IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 6 Ver. 16 (June. 2018), PP 54-57
www.iosrjournals.org

A Study On The Physical Facilities, Area Requirements, Architectural And Engineering Designs And Plans To Establish A 30 Bedded Dialysis Center.

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Date of Submission: 18-06-2018 Date Of Acceptance: 03-07-2018

I. Introduction:

It has been known for many years that ESRD is associated with very high mortality. The burden of Chronic Kidney Disease is increasing in alarming proportion all over the world. In India, especially in rural areas due to lack of financial resources & infrastructure, quality of dialysis care is not high. This study assesses the facilities and designing required to establish a dialysis centre as per the prevalent guidelines.

Objectives:

1. Assessing the physical facilities and area required to setup a 30 bedded dialysis unit
2. Architectural and engineering planning for the dialysis unit

II. Methodology:

1. An observational and comparative study was done where the data pertaining to dialysis was collected and analyzed.
2. Dialysis unit of Nizam's Institute of Medical Sciences was visited and the requisite data collected. Personal interviews were conducted with staff of these units.
3. Current dialysis guidelines and Dialysis related Literature was reviewed
4. Standard Treatment Guidelines for Haemodialysis (developed by Indian Society of Nephrology under the guidance of Ministry of Health and Family Welfare, Govt of India) was reviewed.

Observations and Suggestions:

Physical facilities

It is recommended by Indian Society of Nephrologists Standard Treatment guidelines that Hemodialysis unit has the following facilities

We recommend that the hemodialysis area should have the following features

- Each machine requires at least 11 x 10 ft. (100 to110 square feet).This is needed because in case of an emergency, cardiac resuscitation equipment could be easily wheeled on all four sides of the patient. Facilities for non-invasive blood pressure monitoring of all patients and ECG monitoring of select patients are needed.
- Each machine area should be easily observed from the nursing station which should be included in this area.
- Nursing station should have enough space for adequate number of nurses/technicians depending on the number of dialysis machines, a computer terminal & working desk/bench.
- Head end of each bed should have stable electrical supply (at least 3 outlet of 5/15 amps), oxygen &vacuum outlet, treated water inlet & drainage facilities.
- Air conditioning is strongly recommended to achieve 70 to 72 degrees F temperatures & 55 to 60% humidity.
- Areas for dialyzing patients having viral diseases (HBV/HCV) should be separated from those patients not having any viral infections. These spaces should have independent drainage, independent water supply, independent air handling & separate personnel facilities.

- Preparation, Work and Storage area: We recommend that the Preparation, work & storage area should have the following features
- Independent area is needed for reprocessing the dialyzers. This should have a work bench with sink having side board & drainage.
- The work bench should be supplied with treated as well as untreated water which are separately marked.
- Two sinks for the work bench should be provided
- The space should be sufficient for at least two persons working simultaneously.
- This preparation area should be physically separate for processing dialyzers from viral infection patients versus those not having any viral infection.
- For both areas stable electrical supply & drainage is needed for the work bench. There should be space for dialyzer reprocessing machine(s) in this area.
- There should be two storage areas, one for storage of new supplies and one for reprocessed dialyzers.
- The principle of dry storage area is to be able to store 3months supply of dialyzers, tubings, hemodialysis concentrate solutions, IV fluids. It should also have space for stationery, linen etc.
- The wet storage is for reprocessed dialyzers & tubings.
- The dry storage area should be separate from the wet storage.
- A clean room with a work bench is needed for preparation of sterile trays for dialysis startup kit & for preparation of injections & storage of emergency equipment.
- This area should have a designated place for keeping wheelchair /trolleys for transporting patients & weighing scale.
- There should be an area for dirty utility. This area should be located in such a way that personnel and material need not come from dirty utility to clean area of dialysis.
- There should be a consulting room for the doctor in-charge of the unit.
- We recommend that there should be office area for nurses & technicians
- Each patient is generally accompanied by two individuals; hence, we recommend a specially designed area for their stay and some relaxation should be provided. Patients waiting to go on dialysis & those who have recently completed dialysis could also utilize the same area.
- We recommend that storage facility should be provided for individual patients belongings.
- We recommend that there should be change rooms for male & female staff.
- Facilities for hand washing and alcohol based rub should be available in patient area.
- We recommend that there should be adequate toilets for consultants, technicians, patient & patients' relatives. Separate for men & women.
- We recommend that there should be space for a water treatment unit
- We recommend that a Procedure room / operating room is required. This facility in general hospital could be shared but it should primarily be under control of dialysis staff.

Table 1: Area Requirement

Unit	Area per unit in sft	Total area in sft
30 HD machines (divided into 2 stations of 15 machines each)	100	3000
Nursing stations (1 for each station)	50	100
Procedure and Work area	150	150
Storage area- for supplies and tubings	100	100
Storage area- for reprocessed dialyzers	150	150
Storage area – for linen and nursing equipment	100	100
Dirty utility area	150	150
Wash rooms - 5	40	200
Nurses room	100	100
Doctors consultation room	150	150
Administrative office room	150	150
Billing section	50	50
Medical records store	100	100
Equipment and Trolleys storage area	250	250
Waiting area for pts attenders	500	500
Area for water treatment plant	500	500
Total area		5750
Circulation space (stairs, corridor,elevator) of – 30 %	2000	1750
TOTAL AREA		7500 Sft

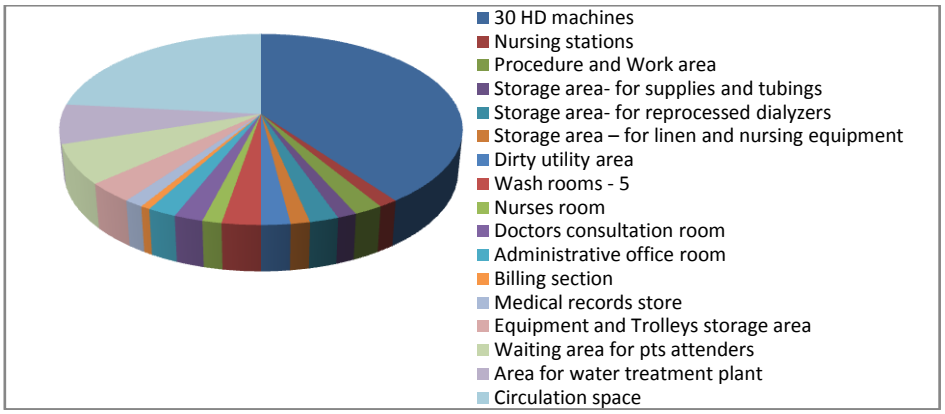

Fig 1: Area Requirement

Architectural Planning

- It is preferable to have 2 separate stations of HD units of 15 machines each.
- Areas for dialyzing patients having viral diseases (HBV/HCV) should be separated from those patients not having any viral infections.
- These spaces should have independent drainage, independent water supply, independent air handling & separate personnel facilities

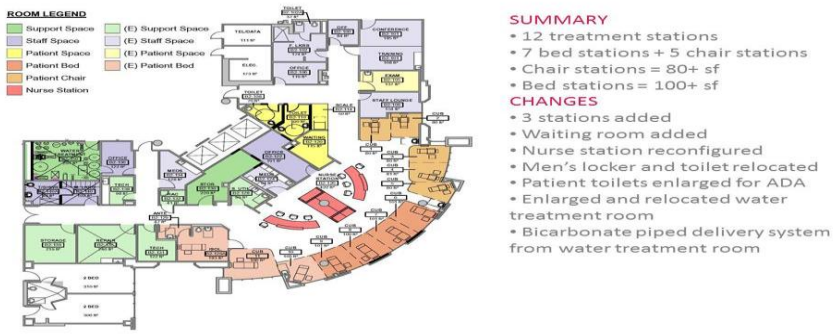

Fig 2: Sample Architectural design

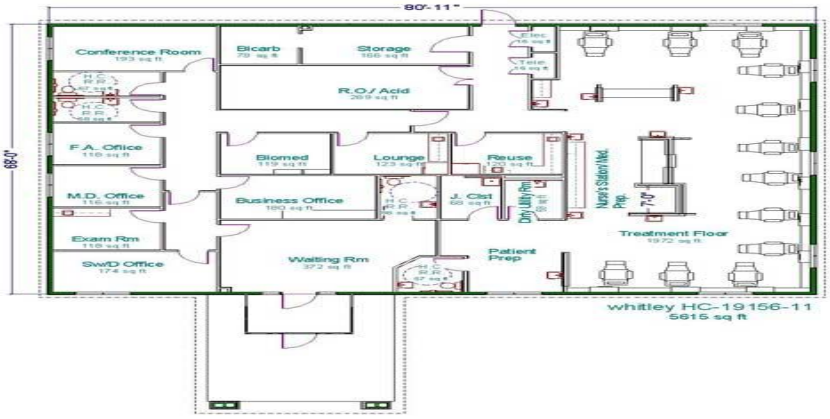

Fig 3: Sample Architectural Design

Engineering planning

- Head end of each bed should have stable electrical supply (at least 3 outlet of 5/15 amps), oxygen &vacuum outlet, treated water inlet & drainage facilities.

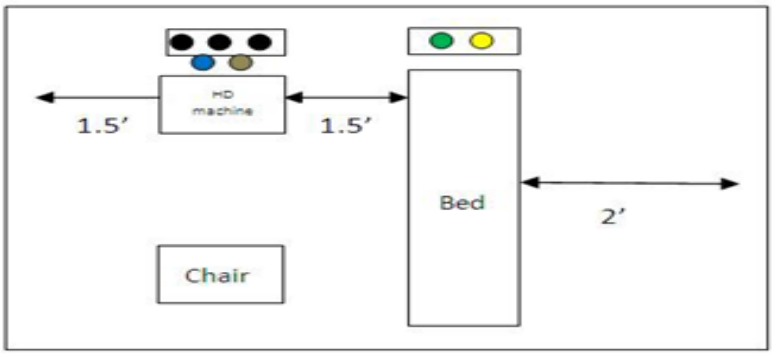

Fig 4: Head end of bed

HD Area
Blacks dots: Electricity
Green dot : Oxygen outlet
Yellow dot: Vacuum outlet
Blue dot: treated waterinlet
Ash dot: drainage outlet

Electricity: Stable voltage continuous supply is required. Online UPS is recommended. It should have a backup for at least 30 minutes. The power capacity of the UPS should be able to support all functions of the dialysis machine

The electrical supply should be stable & uninterrupted, preferably a pure sine wave both voltage and frequency regulated. The use of electrical surge protectors is necessary to protect dialysis machine's electronics.

Adequate capacity generator is recommended.

Air conditioning: All hemodialysis machine areas, consultants & technicians/nurses rooms should have air conditioning. Treatment areas should have temperature70 to 72 degrees F & 55 to 60% humidity.

Relative's waiting / recreation area & reception should be well ventilated with fans or may have air conditioning

Plumbing & drainage:

All treated water pipelines should be stainless steel grade 316 or medical grade PVC. There should be minimum bends & blind loops should be avoided.

All drainage should be connected directly to the main drainage line. There should be no bends or blind loops.

There should be oxygen & vacuum outlets at the head end of each dialysis machine.

- Independent area is needed for reprocessing the dialyzers. This should have a work bench with sink having side board & drainage.
- The work bench should be supplied with treated as well as untreated water which are separately marked.
- Two sinks for the work bench should be provided.

III. Conclusion:

In any dialysis facility, quality of patient care is the most crucial factor and the facilities, area, architectural and engineering planning should be done as per the prevalent standard guidelines to meet the required quality.

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