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Report on Space Management for a 100-Bedded Hospital

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CERTIFICATE

This is to certify that Dr Kuldeep Gupta has completed his summer training at Comprehensive Health Care Private Limited from 19th March, 2014 to 31st May,2014 and has successfully completed his project under my guidance and supervision.

This work is partial fulfillment to the course requirements for the Post Graduate diploma in Health and Hospital Management with specialization in Hospital Management.

I wish him all the best for his future endeavors.

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TO WHOM SO EVER IT MAY CONCERN

This is to certify that Dr. Kuldeep Gupta, student of IHMR, Jaipur has completed his summer internship at Comprehensive Healthcare Pvt. Ltd., Jaipur in the department of Hospital planning and designing under Dr. Prateek Sharma. He did his training from 19-Mar-14 to 31-May-14.

The topic selected by him during his internship was "Space Management for 100 bedded Hospital".

For Comprehensive Healthcare Pvt. Ltd.,

For Comprehensive Healthcare Pvt. Ltd.

Director

A REPORT ON AN SPACE MANAGEMENT FOR A 100-BEDDED HOSPITAL

ACKNOWLEDGEMENT

The internship period gave me an opportunity to explore the field which i always want to know about.

I am indebted to Dr. Prateek Sharma, Director comprehensive health care Pvt. Ltd. for giving me an opportunity to work in his organization.

EXECUTIVE SUMMARY

This study was carried out at Comprehensive Health Care Pvt. Ltd. which has experience of planning and designing several hospitals. This study is about a brief for a proposed 100-bed multi specialty Hospital in Jaipur.

Once a decision to plan the hospital is taken, the next step would be to plan its architectural design. The landscape, facility mix, bed mix, availability of utilities in the vicinity will be considered. Just to illustrate the standards for healthcare design in India, we are still designing facilities where total area per bed is hardly 600 sq. ft. whereas western standards are close to 1,400 – 2,000 sq.ft./ per bed and WHO recommends an area of 800- 1200 sq. ft/ per bed. It is not possible to take the western standard blindly, we can take some of the good things to improve the health standards. Some of the issues that could be adapted from developed countries are flexibility for future expansion, larger secondary areas for better patient comfort, proper utilities for wait areas, nurse stations, storage, changing rooms, alcoves for stretchers/ wheelchairs, adequate transport facilities, parking facilities, proper light and ventilation etc.

The study will help in formulating a functional brief or an architect's brief that will have an analysis of functional needs, interrelationship of departments, area requirements, major equipment, the grouping of accommodation and the main outline of traffic flow.

This report would help the architect in understanding the complex needs of hospital functioning and enable him to build a hospital that is functional, efficient and yet economical without compromising on the design aspect.

1.1 INTRODUCTION AND BACKGROUND INFORMATION:

Planning can be defined as ' The specification of the means necessary for the accomplishment of goals and objectives before action towards these goals has begun'

1. Physical evaluation of existing facilities (along with architect)
2. Functional evaluation of existing facilities.
3. Preparation of workload projections.
4. Functional programming.
5. Space programming (along with architect).
6. Master site planning (along with architect).

Determination of the services to be provided in quantitative terms requires consideration of the following:

有Functions

有Locations

有Relationship

有Utilization

有Staffing pattern

有Space requirements

有Work flow

Before an architect develops a hospital design that will best serve its functions, he has to be provided a written programme explaining these requirements. This is the architects brief from the interpretation of which he prepares schematic drawings and sketch plans.

The brief would contain the permission required from various regulatory bodies, spatial needs of various departments, manpower required, special requirements of various departments, inter and intra departmental relationships.

OBJECTIVE:

To prepare a report on space requirement in a hospital for different departments

SPECIFIC OBJECTIVES:

1. To study/understand the issues involved in functional planning of a hospital.

2. To determine the recent modifications and changes in the hospital to improve the functionality and quality of the hospital.

3. To draw up a space plan for the proposed hospital.

METHODOLOGY:

Both primary and secondary research was carried out with more emphasis on the latter.

- Primary research will involve in-depth interviews with hospital consultants on the basis of a questionnaire.(attached as an annexure I)
- Secondary research will involve descriptive studies of the functional planning carried out while building hospitals in the recent past. This will also involve literature review by going through different books and journals. Thus, the study design is both exploratory and descriptive in nature

LIMITATIONS OF THE STUDY:

Considering the time factor all the departments of the hospital were not covered. Only the main departments were taken under consideration and all the efforts were made to cover all the sections of the questionnaire.

The study could provide only a preliminary brief for the space requirement. It would be the basis for the development of a more detailed brief.

Space Program:

The space plan is made on the basis of personal interviews with hospital administrators experienced in building hospitals and also with the help of literature review and would help the architect in finalizing his plans. Hospitals are a difficult planning subject as explained earlier. The maxim 'Design follows function' must be kept in mind while allocating space details.
The area specifications may be taken as indicative so that suitable alterations would have to be made by the architect to conform to the grid matrix.

Stack Planning;
Considering in today's world, as price of land is increasing exponentially, a hospital with a vertical stack planning is more preferable. In these planning, stacking different departments on different floors is very important. This stack will play a major role in connecting different departments during its functionality and operations. This stack planning is also very important in controlling traffic and infection in the hospital. Considering a standard and ideal situation, this stack planning is as follows.

Ground Floor:
Key Departments like OPD, Emergency, Radiology, and Laboratory should be situated on the ground floor.
The Radiology dept. should be situated near the Emergency dept. (According to a study nearly 40% of cases coming to Emergency require X rays)
The administration department would be located on the 1st floor along with the Blood bank and General and Paediatric wards.
The Labour room, Obstetric ward and NICU would be located on the 2nd floor along with the semi-private ward.
The CSSD would also be located on the 2nd floor just below the operation theatre with provision for dumb waiters between the CSSD and the OT.
The OT's will not be located on the top floor to avoid the excess heating nor will they be located near the major traffic areas.
The ICU's and private wards will also be located on the 3rd floor.
The residential area will be located on the 4th floor just above the ICU's and the OT's. So a doctor can easily attend to the patient when called.

30% of the area is kept for circulation

Some general features that should be incorporated into the design are discussed here:

1. Allowing maximum light and breeze to all parts of the building is an important factor.
2. Windows should be screened, as far as possible, to keep out mosquitoes and flies that seems to be ubiquitous in our hospitals.
3. In principle, there should be three separate entrances' to a hospital through smaller hospitals can do with less. The main hospital entrance, emergency entrance and service entrance.

One of the problems of the hospitals administrations is the control of visitors. Theft is not uncommon in our hospitals particularly through unsupervised passages.

Each additional entry point increases the problem. Moreover, additional entrances increase cost of design, access roads and walks.

4 Service entrance should be adjacent to the kitchen and storage area which receive bulk of the supplies. Garbage and other solid waste are removed from this point, so also dead bodies in many hospital. In some hospitals, this exit point is combined with emergency entrance for better control.

5 planning of designing of traffic flow for patients, personnel and visitors should be given main concerned.

6 outpatients should be routed from the registration and medical records to sub waiting areas from there to laboratory ray, pharmacy, and special therapeutic and other service areas. They should not be routed to pass through in patient areas.

7 in patients may be routed from the admitting office and medical social worker's office, if necessary, to laboratory ray and other departments and then to rooms on the patient's floors according to established admitting procedure.

8 separate parking entries for doctors and staff to avoid unnecessary crowd .with this separate entrance for doctors is also preferred. Doctors normally prefer less crowded corridors to avoid garrulous patients and relative.

9 visitors route should be controlled carefully so that they should not be allowed to wander undirected through patient areas. They are best routed pass the information or main office.

Where a system of passes is used, colour coded visitors' passes may be issued to a particular ward for floor which the pass is applicable.

10 Floors should be constructed of materials that are determined by their future use and maintenance.

11 Corridors of 2.44 m.(8 feet) width with a finished ceiling height of 2.44 m(8 feet) are the most widely accepted pattern. They should be straight as possible.When ramps are used, the gradient should not exceed 1:10.

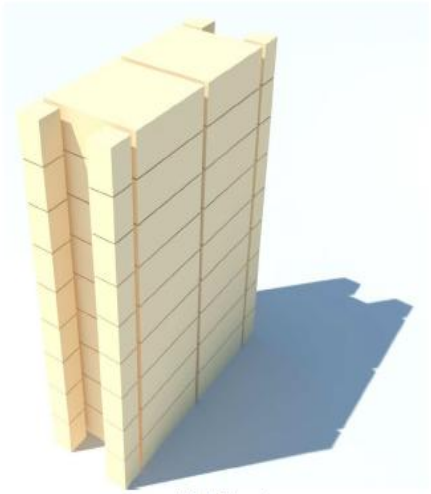
12 walls must be smooth so as not to collect dust and dirt.

13 Corners should be provided with protective metal or rubber guards to prevent any damage through stretcher wheel chair

14 Normally stairways may not be used in handling traffic when there are elevators. Nevertheless; they must be planned with care as they essential in case of fire.

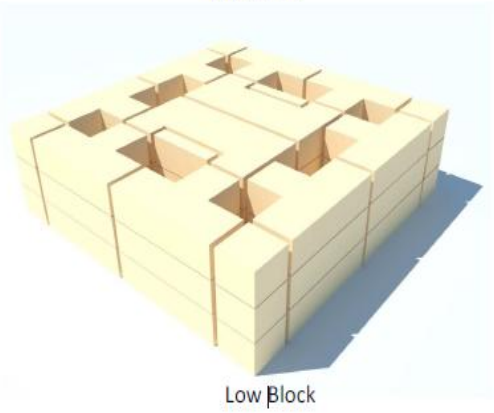
Shown below are various configurations of hospital built form:

Articulated Tower



High Block

Pavillion



Low Block

Tower on Base

DEPARTMENT WISE SPACE REQUIREMENT FOR HUNDRED BADED HOSPITAL

Space management for 100 beded hospital

1	**OPD**	
A	Public area facilities	
	Alcove for wheel chair and stretcher	50 sqft
	lobby and waiting area	200 sqft
	toilet	40 sqft
	Water coolar	20 sqft
	STD/ISD	20 sqft
B	CLINICAL AREA FACILITIES	
	examination room	80 sqft
	special purpose examination room	100 sqft
	injection room	50 sqft
	sample collection room	50 sqft
	storage area for sterile supply	30 sqft
C	EQUIPMENT	
	Examination light (500 lux)	5 sqft
	crash cart	4X4 sqft
	examination couch	7X3 sqft
2	**IPD**	
A	General ward	
	Area of room	110sqft/bed
	toilet area	20 sqft/bed
	drinking water	50 sqft
	public waiting area	120 sqft
	nursing station	250 sqft
	staff change room with toilet	150 sqft
	rest room with toilet	100 sqft
	dirty utility	80 sqft
	clean utility	80 sqft
	equipment bay	100 sqft
	hand washing bay	80 sqft
	pantry	100 sqft
B	semi private ward	
	area of one room	350 sqft
	area of toilet with bath	100 sqft

C	isolation room	100sqft
D	private room	300 sqft
	toilet with bath	80sqft
E	deluxe suit	400sqft
	toilet with bath	100 sqft
3	**emergency**	
A	Public area	
	alcove for wheel chair and stretcher	40 sqft
	waiting area	100 sqft
B	clinical area	
	Triage	40 sqft/bed (emergency room)
	examination area	30 sqft/bed (emergency room)
	resuscitation room	50 sqft/bed (emergency room)
	recovery room	30 sqft/bed (emergency room)
	dressing room	30 sqft/bed (emergency room)
	plaster room	35 sqft/bed (emergency room)
	isolation room	60 sqft/bed (emergency room)
C	other areas	
	reception area	50 sqft
	change room	20 sqft
	scrub area	10 sqft
	duty room for doctor	60 sqft
	storage room	20 sqft
	janitor closet	10 sqft
	nurse station	100 sqft
	toilet	40 sqft
4	**SICU**	
A	public area facility	
	alcove for wheel chair and stretcher	50 sqft
	toilet	40sqft
	water cooler	20 sqft

B	clinical area facility	
	beds	140 sqft
	toilets	40 sqft
	nursing station	150 sqft
	dirty utility	50 sqft
	clean utility	50 sqft
	scrub area	50 sqft
	change room	50 sqft
	doctor's room with toilet	100 sqft
5	**MICU**	
A	public area	
	alcove with wheel chair	40 sqft
	lobby with waiting area	120 sqft
	water cooler	20 sqft
	toilet	40 sqft
B	clinical area facility	
	Ante room	30 sqft
	isolation room	150 sqft
	obervation room	150 sqft
	nurse station	150 sqft
6	**NICU**	
A	clinical area	
	Ante room	5X4sqft
	observation room	120sqft
	isolation room	120 sqft
B	other areas	
	storage area	80 sqft
	duty room for doctor	120 sqft
	janitor closet	20 sqft
8	**OT**	
A	ZONE	
i	Protective zone	
	change room	
	shoe rack	
	general store	
ii	clean zone	
	pre op room	80 sqft

	post op room	80 sqft
	centralized manifold	
	nursing station	
	OT works room	
	equipment store room	
	anesthetist room	120 sqft
iii	Sterile zone	
	scrub area	6x3 sqft
	OT suit	20x20 sqft
	sterile store	
	trolley lay out area	
iv	Disposal zone	
	hatch window separate for each operation suit with wash basin and deep sink	
	dirty utility	
10	**blood bank**	
	reception and blood issue	80 sqft
	examination room	100 sqft
	blood donar room	100 sqft
	refreshment and recovery	100 sqft
	blood storage area	80 sqft
	serology laboratory	100 sqft
	blood transmission diesease laboratory	100 sqft
	quality control	80 sqft
	component separation area	100 sqft
	incharge room	80 sqft
11	**laboratory**	
	histopathology	200 sqft
	hematology and serology	255 sqft
	biochemistry	300 sqft
	microbiology	255 sqft
	immunology	200 sqft
	storage	120 sqft
	wasing and sterilizing area	100 sqft
	HOD room	80 sqft
	report writing room +sample collection room	130 sqft
	change room	80 sqft

12	**radiology department**	
	reception	100 sqft
	waiting area + toilet	300 sqft
	x- ray room	300 sqft
	dark room	100 sqft
	USG + toilet	200 sqft
	MRI	400 sqft
	CT scan	300 sqft
	consol room	100 sqft
	mammography + change room	150 sqft
	radiologist room	200 sqft
	storage room	100 sqft
	ECG& ECHO	195 sqft
	TMT	40 sqft
14	**CSSD**	**7.5 sqft,bed**
	ZONE	
	dirty zone	
	reception and storage of dirty material	100 sqft
	cleaning, washing	100 sqft
	change room with toilet	75 sqft
	clean zone	
	drying, packing, labeling, and storage	200 sqft
	Sterile zone	
	sterilization	150 sqft
	storage of sterile set and issue	100 sqft
	supervisor office	100 sqft

Operation Theatre

Function:
The function of this department is to receive patients after diagnosis, to anaesthetize them, to operate upon them and to supervise their post-operative condition before returning them to their wards.
The surgical patients account for 30% to 40% of the in-patient admissions.

Location:
The OTs can be grouped together in a centralized form to have an entire OT complex or they can be decentralized.
However for having decentralized OTs e.g. like those for gynaecology, ophthalmology and ENT the quantum of work should justify the need for them.
Centralized OTs are preferred normally as there is greater economy of staff and equipment, better professional supervision and greater efficiency.

There will be 3 OT's- 2 General and 1 Specialty OT. They will be located on the 3rd floor.
The location will be such that they will be away from major traffic areas and also not on the top floor. This will avoid overheating.
They will be located close to the ICU's for the easy transport of patients. They will also be located close to vertical transport and above the CSSD.
There will be 2 dumbwaiters- one for clean linen and one for soiled linen.

Key Factors influencing OT complex Planning:
The total volume of expected operations alongwith the anticipated work period is used to calculate the no. of operating rooms needed.
Around 1 operating suite is recommended for every 50 beds. The number of operating rooms has also been indicated to be 5 per cent of the total number of surgical beds.
OR in larger hospitals a thumb rule 0.1 operations per bed per day has been used.
For Indian theatres conducting general surgeries it is estimated that the average time taken for each surgery will be around 75 minutes per operation.
Hence one OT can perform around 5 general surgeries daily. A separate emergency OT would be justified when 50 or more cases are reported in the casualty.

The other factors that would influence the planning are the case mix and the type of operations to be performed and also the ALOS of surgical patients.
The no. of operating rooms forms the basis for determining the number of pre-op beds and the post-op beds.

Number of operations per day = No. of surgical beds

ALOS of surgical patients
Number of OT rooms = Total no. of operations in hospitals

Capacity of 1 OT
Layout:
The OT will be independent of the general traffic and movements of the rest of the hospital.
The rooms should be arranged in a manner that allows continuous progression from the entrance through the various zones that become increasingly clean.
The various zones in the OT are

- **Protective Zone**
- **Restricted Zone**
- **Clean zone**
- **Super clean Zone**

Ultra clean Zone.

THE PROTECTIVE ZONE is the area where the entry is restricted to the patients, the staff and their relatives. It is till the waiting areas for the relatives.

The entry to **THE RESTRICTED ZONE** is limited to the patients and the staff. This area includes the patient reception area, the staff changing rooms.

THE CLEAN ZONE, which is the next zone, consists of the pre and post op areas, the administrative areas, the stores, laboratory, space for equipment storage.

THE SUPERCLEAN ZONE consists of the operating theatre and its ancillary rooms like the scrub room, the instrument room and wash room.
The ultraclean zone consists of an area of 1 metre on either side of the operating table.
An operating room for general surgery will have an area of 450 sq ft. However operating room for specialty surgeries like orthopaedic and Neurosurgery will be around 625 sq ft.
The operation suite will consist of an operating room, a scrub room, a waste disposal room and an exit room. The waste disposal room will lead into the dirty corridor so that waste can be disposed off without it being allowed to renter the clean zones. There will be a service lift to carry away the waste and also a dumb-waiter to carry the soiled linen to the CSSD.

In older times it was believed that it was desirable to have a separate induction room.
However while such a room reduces the operating rooms occupancy time as the patients can receive pre-operative anaesthesia while other patients are on the operating table.
The disadvantages however outweigh the benefits. The main disadvantage may be the huge increase in capital as well as running costs incurred in such a room.

Also there will be the cost of additional equipment and the utilization of the room will be low.
有 The pre op holding area and post op recovery room should have piped and medical gas outlets.
有 Provisions should also be made for flash sterilizers.

If the operating room has windows this will increase the heat load inside and provision should be made for it.
Windows provide for visual relaxation but whether operating rooms should have them or not is a debatable question as they may cause distraction if provided.

- The temperature inside the OTs will be maintained at 21 degrees. The airflow is laminar airflow i.e. positive pressure is created such that air flows from the clean zones to the dirty zones.
  The laminar airflow is created through a plenum in the ceiling. The velocity of air flowing through this plenum is 60 ft/min. The size of the plenum will be around 6 by 6 feet.
  This will be enough to cover the patient on the operating table and also the entire operating team.
  The air moves outwards through outlets, piped gas, suction and nitrous oxide are provided through pendants in the OT.

- HEPA filters which can filter air up to 0.3 microns will be used.
- between 20- 100% fresh air is used. The rest is recycled.
- Humidity levels will be 55% plus or minus 5%
- The floor of the OT will be granite with brass strips. This helps in earthing purposes for the electrostatic current. The walls can be of stainless steel or marble whereas the ceiling can be of stainless steel or Plaster of Paris. The theatre corridors will preferably be 3.2 metres and not less than 2.85 metres wide.

Intensive Care Units:

Function:
ICUs are specialty nursing units designed, equipped and staffed with specially skilled personnel for treating very critical patients or those requiring specialized care and equipments.
Location:
The ICU's should be located in a geographically distinct area within the hospital with controlled access. No through traffic to other departments should occur.
Location should be chosen so that the unit is adjacent to or within direct elevator travel to and from the Emergency Department, operating room, Intermediate care units and Radiology department.
There are 2 schools of thought-
One suggests that ICUs should be in a centralized place and be contiguous with or readily accessible to one another.
Having intensive care facilities in a centralized place allows the specially trained professionals and equipment an almost instant access to patients in all clinical services when an emergency develops.

Such an arrangement also eliminates the need for duplication of costly equipment and personnel.
The second school of thought favours that the location should be dependent on the type of patients
eq.-The surgical ICU should be close to the operating rooms.
- The Medical ICU should be in close proximity to the medical wards.
- The NICU should be close to the obstetrics ward.
- The Neurosurgical ICU can be located close to the emergency department

Layout:

12 to 16 beds per unit are considered best from a functional perspective. There
Will be 10 beds in the ICU. There will also be 2 isolation rooms within the ICU to
Accommodate increasing incidence of contagious and immunocompromised patients.
Supply corridors should be separated from public/patient corridors.

The ICU consists of the following areas

- Patient rooms.
- Central/ Nursing Station
- x ray viewing areas/ Storage areas
- Clean and dirty utility rooms
- Equipment storage
- Food prep area/ Pantry
- Staff areas/ Doctors Room/ Nurses rest room
- Supply and service corridors.
- Stat lab
- Visitors waiting room.
- Doctors room.

Patient rooms:

Patient rooms must be designed to support all necessary healthcare functions. There will be at least225 square feet area per bed.
An emergency alarm button must be present at every bedside within the ICU. The alarm must sound automatically in the central nursing station and the origin of these alarms must be discernible.
The patient bed should be located permanently away from the wall to give staff a 360 degree access to the patient.
There is generally a headwall behind each patients bed for a freestanding utility column to mount monitors and equipment and to supply suction, air, oxygen and regular electrical and emergency electrical services. Space for computer terminals and patient charting should be incorporated in the design.
Storage for computer terminals and patient charting should be incorporated in the design.
Storage for patient's personal belongings, patient care supplies and pharmaceuticals should be provided at the bedside. An ICU design should consider natural illumination and view.
Windows are an important aspect of sensory orientation and every room should have the patient
Facing the windows to reinforce day/ night orientation if possible.
The patients must be situated so that direct visualization by healthcare providers is possible at all times.
This approach permits the monitoring of patient status under both routine and emergency situations.
Movable Modular Casework:

- Bedside supplies placed in an L cart with drawers or in a storage unit.
- Locker within or adjacent to the patient room to house immediate necessary supplies and linen.
- Cantilevered work surface or mobile table with a keyboard tray as a station for nurse charting done on a bedside computer.

Isolation rooms:
There will be 2 isolation rooms in the ICU. Isolation rooms are used by patients with highly communicable diseases or those who are unusually susceptible to infection.
Cleanliness and contamination are key concerns in these rooms. Each isolation room will contain at least 250 square feet of floor space with an anteroom.
Each anteroom should contain at least 20 square feet to accommodate hand washing, gowning and storage. An attached
toilet must be provided in the isolation rooms.

Movable Modular Casework:
Same as that required for patient rooms.

Central station:
A central nursing station should provide a comfortable area of sufficient size to accommodate all necessary staff functions. Within the nurses' station the staff manages

patient records and charts, communicates regarding the patients conditions, views patient monitors, orders tests and treatments and dispenses medications.
Adequate space for computer terminals and printers is essential. Patient records should be easily accessible and adequate space must be provided for them.
Adequate surface space and seating for medical charting by both physicians and nurses should be provided.
Shelving file cabinets and other storage for medical record forms must be located so that they are readily accessible by all personnel requiring their use.
A refrigerator for pharmaceuticals and a sink with hot and cold running water must be provided.
Behind the nursing station a small area may be provided as a rest room for nurses. This area can contain a bed, which can be utilized by pregnant nurses to rest in between work.
Doctors Dictation:
An area should be provided for physicians to review patients charts, dictate progress notes and write patients orders. It should have access to telephones.

Charting: A stand up or sit down area should be provided with access to patients charts by nurses and physicians. This area is generally maintained by the unit clerk or the unit secretary.
Cart Storage:
An area must be provided to store and quickly access crash carts and procedure carts. This area should be accessible to supplies for restocking carts and have electrical access to maintain rechargeable equipment.

Lavatories:

Lavatories should be easily accessible to waiting patients. Some should be larger so that an attendant could assist. Handgrips on the wall for the patient are recommended.
Doors to lavatory compartments should open outwards.
All lavatories must have a wash basin.
Changing cubicles: he patients who are to be X rayed require undressing or stripping to the waist. Each X ray room requires about 2 well lit and ventilated cubicles of about 1.3 sq mts size.
Each cubicle should have a chair, clothes hook and a mirror. Contrast media preparation room/Barium Preparation:
In the vicinity of the undressing cubicles and X ray rooms there should be a room where contrast media, frequently barium powder is mixed for investigations.

X ray screening room:

A standard size of 40 sq mts has been recommended. The depth of the screening room should not be less than 5.8 m. In the room a working height of about 3.3 m is recommended.
In all X ray rooms a stainless steel unit with a sink and a washbasin is needed because of the microbial cross-contamination and infection potential.

Door openings should be at least 1.3 m wide.

Radio diagnostic rooms should have natural lighting and ventilation whenever possible. All artificial lighting in the screening room should be wall mounted. The ceiling has to be free from air ducts, pipes etc and should be weight bearing in all directions for the installation of ceiling mounted equipment.
All rooms will have a control, tube (an X ray emitting device), tube stand or support and cabling.
Important design considerations:
• The space should be configured to allow a stretcher to be manoeuvred with minimum turns by placing the axis of the X ray table perpendicular to the wall with the door by which the patient will enter the room.
•The control console will be opposite the door with direct access to the vertical core.
• Minimum size of a room should not be less than 20 sq mts/ideal is 40sq.mts.
•An overhead type tube support facilitates X raying a patient in bed or on a stretcher.
•The X ray tube should never point towards the control unit, darkroom or window.
• Control panel should be as far away as possible from X ray table.
•Radiation hazard to the occupants of the X ray room is inversely proportional to the square of the distance between the tube and the individuals.
•The passage of film cassettes from the radiography room to the darkroom takes place through the hatch window opening into the darkroom.
The hatch must be adequately lead lined to prevent the entry of radiation scatter into the darkrooms.
•Also the doors and windows of the radiography room have to be lead lined to prevent radiation scatter from the room A door on the control booth is required to protect the technician in the booth from scattered radiation.
•The control panel should be wired to a signal outside each X ray room to indicate when the machine is on, to prevent other personnel from inadvertently entering the room.
A red light bulb will be satisfactory as a signal.

Special equipment:

♦Table and tube.
♦Wall Bucky (a device that holds film in a position during exposure)
♦Control console
♦Sink and casework
♦Transformer and power cabinet.

Fluoroscopy room:

Fluoroscopy makes use of radio- opaque media that may be introduced into the body to create images of tissue that would not otherwise show up well on X ray.
Because the radio- opaque material is typically barium introduced through the mouth or the rectum, it is important to have a toilet room directly accessible from the procedure room.

Important design considerations:

Apart from the design considerations for X ray rooms other considerations peculiar for fluoroscopy room are:
• The toilet room will be directly attached to the fluoroscopy room.
• Barium will be prepared in a procedure room.
• Floors should be designed keeping in mind that loads up to 2,000 kg/m will be borne by the floor.

Special equipment;

♦Fluoroscopic X - Ray tube and table.
♦Image intensifier.
♦Spot film camera
♦Video monitor.
♦Wall Bucky
♦Control Console
♦Sink and casework. Transformer and Power cabinet.

X ray machines:
Machines which operate at higher milli amperage are better for taking X rays of thicker part of the body with less exposure time, but they are more expensive.

For chest X rays and X ray of the extremities better films of these parts are obtained with 100 or 200 mA machines.
However Examination of the skull, abdomen and special investigations are best carried out with machines working at 500 mA and above.
Image intensifiers:
Special investigations and fluoroscopy together form about 14 percent of all Investigations. Image intensifiers greatly enhance the brightness of the normal fluoroscopic images reducing the dose to the patient
. Image intensifier systems are distinguished by a C arm suspended from an overhead support clamped between the floors and ceiling on an upright metal column.

Central Sterile Processing Department (CSSD/CSPD):

Functioning:
Central Sterile Processing is a service whereby medical/surgical supplies and equipment-both sterile and non-sterile are cleaned, prepared, processed, stored and issued for patient care. Its primary function is the sterilization of instruments for surgery, labour and delivery and other departments. It is also responsible for the distribution of sterile and clean disposable items.

Objective:
The objective of the CSSD is to provide a centralized and standardized sterilization facility with a view to reducing the incidence of infection in a healthcare setting.
Location:
Since around 40% of the load on CSPD is from the surgical department the ideal location of the CSPD would be next to the surgery or either above or below surgery.
Vertical transport is important if the location is either above or below the surgical department. This is usually through dumbwaiters that provide direct access for both clean as well as soiled materials.

Interdepartmental relationships:

The CSSD is located such that it is easily accessible from the surgical department, the wards and the ICUs.

Key factors to be kept in mind while planning CSSD While designing the CSSD care should be taken that the flow of traffic is
continuous from receiving where the soiled items commence their journey to issuing where sterilized items are issued, without retracting steps.
The CSSD is located on a lower floor then 2 dedicated dumbwaiters should be provided-one sterile and the other soiled-which connect the CSSD floor with the surgical suite.
Dumbwaiters are small elevators that are used to deliver supplies. The sterile dumbwaiter opens into the sterile area of the surgical suite and transports all sterile
items without being contaminated in transit. The second dumbwaiter which opens from the disposal zone of the surgical suite, brings down the soiled items to the
soiled area of the CSSD for reprocessing.

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