nursing units as close to the mothers as possible and away from the line of traffic of other than maternity services.

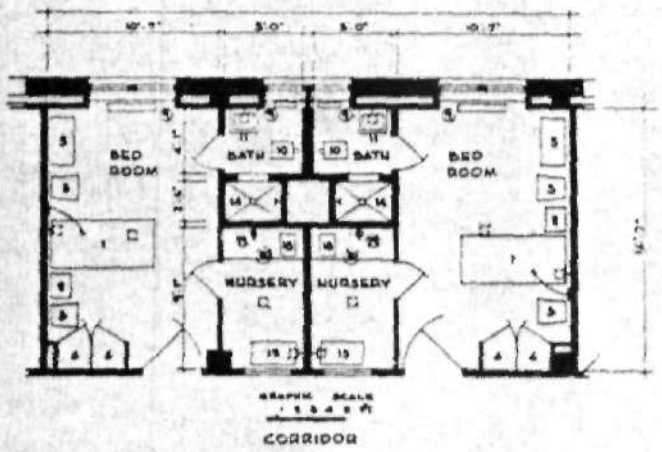
Decentralized Nursery

Here, the nursery is broken into small groups of infants, with their services immediately adjoining their mothers rooms. The infants do not have to be carried great distances through the corridor. See figure 14.



Four crib nursery unit disposed between a pair of 2-bed mothers' rooms. Except for toilets and communicating doors, this type proved to be the most popular (see photo on page 137) "Nurseries Designed for Modern Maternity."

BEDROOM (EACH)—1. Bed, 2. Bedside stand, 3. Straight chair, 4. Locker unit, 5. Lavatory, 11. Curtain rod. NURSERY —5. Lavatory, 12. Bassinet unit, 13. Table for scales. EXAMINATION AND TREATMENT ROOM—16. Sink, counter type, 17. Cabinets over counter, 18. Electric hot plate, 19. Instrument sterilizer, 20. Refrigerator under counter, 21. Linen hamper. CHART ROOM—3. Straight chair, 23. Desk, 25. Lavatory, 26. Hook strip.



Private room, bath, and nursery. "Nurseries Designed for Modern Maternity.

BEDROOM (EACH)—1. Bed, 2. Bedside stand, 3. Armchair 5. Dresser, 6. Locker unit, 9. Waste receptacle. BATH (EACH) —9. Waste receptacle, 10. Water closet, 11. Lavatory 20 by 18 inches, 14. Shower. NURSERY (EACH)—15. Bassinet unit, 18. Sink, 19. Electric hot plate, 20. Sanitary waste receptacle.

FIGURE 14 DECENTRALIZED NURSERY

Provision should be made for Isolation and prenature infants.

Some authorities believe that prenature infants should be removed to the paediatrics nursing unit on birth and presumably there should be no prenature nursery anywhere in the maternity section for the following reasons:[5]

1. The care of prenature infants generally comes under the direction of the paediatrician
2. It is easier to care for such infants there as the paediatrics department had already got infants services.

It is the authors opinion that prenature infants should be kept within the delivery suite after birth because such infants should not be moved far after birth.

> "... Incubator (Prenature) babies would be better housed in a separate nursery as close to the delivery suite as possible. They should be grouped in four, preferably, a nurse should not be obliged to care for more than that number of Prenature infants because they require much closer attention than do normal babies..."[6]

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5. Isador Rosenfield - Hospitals - Integrated Design, Page 183.
6. Isadore Rosenfield - Hospitals integrated design, page 134.

Nursery Provisions Include:-

1. Small examination room into which the infants can be carried or passed by the nurse without the doctor passing through the nursery.
2. A small workroom adjoining the examination room and accessible from the nursery. It is through this room that the nurse gets access into the nursery.

In addition to the normal nursery, there must be at least two and preferably four isolation bassinets for babies with known or suspect infection

PAEDIATRIC NURSING UNIT

Paediatrics patients follow both the medical and surgical pattern of care with increasing proportion of surgical cases.

Subdivision of beds for this unit depends on the distribution of population within the age of 0 - 14 years - and the proportion of those needing bassinets, small beds (cribs) and adult size beds.

Flexibility in room use is important in this unit. Rooms for cribs should be designed to accommodate adult size beds in case of need. The problem of housing the parents overnight should be considered since sick children require the presence of their parents.

Planning Principles:-

1. The paediatrics nursing unit should not be as large as an adult unit since children need more care.

2. Every bed should be separated by a partition. This is on the assumption that every child is a potential carrier of disease that could be transmitted to another child. The partition should extend to the floor and ceiling. This precaution according to Isadore Rosenfield is necessary to prevent children passing toys or other objects to each other and in order to create at least a partial physical barrier to aireborn bacteria.
3. There should be an observation section which is used to house new admissions until they are fully diagnosed. This is again on the assumption that every child is a potential carrier of some kind of communicable disease .
4. All partitions should be glazed. To be happy the children must at least be able to see each other and exchange smiles if nothing else.
5. Sufficient floor area should be given to each patient for toys, small table, chairs, etc.
6. A play room and an outdoor play terrace should be provided. These are necessary for features for converlescent children. In larger children institution it would be desirable to add a class room and a shop.[7]

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7. Massaoud A.A. The General Hospital as an Architectural Organism. Page 49.

* It is in the author's opinion that the provision of floor to ceiling partition within the paediatric patient bedrooms is not necessary, especially with the intention of creating a partial physical barrier (as Isadore puts it) to air-borne bacteria. The partions only devide the room into cubicles with one side without wall, therefore there is still a danger of contaminated air from one cubicle flowing into another.

* The risk of cross-infection within a room is minimum since only patients with similar diseases are accommodated in each room. Therefore the partition should be kept below the ceiling level to allow free air movement within the room at the same time minimise children contact.

Location:

The paediatrics nursing unit should be located in an area away from possible sources of infection because of the nature of children.

> .....If the unit must be on the same floor as the adult nursing unit it is considered preferable to have the children section adjoin a women's unit.....[8]

However, Mr. Massaoud, A.A., in his thesis on Hospital Architecture writes that

> "..... It is not preferable to have the children's patient care unit adjoining a women's (obstetric nursing unit) unit because of the risk of infecting the new born.

The author agrees with Mr. Massaoud's view. However the unit can be located by a medical women's unit.

The paediatrics nursing unit, being a medical - surgical nursing unit for children, requires the services of all the adjunct diagnostic and therapeutic facilities and the supporting services of the C.S.S.D, Kitchen, pharmacy and General stores. There should therefore be a link to these facilities.

NURSING UNIT ELEMENTS

I. The Patient Bedroom

It is the focus of the hospital services and that of the patient's life at a time when his condition exaggerates the effect of every detail of environment. There is no multi-purpose space in the hospital more demanding in its design requirements than the patient's bedroom. It serves as his bedroom, his visitors reception, dining room, treatemtn room, etc.

The patients' bedroom is a nursing unit will be analysed under the following headings

1. Number of Beds per Room
2. Bed Arrangement in the room
3. Design Considerations

1. Number of Beds

The traditional nursing unit is made up of an open ward accommodating all the patients in one large space with provision for isolation and service rooms towards the entrance. The traditional open ward has the following anvantages

- ample visibility of the patients
- cross ventilation
- low cost of construction and naintainance.

It also has the following disadvantages:

- Lack of privacy

- Danger of Cross-infection
- Noise
- Difficulty in controlling climatic conditions to suit all patients

.... There is another form of lack of privacy that is important. It is inpossible to take a good medical history from a patient in an open ward. He is aware that the patient in the next bed, with his nose buried in his book, has his ears tuned in to all that is said.....[9]

Most hospital architects and administrators prefer to subdivide the traditional ward into smaller bays containing fewer number of beds. This was first demonstrated in the wards of Ries Hospital in Denmark. The bays were further developed to complete bedrooms by erecting the fourth corridor wall inorder to further reduce the noise level in the patient areas.

The distribution of beds into one-bed and multiple-bed rooms depends on

1. The level of Privacy required
2. The provision for Isolation needed
3. Flexibility
4. Construction and runnin cost
5. Economy in space usage.

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9. Gainsborough H and Gainsborough J - Principles of Hospical Desi Page 33.

One-bed room is the ideal in terms of privacy, isolation or flexibility. Only one patient is accommodated and this can be of any age or sex. Patients needing isolation can be conveniently accommodated in a single-bed room - other commonly used bed-rooms are two-bed, three-bed, four-bed and six-bed rooms. Each of these had its shortcomings on the basis of above factors of choice and the social factor of choosing a living partner.

The one -bed room obviously cannot be afforded in a non-profit making scheme because of its high cost of construction and running. The two-bed room, although it seems to be the compromise between the one-bed and the multiple-bed arrangement, has the problem of two patients who on their liking may not like to live together. In a three-bed room two may become friendly leaving the third person alone. This effect of loneliness may affect his rate of convalescence. The six-bed room tend to be the normal open ward and it is difficult for the patients to choose partners. The four bed-room is a better social unit. Each patient has his corner especially when the door is placed centrally. The room depth of four-bed room allows sufficient natural light to reach the remotest bed from the window wall. Figure 16 shows some bedroom sizes and layout.

BEDS LAYOUT

Nightingale's Open Ward Layout

In the Nightingale's open ward, the wards were designed to accommodate 30 - 40 patients, with the beds so arranged that the head of the patient is against the external window wall. The

construction method provides a window for each patient bed. The patient, when he glances either side, sees a glaring window and cannot possibly do otherwise because of the nature of the beds arrangement. The only way he can escape from this hardship is by lying on his stomach, which he may not be able to do because of his nature.

Rigs Ward Layout

Many of the difficulties of the perimeter of Nightingale's ward are overcome by the rigs ward. It is named after the Rigs Hospital of Copenhagen, Denmark, where it was first built.

The beds here are arranged such that the heads of the patients are against partition walls subdividing the open ward into bays. In the original Rigs Hospital, beds were grouped in semi-private groups of four. With this arrangement the patient is able to turn his head away from the window at will.

AREA PER BED-ROOM

> .... A module of 6.7 M (22ft) can accommodate 4 or 6 ward beds, depending on the depth or two double or triple bedrooms or two single-bed rooms with bath....[10]

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10. Isadore Rosenfield - Hospitals Integrated Design . Reinhold Publishing Corporation, New York, 1960.

Time saver standards given the sizes as

1. Single-bed room - 10.87 - 15 M^2
2. Two-bed Room - 14.59 - 19.51 M^2
3. Four-bed Room - 28.61 - 37.25 M^2

Major differences are found in depths from inside of external wall to room side of corridor partition.

- single-bed room - 4.420 M
- two-bed room - 4.572 M
- four-bed room - 6.604 M

The width of single and double rooms is 3.5 M max. or less depending on futniture required.[11]

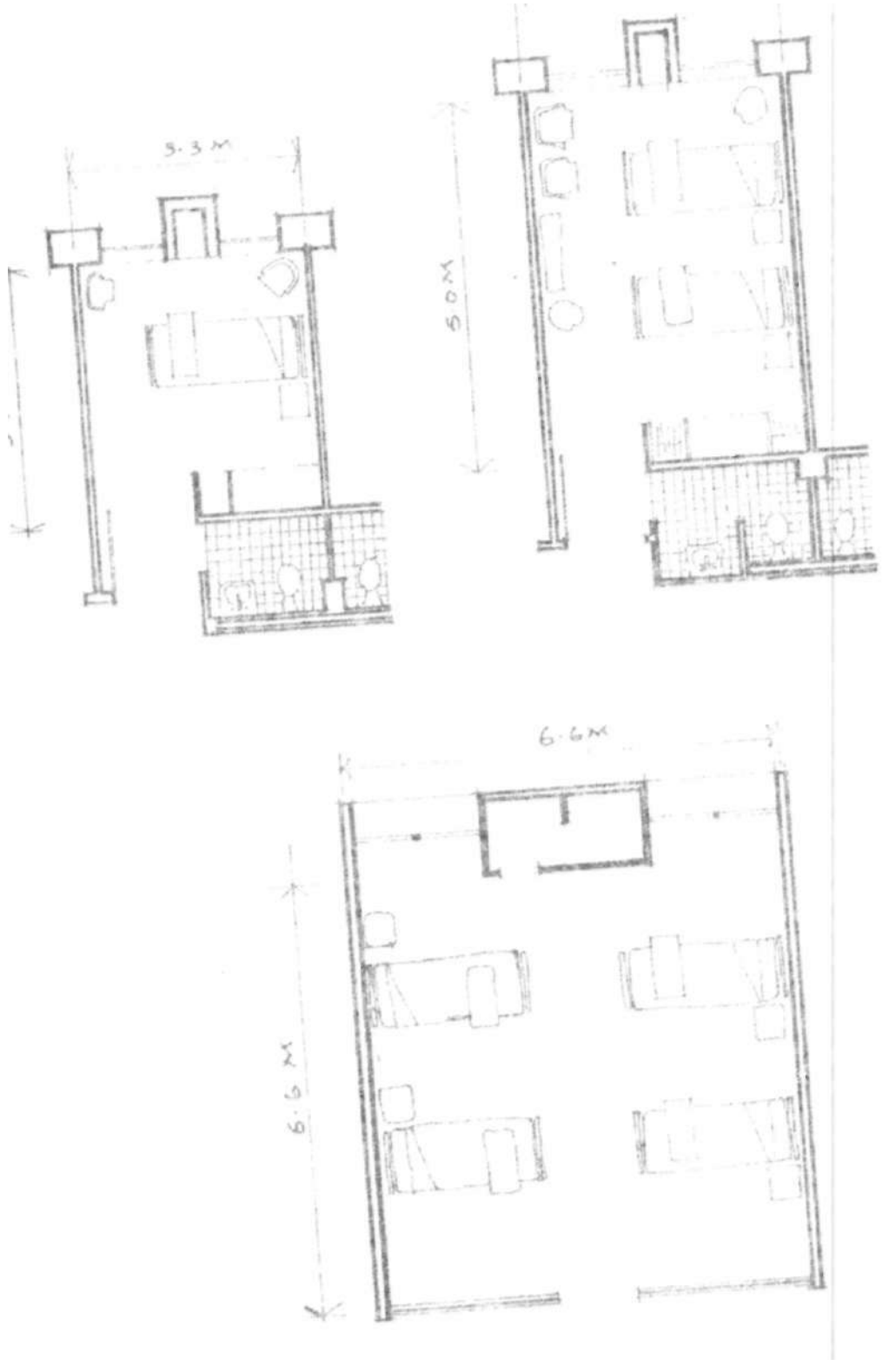
Generally to determine the size of any bed-room, a schematic layout of the room should be made with the various furniture required functionally arranged. This will give a better reliable space size rather than relying on standards. However, an accepted area per bed of 7.5M^2 can be used for calculating the sizes of rooms bigger than one-bed room. For single-bed rooms the area is between 9.3M^2 to 11.15M^2. These areas ecluse the required provision for toilet rooms (figure 15).

II. THE NURSES' STATION

This is the working and control centre of the nursing unit. All patients' medical records are kept here. In addition to its medical function, the Nurses' station controls the movement of visitors and

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11. Calender - Timesaver Standards - hospitals Page 1158.


5.3M
5.0M
6.6M
6.6M

handling all patients' correspondences while in the unit. The station should be centrally located near the main entrance for control of all public movement into the unit. It should provide easy nursing observation and access to the various patients rooms.

Facilities include:

1. Control desk
2. Charting desk
3. Nurses lockers and toilet.

As regards to size and the number of charting seats per unit, Todd Wheeler suggests one seat for every two nurses and one seat for every three doctors[12]

III. MEDICATION ROOM.

This is normally an integral post of the nurses station because of the nurses frequent use. It can be a small alcove with shelves for keeping medication and a counter for preparation of all medicines before they are taken to the patients' rooms.

IV. SISTER'S OFFICE:

This office is for the head nurse attached to the nursing unit. Her function is to supervise all the activities at the nurses station and the unit in general. The room could also be used for small group conferences between the staff members. The location is best as an integral part of the nurses station or very near to it.

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12. Todd Wheeler - Hospital Design and Function
Page 103.

V. Examination and Treatment Room

This is necessary for procedures which cannot be done in the patients' room such as surgical dressings. The room should be designed to take one standard treatment table, and should contain a stool, two treatment trolleys, a standard inspection lamp and a lab basin fitted with elbow operated taps. The doors should be high and wide and the room size should not be less than $17M^2$.

VI. Utility Room:

This is usually divided into clean and soiled areas. Here are disposed all bulky wastes not taken care of in the patients' toilet. Soiled linen and rubbish carts are stored here before taken out of the unit. On the clean side are the storage carts or shelves for clean linen or other supplies except drugs and food.

> .... separation of the soiled and clean sides may be by cabinets or counters and need not be full height ....[13]

The room should adjoin the exam and treatment room with a window connecting the dirty side and the treatment room. $20M^2$ of space is enough for this room.

VII. Toilets and Bathroom:-

Each Isolation or Intensive care room should have a toilet, wash-hand basin and a shower for aseptic reasons. For the same reason

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13. Todd Wheeler - Hospital Design and Function, Page 104.

and in order to reduce the length of the nursing unit toilet rooms should be provided for each patients room. The United States Public Health Service recommends as a minimum, one toilet for each four patients and 4 showers for each patient care unit. To provide room for stool, each shower cubicle should be a minimum of $1.0M^2$

For each WC there should be at least a wash hand basin. The question arises as to where the basin is to be located - in the toilet room or exposed in the patients' room. The latter encourages observation of aseptic techniques. For the former, it is hygienically required to have a basin adjoining a toilet.

It is in the author's view that the basin should be located outside the toilet room for these reasons:

1. For the said observation of aseptic technique
2. That the hygienic requirements can be met by nearby location
3. The basin can be kept out of sight to solve the problem of unsightly view.

Showers and baths will be centrally located for reasons of economy since they do not have any aseptic requirements.

Special attention should be given to clearances and to providing handrails and grab bars as aids to the faltering patient. All doors should swing out to permit access should a patient faints and fall against it.

VIII. Floor Kitchen or Pantry.

A small kitchen or pantry should be provided for handling the patients' food service. The food will be received in heated carts from the central kitchen and will be distributed from here on trays. Trays will later be returned to the central kitchen for cleaning. Neufert suggests a room^3/M x 4.75M in size for this purpose.

IX. Test Room

The room is for carrying out minor investigations like urine or blood tests. An alcove in the doctors room can be used for this purpose. Such a provision sometimes make an unqualified staff to do a job he is not trained to do.

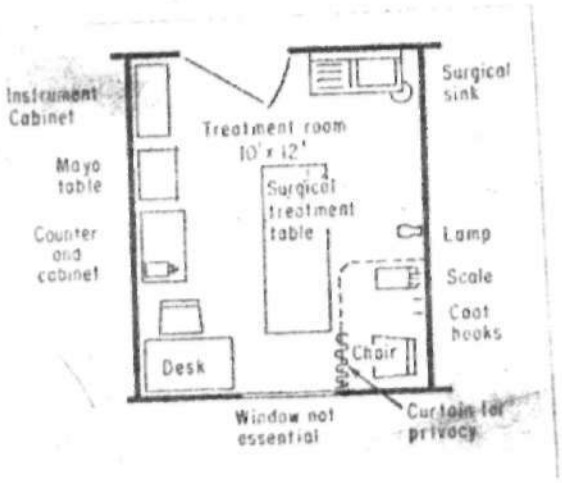
In the author's view all laboratory investigations should be carried out in the central laboratory. However, the room can be used for taking specimens.

X. Day Room:

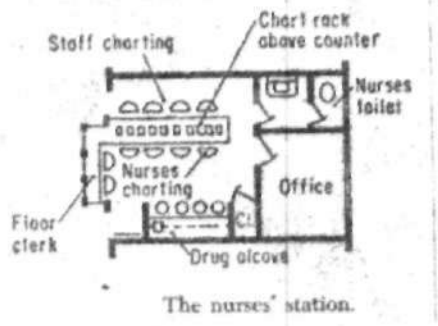
A day room should be provided for convalescent patients at the rate of 0.75M^2 per patient.

Other requirements of the Nursing Unit include a small waiting space for visitors and a storage space for wheelchairs and stretchers and a hanitors' closet.

See nursing Unit Service rooms (figure 16).

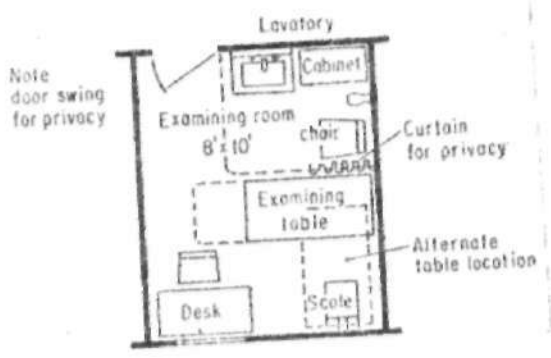


Surgical Treatment Room

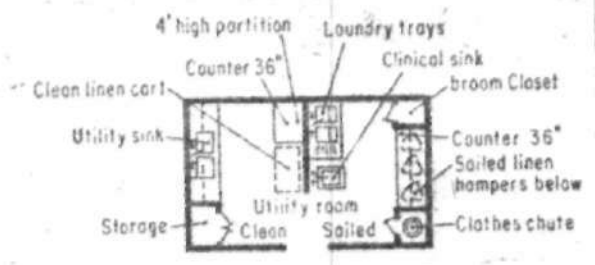


The nurses' station.

The Nurses' station



Examination room



Utility room

FIGURE 16 - SOME NURSING UNIT SERVICE ROOMS

CHAPTER E

GENERAL HOSPITAL DIAGNOSTIC AND THERAPEUTIC SERVICES

THE SURGICAL OPERATING SUITE

It is technically a therapeutic aid in which a team of specialist doctors and trained nurses operates upon a patient.

The surgical operating suite serves the admitted surgical cases and those coming in through the emergency department. It from time to time consult specialists from the departments of radiology and patholog for advice

Services also come from the central sterile supply department and the pharmacy. These requirements determine the location of the suite in relation to other departments.

The department should be situated at a dead and location inorder to cut off all unecessary traffic to the suite. See flow chart in figure 17 a.

SIZE:-

The size of the surgical suite is determined by the types and number of operations the department expects to handle. The length of time and seriousness of different types of operations varies, which in turn affects the size of the suite.

Types of operations generally handled in general hospitals are all minor operations requiring the use of anaesthesia and the following

1. Chest
2. Abdominal

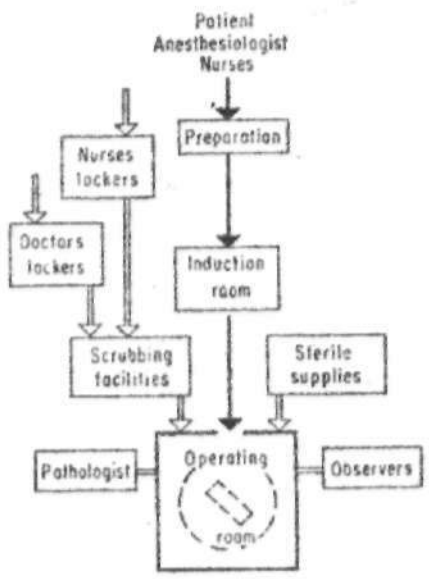


Fig. 3.53. Surgical patient preoperative.

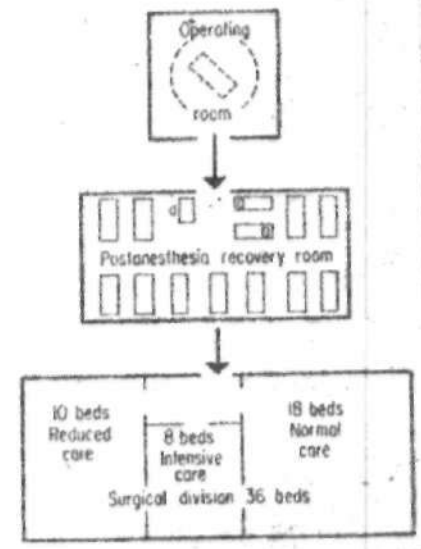


Fig. 3.54. Surgical patient postoperative.

FIGURE 17a - SURGICAL SUITE FLOW DIAGRAM.

3. Cranial operations

4. Orthopaedic operations

Special operations are also done here. These include:

5. Gynaecological operations

6. Cesarean sections

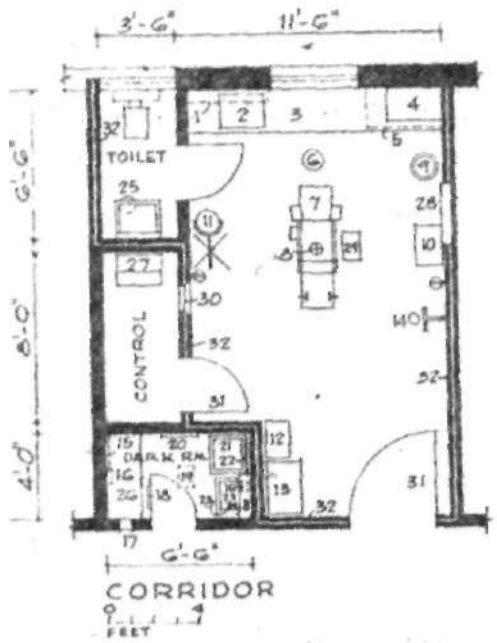
7. Cystoscopic operations

8. Eye and ENT.

It should be decided at the initial stage of the programme where gynaecological and cesarean sections will be performed. These are either done in the delivery suite or in the operating suite.

> However, the author's view on this is that all surgical cases requiring the use of anaesthesia should not be handled anywhere outside the surgical operating suite. This will ensure maximum utilization of staff and non-duplication of facilities like anaesthesia equipment and other surgical equipment, and at the same time ensure the patients' safety.

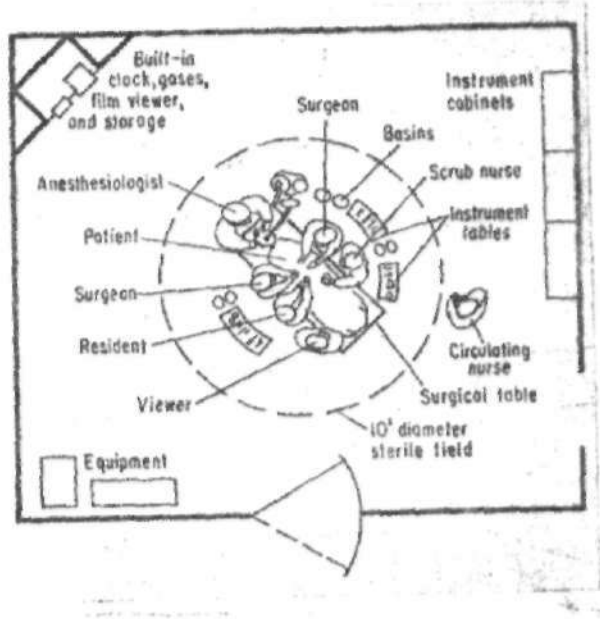
Cystoscopic operations performed by the urologist call for special equipment but only a limited use of general anaesthesia. Cystoscopic cases are received from the nursing units and the out-patient department. (Figure 17 b)



1. Shelf over
2. Sink in counter with gooseneck spout and knee control
3. Counter, 34 inches high, open below
4. Transformer platform, 5 feet above floor
5. Cabinet below
6. Adjustable stool
7. Urological x-ray table
8. Ceiling light
9. Kick bucket
10. Wheeled catheter tray
11. Examining light
12. Electric cautery
13. Urological instrument cabinet, 19 x 30 inches
14. Irrigator stand
15. Film hanger rack above counter
16. Safelight
17. Exhaust fan
18. Light proofed door with light proof louver
19. Ceiling light, white and red
20. Towel bar
21. Developing tank, 18 x 22 inches
22. Film drying bracket for 12 films
23. Sink with shelf over
24. Timer
25. Waste paper receptacle
26. Counter, 34 inches high, with cabinets below
27. Control unit
28. Recessed double x-ray film illuminator
29. Footstool
30. Leaded glass view window *
31. Lead lined door *
32. Lead lined walls, floor and ceiling *

* As required by National Bureau of Standards Handbooks No. 4 No. 50.

Fig.17b Cystoscopic Room



Operating Room

FIGURE 17b - CYSTOSCOPY & OPERATING ROOMS

> ".... Thus the room for cystoscopy in all hospitals larger than 80 beds is usually separate and occasionally located away from the surgical suite and adjoining X-ray and Emergency. Wherever it is it should be accessible to ambulant (out) patients without their having to pass through the main operating suite and also be privately accessible to bed patients...."[1]

Within the surgical suite, three basic zones will be discussed (~~figure 18~~

1. Outer zone - This zone receives all traffic coming to surgic suite. A reception space is required at the entrance with a small waitin space for hospital staff and stretcher patients. This zone should be accessible from the emergency and nursing units.

Elements include:

a) Reception and records

b) Clerical offices

c) Staff changing and rest room (nurses and Doctors)

d) Non-sterile store

2. Intermediate zone - is essentially a work and storage area. Outside personnel deliver services to this zone but do not penetrate the inner zone. Elements include:

1. Recovery room

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1. E Todd Wheeler - Hospital Design and Function - Page 121.

2 - Sterile storage space

3 - Nurses station

The recovery room should be an open ward type to ensure maximum observability by the nursing staff. The requirement is 1½ to 2 beds for every operating room.

The sterile store should be near the operating rooms for easy reach and should be big enough to take the requirement of the suite. Doctor Carl Walter has estimated that an average of 7.5M^2 per operating room is needed for storage of various surgical supplies and equipment.

The nurses station should be a standard station with charting and dictating desk and a small office for the head nurse.

3. Inner zone:- The inner zone is the space requiring a careful design in terms of flow of patients and operating staff. It requires a high level of aseptic condition.

The elements here are:

- The Operating Room
- Scrubbing space
- Patient holding and induction area
- Workroom and sterilization space

- The Operating Room being the determining factor in sizing the entire operating suite will be discussed under the following headings

a) Number

b) Size

a) Number of operating rooms required in a surgical suite is dependent on an expected operation load.

> "The number of operating rooms required for a general hospital is difficult to determine because the number of operations that can be performed per day per operating room is difficult to establish due to variations in length of operations. However, the USPHS recommends one operating room per 50 hospital beds..."[2]

However it is best and more reliable to base the calculation of the required number of operating rooms on an existing hospital statistics because this reflects the actual need of the community. Based on the types of tropical diseases and community need, the World Health Organisation recommends one room for every 50 beds.

b) Size of Room:- The size of the operating room is dependent on the number of operating staff and the type of operation.

> "In general hospital, the tendency is to have all major operating rooms as nearly identical as possible to facilitate scheduling of various surgical procedures. Floor space should be 18 ft x 20ft (5.5M x 6.0M) or approximately 32.5M^2. Many surgeons and surgical supervisors recommend 6.0M x 6.0M free floor space[3]

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2. Massoud A.A. The General Hospital as an Architectural Organism - page 59.
3. F.W. Dodge Corp - Hospitals, Clinics and Health Centres, pp 115, 1960.

For most operations, the range of 5.5 x 5.5M to 5.5 x 6.0M will be satisfactory. The table and operating team take about 3.0M diameter leaving 1.2M clearance for equipment.[4]

- Scrubbing and substerilizing spaces are normally designed as a unit with a room divider between. The doctors and nurses are desired to scrub their hands and arms for a stipulated time before entering the operating room. Thus it should be adjacent to the operating room with a glazed window opening into the operating room to permit the surgeon to view the activities in the operating room while he scrubs. The requirement of this room are at least three deep sinks with soap dispenser for each. The substerilizing room is traditionally used for sterilizing surgical instruments. The space is also used as a work room for nurses. The former function is now taken care of in the C.S.S. where all hospital equipments are sterilized and distributed in sterile packs.

> ".... The concerted move toward having all items sterilized in central sterile supply and providing packs of instruments and other items for emergency use suggests that auto-claves and instrument washer sterilizers in the operating room may go the way of the earlier boiling water immersion sterilizer and disappear entirely...."[5]

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4. E Todd Wheeler - Hospital Design and Function, Page 132, 1964.
5. E Todd Wheeler - Hospital Design and Function, Page 129.

The author feels the room can be retained for general pre and post operative work. A central work room can effectively serve all operating rooms if carefully planned.

- Patient holding an induction area is where the patient is first brought for pre-operative propation and anaesthesia induction. There is a danger of gas explosion while anaesthesia equipment and patient are being moved to an operating room. Mr. Ahmed Hassoud in his General Hospital as an Architectural Organism recommends that no induction room should be provided and that induction should be done within the operating room.

THE OBSTETRICAL DELIVERY SUITE

The obstetrical Delivery Suite is very much like the surgical operating suite in terms of requirements and location. It is required to have this suite near the emergency entrance to the General Hospital and easily accessible to the obstetrics ward unit. Its location should be in a cul-de-sac away from hospital traffic to other unrelated departments. If it is decided to perform cesarean sections in the operating suite, the delivery suite should adjoin the surgical operating suite. Thus this suite is related to

- The surgical operating suite
- The Central Strile supply
- Pharmacy
- Anti natal clinic

The elements of this suite will be discussed under the following headings:

1. Administration and Reception
2. Staff changing facilities
3. Labour and Preparation
4. Delivery room and immediate services
5. Premature nursery

1. Administration and Reception - patients from the nursing unit or emergency are received here. Usually the patients are accompanied by their relatives, therefore a waiting space is required for them. The patient is then taken to an examination room for further investigation. If she is found to be in labour, she is then taken to a labour room. Facilities here include:

- Clerical and records office
- Reception and waiting space
- Examination room with toilet

2. Staff changing facilities is required for doctors and nurses. This is exactly the same as in surgery. A small lounge where doctors or nurses could rest after delivery or wait for the next delivery case to be ready is the optimum requirement. It should be close to the work-room and scrubbing spaces.

3. Labour and Preparation

A woman in labour is brought to this room where she will spend her labour period before delivery. She is later prepared and taken to one of the delivery rooms for delivery.

> "... It is agreed that this should be a single room and if it is to be used for preparation, each room should have its own toilet closet and adjacent shower and wash hand basin..."[6]

The number of labour rooms required in a general hospital depends on the number of delivery rooms in the suite-in other words it depends on the expected daily deliveries in the hospital.

Basing their argument on the ratio of times spent in labour and delivery rooms, the United States Public Health Service rationally recommends a ratio of 2 to 2.5 labour rooms to one delivery room.

However it is more logical to use for estimating the number of labour rooms an expected daily admission rate based on the size of community and annual delivery load. The room should be big enough to take a labour bed and toilet facilities.

4. Delivery room and immediate services:-

This is the room in which the baby is delivered. It should be located away from the entrance to the unit in order to reduce traffic and provide privacy for the patient. The requirements of this room are similar to those of an operating room although less people are involved here. The size should be at least 5.0M square. Scrubbing space should adjoin it with a central or decentralized work room nearby..

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6. Gainsborough H and John Gainsborough - Principles of Hospital Design page 199.

Near the delivery room should be a post-partum recovery room. Patients after delivery will be brought here before they are transfered to a nursing floor. One third to one half of labour rooms is used as a design figure for recovery beds.

A nursing station should be conveniently located near the recovery beds and labour rooms since a constant visit to the labour rooms is essential. See floor chart in figure 18.

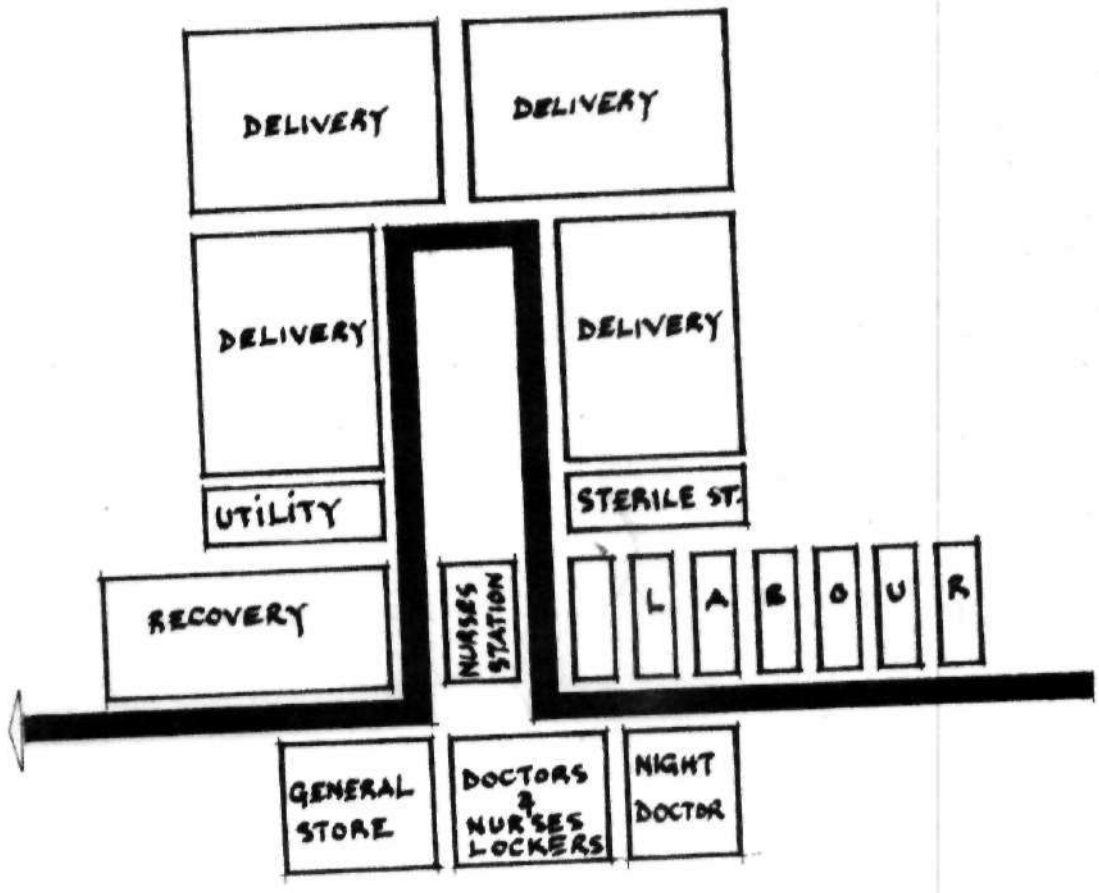
A premature nursery will be provided here to ensure such infants are not moved far after birth (see Obstetric nursing unit in previous chapter).

THE PATHOLOGY DEPARTMENT

The Pathology Department of a General Hospital receives for examination specimens taken from in-patients and out-patients. Thus specimens come from the nursing units, the theatres, emergency and out-patient departments and the notuary unit. Patients may in certain cases visit the department for fresh specimens to be taken or for special examinations to be performed.

Planning considerations include:

1. Flexibility
2. Relationship with other Departments
3. Size of Department
4. Circulation



FLOW CHART DELIVERY SUITE

FIGURE 18

Because of the growing nature of the department, consideration should be given to flexibility in use and expansion possibilities.

The location should (with the exception of the motuary unit):

1. Be accessible to in-patients and out-patients.
2. Be favourable for the laboratory and other staff.

After studying the function and relationship of this Department - Mr. Todd Wheeler said "usually the laboratory ends up in some place that is fairly close to the centre of hospital traffic but not necessarily the busiest spot.

Circulation of personnel and movement of specimens from one space to another within the department should be considered. It is necessary to bear in mind the relationship of the spaces as it makes the laboratory work more orderly and efficient. See flow diagram in figure 19.

Size of Department:

The size of the department is determined by the number of tests performed annually. This figure is made up of the various tests performed by the various units of the department. The number of technologists should be determined according to their capacity to do the work and finally the necessary equipment and space for each technologist could be determined. See table I.

Room Size and Work-top Layout:-

The size of the laboratory space depends on the type of work-top layout adopted. The following factors should be considered in laying out of the laboratory work-tops:-

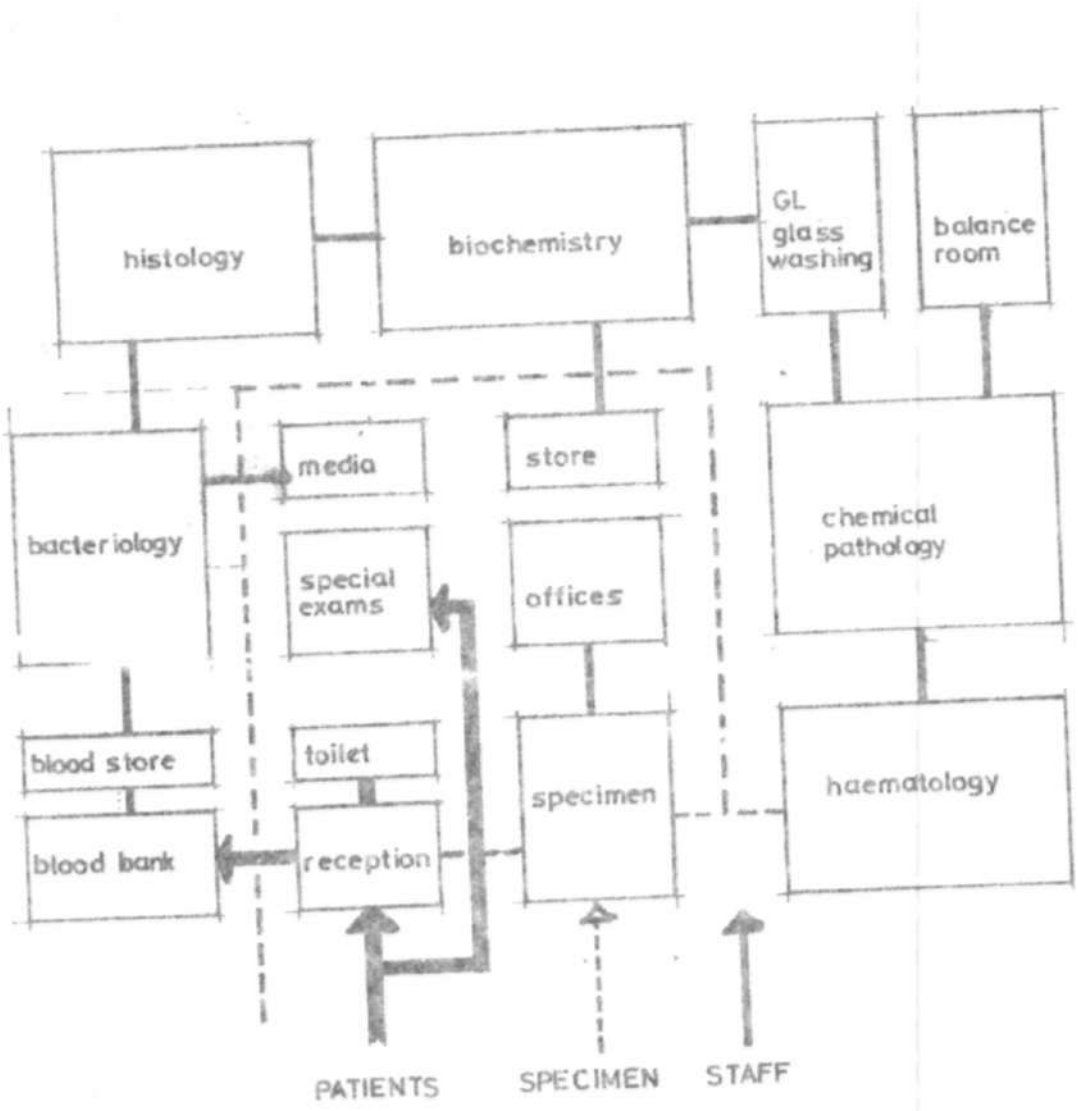


FIGURE 19
PATHOLOGY DEPARTMENT
FLOW DIAGRAM

Unit	Number of Tests	Technologists Required
Urinalysis	11,300	0.4
Haematology	35,800	2.5
Serology	6,800	0.6
Biochemistry	6,600	0.7
Parasitology	Included in Urin	
Bacteriology	1,800	0.2
Histology	1,800	0.5
Basal Metabolic	400	
Rate Test	1,300	
E K G	4,500	1.0
Blood Bank Test	1,000	
Transfusion	1,700	
Other		

Table 2

Laboratory tests performed annually in a hospital 150 - 200 beds.

Source: Callender: Time Saver Standards for Architectural Design.

1. Safety
2. Ease in working
3. Communication
4. Anthropometrics.

A unit of laboratory space should be used for planning purposes. The unit should be in such a way that it can be dimensioned to cater for all work-top scale disciplines.

From the point of view of interchangeability between the work-top disciplines (flexibility), a planning grid of 3.3M to 3.6M places the least restriction in use.[7]

The work-top length of 7.2 - 7.5M if placed normal to the window all on either side of a deep room shows some advantages:[7]

1. It provides working areas which are suitable to individuals in a large range of disciplines.
2. In the hospital context such a bay would provide accommodation for 3 to 4 workers in chemical pathology or bacteriology; or for 2 to 3 workers in a high-use discipline such as biochemistry.

Pathology Department Subdividion by Services

The Pathology Department services can be subdivided into the following diagnostic laboratory services:

---

7. Architects Journal - July 1967.

1. Chemical Pathology

This laboratory unit undertakes the chemical study of body fluids, excreta, and occasionally tissues of the body and sometimes examination of suspended poisons or other chemical substances. Counter height should be 90cm in this unit.

Requirements include:

1. A general laboratory
2. Balance and instrument room
3. Glass washing room

2. Bacteriology Laboratory

This unit is concerned with the bacteriological study of diseases and immunity to diseases. Besides a general laboratory for this procedure, the unit requires:

1. a media kitchen in which are prepared the media in which bacteria can be caltivated.
2. a glass washing room. This can be used by both bacteriology and chemistry units.
3. a sterile storage for materials and equipment.

3. Histology Laboratory

This unit deals with the study and examination of tissues. It is used for the examination of surgical and autopsy specimens and for selection of the tissues for slide sections to be prepared by the technologist.

The unit should be near a pathologist's office for maximum supervision.

Space will be needed for specimen cutting and Cytodiagnostic procedures.

4. Haematology Laboratory:-

Haematology is concerned with the count of the red and white corpuscles and general blood chemistry. Included in the work of this laboratory is the estimation of coagulation time, the control of anti-coagulant therapy and bone marrow investigation.

Requirements include a transfusion laboratory and if no separate blood bank is provided, there should be a storage space for blood- usually in bottles kept at a temp. of 4° - 6°C.

5. Parasitology Laboratory:-

This unit studies parasites commonly found in tropical diseases. It uses chemistry and microscopy largely on specimens of faeces.

The unit can be part of a chemical pathology unit adjoining bacteriology since most of the investigations concern these two units.

Other units which can be part of the main laboratory units or separate, depending on the amount of investigations available are Serology - the microscopic and chemical investigation of blood serum; and Virology - the study of diseases caused by a virus.

A blood bank is usually provided in a large General Hospital. This unit requires a space for receiving blook donors and two to three treatment beds. A space is also needed for blood storage and study.

Tests included in the laboratory, because of requirement of quite location include:

1. BMR - Basal Metabolic Rate

   This is essentially a volumetric test of inhalation and exhalation measuring the patients' metabolism.

2. Cardiography: - EKG.

   The Electrocardiographic test is for recording the changes of electrical potential occuring during the heart beat, and is used especially in diagnosing irregularities of heart action. This test requires:

   1. a one bed room
   2. an office for technician
   3. office for secretarial work
   4. a preparation space.

Cardiography and Basal metabo;ic tests are normally grouped together because of their common requirement of a quite location. This grouping enables only one technician to look after both.

P.B.I - Protein Bound Iodine

This test is replacing the BMR test because its results yield a more complete analysis in regard to iodine content. The P.B.I is a blood test. The serum protein-bound iodine determination when performed accurately, is the most valuable diagnostic test of thyroid function. It measures the amount of iodine bound to serum protein, which actually is the iodine content of the thyroid molecule.

The location of the room for P.B.I test should be close to the biochemitry laboratory, but isolated for test accuracy.

Electro-Excephalography - E.E.G

The test is for recording graphically the electrical emanations from the brain which indicate areas of inbalance or malfunction. Thus this test is a neurological test.

It should be located in a quiet area and as far as possible from diathermy equipment. The location should be near the psychiatric unit of the out-patient department or a neurological nursing unit if they exist in the general hospital.

Space requirements are:[8]

a) a patients' examination roo, at least 3.6M x 1.8M

b) an instrument room of similar dimensions, and

c) an office and record room 4.2M x 2.4M

---

8. Isadore Rosenfield - Hospitals Integrated Design - pp 244 - 248

Figure 20 shows a typical pathology laboratory equiped for a small general hospital. Also for rooms size and equipment for and EEG *see figure 21*.

The Motuary unit of a general hospital is attached to this department but because of the nature of its function it is usually situated away from this department nearer to energency, surgery and the nursing units. This unit receives dead bodies from the departments mentioned above for storage before postmoten is carried out. Specimen of body tissues are taken for further investigation in the main histology laboratory.

The requirements are:

1. Waiting space for relatives
2. A small laboratory room
3. Autopsy room
4. Cold store for bodies
5. A small office and toilet for attendant

THE RADIOLOGY DEPARTMENT

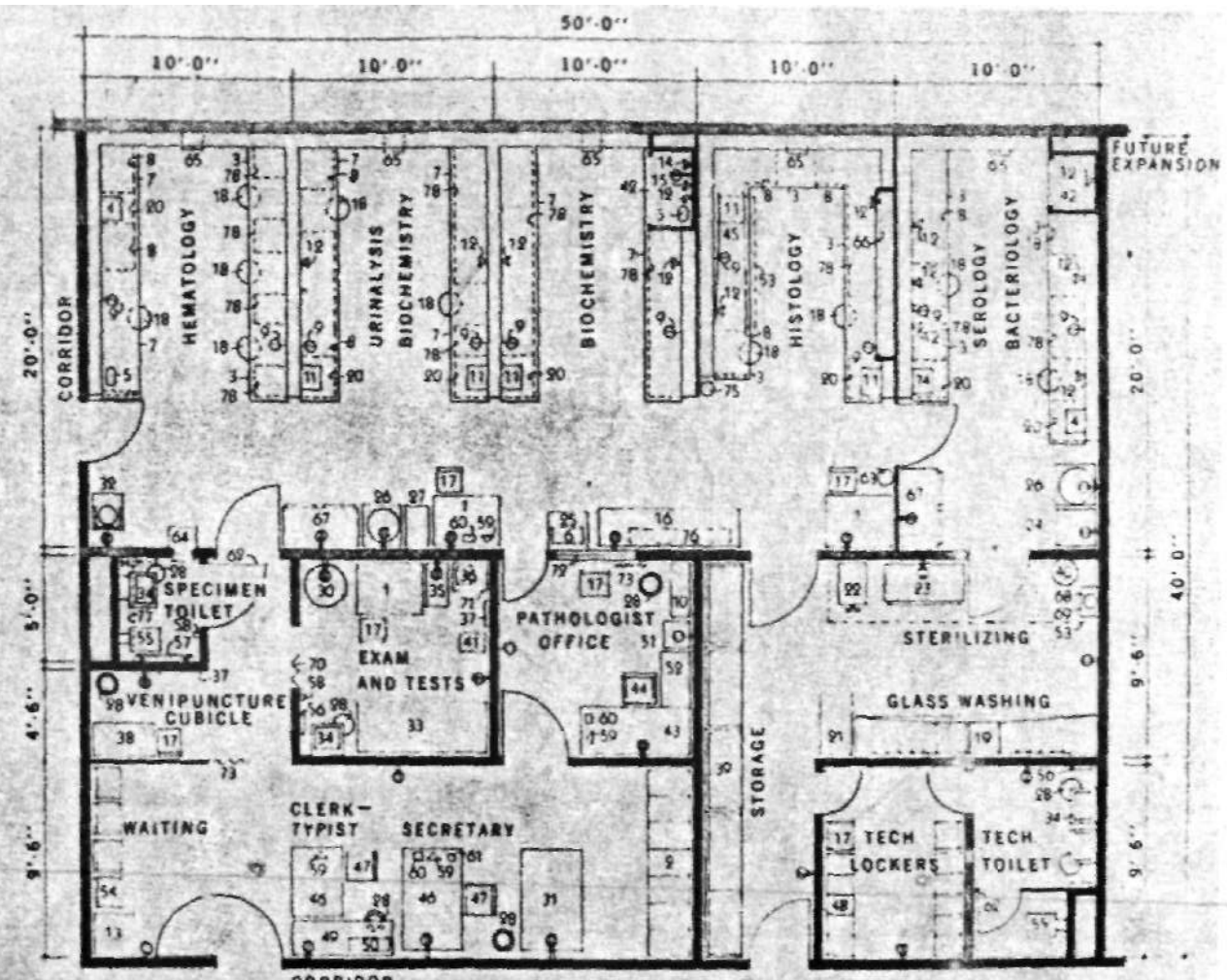
This is functionally a diagnostic and therapeutic department, serving both in-patients and out-patients. Sometimes the out-patient load exceeds that of the in-patients. Unlike in the laboratory, here it is the patient who comes to the department not his specimen.

Essentially, two diagnostic techniques are used:

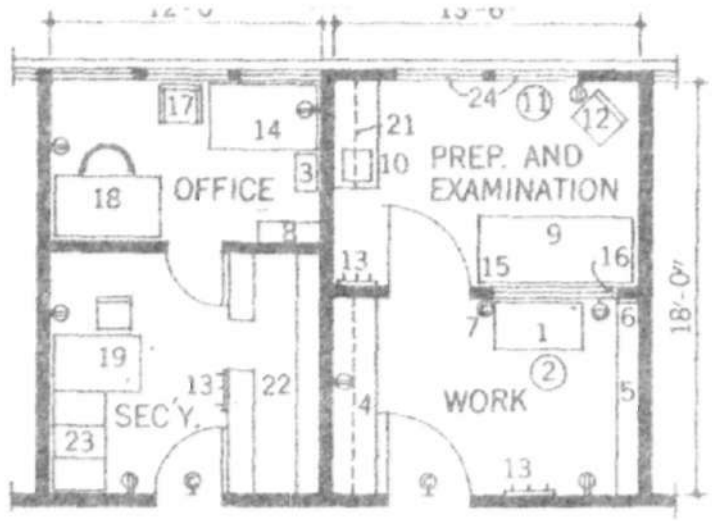
1. Radiography
2. Fluoroscopy.

LEGEND

1. Desk, 30 by 40 in., single pedestal
2. Filing cabinet, letter size
3. Counter, 30-in. high
4. Staining sink
5. Cup sink
6. Analytical balance
7. Counter, 36-in. high
8. Cabinets with adjustable shelves, below counter
9. Electric strip outlets, continuous
10. Bookcase
11. Utility sink
12. Gas outlet
13. Table for magazines
14. Suction outlet
15. Compressed air outlet
16. Table for instruments
17. Straight chair
18. Stool
19. Two-compartment sink 8-in. deep; drainboards-noncorrosive metal; peg boards above drainboards
20. Cabinet with trash receptacle on inside of door
21. Utility cart
22. Laboratory pressure sterilizer
23. Hot air oven
24. Incubator
25. Shelf or table for analytical balance
26. Centrifuge
27. Table for Harvard trip balance
28. Waste paper receptacle
29. Refrigerator, 8 cu. ft.
30. Refrigerator, blood bank
31. Worktable
32. Micro-hematocrit centrifuge
33. Examination table
34. Lavatory
35. Basal metabolism apparatus
36. Electrocardiograph
37. Hook strip
38. Table, 24 by 36 in.
39. Storage cabinets
40. Water still, 2-5 gals. per hr.
41. Adult scale
42. Fume hood
43. Double-pedestal office desk
44. Office chair, swivel, with arms
45. Noncorrosive metal work surface; pitch to sink
46. Typewriter desk
47. Posture chair
48. Technicians' lockers
49. Specimen receiving table
50. Request file with pigeon holes
51. Slide file cabinet
52. Microscope table
53. Exhaust hood
54. Easy chair
55. Wall-hung water closet
56. Paper towel dispenser
57. Grab bar, continuous
58. Emergency call station (push button) connected to buzzer at secretary's desk



Plan A (70,000–120,000 Tests Annually)
for Average Size of 150–200 Beds



EQUIPMENT LIST

1. Electroencephalographic unit
2. Stool
3. Costumer
4. Workbench, cabinets below
5. Shelf
6. Photostimulator panel (if used)
7. Clock with sweep second-hand in convenient view of technician
8. Bookcase
9. Adjustable hospital bed
10. Sink in counter, cabinets below
11. Sanitary waste receptacle
12. Chair for patient preparation
13. Hook strip
14. Work table
15. Glass window
16. Two holes thru wall, 5 and 20 inches above floor
17. Armchair
18. Executive-type desk and chair
19. Typewriter desk and posture chair
20. Office-type desk and chair
21. Cabinets above for electrodes and preparation supplies
22. Shelves for storage of EEG recordings
23. Filing cabinets, legal size
24. Venetian blinds

E.E.G. Unit

FIGURE 21 EEG UNIT

Radiography is the making of a pictorial record by means of X-rays on a sensitive film.

Fluoroscopy is the direct visualization of the parts of the body through the medium of X-rays.

Equipment serving the dual function of radiography and fluoroscopy have now been developed.

Diagnosis can also be done by means of a radioisotopic process to measure the gross functional status of certain organs (scaler) and to provide a different kind of diagnostic information (scanner).

The therapy section is usually integrated with the diagnostic unit for use of common facilities and better utilization of staff. otherwise it can be an independent unit. (Figure 24)

It is divided into two elements:-

- 1. Deep Therapy room - where patients are exposed to treatment by means of high voltage X-ray or Radioisotopic cobalt-60 machines.

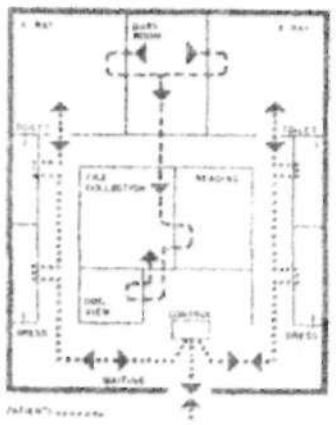
2. Superficial Therapy Room - where patients needing less intensity of radioactive radiation are treated.

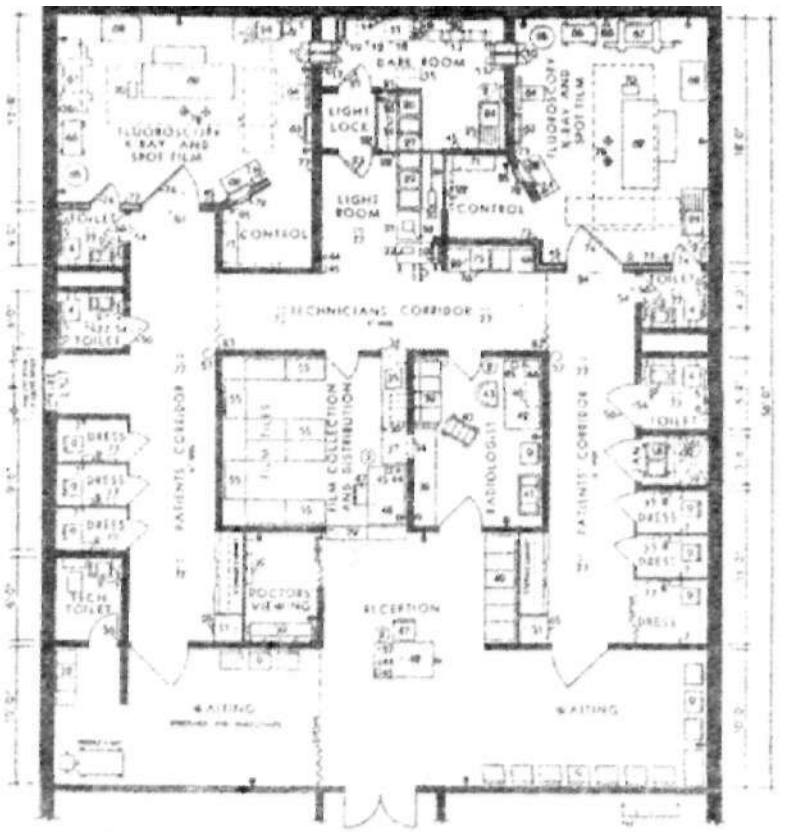
Planning Considerations

1. Interdepartmental Relationship with

- Out-patient
- Emergency
- Surgery
- Laboratory
- Nursing units.

See flow diagram in figure 23



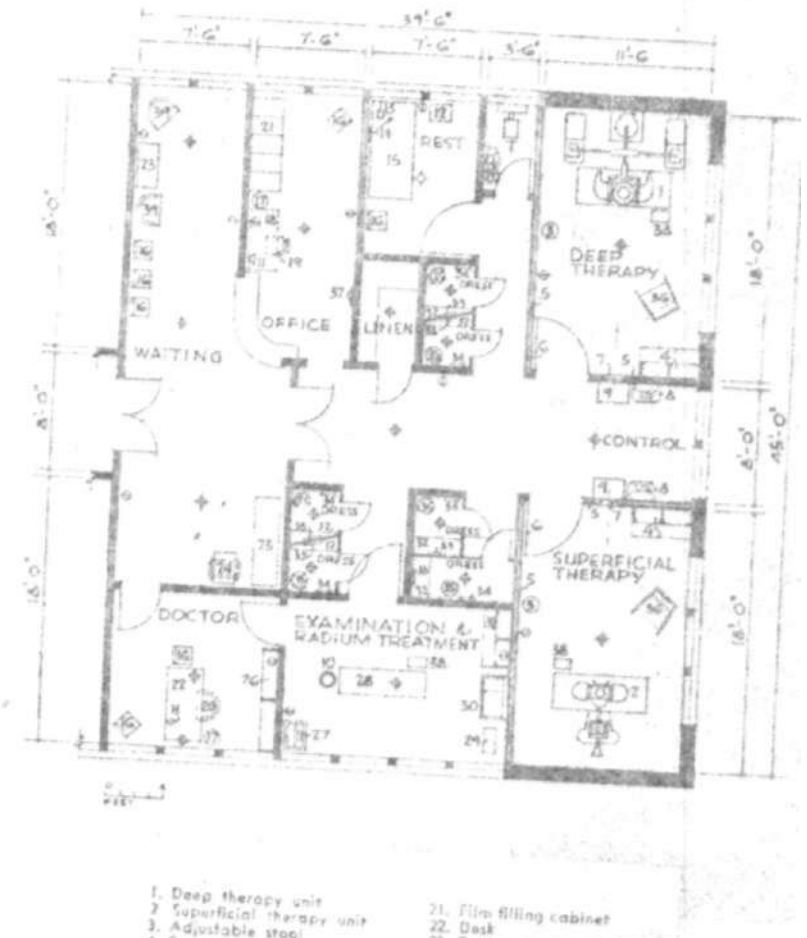


Diagnostic Radiographic Suite—Plan A

LEGEND

1. Paper towel dispenser
2. Waste paper receptacle
3. Lavatory
4. Wall-hung water closet
5. Continuous grab bar
6. Emergency calling station (push button)
7. Hook strip
8. Mirror and shelf below
9. Straight chair
10. Cassette pass box
11. Film loading counter
12. Film storage bin
13. Film hanger racks under counter
14. Safelight
15. Ceiling light, white and red
16. Timer
17. Counter with storage cabinets below
18. Cassette storage bins
19. Trash deposit cabinet
20. Cassette cover cabinet and wall guard
21. Door with [illegible] in upper panel
22. Access panel
23. Door with [illegible]
24. Utility sink
25. Refrigerator
26. Developing [illegible]
27. Through the [illegible]
28. Light proof [illegible]
29. Washing [illegible]
30. X-ray film [illegible]
31. Film dryer
32. Film dryer [illegible]
33. Film [illegible]
34. Film pass slot
35. Float-mounted [illegible]
36. Film sorting [illegible]
37. Film sorting counter
38. Counter with cabinets below
39. On-wall or mobile film illuminators
40. Temporary film file cart
41. Stereoscope
42. Executive type desk
43. Executive type chair
44. Telephone outlet
45. Intercommunication system outlet
46. Bookshelves, 42 cm by 14 in
48. Typist desk
49. Filing cabinet, letter size
50. Gown storage, open shelves, storage cabinet above
51. Gown storage, open shelving with laundry hamper below
52. Technicians' lockers
53. Fire door
54. Dome light, buzzer and annunciator at receptionist's desk
55. Closed metal film files, 5 shelves high
56. Hook on toilet side of door
57. Fire extinguisher
58. Mop truck
59. Shelf
60. Curb and receptor on janitor's sink
61. Mop hanging strip
62. Storage cabinet and writing counter
63. Fluoroscopic apron and glove holder
64. Fluoroscopic chair
65. Laundry hamper
66. Clean linen cart
67. Cassette changer
68. Transformer
69. Radiographic-fluoroscopic unit with spot film device
70. Foot stool
71. Control unit
72. Leaded glass view window
73. Lead lining (or other shielding material) as required
74. Lead-lined door, light proofed
75. Barium sink
76. Barium storage (below counter)
77. Red light for dark adaptation
78. Fluoroscopic ceiling light
79. Counter with gate
80. Film identifier, cabinet below
81. Anti-splash panel
82. Wall cabinet over sink
83. Curtain, floor to ceiling
84. Warning light
85. Microphone
86. Loudspeaker
87. Annunciator (for emergency calling station)

FIGURE 23 - X-RAY DEPARTMENT AND FLOW CHART (PATIENTS & FILMS)



1. Deep therapy unit
2. Superficial therapy unit
3. Adjustable stool
4. Supply cabinet
5. Lead Lining (Size and extent varies for floors, walls and ceiling)
6. Lead Lined door
7. Leaded glass view window
8. Control unit
9. Counter, 42 inches high
10. Sanitary waste receptacle
11. Telephone outlet
12. Bedside table
13. Bed light
14. Nurses calling station
15. Bed
16. Straight chair
17. Waste paper receptacle
18. Typewriter desk
19. Typist's chair
20. Desk chair
21. Film filling cabinet
22. Desk
23. Table, 12 x 24 inches
24. Wheel Chair
25. Wheel stretcher
26. Bookcase
27. Cautery
28. Examining table
29. Instrument sterilizer, 4 x 6 x 16 inches
30. Combination instrument and scrub sink, with gooseneck spout and knee control
31. Instrument cabinet
32. Shelf—31 inches high
33. Mirror
34. Hookstrip
35. Stool with back
36. Non-metallic treatment chair
37. Dome-light and buzzers
38. Foot stool
39. Easy chair

FIQURE 24 RADIOTHERAPY UNIT

Design Elements of the Diagnostic Unit:

1. Reception and administration
2. Changing and Preparation
3. Radio-diagnostic Room
4. Film Processing and Viewing
5. Staff facilities.

1. Reception and Waiting space for out-patients and in-patients should be provided at the entrance to the department. Consideration should be given to stretcher and wheel chair parking space. The waiting space should be provided at the rate of $1.5M^2$ per patient.

2. Changing and Preparation:- include

a) Changing cubicles where patients change into a hospital garment or undress to the requirements of the radiographer prio to diagnosis.

The requirements are:-

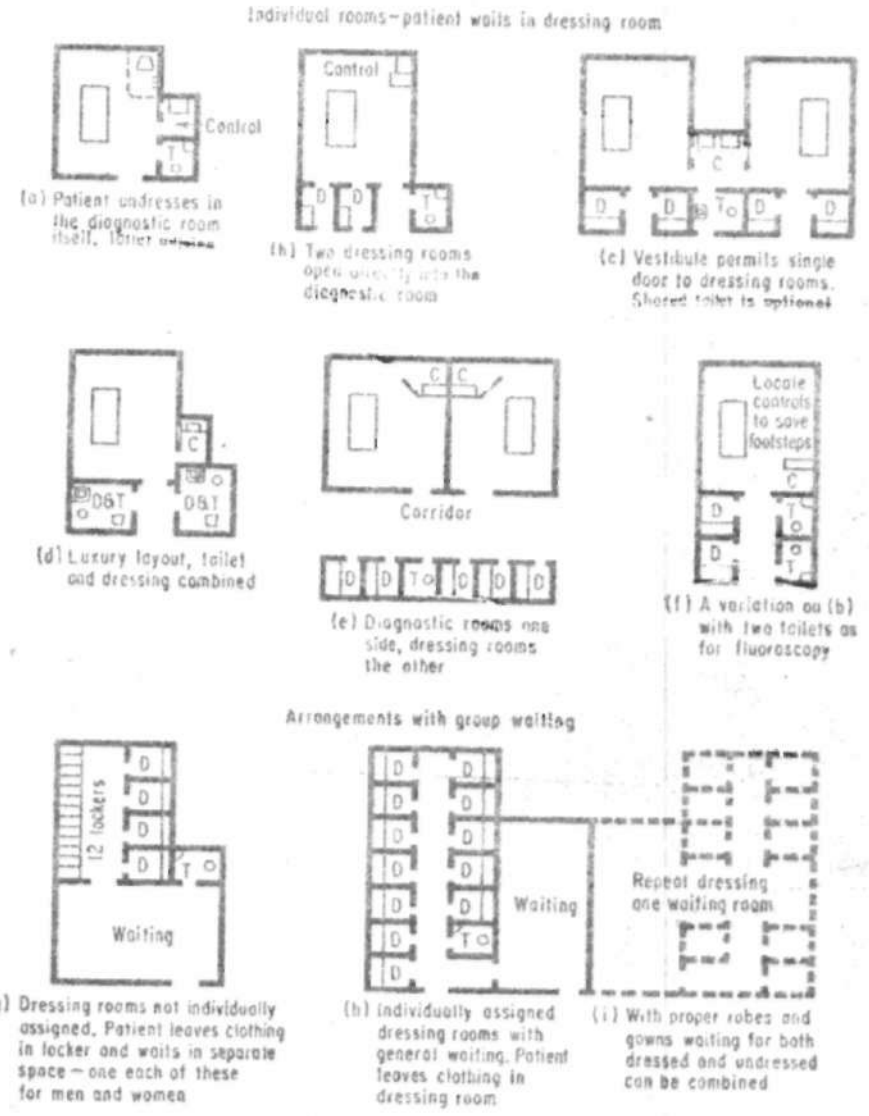
1. Minimum 3 cubicles/room
2. Minimum size $1.5M^2$ with a height of at least 2.1M.[9]

The changing cubicles should be adjacent to the X-ray rooms for privacy and shorter distance of travel (figure 22)

b) A toilet should be provided for use by barium enema patients undergoing gastro-intestinal investigations. It should be adjacent to the changing cubicles.

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9. Hospital Building Notes Vol.



Dressing rooms for radiology.

FIGURE 22 - RELATIONSHIP OF DRESSING CUBICLES TO X - RAY ROOMS

3. Radio-diagnostic Room:-

It is the most important element in the radiology department All diagnostic procedures are performed here with the aid of the X-ray equipment.

* Number of Rooms - The number of rooms depends on the out-patient and in-patient load. The United States Public Health Service recommends one diagnostic room for a 50 bed General Hospital or a minimum of two rooms for a hospital of 150 beds and above.

E. Todd Wheeler, in his book suggests the use of a formula for calculating the number of diagnostic rooms required in a given hospital considering the following:

1. Number of determinations per annum - E
2. Days per week in operation - D
3. Hours per day in operation - H
4. Determinations per room per hour - R
5. Weeks per year in operations - W

The number of determinations per room per day depends on the ability of the radiographer and the complexity of the determination. However averagely an X-ray diagnostic determination takes about 15 minutes.

An existing hospital survey will be able to provide the designer with an average annual load.

Thus the formula gives the number of rooms as

$$N = \frac{E}{W \times H \times R \times D} \quad 10$$

---

10. E. Todd Wheeler - Hospital Design and Function. Page 163

The Room Size:-

The minimum size of the X-ray is 4.5M x 5.5M with a Control booth of 4 - 5M^2 in size[11] (width 2.2M). The booth should be located on the right side of the patient to permit view of the patient while the operator is in the booth. This is because the X-ray machine is usually on the left side and thus covers the patient. The booth should have a viewing window of lead glass opening into the room.

There is need for a small barium kitchen near or in the X-ray room where gastro-intestinal investigations are done.

Room Location:-

The functional requirements of the department are usually best satisfied by a cul-de-sac location. In this location the activities within the X-ray rooms will not be disturbed by through traffic to other departments. From the point of view of economy, the use of external walls as part of the radiographic rooms should be considered in order to reduce the amount of lead isulation. See table 2 for shielding requirements of various machines.

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11. Architectural Record - Hospitals, Clinics and Health Centres - Page 142 - 143.

MINIMUM LEAD AND CONCRETE PROTECTIVE INSULATION FREQUENCY REQUIREMENT FOR VARIOUS X-RAY MACHINES

Type of Work	X-Ray Generated by Peak Voltages	Minimum Equivalent Thickness of Lead	Concrete Equivalent Thickness
Fluoroscopy	75kV	1.0mm	
Radiography	100kV	1.5mm	120mm
Skin Therapy	100kV	1.5mm	120mm
Medium Therapy	150kV	2.5mm	
	175kV	3.0mm	
Deep Therapy	200kV	4.0mm	220mm
Deep Therapy	225kV	5.0mm	
Deep Therapy	300kV	9.0mm	
Deep Therapy	400kV	15.0mm	260mm

Table: 2

Source: Hospitals Integrated Design by Isadore Rosenfield

4. Film Processing and Viewing:

Exposed film processing is done in a darkroom. The darkroom could serve two or more rooms if conveniently situated. Automatic processing machines capable of developing 140 films per hour are now in use. The size is about 350mm x 420mm. This has reduced the size of darkrooms to small loading cubicles.

A viewing room is required at the output end of the automatic processing unit. Films will be sorted here before distribution to patients and departments.

A film storage alcove should be attached to the darkroom so that fresh films could be loaded into cassets before they are taken to the X-ray rooms. A cupboard for 3,000 films is about 2.1M x 0.9M.[12]

5. Staff Facilities.

Staff facilities include offices for radiologist and radiographer a rest room with toilet facilities. There is a need for storage space for used films and portable X-ray units used in surgery or energency departments but under the care of the radiology department.

Design Considerations:-

1. Smooth flow of patients
2. Smooth flow of staff
3. Climatic considerations
   - lighting
   - temperature

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12. E Neufert - Architects Data, Page 175 - 177.

4. Technical considerations

- position and instalment of equipments
- protective insulation against radioactive radiation

See figure 2/ for plan equipment and flow of traffic.

PHYSICAL MEDICINE

The physical medicine department is a therapeutic facility serving both out-patients and in-patients.

The location of this department should be such that it is easily accessible to the patients it serves. The trip from the hospital entrance to the physical medicine should be as short as possible since most of the patients are disabled.

The department has two therapy units

1. Physiotherapy unit
2. Occupational therapy unit

1. Physiotherapy Unit

The treatment in this unit is through the utilization of physical aids of heat, light, water, electricity, etc. Thus the treatment is in a form of exercise, manipulation, massage, hydrotheraphy, or electrotherapy.

The physiotherapy unit does not handle a large number of patients daily as a radiology.

A ground floor location, convenient for both patients and for access to an outdoor exercise area is recommended.

- The amount of space needed depends on the number of patients treated, the kinds of disabilities and treatment required.
- No absolute standard can be recommended as the amount of space needed for physical therapy in a general hospital. The most that can be said is that, if possible, it is desirable to plan for at least a thousand square feet ($1000f^2$) of floor space, free of structural obstructions. About half of that should be exercise area.[13]

Also to be considered is the fact that some space consuming equipment such as a Wirlpool bath, treatment tables, parallel bars, etc. are minimum essentials for even a small unit.

Physiotherapy Elements:-

a) Patients reception and waiting
b) Passive treatment area
c) Changing and Active treatment
d) Staff facilities and storage

---

3. Architectural Record - Hospitals, Clinics and Health Centres - F.W. Dodge Corporation, 1960.

a) A reception space capable of keeping current records of patients should be provided. Adjacent to this space should be a small waiting space at the rate of 1.5M^2 per patient. A small parking space is needed for wheelchairs and stretchers. Wheelchair patients should be considered in planning patient toilets.

b) Passive Treatment area - requires cubicles for thermal, massage or manupulation treatment. The cubicle should be at least 2.4 metre square to enable a physical therapist to work on either side of the table. Cubicles are best subdivided by drapes for easy access by wheelchair or stetcher patients.

There is need for a hydrotherapy room for underwater exercises. This room requires space for underwater exercise equipment, wheel stretcher and a treatment table.

c) Changing and Active Treatment Area - requires changing rooms for both sexes and a large active exercise hall. One wall of the treatment hall should be reinforced for installation of stall bars.

The minimum size of the exercise room, as recommended in British Hospital Building Note - is 7M x 15M x 4.6M high. Maximum size is given as 9.0M x 18.0M x 5.5M high. See figure 25 for layout and equipment.

) Staff facilities and Administration include:

- a general rest room and toilets
- offices for administrative purposes
- private room for patient interviewing and examination.

1. Posture Mirror
2. Parallel Bars
3. Steps
4. Stall Bars
5. Gym Mat
6. Stationary Bicycle
7. Sayor Head Sling Attached to Ceiling
8. Pulley Weights
9. Shoulder Wheel
10. Gym Mat Hooks
11. Cart with Open Shelves
12. Open Shelves
13. Wheel Chair
14. Shelf
15. Wall Hooks
16. Wall Cabinet
17. Lavatory, Gooseneck Spout
18. Water Closet
19. Hand Rail
20. Waste Paper Receptacle
21. Portable Equipment
22. Adjustable Chair
23. Whirlpool
24. Chair
25. Table
26. Chair, preferable with arms
27. Wheel Stretcher
28. Desk
29. Swivel Chair
30. File Cabinet
31. Bookcase
32. Bulletin Board
33. Wall Desk (counter, shelf below)
34. Lavatory, Gooseneck Spout and Foot Control
35. Wall Cabinet with Lock
36. Treatment Table, Storage below
37. Mirror and Glass Shelf over Lavatory
38. Adjustable Stool
39. Laundry Hamper
40. Sink with Drainboard
41. Paraffin Bath
42. Glass Shelf over Sink
43. Overhed Trapeze
44. Three Single Outlets on separate branch circuits, 1 outlet 2-pole, 2 outlets 3-pole
45. Folding Door
46. Cubicle Curtain
47. Under Water Exercise Equipment
48. Overhead Lift
49. Coat Rack
50. Telephone Outlet

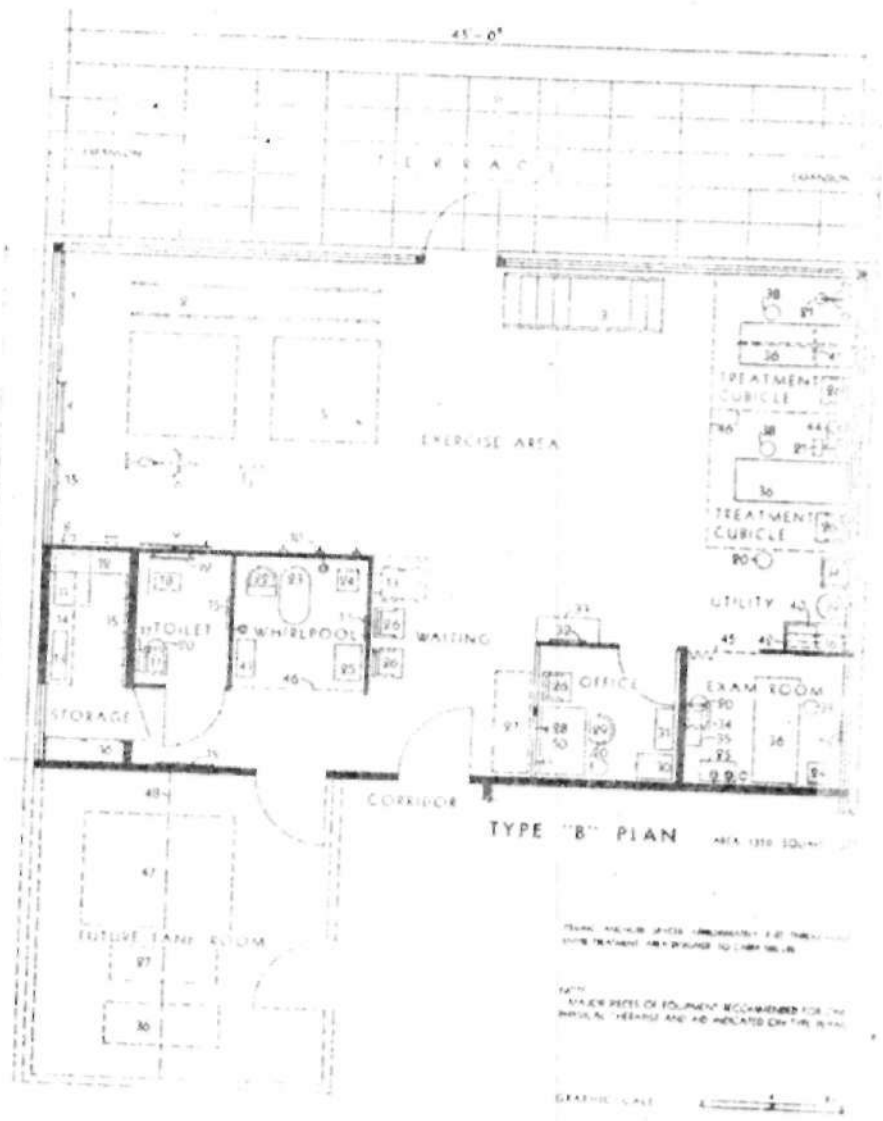


FIGURE 25 *Physical Therapy Department*

e) Storage Space - for equipment and supplies usually needed in the passive and active treatment areas.

2. Occupational Therapy:-

The accuprational therapy seeks to help the patient in putting his regained physical ability to some economic or social use. Thus it also deals with physically handicapped, but the therapy methods are through training and demonstration.

> - "A formula that may be used to estimate the size of the department has been worked out by Mr. Britsh in which formula he assumes that 30% of the hospital patients may be referred to this unit. Of these 60% might receive bedside treatment; the other 40% would be ambulatory or wheelchair patients who would be treated in this department. Therefore 13% or 14% of the total hospital beds will receive the occupational therapy treatment in this unit. Mr, Britsh stated that in the opinion of leading occupational therapist authorities, 50 to 54 ft^2 (4.65 to 5.0M^2) per patient should be provided for the total area including office and storage space, of which 42ft^2 (4.0M^2) per patient should be devoted to therapy area"[14]

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14. Massaoud A.A. The General Hospital as an Architectural Organism.

The elements of this unit include the treatment area made up of quite and noise activity areas a id an office space for the therapist.

Other common facilities are normally shared by patients. See figure 26 for typical layout.

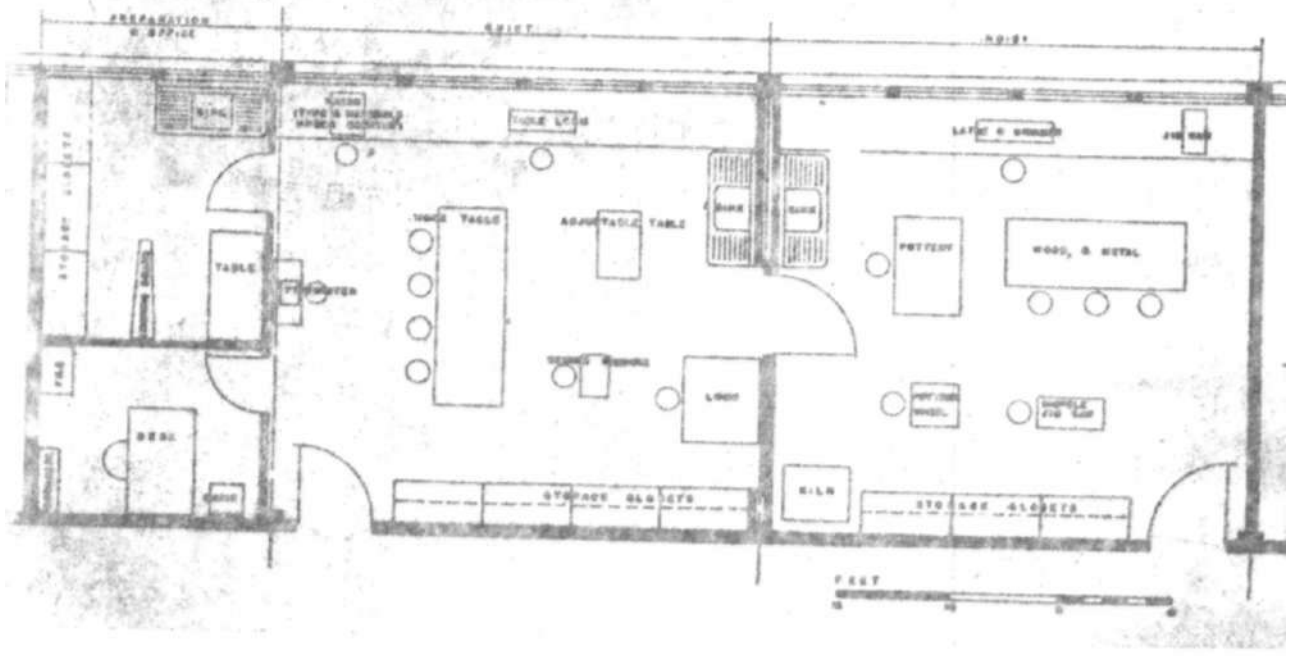


FIGURE 26 - OCCUPATION THERAPY UNIT

THE PHARMACY DEPARTMENT

The pharmacy supplies medication, anaesthesia requirements, laboratory chemicals and other chemical requirements to the therapeutic departments and the nursing units. The department is therefore required to be accessib to the staff of these therapeutic and nursing units for easy supply of thei requirements.

The pharmacy functions as a dispensing, compounding, and in some bigger general hospitals manufacturing unit. Only the dispensing section should open to the public. It is more functional to have a separate dispensary in the out-patients department only to be supplied with bulk medication from the central dispensing unit serving all departments.

The size of this department depends on the size of the general hospital. The United States Public Health Service recommends $20M^2$ for 50-bed hospitals, $50M^2$ and $110M^2$ for 100-bed and 200-bed hospitals respectively[15].

Its location should be near the service entrance, easily reached from bulk stores area for bringing in supplies. The distribution centre should be open to the hospital staff towards the service corridor.

1. Facilities include:-

    1. Storage space for goods to be dispensed with

        a waiting space at the out-patient dispensary

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15. Massaoud A.A. - The General Hospital as an Architectural Organism, Page 83 - extracted from Elements of the General Hospital by U.S.P.H.S.

2. Distribution room for supplying requests to the hospital departments.
3. An office for at least a pharmacist
4. Clerks and records office
5. Storage for bulk chemicals and drugs
6. Compounding area
7. Manufacturing unit if required.

THE OUT-PATIENT DEPARTMENT

This is regarded as a separate service in the hospital. However for economy it is integrated with the hospital inpatient facilities in order to utilize the hospital's adjacent services, such as the radiology, pharmacy, pathology, etc.

The out-patient department (OPD) is often a patient's first introduction to a hospital except where a patient comes through the energency unit. Thus the department should be located at the main entrance to the hospital convenient to the hospital aproach roads and pedestrian paths. It should be conveniently associated with the hospital diagnostic and therapeutic facilities. It also requires allowance for future expansion because of the growing need of immediate medical consultation by the community.

The functions of the OPD are three

- Education
- Prevention
- Diagnosis and treatment

Health education and preventive care are offered through teaching and taking adequate medical measures towards preventing preventable diseases. In accordance with the different types of diseases, the OPD offers diagnostic and treatment services in the following clinics:-

1. General Medical
2. General surgical
3. Dermatology
4. Maternity
5. Paediatrics
6. Eye clinic
7. Ear nose and throat (ENT)
8. Gynaecology
9. Orthopaedic
10. Immunization
11. Diabetic
12. Dental

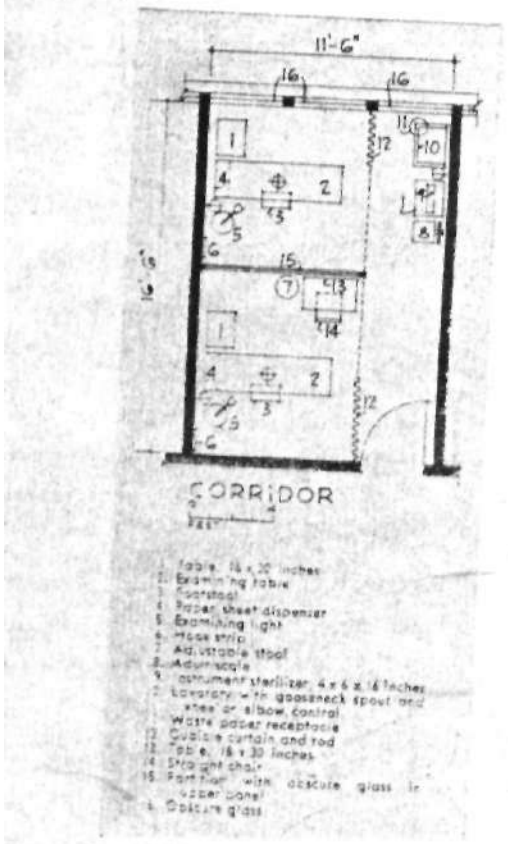
The elements of this department are:

- Reception and waiting facilities
- Consulting and Examination rooms
- Treatment and work rooms
- Special clinics for opthalmology, Otolaryngology (ENT) Dentistry, etc.

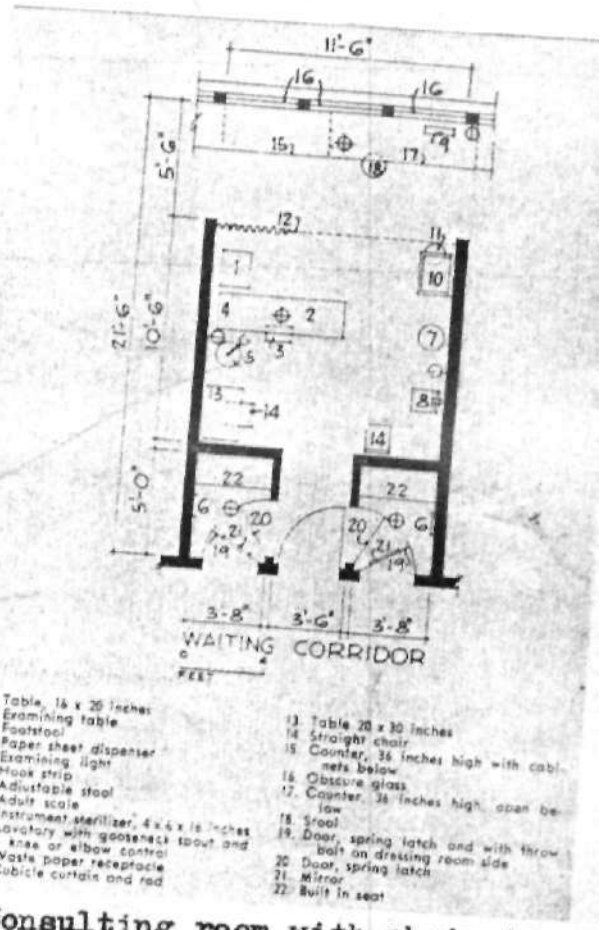
- The reception room should be the main entrance hall of the department. All registration and records facilities will be accommodated here. It is better, apart from the main waiting hall, to have decentralized waiting spaces adjoining the various clinics.
- Some clinics require separate consulting and examination rooms while others could use one room for both. Howevern the provision of separate rooms for these procedures should be based on economic grounds.
- Treatment rooms for surgical treatments and injection should be provided. These should adjoin the consulting rooms for easy transfer of patients. The rooms should also be close to the nurses station for effective staff supervision. For layout and equipment of these rooms see figure 27.
- Some special clinics require specially planned rooms because of the sofisticated equipments used and the diagnostic procedure. An eye Clinic requires, adjoining the exam. room, a darkroom for diagnosis of certain cases. A refractionists room could be used for consultation and vision test. An audiometry room is required in an ENT clinic for measuring the sensitivity of a patient's hearing system. A separate work room and one for recovery are essential in the dental clinic. See figure 27 and 28 for rooms layout.

EMERGENCY DEPARTMENT

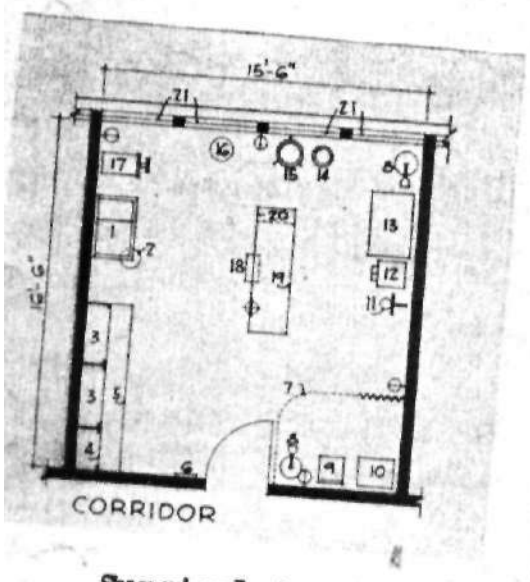
This is an out-patient department offering services to emergency cases due to accident or sudden illness. The department provides life



Consulting/Exam room



Consulting room with chainging cubicles



Surgical treatment room

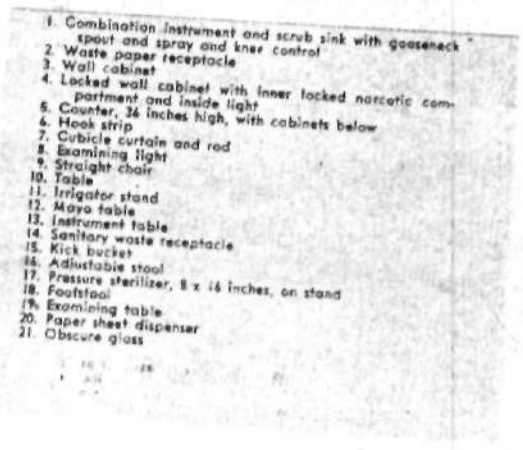


FIGURE 27 - OUTPATIENT DEPARTMENT SERVICE ROOMS

EYE, EAR, NOSE AND THROAT ROOM FOR A 200-BED HOSPITAL



1. Specialist's chair
2. Adjustable stool
3. Treatment table
4. Supply cabinet
5. Illuminating spot light
6. Trial lens case
7. Mayo table
8. Examining table
9. Straight chair
10. Illuminated test card cabinet
11. Table, 20 x 36 inches
12. Table for transilluminator equipment
13. Perimeter
14. Slit lamp
15. Combination instrument and scrub sink with gooseneck spout and knee control
16. Waste paper receptacle
17. Instrument sterilizer, 4 x 4 x 16 inches
18. Compressed air and vacuum apparatus
19. Foundcle cuspidor
20. Sanitary waste receptacle
21. Examining light
22. Hook strip
23. Sliding curtain
24. Partition, 6 feet high
25. Shades or venetian blinds
26. Table, 16 x 20 inches

DENTAL SUITE WITH TWO OPERATING ROOMS

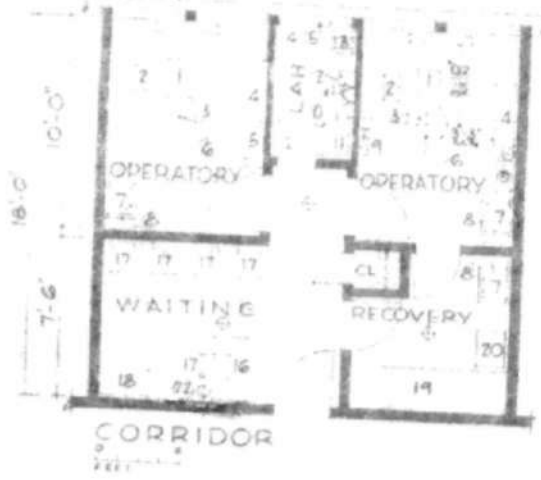


Figure 28 - SPECIALIST CLINICS

saving services needed immediately upon admission before it can properly be determined which hospital division should receive the patient.

Emergency patients may need immediate laboratory tests, X-rays, and even surgical interventions. Following emergency treatment, a patient may need intensive care or rest.

Thus the department should be close to

- Surgical suite
- Radiology
- Pathology
- Admission office.

The department can be subdivided into the following elements

1. Reception of patients and waiting
2. Consulting and treatment
3. Minor operating theatre
4. Post-treatment observation beds

1. The reception room should open to an ambulance entrance screened from public view and waiting area. Another side entrance is required for patients coming on their own.
2. Consulting rooms are similar to those provided in the OPD. Adjacent to these should be treatment rooms with workrooms and a nurses station for control of patients and staff.

3. An operating theatre is often provided in an emergency department, although this is open to argument.

> "An emergency operating room is not needed and it is even wrong to perform a serious operation in such a department, as is neither equipped nor staffed for major operations - while there are fully equipped operation rooms within the same building. However, for minor surgical procedures, a room should be equipped and should have a plaster sink, a splint Cabinet and the like."[16]

The author, as said above, feels that no major operating room should be provided in the emergency unit for the following reasons:

1. Economy in equipment and staff usage.
2. For patients safety and non duplication of staff facilities essential to an operating suite.

See flow chart of emergency traffic - figure 29.

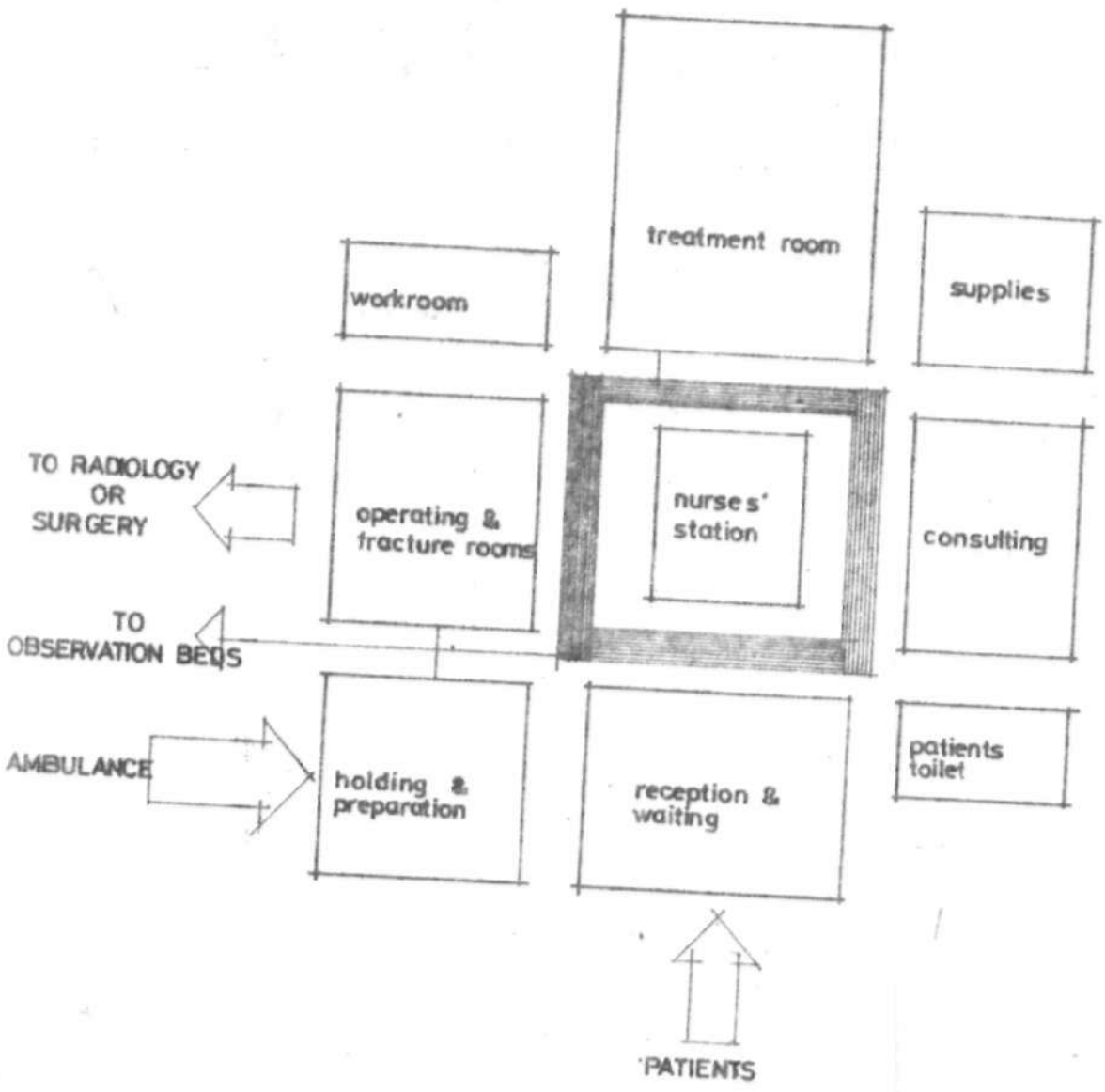


FIGURE 29
EMERGENCY SUITE FLOW CHART

CHAPTER F

ANCILLERY SERVICE UNITS

THE CENTRAL STERILE SUPPLY DEPARTMENT

The central sterile supply department supplies from a central poin all necessary sterile materials and equipment required by these medical service departments:

- Surgical suite
- Delivery suite
- Patient care Units
- Emergency and OPD

Its location should be convenient to the staff of the above for efficier receiving and distribution of used and sterile items.

The processes involved in this department are:

- Receiving and sorting
- Washing and drying
- Packing
- Sterilization
- Storing
- Distribution

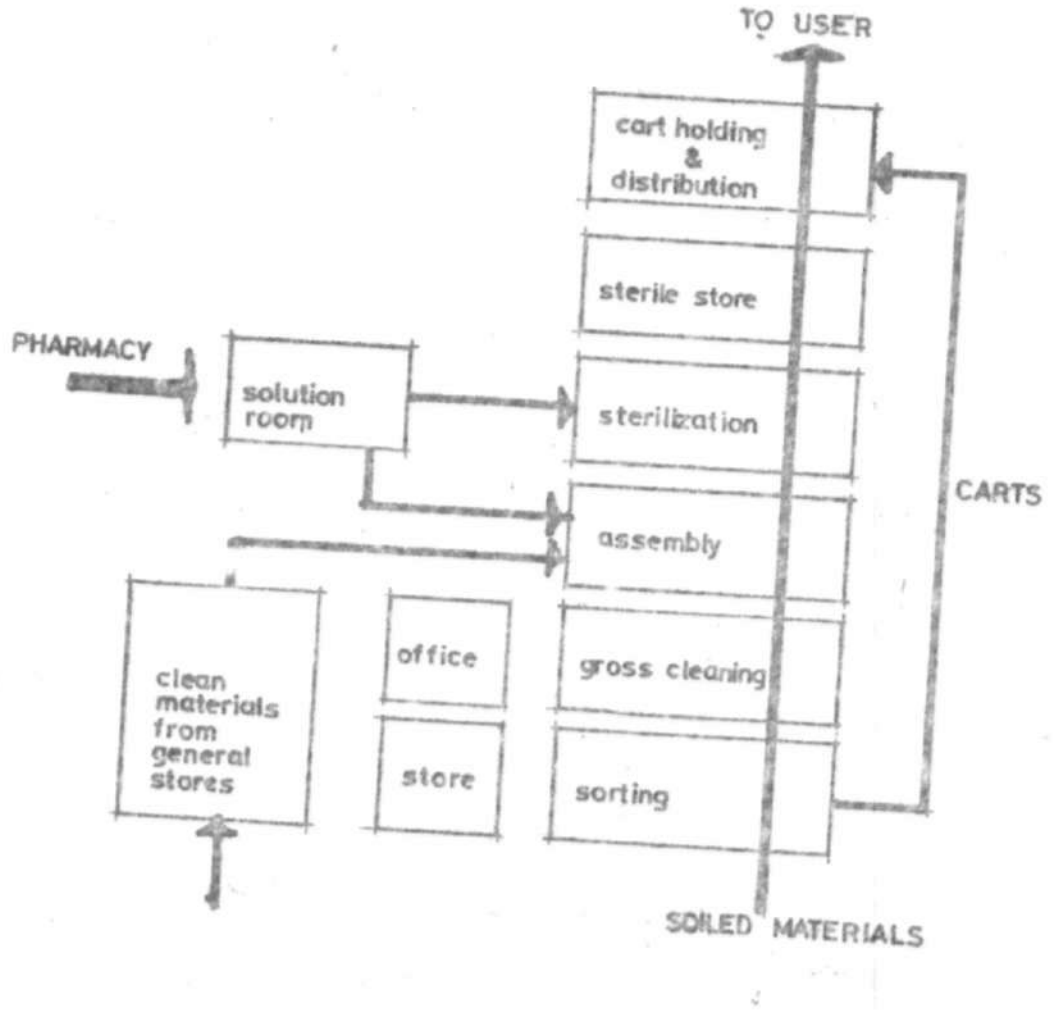
See work flow diagram in figure 30.

The recommended floor area for the CSSD is $0.65M^2$ to $1.0M^2$ gross per hospital bed. For determining the total space needed for this department, the most accepted figure is $0.75M^2$ per bed. This estimation will be acceptable in hospitals of up to 600 beds in size.[1]

---

1. E Todd Wheeler - Hospital Design and Function. Page 206.

FIGURE 30
CENTRAL STERILE SUPPLIES UNIT
work flow diagram



For determining the specific percentage within the total area for the performance of the different function of this unit, the American Sterile Company recommends the following:[2]

- Workroom - 20%
- Sterile store - 17%
- Bulk store - 12%
- Washroom - 11%
- Syringes and lust room - 10%
- Offices, restroom, receiving and sorting, and circulation - 30%

In designing this department these points should be considered.

1. It should be organized and planned to provide proper work flow and economy of labour.
2. Contaminated articles and sterile packs should be kept separate.
3. A formula room should be provided within the C.S.S. to avoid its duplication in the maternity nursing unit.
4. The supervisor's office or station should overlook the entire unit for effective supervision.

The Laundry and Housekeeping

The hospital laundry handles all linen washing, mending, marking and distribution. Linen requiring sterilization are later taken to the C.S.S. for sterilization.

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2. Architects Journal, July 1967.

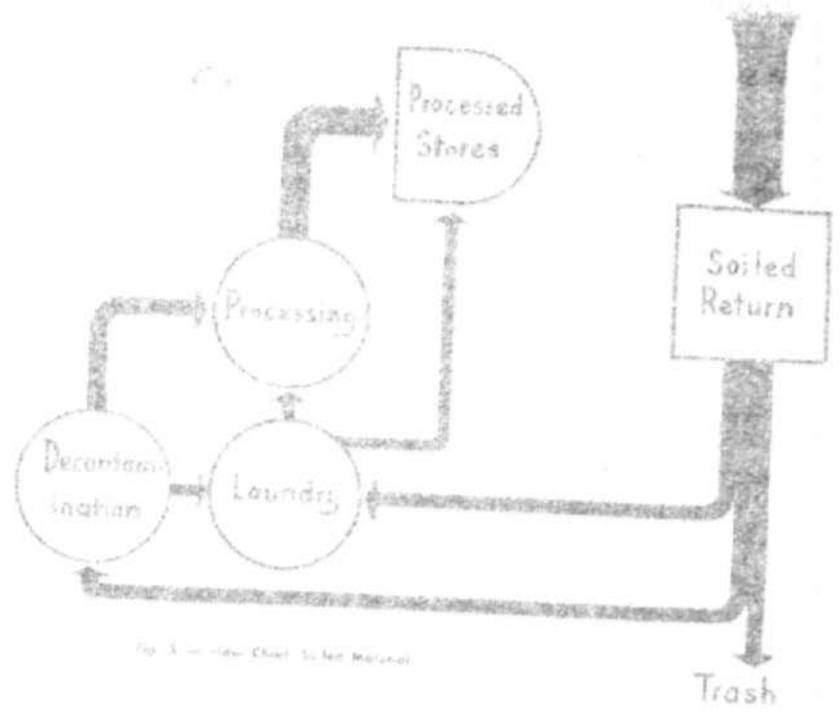
The laundry can functionally be divided into two work areas

- Dirty work area where dirty items are received and sorted out. Here is required a number of sorting compartments depending on the types of linens handled. The sorted linens are then fed into washing machines.
- Clean work area where the washed materials are extracted and dried. Those requiring mending are passed to the tailors for inspection and mending. The rest are ironed, folded and stored for distribution. See flow chart of soiled materials in figure 31.

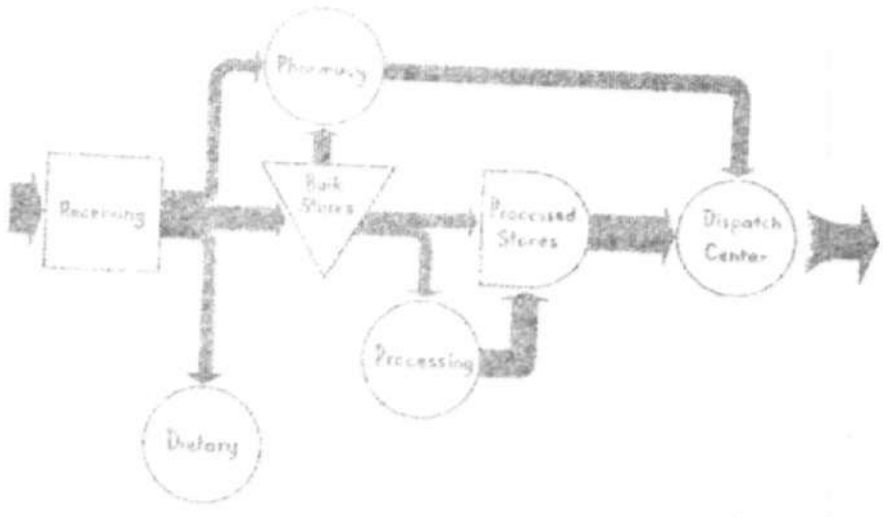
For these functions, the department requires the following facilities:

1. Space for collection and sorting
2. Office space for supervisor and clerks
3. Main washing area
4. Mending room
5. Drywork area for pressing and folding
6. Clean linen store
7. General store
8. Distribution area

For the purpose of estimating the size of the laundry Mr. Todd Wheeler suggests an allocation of 4.6kg per patient per day, while E. Neufert recommends $0.60M^2$ per tonne as a basis for calculating the total area of laundry. Consideration should be given to employee linen which will be supplied clean by the hospital.



FLOW of MATERIAL (Clean)



FOOD SUPPLY, PROCESSING and DISTRIBUTION SYSTEM

FIGURE 31 FLOW OF SOILED AND CLEAN MATERIALS

The receiving and sorting room should be near the main service corridor to shorten the travel distance the staff have to cover. The same applies to the distribution centre. The whole block should be easily accessible to the central sterile supply unit because of service connection. See figure 32 for layout and equipment in a typical laundry.

The housekeeping section of a general hospital deals with cleaning of the hospital buildings. This is an important section in that the standards of cleanliness required in a hospital are exceptionally high. The unit does all the cleaning, gives maid service and handles all sanitary supplies.

Elements:-

- Floor cleaner's store for keeping all cleaning equipment of each block floor. The room requires a sink (floor type) and a closet
- Central workroom
- Storage for supplies
- Office for housekeeper
- Restroom for cleaners

Central General Stores

The central general stores function as a storage area for goods purchased in bulk only to be used in small quantities. The purchasing unit of the hospital is also accommodated here. Thus the CGS is the main receiving and storage area as well as the distribution centre of hospital requirements.

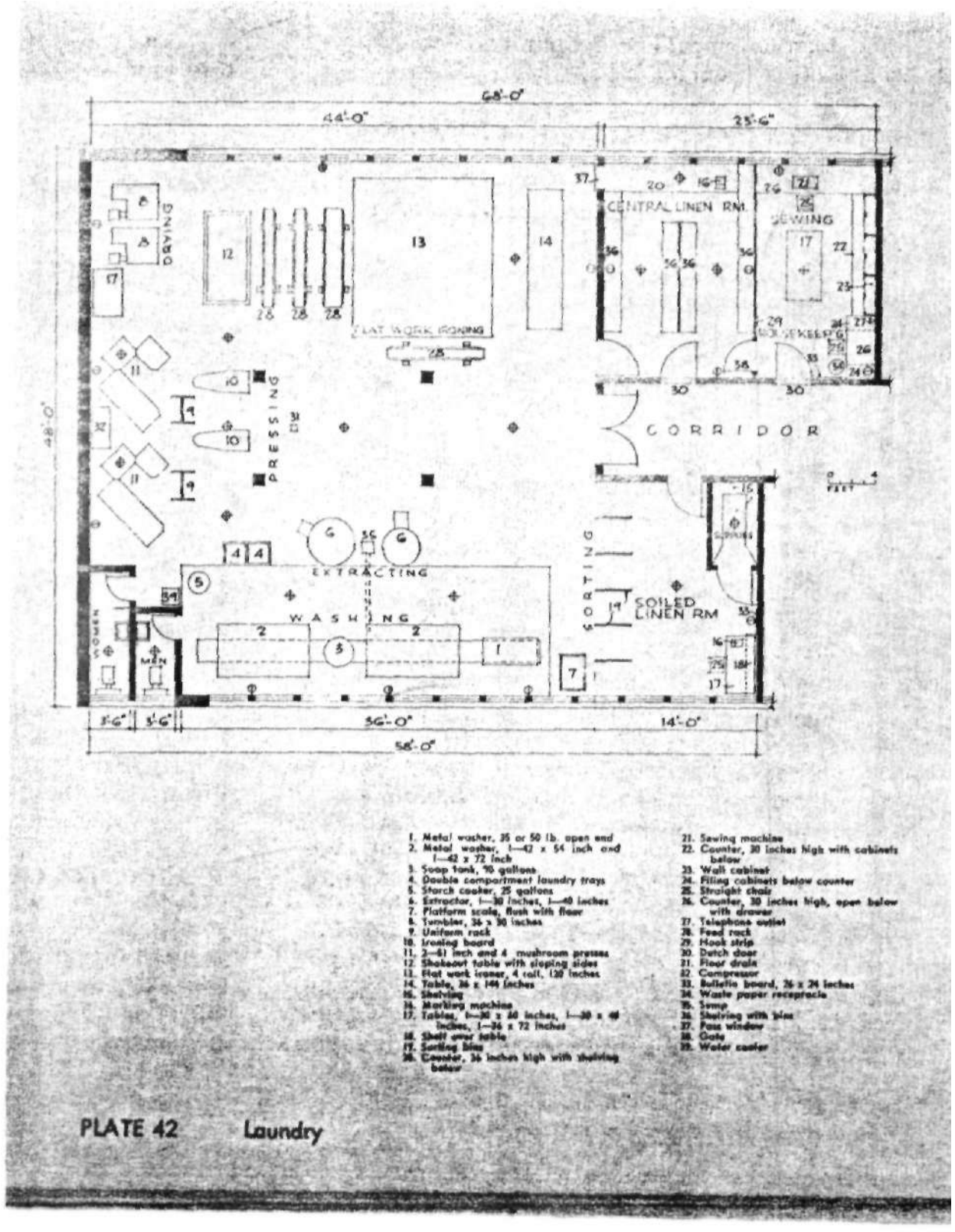


FIGURE 32 - LAUNDRY UNIT

Stores include:

- Pharmacy main store with separate volatile store.
- Bulk food store for non-perishable foods
- Furniture store
- Hospital equipment stores

Apart from the main store area there is need for:

- Offices for clerks and supervisors
- Receiving room with counters
- Work space for finishing outgoing goods.

The stores should be grouped in such a way that they are easily accessible to vehicles bringing in fresh supplies.

The U.S.P.H.S. recommends as a minimum $2M^2$ per bed for average hospit situated near the central market of the area.

See clean materials flow diagram in figure 31.

THE KITCHEN

The hospital kitchen serves food to hospital inpatients and employees In some cases out-patients are also considered but this depends on the hospital policy.

It relies upon central general stores for receiving all food and the storage of non-perishables until drawn for use.

Location is governed by the essentials of direct access to a service entrance, light and air. Consideration should be given to distance of travel to the nursing units and the staff dining room. The location should ensure that noise or cooking odour emanating from the kitchen do not affect the other hospital departments.

Food Distribution objective is to serve palatable food, i.e. hot foods hot, cold foods cold, etc. Three distribution methods are used:-

a) The central Tray Service where trays are completely assembled in the main kitchen. Food is served into the plates and plates in groups of 16 to 20 are taken to the patients care unit. This method allows control at one central point and reduces the ward kitchen to a small pantry. However, it has the disadvantage of taking a long time to transport and hence increases the risk of serving cold food to the patient.

b) Decentralized: Trays are set up in the ward kitchen. Hot food is brought from the central kitchen in bulk and is served into the plates on the ward kitchen. The served plates are carried to the patients in small groups of 3 to 4. After meals, trays and plates are cleaned in floor kitchen and kept for next service.

This method reduced time from serving of plates to recepit by the patient. The total serving time is longer and the three stage process of handling food makes it less palatable. There is a poor utilization of staff arising from decentralizing the servic

c) The third method, called, bedside food service uses the floor pantry for making up the plates, short of placing the food on ther the empty plates are wheeled out and distributed among the patien When the food is brought in bulk in insulated food cast from the main kitchen, the food is served into the plates infront of the patient. This provides the patient with the type and quantity of food he needs.

Elements of a kitchen are:-

a) Kitchen stores for storing of foods and equipment.

These include:-

- Cold store for meat and fish
- Vegetable cold store
- Equipment store
- General store

b) Preparation area for meat and fish prepation, vegetable preparatio special diets, etc.

c) Cooking and service area.

d) Food Trolleys washing and parking

e) General Wash up space

f) Staff facilities such as:

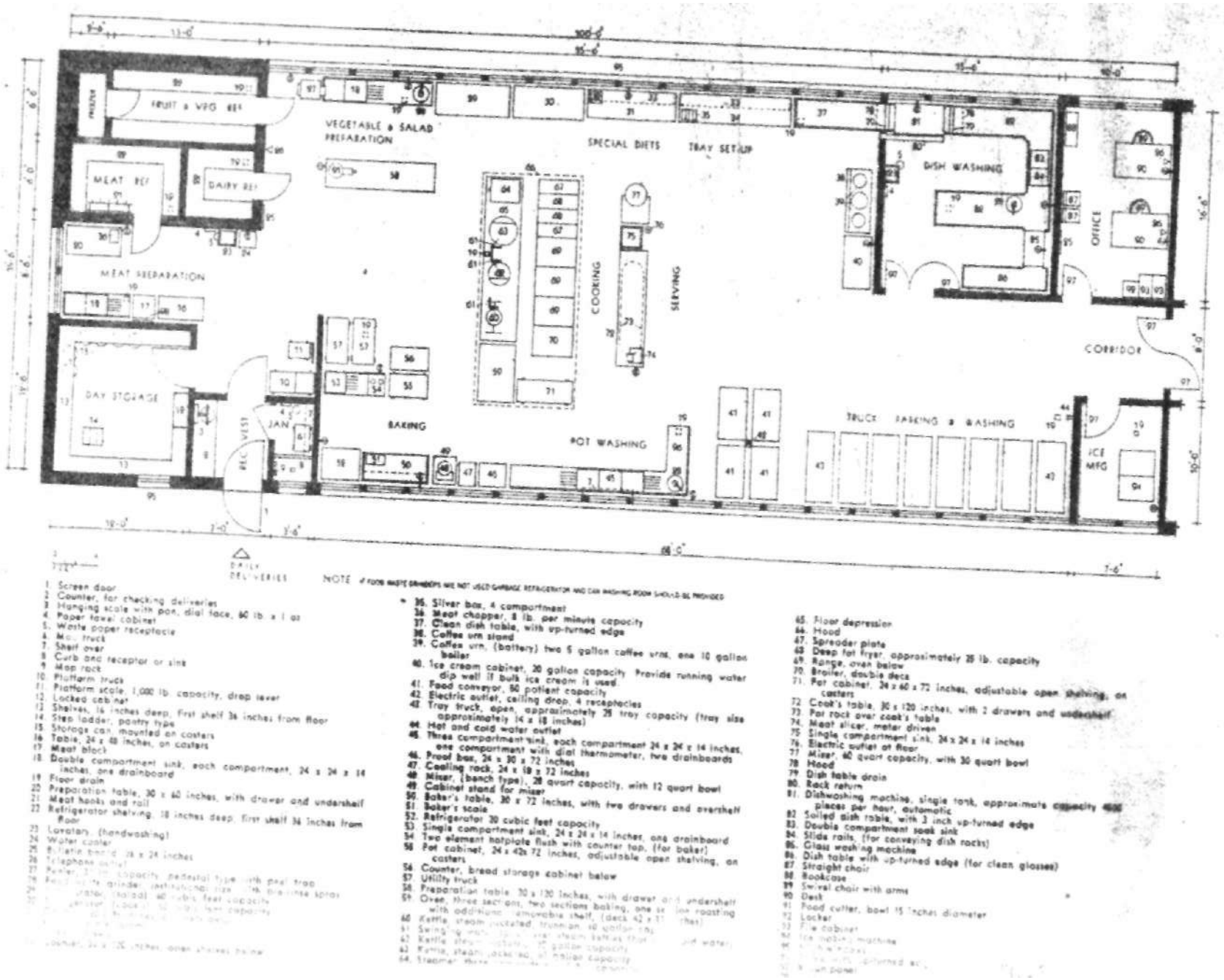
- Catering officer's office
- Dietitian's office
- Changing roons
- Lavatories
- Staff rest room.

g) Refuge and swill disposal

- bins
- Empties

See plan in figure 33 for equipments and space relationships.

The size of the hospital kitchen is determined by the number of meals the kitchen is expected to serve at any one time. The United States Public Health Service recommends $144M^2$ for a 50 beds general hospital, $233M^2$ and $335M^2$ for 100-beds and 200-beds general hospitals respectively.



1. Screen door
2. Counter, for checking deliveries
3. Hanging scale with pan, dial face, 60 lb. x 1 oz
4. Paper towel cabinet
5. Waste paper receptacle
6. Mop truck
7. Shelf over
8. Curb and receptor or sink
9. Mop rack
10. Platform truck
11. Platform scale, 1,000 lb. capacity, drop lever
12. Locked cabinet
13. Shelves, 16 inches deep, first shelf 36 inches from floor
14. Step ladder, pantry type
15. Storage can, mounted on casters
16. Table, 24 x 48 inches, on casters
17. Meat block
18. Double compartment sink, each compartment, 24 x 24 x 14 inches, one drainboard
19. Floor drain
20. Preparation table, 30 x 60 inches, with drawer and undershelf
21. Meat hooks and rail
22. Refrigerator shelving, 18 inches deep, first shelf 36 inches from floor
23. Lavatory, (handwashing)
24. Water cooler
25. Bulletin board, 24 x 24 inches
26. Telephone outlet
27. Range, 36 inch, 4 burner, with griddle and oven, (optional, 60 cubic feet capacity)
28. Refrigerator, 30 cubic feet capacity
29. Single compartment sink, 24 x 24 x 14 inches, one drainboard
30. Two element hotplate flush with counter top, (for baker)
31. Pot cabinet, 24 x 42x 72 inches, adjustable open shelving, on casters
32. Counter, bread storage cabinet below
33. Utility truck
34. Preparation table, 30 x 120 inches, with drawer and undershelf
35. Oven, three section, two sections baking, one section roasting with additional removable shelf, (deck 42 x 72 inches)
36. Silver box, 4 compartment
37. Meat chopper, 8 lb. per minute capacity
38. Clean dish table, with up-turned edge
39. Coffee urn stand
40. Coffee urn, (battery) two 5 gallon coffee urns, one 10 gallon boiler
41. Ice cream cabinet, 20 gallon capacity. Provide running water dip well if bulk ice cream is used
42. Food conveyor, 60 patient capacity
43. Electric outlet, ceiling drop, 4 receptacles
44. Tray truck, open, approximately 25 tray capacity (tray size approximately 14 x 18 inches)
45. Hot and cold water outlet
46. Three compartment sink, each compartment 24 x 24 x 14 inches, one compartment with dial thermometer, two drainboards
47. Proof box, 24 x 30 x 72 inches
48. Cooling rack, 24 x 18 x 72 inches
49. Mixer, (bench type), 28 quart capacity, with 12 quart bowl
50. Cabinet stand for mixer
51. Baker's table, 30 x 72 inches, with two drawers and overshelf
52. Baker's scale
53. Refrigerator 30 cubic feet capacity
54. Single compartment sink, 24 x 24 x 14 inches, one drainboard
55. Two element hotplate flush with counter top, (for baker)
56. Pot cabinet, 24 x 42x 72 inches, adjustable open shelving, on casters
57. Counter, bread storage cabinet below
58. Utility truck
59. Preparation table, 30 x 120 inches, with drawer and undershelf
60. Oven, three section, two sections baking, one section roasting with additional removable shelf, (deck 42 x 72 inches)
61. Kettle, steam jacketed, trunnion, 40 gallon capacity
62. Swing faucet, over steam kettles (hot and cold water)
63. Kettle, steam jacketed, 20 gallon capacity
64. Kettle, steam jacketed, 40 gallon capacity
65. Floor depression
66. Hood
67. Spreader plate
68. Deep fat fryer, approximately 25 lb. capacity
69. Range, oven below
70. Broiler, double deck
71. Pot cabinet, 24 x 60 x 72 inches, adjustable open shelving, on casters
72. Cook's table, 30 x 120 inches, with 2 drawers and undershelf
73. Pot rack over cook's table
74. Meat slicer, motor driven
75. Single compartment sink, 24 x 24 x 14 inches
76. Electric outlet at floor
77. Mixer, 60 quart capacity, with 30 quart bowl
78. Hood
79. Dish table drain
80. Rack return
81. Dishwashing machine, single tank, approximate capacity 4000 places per hour, automatic
82. Soiled dish table, with 3 inch up-turned edge
83. Double compartment soak sink
84. Slide rails, (for conveying dish racks)
85. Glass washing machine
86. Dish table with up-turned edge (for clean glasses)
87. Straight chair
88. Bookcase
89. Swivel chair with arms
90. Desk
91. Food cutter, bowl 15 inches diameter
92. Locker
93. File cabinet
94. Ice cubing machine
95. Counter, 24 x 120 inches, open shelves below
96. Counter, with up-turned edge
97. Wash sink

NOTE: IF FOOD WASTE GRINDERS ARE NOT USED GARBAGE REFRIGERATOR AND CAN WASHING ROOM SHOULD BE PROVIDED

Administration

This include offices for normal running of the hospital and the main entrance hall and public facilities like telephone booths and the like. The administration section deals with public relations matters, employment and purchasing of hospital materials and equipment; medical and nursing staff organization; public health programmes and social service for needy patients.

Offices required for these functions include:

- Administrator and Assistants
- Business or Purchasing offices such as:

  Accountants

  General office and

  Purchasing office.
- Public relations offices
- Medical staff offices
- Nursing staff offices
- Library
- Conference room
- Toilets for males and fenales

Admission Department

The admission unit handles all patient admission and discharge problems as well as records keeping for all in-patients and out-patients.

The admitting office should provide privacy convenient to the main lobby and preferably adjacent to the Social service office. Facilities required within the admitting section are:-

- Office for admitting officer
- Clerical office for records
- Medical screening and interview rooms
- Room for night doctor
- Waiting space for patients and relatives

The records section requires adequate space to handle the anticipated in-patient and out-patient load, and the necessary number of personnel to staff the section. Elements include:

1. Filing space
2. Workspace for sorting and stacking of current records adjoining active records storage
3. Space for records clerks
4. Office for records officer
5. Storage for equipment and supplies

Space required for records keeping depends on the type of filing methods adopted and the method of distributing and collecting records from patients. For details on this see Hospital Design and Function by Todd Wheeler, page 220 - 224.

Maintainance Unit:-

This is a form of workshops for repairs of furniture, painting and general building maintainance. It is the duty of this unit to repair all electrical faults in the hospital and run the hospital standby generator, Thus the units requirements will include workshops for:

Painters

Woodwork

Plumbers

Electricians, etc.

Staff Facilities:

Changing facilities should be provided to enable hospital workers to change from street clothes into hospital garments. There should be some rest or coffee rooms for each department if no central one is provided. Dining facilities are also required so that staff do not have to leave the hospital for their meals.

PART TWO

CASE STUDY

CHAPTER G

MEDICAL CARE IN NIGERIA

Whatever the development stage of a nation or society, adequate health care is considered the right of every individual. Nigeria is currently taking bold steps towards adequate health care provision in the country. In the current development plan, the Federal Military Government intends to pay more attention to the neglected health facilities planning in the country. The Government has intended to increase the bed-population ratio to 5 beds for 1000 inhabitants. However, considering the existing situation in the country - lack of adequate medical and para-medical personnel and peoples response towards using medical care facilities, the Nigerian Medical Association proposed two beds per one thousand people as a planning guide for new health care facilities and three beds per one thousand people in the highly populated urban centres like Lagos, Ibadan, Kano, Kaduna, Enugu, Aba, etc.

The integrated planning proposal is to have one teaching hospital in each of the former twelve state capitals. This institution will function as the medical centre of the entire state and will bring up the needed medical and nursing staff without whom the whole planning will be a failure. Smaller general hospitals will be planted in specific areas of the large urban areas and the rural district headquarters. These will be followed by smaller health centres, clinics and dispensaries, to be built in the urban areas of smaller population and the rural settlements.

Health Care in Urban Kano.

Health care in Kano state is provided by the Government. A few clinics run by private practitioners exist but these are only attended by the few people who can afford the financial expenses. There is one general hospital situated in the old city. It was built in 1925 and is still serving the entire population. It has undergone a lot of physical expansion because of new techniques of medical care and community need. The bed population is now 558 beds divided by services into:

Medical	97 beds
Surgical	101 beds
Gynaecology	41 beds
Orthopaedic	110 beds
Maternity	107 beds
Opthalmology	12 beds
Paediatrics	90 beds
Total:	558 beds

Source: Kano city hospital statistics office 1976.

Another hospital of genral nature is at Nasarawa Government Residential area. This is meant to serve the senior personnel in the civil service and the rick who can pay for their medical services.

The city hospital because of poor location in relation to the entire urban population is able to serve only a very few percent of the people. The hospital is over populated with about 50 to 60 patients accommodated

in wards meant for only 25 patients. This creates a very poor environment for both patients and the hospital staff. The staff have very poor service facilities. For distribution of hospitals in urban Kano see figure 33.

To ease the present load on the existing general hospital, the author intends to prepare a general hospital sketch for the township and commercial area of urban Kano. This will bring medical care closer to the township population of about 95,000 people. The sizing and planning of this hospital proposal will be based on the general hospital study documented in the first part of this writing.

The next chapter shows the necessary vital statistics for the programm

Climatology and Distribution of Population

Kano is situated between latitude 12° north of the equator and longitude 8° east of the greenwich meridian. The climate is of relatively wide and rapid changes in temperature and humidity. The long period average (20 years) relative humidity if between 33% and 65%. The long period average daily minimum and maximum temperature are respectively 19°C and 33°C (1953 - 1973).

The population of Kano state according to 1963 was 5.8M. Population projections for the state is based on 2.5% population growth rate based on Rural Demographic Sample Survey conducted in 1965 - 1966 by the Federal Office of Statistics. For distribution of population see next chapter on statistics.

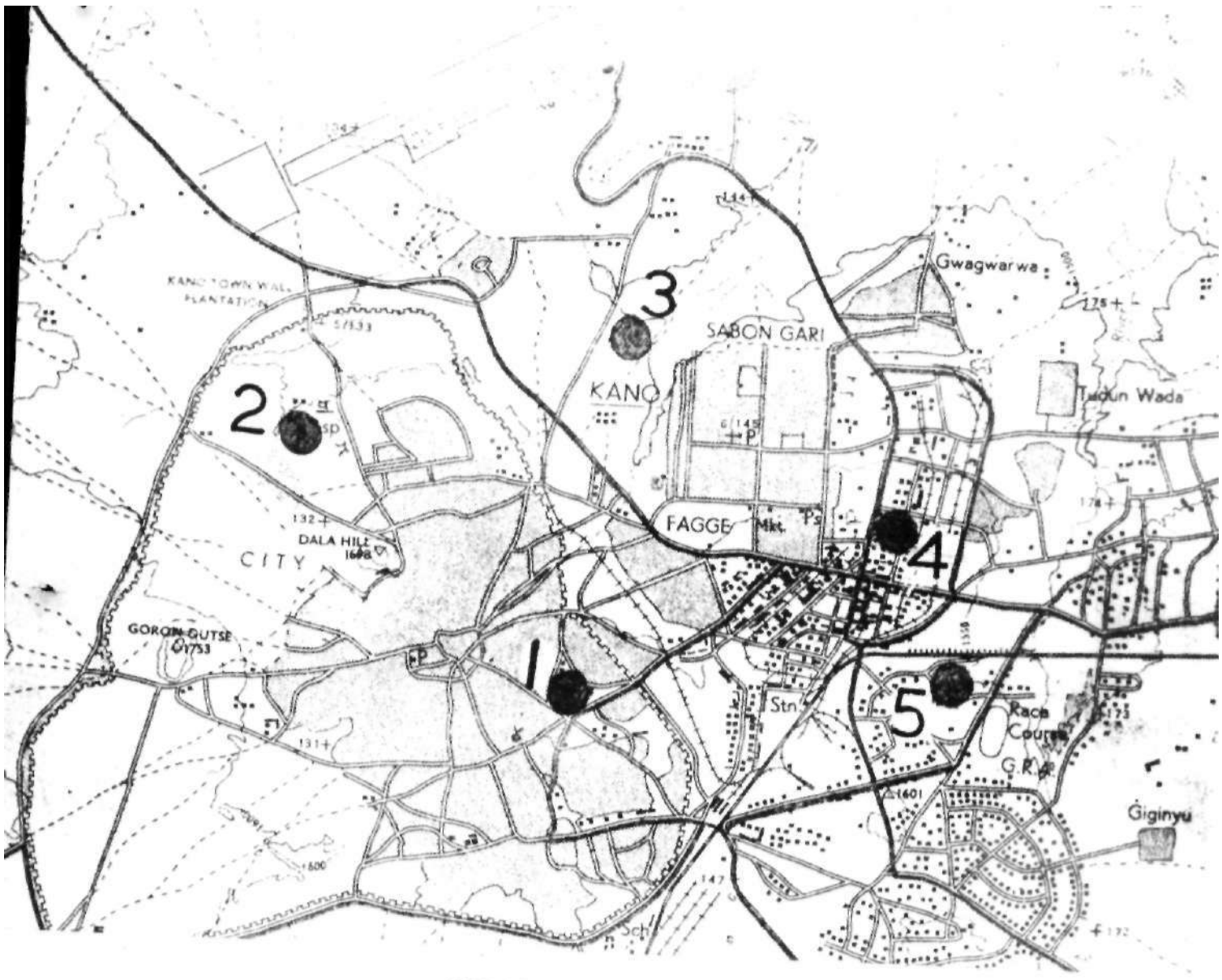


FIGURE 33
DISTRIBUTION OF HOSPITALS

1 city general hospital
2 A.B.U orthopaedic hospital
3 infectious diseases hospital
4 S I M eye hospital
5 nasarawa hospital

EXISTING CONDITION

IN

CITY GENERAL HOSPITAL

KANO



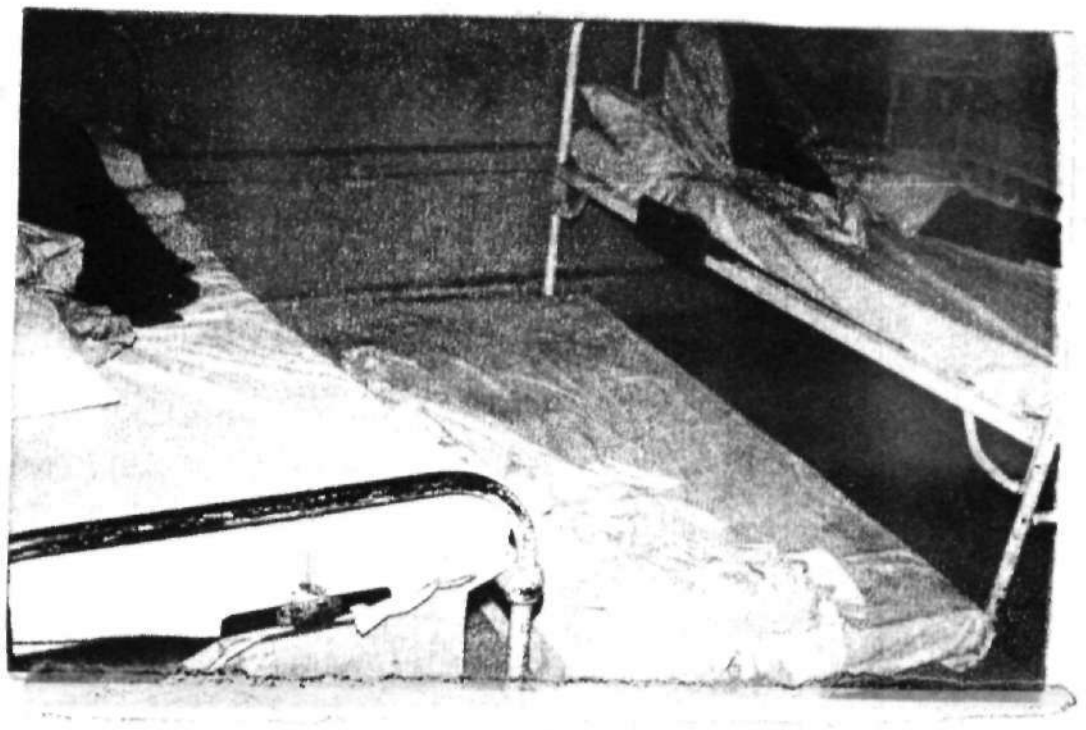


TABLE 3

Kano Mean Daily Maximum abd Minimum Temperature (°C)

Long-period Average (1953 - 1973)

Temp.	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Minimum	13	15	19	23	24	23	21	21	21	20	16	13
Maximum	30	33	39	38	36	33	30	39	31	34	33	31

Year average - Maximum Temp. 33

Minimum Temp. 19

TABLE 4

Rainfall in mm (Long period averages) for Kano - (1953 - 1973)

Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
0.0	0.0	0.3	1.8	9.9	65.3	208.0	.208	306.3	136.7	13.1	0.0

Source: Annual Abstract of Statistics 1973, Federal Office of Statistics, Lagos.

TABLE 5

Kano City Hospital - Surgical Suite Annual Load

Year	No. of Operations/annum
1971	8,160
1972	8.016
1973	10,079
1974	7,561
1975	12.202
Total	46.018
Average load	9,204

TABLE 6

Kano City Hospital - Obstetrical Delivery Suite

Annual Load - 1973 - 1975

Year	Total Deliveries
1973	7,519
1974	7.908
1975	10.027
Total	25,485
Average Annual	8,485

TABLE 7

Kano City Hospital X-Ray Department

Annual Load - 1971 - 1975

	Year						
Type of Exam	1971	1972	1973	1974	1975	Total	Average
Chest	7685	9463	10853	9686	12350	52036	10407
Special	816	809	642	1015	843	4125	825
Other	7400	7678	10730	8093	10800	45401	9080
Number of films used	22850	26754	41962	39968	33950	165484	33097
Average film/ patient	1.5	1.4	1.9	2	1.4	6.8	1.36
Total No. of Exams.	15901	17850	22230	19583	24193	99757	19951

Average Exams: 20,000

Source: Kano city hospital statistics office

Special exams include:

Gastro-International investigations

Intravinal uro

Choleuptograms (gal bladder)

Myelograms, etc.

Others include: skull, spine, abdomen, limbs, elvis.

TABLE 8

Outpatient Annual Attendance

Kano City Hospital 1971 - 1975

Year	Load x 1000
1971	357
1972	364
1973	392
1974	361
1975	515
Average	398

TABLE 9

Inpatient Annual Load

Kano City Hospital 1971 - 1975

Year	Load x 1000
1971	20.2
1972	21.5
1973	27.2
1974	15.4
1975	18.4
Average load	20.54

TABLE 10

Desirable Health Manpower and Facilities in Nigeria -

Compiled in 1972

Females in reproductive age groupd	-	15% of population
Paediatric beds in a General hospital	-	15% of total beds
Nursing staff	-	1/1000 people
Bed compliment	-	2 - 3 beds/1000 people
Medical Practioners	-	1/10,000 people
Dental Practitioners	-	1/100,000 people
Pharmacists or other technicians	-	3/100,000 people
Technologists	-	1/10,000 people
Social welfare officers	-	2/100,000 people
Social welfare workers	-	6/100,000 people

Prepared by Babalola, A.A. Dada, Consultant Medical Statistitian i/c, Medical Statistics Division, Lagos State Ministry of Health 1972.

Kano Metropolitan Population Census Projections by District. 1974 - 1985

District	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Kano City	193.7	198.5	202.5	208.6	213.8	219.1	224.6	230.2	236.0	242.8	248.9	255.1
Waje	194.0	199.0	203.0	209.0	214.4	220.5	225.3	231.2	237.3	244.1	250.0	256.4
Ungogo	115.1	118.0	120.9	123.9	126.0	129.15	132.1	135.3	138.0	141.4	144.3	147.1
Kumbotso	110.8	113.6	116.4	119.5	121.2	124.4	127.0	131.0	134.1	137.3	140.4	143.8

Source: Kano State Statistical Year Book 1970 (Population Projected from the 1963 Population Census)

Population of Kano Township and Surrounding Areas 1963, 1975 and 1985

Area	Population		
	1963	1975	1985
Commercial area	3,755	4,882	6,102
Sabon Gari	31,883	41,448	51,810
Gama	2,418	3,143	3,929
Gwagwarwa	14,562	18,930	23,662
Motor Park	1,332	1,732	2,165
Abdie Sanusi	982	1,276	1,595
Fagge ta Kudu	588	714	892
Fagge ta Gaba	353	459	674
Fagge A	2,480	3,224	4,030
Fagge B	16,024	20,831	26,039
Total	96,377	96.639	121,898

Source: Northern Nigeria Population Census 1963

Projected using 2.5% Populatihn Growth.

Percentage Distribution of Kano Urban Population by age

(0 - 19 years)

5 Year Age Groups	% Population
0 - - 4	16.5
5 - 9	13.1
10 - 14	8.5
15 - 19	12.4

Source: Kano State Statistical Year Book 1970

Published by Military Governor's Office,

Economic Planning Division,

Kano State.

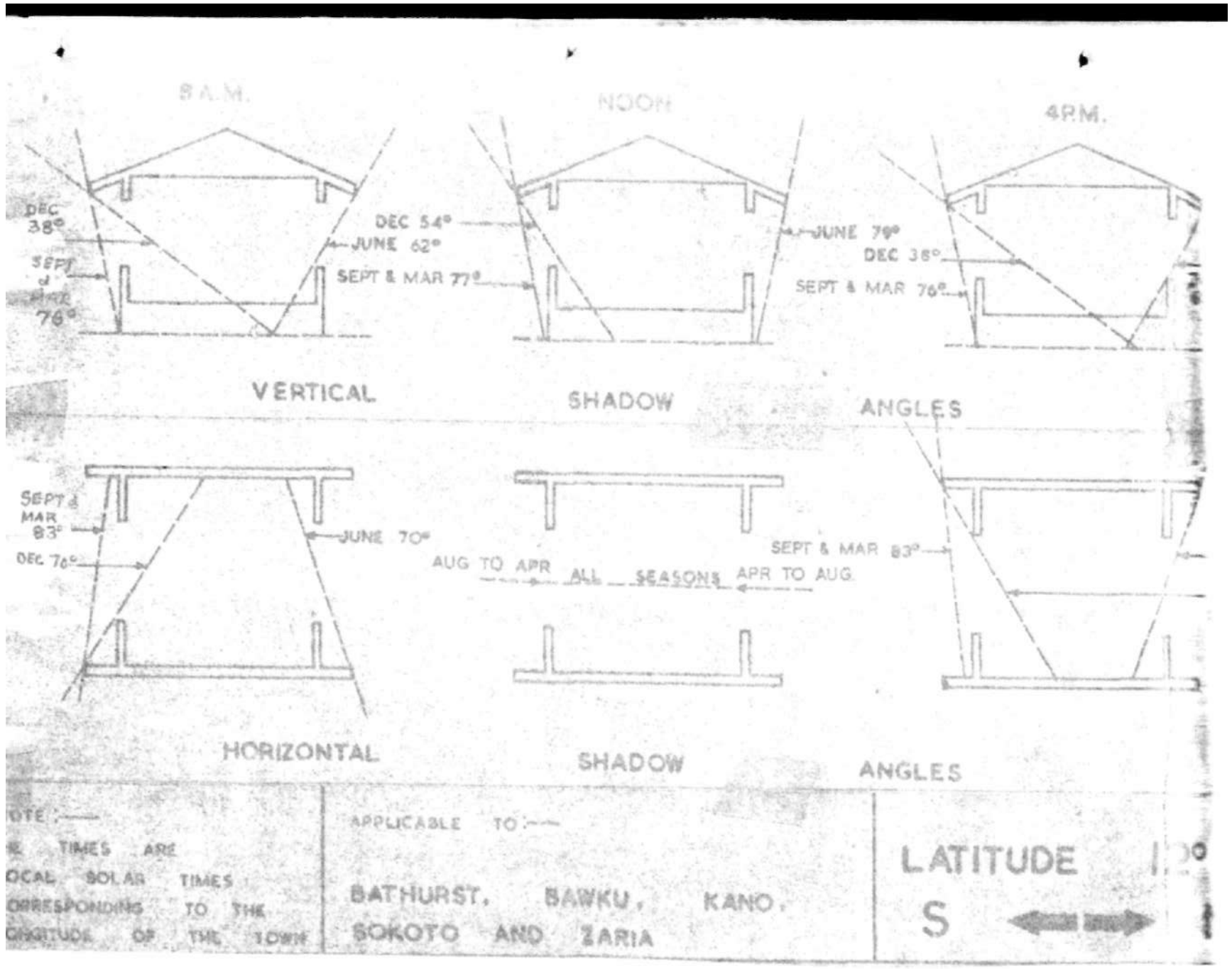

8 A.M.
NOON
4 P.M.
DEC 38°
SEPT & MAR 76°
DEC 54°
JUNE 62°
SEPT & MAR 77°
JUNE 79°
DEC 38°
SEPT & MAR 76°
VERTICAL SHADOW ANGLES
SEPT & MAR 83°
DEC 76°
JUNE 70°
AUG TO APR
ALL SEASONS
APR TO AUG
SEPT & MAR 83°
HORIZONTAL SHADOW ANGLES
OTE :—
TIMES ARE
OCAL SOLAR TIMES
ORRESPONDING TO THE
GNITUDE OF THE TOWN
APPLICABLE TO :—
BATHURST, BAWKU, KANO,
SOKOTO AND ZARIA
LATITUDE
S

FIG 2a

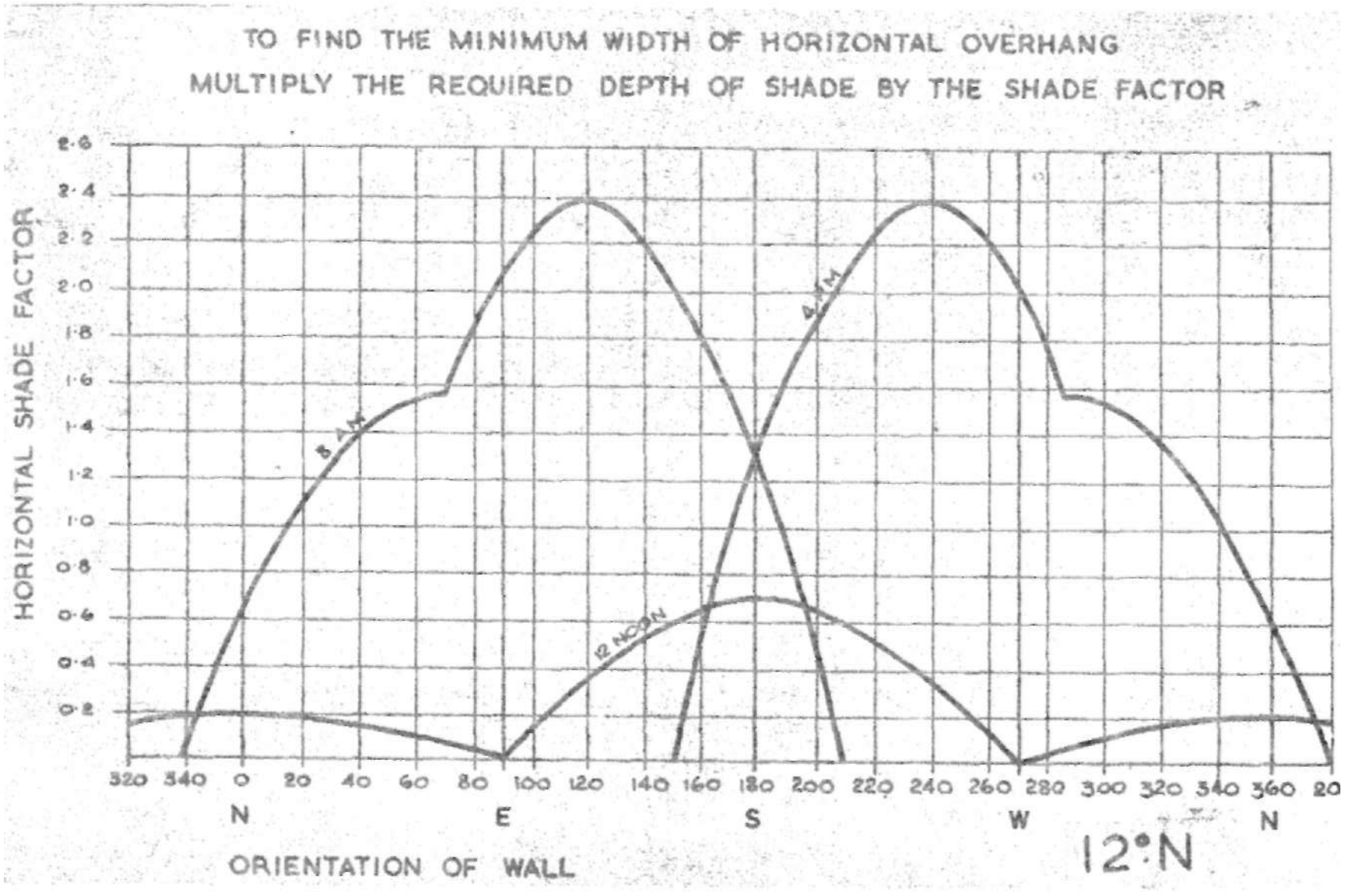

TO FIND THE MINIMUM WIDTH OF HORIZONTAL OVERHANG
MULTIPLY THE REQUIRED DEPTH OF SHADE BY THE SHADE FACTOR
HORIZONTAL SHADE FACTOR
2·6
2·4
2·2
2·0
1·8
1·6
1·4
1·2
1·0
0·8
0·6
0·4
0·2
8 AM
4 PM
12 NOON
320 340 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 20
N E S W N
ORIENTATION OF WALL
12°N

FIG 21

CHAPTER I

HOSPITAL BED NEED.

The population of Kano Township as projected from the 1963 National population census is as follows:

1975 - 94,000 inhabitants

1985 - 140,000 inhabitants

In accordance with the Nigerian Medical Association recommendation of 3 hospital beds per 1000 inhabitants. There wil be

282 beds for a population of 94,000 and

420 beds for a population of 140,000

The programme is divided into two phases. The first phase will be general hospital of 300 beds capable of expanding to 400 by 1985. Thus the second phase will be an expansion programme of 100 beds.

Distribution of beds by services:

Medical beds	- 25%	=	75 beds
Surgical beds	- 35%	=	105 beds
Obstetric beds	- 20%	=	60 beds
Paediatric beds	- 15%	=	45 beds
Intensive care	- 5%	=	15 beds
Total beds	- 100%	=	300 beds

A nursing Unit will accommodate a minimum of 32 patients with 4 single rooms for Isolation. The paediatric floor will be designed to accommodate all the 45 patients in cribs, normal beds and bassinets according to age distribution.

Schedule of Accommodation

1. Medical Nursing Unit:

There will be two nursing floors each accommodating 32 patients, with 4 single-bed rooms for Isolation or intensive care of patients.

Accommodation - One Nursing Floor

Space or room Designation	Number of rooms	Size of each room M^2	Total area M^2
4-bed room	7	43.56	304.92
1-bed room	4	16.50	55.00
Head Nurses off.	1	10.00	10.00
Nurses station & Medication	1	18.00	18.00
Nurses changing	1	10.00	10.00
Exam & Treatment	1	18.00	18.00
Clean utility room	1	12.00	12.00
Dirty utility room	1	12.00	12.00
Pantry	1	10.00	10.00
Doctors room	1	10.00	10.00
Day room	1	43.00	43.00
Storage linen & supplies	1	10.00	10.00

Accommodation - One Nursing Floor (Cont.)

Space or room Designation	Number of rooms	Size of each room M^2	Total area M^2
Cleaners room	1	10.00	10.00
Waiting space for relatives	1	10.00	10.00
Birth room	1		18.00
Patients toilet	11	$1.5M^2$	16.5
Total			597.00

There will be two of such floors for medical patients. Three floors will be used for surgical patients care. These will accommodate 96 patients. The remaining 9 beds will be in an intensive care floor. Surgical nursing unit requires the same accommodation as medical nursing unit.

The total area for medical, surgical and intensive care units will be six floors, that is $3582.00M^2$ ($597.00M^2$ per floor).

Obstetric Patient Care Unit

Total number of beds here is sixty. Sixty four bassinets will be provided. Isolation and premature bassinets will be accommodated in the Paediatric and delivery suites respectively. Infectious babies are best cared in the paediatric nursing unit where there is appropriate staff

to handle them. Premature infants are best cared within the delivery suite because such infants should not be moved through a long distance immediately after dolivery. Two floors will accommodate the mothers and their babies. The accommodation requirement is basically the same as any medical or surgical unit with an additional space for the babies. The additional requirement is thus:

Obstetric floor additional accommodation

Room Designation	Number of rooms	Area per room M^2	Total area M^2
Babies nursery	8	22.00	176.00
Workroom for above	2	10.00	20.00
Examination room	2	10.00	20.00
Total area:			216.00

Therefore Total area of each obstetric nursing floor will be

216.00 + 597.00 = 813.00 M^2

Total area for two floors = 2 x 813.00 = 1626.00M^2

Paediatric Patients Nursing Unit

The need here is accommodation for 45 patients within the age of 0 - 14 years. Thus adult size beds, small beds and bassinets will be provided according to the distribution of population of children within this age group.

There will be in this unit:

18 bassinets including those for Isolation

12 adult size beds and

15 small beds

Supporting service rooms are the same as in any other unit. The bassinets section will require their separate work a d exam rooms. The area of the unit will be about 813.00M^2

Diagnostic and Therapeutic Services:

1. Surgical Operating Suite:

The recommendation here is that one operating room should be provided for every fifty hospital beds (See research section). There will be 6 operating rooms in the proposed hospital. Twelve recovery beds will be needed.

11 JAN1978

Accommodation:

Space Designation	Number of roons	Size of each room M^2	Total area M^2
1. Operating Room	6	40.00	240.00
2. Scrubbing room	3	10.00	30.00
3. Work/sterilization room	3	10.00	30.00
4. Preparation room	2	20.00	40.00
5. Anaesthesia store	1	10.00	10.00
6. Anaesthesiologist's office	1	10.00	10.00

Accommodation (Cont.):

Space Designation	Number of rooms	Size of each room M^2	Total area M^2
7. Plaster room	1.	18.00	18.00
8. Recovery room	1	72.00	72.00
9. Sterile store	1	18.00	18.00
10. Nurses restroom and lockets	1	36.00	36.00
11. Doctors restroom and lockets	1	36.00	26.00
12. Nurses station	1	18.00	18.00
13. Head Nurses office	1	10.00	10.00
14. General storage	1	10.00	10.00
15. Clerks & records	1	18.00	18.00
16. Stretcher alcove	1	6.00	6.00
17. Reception space	1	10.00	10.00
18. Cystoscopy room	1	36.00	36.00
19. Darkroom	1	15.00	15.00
20. Office	1	10.00	10.00
21. Toilet	1	2.00	2.00
Total	31	-	675.00M^2

2. Obstetric Delivery Suite:

Number of deliveries anticipated is about 5,000 per annum. Number of deliveries per day is equal to $5000/_{365}$. Labour period is usually six to 8 hours. Therefore number of deliveries per room per day is about four. Therefore number of rooms:

$$N = \frac{5000}{365 \times 4} = 3.5 \text{ rooms.}$$

Therefore number of delivery rooms required is four. Labour rooms should be in the ratio of one delivery room to two labour rooms. Supporting servic rooms depend on the number of delivery rooms in the suite.

Accommodation required:-

Room Designation	Number of rooms	Size of each room M^2	Total area M^2
1. Delivery room	4	40.00	160.00
2. Labour room + Toilet	8	20.00	160.00
3. Scrubbing room	2	10.00	20.00
4. Work room	2	10.00	20.00
5. Anaesthesia store	1	10.00	10.00
6. Anaesthesiologist	1	10.00	10.00
7. Nurses station	1	18.00	18.00
8. Head Nurse	1	10.00	10.00
9. Doctors night room	1	15.00	15.00
10. Nurses lockers & rest room	1	36.00	36.00

Accommodation required (Cont.)

Room Designation	Number of rooms	Size of each room M^2	Total area M^2
11. Doctors lockers and rest room	1	36.00	36.00
12. Sterile store	1	18.00	18.00
13. None sterile store	1	10.00	10.00
14. Reception & records	1	18.00	18.00
15. Recovery room	1	40.00	40.00
16. Relatives waiting room	1	40.00	40.00
17. Public toilet	2	10.00	10.00
Total:			631.00

Radiology Department:

The proposed hospital is expected to serve 16,000 radiology patients. The hospital will provide only diagnostic services. Radiotherapy patients will be transfered to the nearby more advanced teaching hospital.

Number of diagnostic rooms required for 16,000 investigations per annum is 4 (See research text for calculation method). Other facilities in the department are dependent on the number of X-ray rooms. The rooms will be used for both radiography and fluoroscopy for flexibility in use.

Schedule of Accommodation:

Room Designation	Number of rooms	Size of each room M^2	Total area M^2
1. Reception room	1	18.00	18.00
2. Patients waiting room	1	43.00	43.00
3. Patients toilets	2	10.00	20.00
4. Record room	1	36.00	36.00
5. Trolley waiting room	1	5.00	5.00
6. Dressing cubicles	12	3.00	36.00
7. WC for barium patients	4	1.50	6.00
8. Diagnostic rooms	4	36.00	144.00
9. Portable units store	1	18.00	18.00
10. Barium kitchen	1	5.00	5.00
11. Darkroom	1	8.00	8.00
12. Viewing & film sorting	1	18.00	18.00
13. Radiologists office	1	10.00	10.00
Radiographers room	2	10.00	20.00
Staff room	1	43.00	43.00
Staff toilet	2	10.00	20.00
General store	1	10.00	10.00
Film Sore	1	4.00	4.00
Cleaners' store	1	10.00	10.00
Total:			364.00

Physical Medicine:

Occupational Therapy will be established when the hospital reaches its maximum size of 400 beds. Mr. Britgh's formula (see research text- physical medicine) has been used to calculate the required space for occupational therapy.

Schedule of accommodation - Physiotherapy:

Physiotherapy - Accommodation

Room Designation	No. of rooms requires	Size of each room M^2	Total Area M^2
1. Waiting space	1	18.00	18.00
2. Patients toilet	2	8.00	16.00
3. Wheel chair park	1	8.00	8.00
4. Reception	1	10.00	10.00
5. Records room	1	10.00	10.00
6. Treatment cubicles	6	5.00	30.00
7. Changing rooms	2	10.00	20.00
8. Active treatment room	1	100.00	100.00
9. Tank room	1	36.00	36.00
10. Examination room	1	18.00	18.00
11. Staff room	1	18.00	18.00
12. Staff toilets	1	8.00	8.00
13. Office	2	10.00	20.00
14. General store	1	10.00	10.00
15. Cleaners room	1	6.00	6.00
16. Open court	-	-	-
Total			328.00M^2

Pathology Department:

The types of services here depend on the diseases commonly occuring in the tropics. In accordance with what exists in the present hospital, this proposed hospital will provide services in the following pathology units:

1. Chemistry and Parasitology
2. Biochemistry
3. Microbiology
4. Haematology and serology
5. Histology

Schedule of accommodation (Pathology)

Room Designation	No. of rooms required	Size of each Room - M^2	Total area M^2
1. Patients' waiting room	1	18.00	18.00
2. Patients' toilets	2	9.00	18.00
3. Patients Exam. room	1	10.00	10.00
4. Records and clerks	1	18.00	18.00
5. Pathologists' office	1	10.00	10.00
6. Head technician	1	10.00	10.00
7. Histology laboratory	1	36.00	36.00
8. Storage and specimen cutting	1	10.00	10.00
9. Cytodiagnosis room	1	18.00	18.00
10. Chemical pathology	1	54.00	54.00
11. Balance room	1	10.00	10.00

Schedule of Accommodation (Pathology) (Cont.)

Room Designation	No. of rooms required	Size of each room - M^2	Total area M^2
12. Glass washing room	1	10.00	10.00
13. Haematology lab.	1	54.00	54.00
14. Blook bank	1	18.00	18.00
15. Transfusion lab.	1	10.00	10.00
16. Microbiology	1	44.00	44.00
17. Media Kitchen	1	10.00	10.00
18. Storage for equipment	1	10.00	10.00
19. Staff coffee room	1	18.00	18.00
20. Staff toilet	1	10.00	10.00
21. EIR room	1	13.00	13.00
22 Preparation room	1	13.00	13.00
23. EKG room	1	13.00	13.00
Total			435.00M^2

Pharmacy Department:

In this hospital the function of the pharmacy department will be compounding and dispensing. It will handle all distribution of drugs, chemicals and injectable solutions to the various hospital departments.

Accommodation requirement:

Space Designation	Number of rooms	Size of room M^2	Total area M^2
1. Compounding and dispensing area		50 M^2	50
2. Office	1	10	10
3. Patental solutions	1	10	10
4. Active storage	1	25	25
5. Clerks office	1	18	18
6. Volatile liquids store	1	10	10
7. Waiting space males	1	30	30
8. Waiting space females	1	45	45
9. Distribution space	1	18	18
Total:			216 M^2

7. Outpatients Department:

The annual load of outpatients in the present Murtala Mohammed Hospital is about ½ the population of Kano.

Accordingly, it is assumed here that the outpatient load of the new hospital will amount to about half the population of the area. Thus about 70,000 people will attend the hospital as outpatients. These will be devided amongst the various clinics. The services which will be rendered here will be:

1. Medical
2. Surgical
3. Dental
4. Opthalmplogy (ENT)
5. Otolarijugology (ENT)
6. Maternity and gynaecology and Paediatrics
7. Social services.

Working hours per day are six and outpatient services will be rendered throughout this period.

Because of social requirement, the out-patients department will be in two sections - Males and females. The maternity services are provided closer to the delivery unit of the hospital to facilitate better utilization of staff.

Outpatients Department space requirement

Space Designation	Number of rooms needed	Size of each room M^2	Total area M^2
A. General Medical			
1. Consulting/Exam	4	18.00	72.00
2. Treatment rooms	4	15.00	60.00
B. General Surgical			
1. Consulting/Exam	4	18.00	72.00
2. Exam/Treatment	2	18.00	36.00
C. Orthopaedic			
1. Consulting	2	15.00	30.00
2. Treatment	2	18.00	36.00
3. Waiting & Records	2	25.00	50.00
D. Opthlmology			
1. Consulting & Test	2	20.00	40.00
2. Darkroom	2	10.00	20.00
3. Waiting	2	20.00	40.00
4. Records	2	10 00	20.00
E. ENT			
1. Consulting/Exam	2	18.00	36.00
2. Test room	2	10.00	20.00
3. Records	2	10.00	20.00

O.P.D. Cont.

Space Designation	Number of rooms needed	Size of each room M^2	Total area M^2
F. Paediatrics clinic			
1. Consulting/Exam	2	18.00	36.00
2. Treatment room	2	18.00	36.00
G. Maternity clinic			
1. Consulting	2	18.00	36.00
2. Exam & treatment	2	18.00	36.00
3. Instruction class	1	40.00	40.00
4. Formula room	1	18.00	18.00
H. Dermatology clinic			
1. Consulting/Exam	2	18.00	36.00
2. treatment	2	18.00	36.00
I. Dental unit			
1. Surgical rooms	2	18.00	36.00
2. Recovery rooms	2	10.00	20.00
3. Workrooms	2	10.00	20.00
J. Gynaecology unit			
1. Consulting/Exam	1	18.00	18.00
2. Exam/Treatment	1	18.00	18.00

O.P.D. (Cont.)

Speace Space Designation	Number of rooms needed	Size per room M^2	Total area M^2
1. Nurses station for control	2	18.00	18.00
2. General waiting	2	50.00	100.00
3. Patients toilet	2	18.00	36.00
4. Dispensing pharmacy			
5. Storage for supplies	2	10.00	20.00
6. Storage for equipment	2	10.00	20.00
7. Head nurses office	2	10.00	20.00
8. Doctors lounge	1	20.00	20.00
Total:			936.00 M^2

8. Emergency Department:

A small operating theatre is provided for minor operations not requiring the use of anaesthesia. The department, in conjunction with the surgical suite will care for accident cases.

Space requirement:

Space Designation	Number of rooms needed	Size per room M^2	Total area M^2
1. Ambulance parking & unloading	1	25.00	25.00
2. Reception room	1	10.00	10.00
3. Preparation room	1	18.00	18.00
4. Waiting room	1	30.00	30.00
5. Surgical treatment room	1	18.00	18.00
6. Exam/consulting	1	18.00	18.00
7. Nurses station	1	18.00	18.00
8. Work room	1	18.00	18.00
9. Observation beds	1	36.00	36.00
10. Theatre	1	30.00	30.00
11. Plaster room	1	18.00	18.00
12. Office for night clerk	1	10.00	10.00
13. Small room for night clerk	1	9.00	9.00
14. Public toilet	2	9.00	18.00
15. Scrub/work room	1	18.00	18.00
Total			292.00

Supporting Service Units

1. Central Sterile Supplies:

This unit will be responsible for supplying all sterile requirements of the entire hospital. It will also receive for sterilization used equipment, instruments and materials from the various departments.

Accommodation requirement:

Room Designation	No. of rooms required	Size of each room M^2	Total are M^2
1. Receiving and sorting	1	20.00	20.00
2. Wash up space	1	20.00	20.00
3. Gloves and instruments washing	1	20.00	20.00
4. Clean work area	1	80.00	80.00
5. Sterile store	1	30.00	30.00
6. Non sterile store	1	20.00	20.00
7. Distribution room	1	20.00	20.00
8. Office for supervisor	1	10.00	10.00
Total:			240.00

2. Central General Stores:

This stores all bulk purchases of the hospital. All articles purchased for the hospital's use will pass through here for recording and checking, and if necessary storing.

Requirements:

Room Designation	No. of rooms required	Area per room M^2	Total area M^2
Receiving area	1	30.00	30.00
Clerks Office	1	20.00	20.00
General Stores	1	280.00	280.00
Bulk food stores	1	60.00	60.00
Linen store	1	30.00	30.00
Volatile liquids	1	20.00	20.00
Used equipment	1	230.00	230.00
Total	7		870.00

3. Housekeeping and Laundry

This unit receives for cleaning all used garments and beddings from the nursing units and other departments. The housekeeping section deals with fresh supplies of linen and the general cleaning of the hospital buildings.

Accommodation Requirement

Room Designation	Number of rooms needed	Size of each room M^2	Total area M^2
1. Collection and sorting room	1	23.00	23.00
2. Central workroom and washing area	1	194.00	194.00
3. Storage for supplies	1	23.00	23.00
4. Mending room	1	20.00	20.00
5. Clean storage	1	18.00	18.00
6. Cleaners lockers and toilet	1	25.00	25.00
7. Staff rest room	1	25.00	25.00
8. Housekeeper	1	10.00	10.00
9. Clerks office	1	20.00	20.00
10. Laundery Manager	1	20.00	10.00
11. Distribution point	1	10.00	10.00
Total			278.00

4. The Kitchen and Catering Facilities:

This unit supplies food to the patients nursing units and the staff dining room. It will be responsible for about 1500 meals.

Accommodation Requirement:

Room Designation	Number of rooms needed	Area per room M^2	Total area or rooms M^2
A. Kitchen stores	-	-	-
1. Cold store-meat	1	10.00	10.00
2. Vegetable cold room	1	10.00	10.00
3. General store	1	10.00	10.00
4. Diet store	1	10.00	10.00
5. Cleaners store	1	5.00	5.00
B. Preparation area	-	-	-
1. Meat and Fish	1	20.00	20.00
2. Pastry and sweet	1	10.00	10.00
3. Vegetable	1	10.00	10.00
4. Diet preparation	1	10.00	10.00
C. Cooking area:			
1. Cooking space	1	40.00	40.00
2. Trolleys parking	1	10.00	10.00
3. Trolleys washing	1	10.00	10.00
D. Administration:			
1. Offices	2	10.00	10.00
2. Changing rooms	2	18.00	36.00
3. Toilets	2	6.00	12.00
Total area			213.00 M^2

5. Administration Officers: For the running the hospital operations including employment of staff and local purchases of hospital requiresments. This unit will also deal with public health of the area

Accommodation requirements

Space Designation	Number of rooms	Size of each room M^2	Total area M^2
1. Administrator	1	18.00	18.00
2. Assistant Administrator	1	15.00	15.00
3. Secretary	1	10.00	10.00
4. Personnel employment	1	18.00	18.00
5. General Office	1	30.00	30.00
6. Clerks employment	1	15.00	15.00
7. Public relations officer	1	15.00	15.00
8. Assistant P.R.O.	1	10.00	10.00
9. Chief medical officer	1	15.00	15.00
10. Chief nursing superintendent	1	15.00	15.00
11. Nursing superintendents	3	10.00	10.00
12. Accountant	1	15.00	15.00
13. Purchasing officer	1	15.00	15.00
14. Clerks purchasing	1	15.00	15.00
15. Matrons (Chief)	1	15.00	15.00
16. Clerks - P.R.O.	1	15.00	15.00
17. Senior Health Officer	1	15.00	15.00
18. Pay officer	1	10.00	10.00

Administration - (Cont.)

Space Designation	Number of rooms	Size of each room M^2	Total area M^2
19. Pay Office	1	20.00	20.00
20. Public Health Office	1	20.00	20.00
21. Library	1	30.00	30.00
22. Committee room	2	20.00	40.00
23. Staff changing room	2	60.00	120.00
24. Staff launge	1	50.00	50.00
25. Stationery store	1	18.00	18.00
26. Central enquiry	1	18.00	18.00
27. Telephone exchange	1	10.00	10.00
28. T. E. apparatus	1	6.00	6.00
29. Head porter	1	10.00	10.00
30. Porters room	1	20.00	20.00
31. Mail office	1	20.00	20.00
32. Public telephones	1	10.00	10.00
33. Public toilets	2	10.00	20.00
34. Staff toilet	2	10.00	20.00
Total			673.00

6. Admissions Offices and Records

Space Requirements:

Space Designation	Number of such spaces	Area per space M^2	Total area of spaces M^2
1. Waiting space	1	30.00	30.00
2. Admitting rooms and interview	3	15.00	45.00
3. Current Record room	1	70.00	70.00
4. Long term records	1	130.00	130.00
5. Records officer	1	10.00	10.00
6. Admission Officer	1	10.00	10.00
7. Records Clerks	1	20.00	20.00
8. Distating space	1	10.00	10.00
9. Storage for supplies	1	5.00	5.00
10. Night doctors room	1	10.00	10.00
11. Toilet	1	5.00	5.00
Total			315.99 M^2

7. Maintainance unit - Space Requirement:

Space Designation	Number of rooms needed	Area per room M^2	Total area needed
1. Chief Engineer	1	18.00	18.00
Secretary & typist	1	10.00	10.00
2. Carpenters			
Pipe fitters (plumbers)	1	54.00	54.00
Masons			
3. Painters	1	54.00	54.00
4. Electricians	1	20.00	20.00
5. Power plant	1	30.00	30.00
6. Telephone Exchance	1	18.00	18.00
7. Ambulance parking	3	45.00	45.00
8. Rest room	1	30.00	30.00

CHAPTER J

DESIGN CONCEPTS

Site Selection and Planning:-

The site chosen is the existing site of the township stadium. The stadium will be demolished since a new sports complex for the city is coming up somewhere. The site had the advantage of being the geographi and population centre of the community. It allows a free movement of vehicular and pedestrian traffic.

Roads have been tapped from the existing Airport and France Roads to serve the hospital Main entrance, Emergency and services area. This enables a complete separation of the many hospital traffic. Separate entrances have been provided for

Out-patients and staff

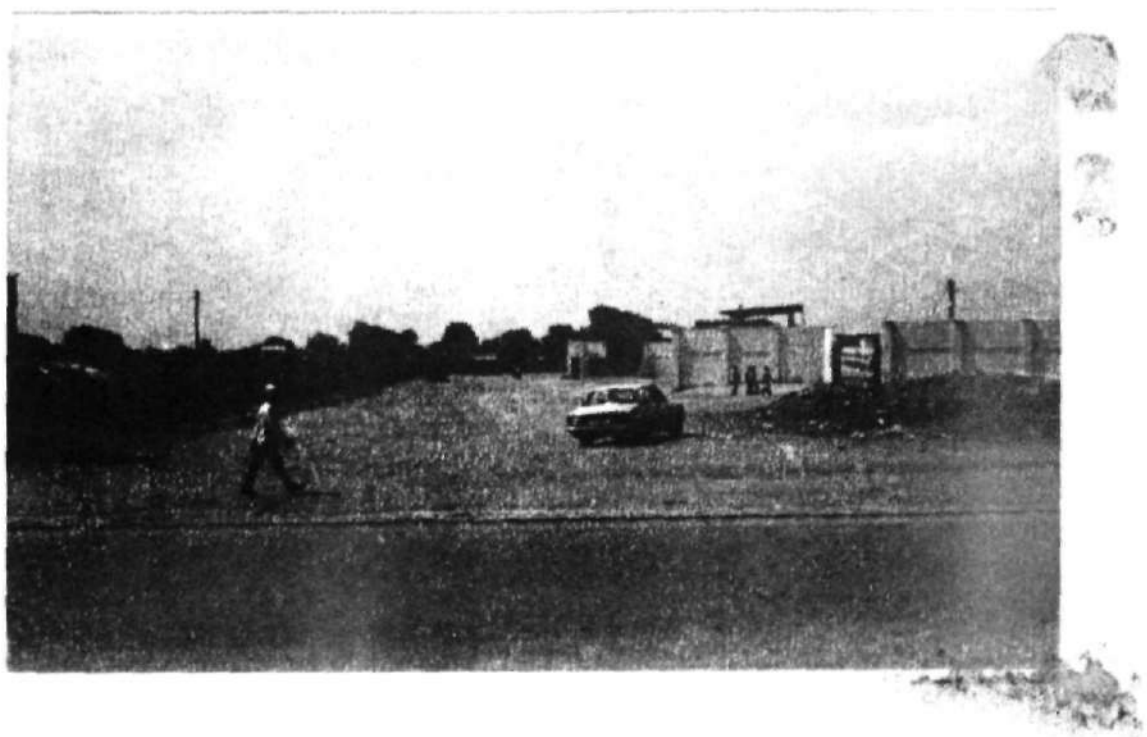
Emergency and motuary

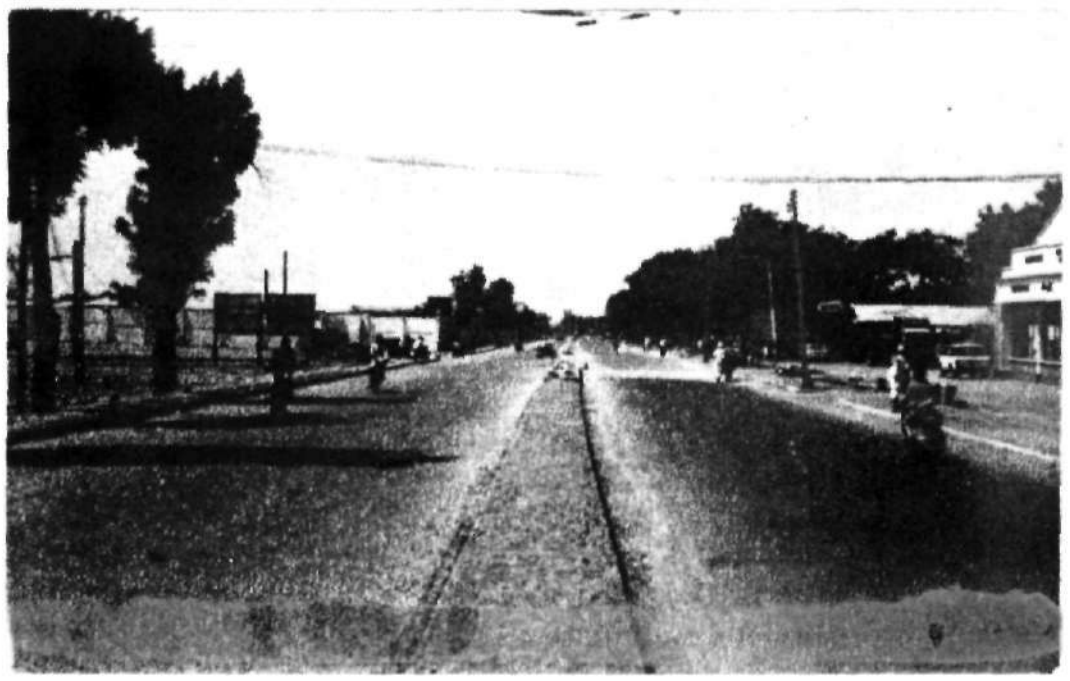
Visitors and staff

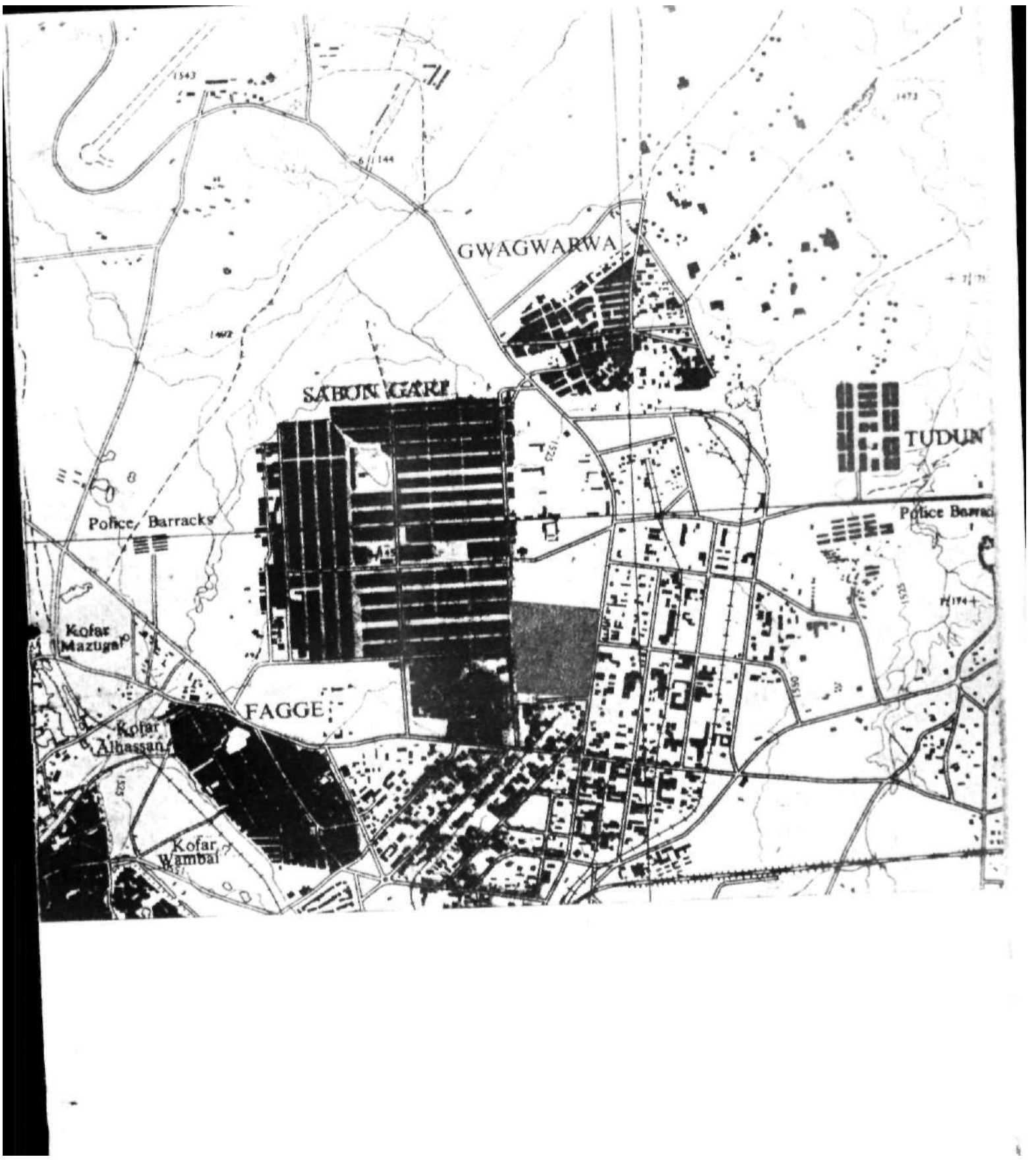
Services.

Withing the complex, the departments have been planned to allow a smooth flow of traffic. This has been achieved by dividing the complex into 4 basic zones namely

1. Services zone
2. Patient care zone
3. Diagnostic and therapeutic area
4. Out-patient and public area.






GWAGWARWA
SABON GARI
TUDUN
Police Barracks
Police Barracks
Kofar Mazugal
FAGGE
Kofar Albassan
Kofar Wambai

The services area has been located adjacent to the existing'France Road' from which its access road is tapped. This road leads to the market area where bulk supplies for the hospital is expected to be purchased. The patient care units are situated away from the two existing roads to reduce noise generated by passing traffic. The out-patient services overlook the main street opposite the hospital main entrance. It has been made possible for patients to be driven right to the main entrance incase of rainy days and necessity. The diagnostic and therapeutic facilities are sandwiched between the out-patients area and the nursing units. This has made it possible for these categories of patients to easily reach these services without any traffic flow conflict between them. The in-patients access the units through separate corridors which are not accessible to out-patients and the public. The emergency section is linked to the main out-patient area with a corridor. It has a separate entrance remote to the main hospital entrance. Accident casualties can be taken to the X-ray or operating suite through a separate emergency corridor which serves emergency maternity women as well.

The motuary unit of the hospital is situated between the radiology and emergency departments in order to keep the distance between the motuary, surgical and delivery suites as short as possible.

A service tower is planned to serve a pair of nursing blocks. At the initial stage one of the towers serves only the paediatrics and obstetric care units block. A second block will be attached to this tower during the second phase of the programme.

THE HOSPITAL COMPLEX

The hospital is a hybrid of the two basic planning concepts 'Mono Block' and 'Pavilion Plan'. The 'mono block' is avoided because such hospitals look monumental and thus makes people feel dimunitive. The pavilion type on the other hand spreads the many departments on the ground which eventually creates a long distance of travel for patients and staff. The 'pavilion plan' does not give the required intimate relationship required by most of the hospital departments.

It is the author's intention to create a hospital building of intimate scale that will make people feel more at home and at the same time produce a compact layout so as to reduce the problems of the pavilion plan. With this in mind, the buildings were designed to a maximum of three floors vertically.

Buildings serving outpatients directly have been placed on the ground floor while the rest of the diagnostic and therapeutic services were placed on the first floor. The nursing units rise to the second floor level.

Plan Shape:

Rectangles and squares with central courtyards were found to be most effective. The courtyard concept was adopted so as to allow free movement of air into the rooms and at the same time let natural light penetrate the spaces. The courtyard concept also reflects African traditional architecture.

The Design

1. Ground Floor:

The hospital is accessible through a main entrance which allows a person into the main reception hall of the hospital. Other entrances are provided for services, emergency patients and visitors.

The out-patient department of the hospital is situated on the left side of the main entrance hall. It is divided into males and females sections because of social requirement. Rooms for consultation, Examination and treatment are grouped together on one side of an open court, while on the other side are the ancillary and test rooms. A central dispensing pharmacy serves the two sections. Special services of opthalmology , ENT and dental clinics that need a quite location have been grouped together at the extreme end of the department.

Admission offices and emergency department are to the right of the main entrance hall. The emergency ambulance unloads casualties into a reception room in the unit. A waiting space for ambulant patients and relatives is situated adjacent to the reception room but screened from view of the ambulance unloading bay. The emergency department is divided into two sections. One provides consulting and treatment services while the second is meant for minor operations. Supporting service rooms have been provided for each section. Between the two sections there is a recovery room and a small nurses station. The recovery room is for post operative and post medication observation of patients.

The physical medicine department is also on the ground floor. It overlooks the main entrance. Physically handicapped patients coming for therapy can get to this department without having to travel a long distance from the main entrance. The active treatment hall is situated at the end of the department. Treatment cubicles are divided by drapes for easy access to patients.

The X-ray department has three entrances for emergency, outpatient and inpatients. The out and in-patients arrive into the same reception room, while the emergency entrance opens directly into the X-ray rooms area for quick investigation. The X-ray rooms are grouped together with a set of six changing cubicles for each pair of X-ray rooms. Each room has a toilet and a barium meal kitchen. Thus each room is capable of undertaking both radiography and fluoroscopy. The darkroom and viewing space are near the X-ray rooms to shorten the staff travel distance to the darkroom.

Also on the ground are the maternity clinic and paediatrics service below the delivery suite. The design concept of these two services is the same as the out-patient department.

The central sterile supplies unit had been placed near the services area for quick delivery of fresh supplies from the central stores.

The First Floor:-

On the first floor are the administration, pathology, surgical and delivery suites. A mezzanine floor links the administration with the rest of the hospital. A staircase in the centre of the main entrance hall brings a person to the mezzanine level.

The pathology department sits on the physical medicine. A small waiting room is provided at the entrance. All ancillary rooms are arranged on one side of the department while the main laboratory work area is to one side. This facilitates flexibility in space usage. Special exam rooms for EKG, and BMR are situated at the end of the service corridor. This location provides the required quiteness for the patients undergoing these exams.

A corridor runs by the side of the pathology department to the nursing units service corridor.

The surgical operating suite opens into the nursing units service corridor at two points. One point serves as a staff entrance to the suite while the other will be used for taking patients to the main reception of the suite. A service tower with a pair of lifts and a staircase serves both the surgical and delivery suites. In-patients and energency cases will be taken down or up to these suites via this service tower. The operating suite has three zones (as described in the study). The first two zones are non sterile and are accessible to operating and service staff. The third zone is the operating rooms area and is cut off from the rest of the suite by means of self closing doors.

Each pair of operating rooms has a set of scrubbing and workrooms for the operating staff. Anaesthesia induction will be performed in the operating rooms, therefore only one preparation room is provided. A recovery room for 12 beds is situated directly opposite a nursing station for maximum observation by the nursing staff. Offices and changing

facilities are located near the staff entrance.The cystoscopy unit of the hospital is placed on the ground floor for easy access to outpatients. The location allows the X-ray and surgical staff to reach it with no difficulty.

The delivery suite is designed using the same flow concept as the operating suite. The delivery rooms are grouped in a dead-end location. Scrub and work rooms are sandwiched between each pair of delivery rooms. Labour rooms and recovery beds are designed near a central nursing station to permit easy checking of labour women and post delivery recovery patients Changing rooms for doctors and nurses, offices and a doctors night room have been arranged near the staff entrance to the suite.

The Nursing Units

The nursing unit block takes the form of a square with a central court yard rising to a maximum of two floors from the ground. Each nursing unit is capable of accommodating 32 patients in adult beds. The service rooms of the unit are grouped together along the main service corridor thus keeping the bedroom area in a quiet atmosphere with minimum traffic penetration. There are four single-bed rooms in each adult unit for isolation of patients liable to infect others. The rest of the bedrooms are designed to accommodate a minimum of four patients. Each patient has his own corner and the room depth allows enough natural light from both side

Each bedroom has a toilet and a wash hand basin located outside the toilet room for flexibility of use and asepsis. The toilets are grouped in pairs along the external wall of the unit. This allows the corridor wall

to be completely glazed for maximum observation by the nursing staff without their entering the room.

The ground floors of the nursing units will house medical and paediatric patients. The medical patients use the diagnostic services more extensively than other patients. This location permit easy travel to these services. Children in paediatrics need ample play space during recovery period. The court yard on the ground can be utilized for this. The two upper floors nearest the delivery suite will house naternity women and their babies while the rest of the nursing floors (four) will accommodate intensive care and surgical patients. It should be noted that some of these nursing floors are horizontally contiguous to surgical and delivery suites. Thus post operative and delivery women can easily be wheeled into one of these floors after recovery

CONCLUSION

Part one of this writing has enabled the researcher to understand the basic problems encountered in hospital planning. The functions and requirements, as regards spaces and location, of the hospital elements has been clearly understood. This has been used in conjunction with a community study of medical care requirements, to propose a hospital for a chosen community in Kano. The thesis has resulted in a hospital of the right size for the right community in the right location.

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