DEPARTMENT OF ANESTHESIOLOGY

M.L.B. Medical College, Jhansi

ORGANIZATION OF INTENSIVE CARE UNIT

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INTRODUCTION

- *ICU is highly specified and sophisticated area of a hospital which is specifically designed, staffed, located, furnished and equipped, dedicated to management of critically sick patient, injuries or complications .*
- It is a department with dedicated medical, nursing and allied staff.
- *It is emerging as a separate specialty and can no longer be regarded purely as part of anaesthesia, Medicine, surgery or any other speciality.*
- It has to have its own separate team in terms of doctors, nursing personnel and other staff who are tuned to the requirement of the speciality

Economics of intensive care

- There is a great demand for ICU bed in a hospital, which costs three times more per day than an acute ward bed.

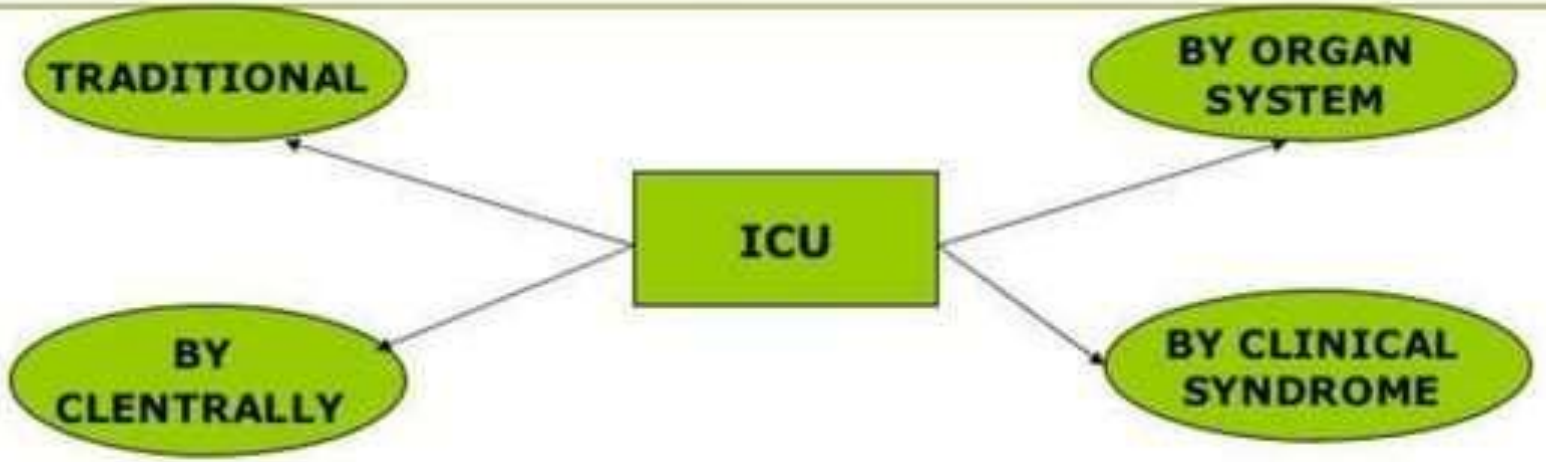
- Batra et al have worked out cost per patient per day from a major teaching hospital in India to be Rs.5000 per day/ICU *(Indian J. Anaesth. 2003; 47 (5) : 328-337)*
- The costs are higher in patients requiring parenteral nutrition, sepsis with usage of more antibiotics, requiring imaging modalities for investigations.

- The design of intensive care units (ICUs), or the modification of existing units, requires not only a knowledge of regulatory agency standards, but also the expertise of critical care practitioners who are familiar with the special needs of this patient population.

- In 1988, the Society of Critical Care Medicine (SCCM) developed guidelines for the design of ICUs

TYPES OF ICU

There are four ways of organizing an ICU.



- **By Traditional Specialties:** Surgical, Medical, Paed
- **By Organ System:** Cardiac, Neuro, Renal, Respiratory
- **By Clinical Syndrome:** Burn, Trauma , Stroke

4. **By Clientele:** Neonatal, Paed., Gynae

ICU Levels

Level I -

- It is recommended for small district hospital, small private Nursing homes, Rural centres
- Ideally 6 to 8 Beds
- Provides resuscitation and short-term Cardio respiratory support including Defibrillation.
- ABG Desirable.
- It should be able to Ventilate a patient for at least 24 to 48 hrs and Non invasive Monitoring like - SPO2, H R and rhythm (ECG), NIBP, Temperature etc
- Able to have arrangements for safe transport of the patients to secondary or tertiary centres
- The staff should be encouraged to do short training courses like FCCS or BASIC ICU Course.
- Should have basic clinical Lab (CBC, BS, Electrolyte, LFT and RFT) and Imaging back up (X-ray and USG), ECG

Level II (Recommendations of Level I Plus)

- Recommended for larger General Hospitals
- Bed strength 6 to 12
- Director be a trained/qualified Intensivist
- Multisystem life support
- Invasive and Non invasive Ventilation
- Invasive Monitoring
- Long term ventilation ability
- Access to ABG, Electrolytes and other routine diagnostic support 24 hrs
- Nurses and duty doctors trained in Critical Care
- CT must & MRI is desirable
- Should be supported ideally by Cardiology and other super specialities of Medicine and Surgery

Level III (All recommendations of Level II Plus)

- Recommended for tertiary level hospitals

- Bed strength 10 to 16
- Headed by Intensivist

- Have all recent methods of monitoring, invasive and non invasive including continuous cardiac output, SCvO2 monitoring etc
- Long term acute care of highest standards and Multisystem care

- Bedside x-ray, USG, 2D-Echo available

- Own or outsourced CT Scan and MRI facilities should be there
- Bedside Broncoscopy

- Bedside dialysis and other forms of RRT available
- Optimum patient/Nurse ratio is maintained with 1/1 pt/Nurse ratio in ventilated patient.
- Doctors, Nurses and other support staff be continuously updated in newer technologies and knowledge in critical Care

ORGANIZATION OF ICU

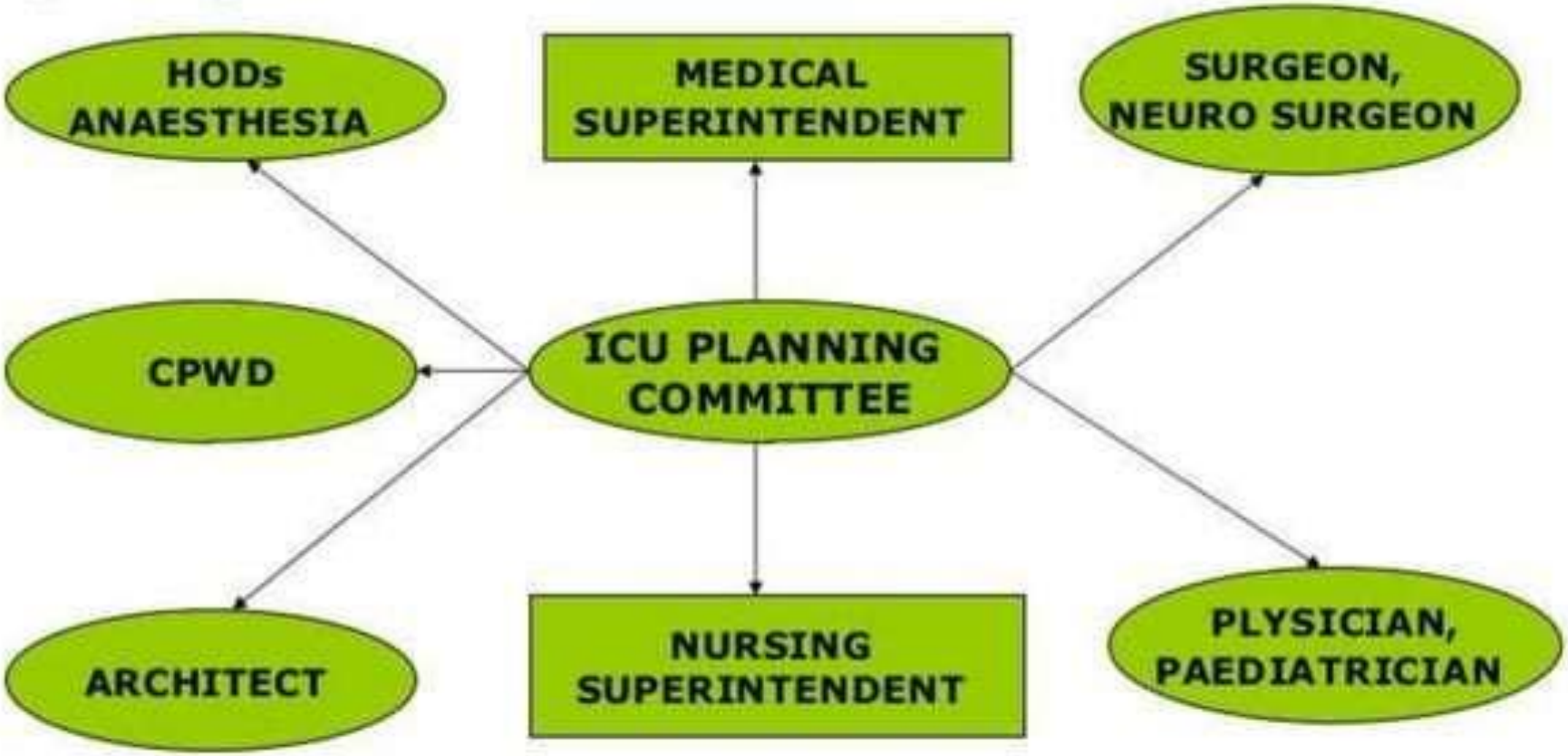
- It requires intelligent planning.
- One must keep the need of the hospital and its location.
- One ICU may not cater to all needs.
- An institute may plan beds into multiple units under separate management by single discipline specialist viz. medical ICU, surgical ICU, CCU, burns ICU, trauma ICU, etc.
- The number of ICU beds in a hospital ranges from 1 to 10 per 100 total hospital beds.
- Multidisciplinary requires more beds than single speciality. ICUs with fewer than 4 beds are not cost effective and over 20 beds are unmanageable

ORGANIZATIONAL MODELS FOR ICUs:

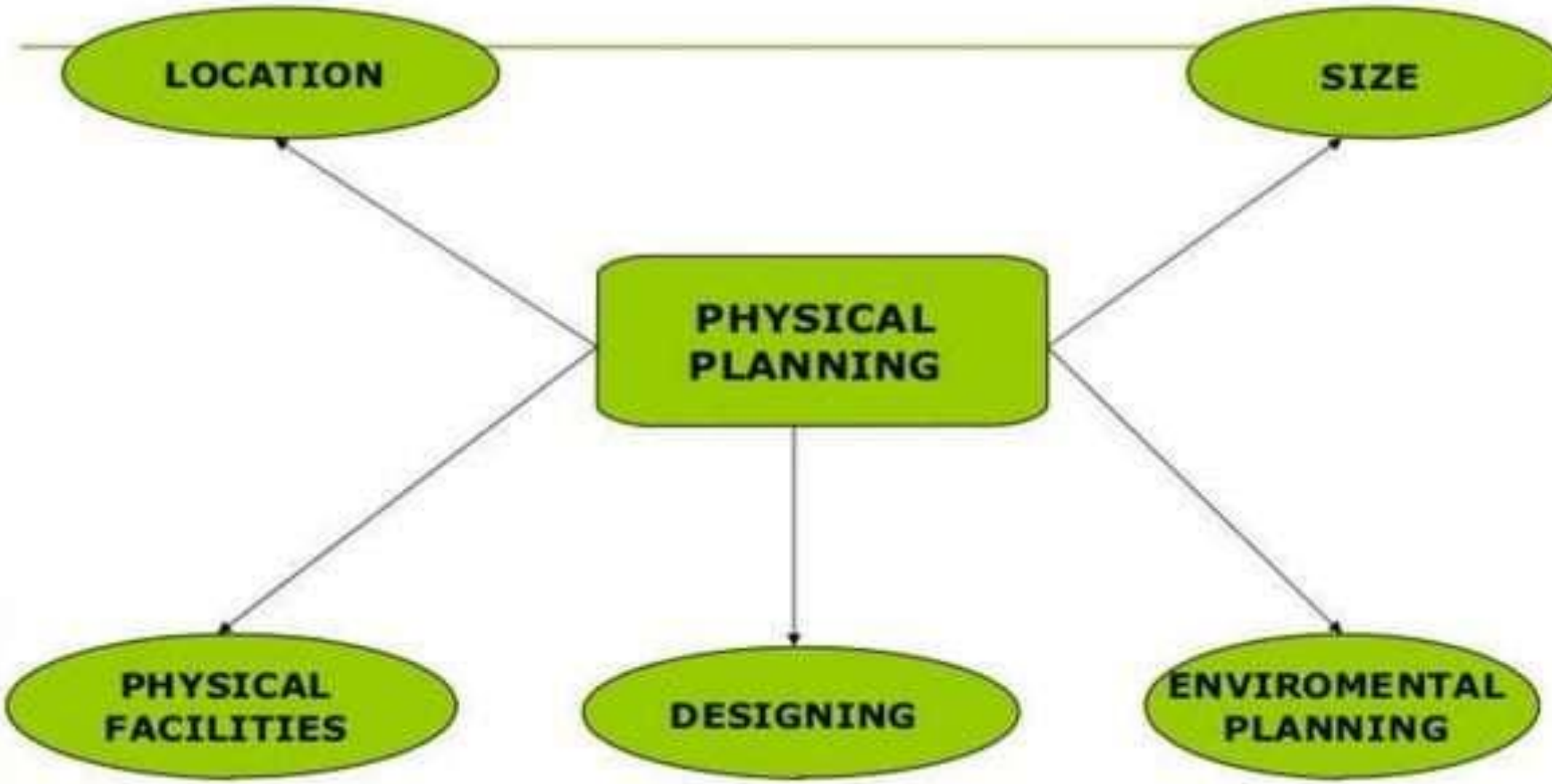
- the *open model* allows many different members of the medical staff to manage patients in the ICU.
- the *closed model* is limited to ICU-certified physicians managing the care of all patients; and
- the *hybrid model,* which combines aspects of open and closed models by staffing the ICU with an attending physician and/or team to work in tandem with primary physicians.

PLANNING AND ORGANIZATION OF INTENSIVE CARE SERVICES

-Intensive care is defined as the provision of sophisticated life support.
-Used for a variety of adult and paediatric patients.
-In a setting of close and constant monitoring.
-A policy guideline to be developed for planning a ICU by the hospital by framing a committee.



PHYSICAL PLANNING



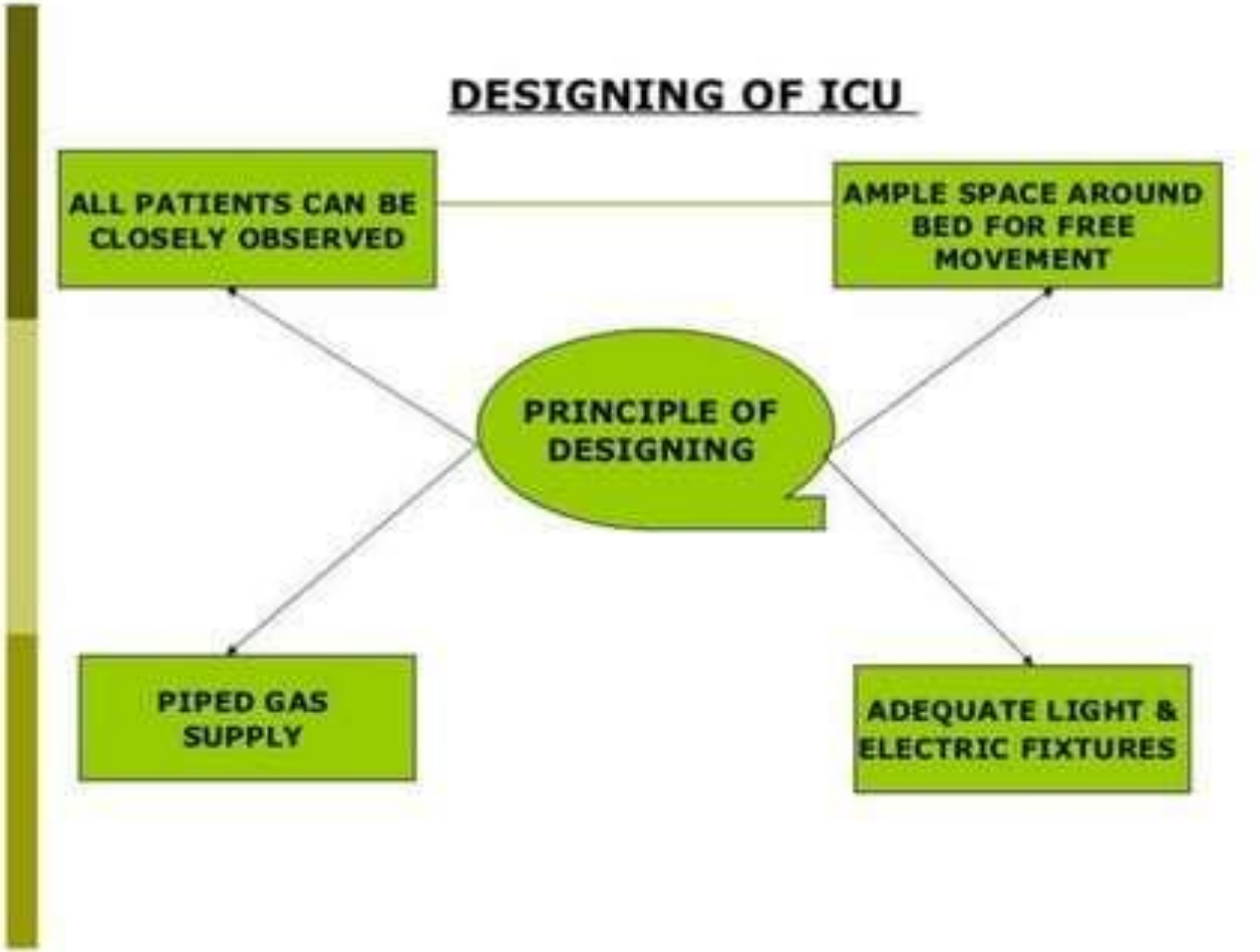
LOCATION:

1. Should be centrally located with easy access to emergency and other wards, OT and OPD.
2. Easily approachable
3. Away from general hospital traffic.
4. Restricted entry

SIZE:

1. Size of ICU depends on the type of services provided.
2. In super specialty hospital 10% of the total beds.
3. In general hospitals 2% of hospital beds.
4. Optimum size is 14 beds, minimum 4 beds.
5. If no. of beds required is more than 14, two ICUs be opened. Ideal ICU is 10 bedded.

DESIGNING OF ICU



PATIENT AREAS.:-

- Patients must be situated so that direct or indirect (e.g. by video monitor) visualization by healthcare providers is possible at all times. This permits the monitoring of patient status under both routine .and emergency circumstances.
- The preferred design is to allow a direct line of vision between the patient and the central nursing station.

- In ICUs with a modular design, patients should be visible from their respective nursing substations.

- Sliding glass doors and partitions facilitate this arrangement, and increase access to the room in emergency situations.

RECOMMENDED NOISE RANGES

- Signals from patient call systems, alarms from monitoring equipment, and telephones add to the sensory overload in critical care units.

- The International Noise Council has recommended that noise levels in hospital acute care areas
  - not exceed 45 dB(A) in the daytime,
  - 40 dB(A) in the evening,
  - 20 dB(A) at night.

Notably, noise levels in most hospitals are between 50–70 dB(A) with occasional episodes above this range

CENTRAL STATION

- A central nursing station should provide a comfortable area of sufficient size to accommodate all necessary staff functions.
- When an ICU is of a modular design, each nursing substation should be capable of providing most if not all functions of a central station.
- There must be adequate overhead and task lighting, and a wall mounted clock should be present.
- Adequate space for computer terminals and printers is essential when automated systems are in use.
- Patient records should be readily accessible .

X-RAY VIEWING AREA.

- A separate room or distinct area near each ICU or ICU cluster should be designated for the viewing and storage of patient radiographs.
- An illuminated viewing box or carousel of appropriate size should be present to allow for the simultaneous viewing of serial radiographs.
- A "bright light" should also be available.

WORK AREAS AND STORAGE

- Work areas and storage for critical supplies should be located within or immediately adjacent to each ICU.

- There should be a separate medication area of at least 50 square feet containing a refrigerator for pharmaceuticals, a double locking safe for controlled substances, and a sink with hot and cold running water.

- Countertops must be provided for medication preparation, and cabinets should be available for the storage of medications and supplies.

RECEPTION AREA

RECEPTIONIST AREA

- Each ICU or ICU cluster should have a receptionist area to control visitor access.
- Ideally, it should be located so that all visitors must pass by this area before entering.
- The receptionist should be linked with the ICU(s) by telephone and/or other intercommunication system.
- It is desirable to have a visitors' entrance separate from that used by healthcare professionals.
- The visitors' entrance should be securable if the need arises.

Special Procedures Room.

- If a special procedures room is desired, it should be located within, or immediately adjacent to, the ICU.
- One special procedures room may serve several ICUs in close proximity.
- Consideration should be given to ease of access for patients transported from areas outside the ICU.
- Room size should be sufficient to accommodate necessary equipment and personnel.

Clean and Dirty Utility Rooms.

- Clean and dirty utility rooms must be separate rooms that lack interconnection.
- They must be adequately temperature controlled, and the air supply from the dirty utility room must be exhausted.
- Floors should be covered with materials without seams to facilitate cleaning.
- The clean utility room should be used for the storage of all clean and sterile supplies, and may also be used for the storage of clean linen.
- Separate covered containers must be provided for soiled linen and waste materials.
- There should be designated mechanisms for the disposal of items contaminated by body substances and fluids.

Other attached area to ICU

- Equipment Storage area
- Nourishment Preparation Area
- Staff Lounge- A staff lounge must be available on or near each ICU or ICU cluster to provide a private, comfortable, and relaxing environment
- The lounge must be linked to the ICU by telephone or intercommunication system, and emergency cardiac arrest alarms should be audible within.
- Conference Room.
- Visitors' Lounge/Waiting Room

Supply and Service Corridors

- A perimeter corridor with easy entrance and exit should be provided for supplying and servicing each ICU.
- Removal of soiled items and waste should also be accomplished through this corridor.
- This helps to minimize any disruption of patient care activities and minimizes unnecessary noise.
- The corridor should be at least 8 feet in width.
- Doorways, openings, and passages into each ICU must be a minimum of 36 inches in width to allow easy and unobstructed movement of equipment and supplies.

Patient Modules

- Ward-type icus should allow at least 225 square feet of clear floor area per bed.
- Icus with individual patient modules should allow at least 250 square feet per room (assuming one patient per room),
- Provide a minimum width of 15 feet, excluding ancillary spaces (anteroom, toilet, storage).
- Each anteroom should contain at least 20 square feet to accommodate hand-washing, gowning, and storage.
- *A cardiac arrest/emergency alarm button must be present at every bedside within the ICU. The alarm should automatically sound in the hospital telecommunications center, central nursing station, ICU conference room, staff lounge, and any on-call rooms. The origin of these alarms must be discernable.*
- Locking drawers and cabinets must be used if syringes and pharmaceuticals are stored at the bedside

Utilities

Each intensive care unit must have :-

- Electrical power,
- Water, oxygen,
- Compressed air,
- Vacuum, lighting,
- And environmental control systems that support the needs of the patients and critical care team under normal and emergency situations.

ELECTRIC SUPPLY- Grounded 110 volt electrical outlets with 30 amp circuit breakers should be located within a few feet of each patient's bed .

- Sixteen outlets per bed are desirable.

Water Supply.- The water supply must be from a certified source, especially if hemodialysis is to be performed.

Lightning- Total luminance should not exceed 30 foot-candles

- Night lighting should not exceed 6.5 fc for continuous use or 19 fc for short periods.
- Separate lighting for emergencies and procedures should be located in the ceiling directly above the patient and should fully illuminate the patient with at least 150 fc shadow-free

ENVIRONMENTAL CONTROL SYSTEMS.

- A minimum of six total air changes per room per hour are required, with two air changes per hour composed of outside air.
- For rooms having toilets, the required toilet exhaust of 75 cubic feet per minute should be composed of outside air.
- Central air-conditioning systems and recirculated air must pass through appropriate filters.
- Air-conditioning and heating should be provided with an emphasis on patient comfort.
- For critical care units having enclosed patient modules, the temperature should be adjustable within each module.

INTENSIVE CARE UNIT EQUIPMENTS:-

Intensive care unit (ICU) equipment includes

- patient monitoring,
- respiratory and cardiac support,
- pain management,
- emergency resuscitation devices, and
- other life support equipment designed to care for patients who are seriously injured, have a critical or life-threatening illness, or have undergone a major surgical procedure, thereby requiring 24-hour care and monitoring.
- diagnostic devices

PATIENT MONITORING EQUIPMENTS

- Acute care physiologic monitoring system
- Pulse oximeter
- Intracranial pressure monitor
- Apnea monitor

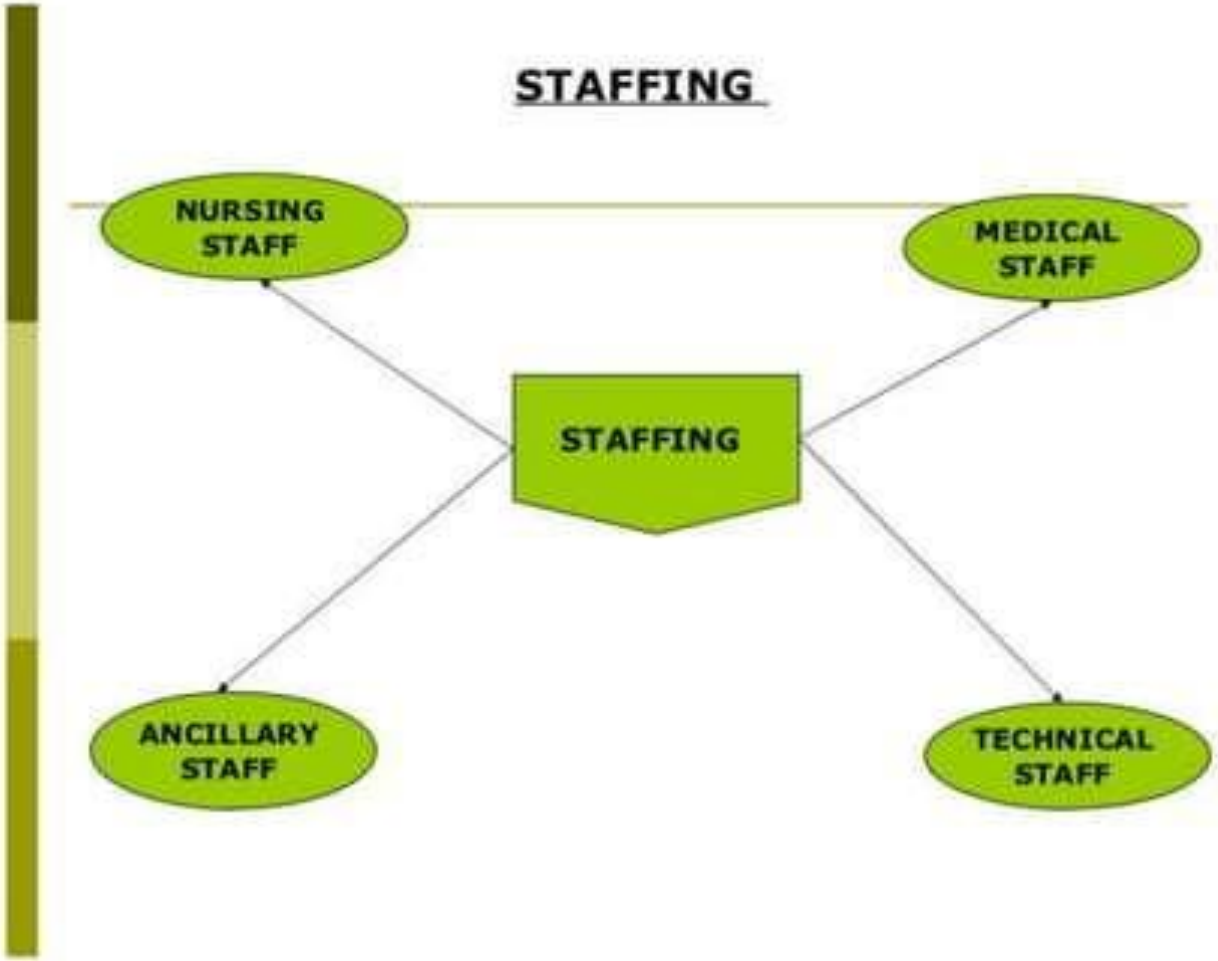
LIFE SUPPORT & RESUSCITATIVE EQUIPMENTS

- VENTILATOR
- INFUSION PUMP
- CRASH CART
- INTRAAORTIC BALOON PUMP

DIAGNOSTIC EQUIPMENTS

- MOBILE X-RAYS
- PORTABLE CLINICAL LAB. DEVICES
- BLOOD ANALYZER

STAFFING


NURSING STAFF
MEDICAL STAFF
STAFFING
ANCILLARY STAFF
TECHNICAL STAFF

Team Leader - It is important to have a good team led by an Intensivist (who spends >50% of his time in ICU). He should be a full timer particularly for tertiary centres. He should be qualified and trained and able to lead the team. Experience is absolutely essential to lead the ICU team

Resident Doctors (only MCI endorsed) - Post graduates from Anaesthesia, Medicine or Respiratory Medicine or other allied branches even surgical specialties. Other residents may be graduates depending upon total Bed strength of ICU.

- it is understood and recommended that one doctor cannot take care of more than five patients who are critically sick on ventilator and/or undergoing invasive monitoring .
- it is suggested that one PG resident with one graduate resident may be good for an ICU of 10 to 14 beds .

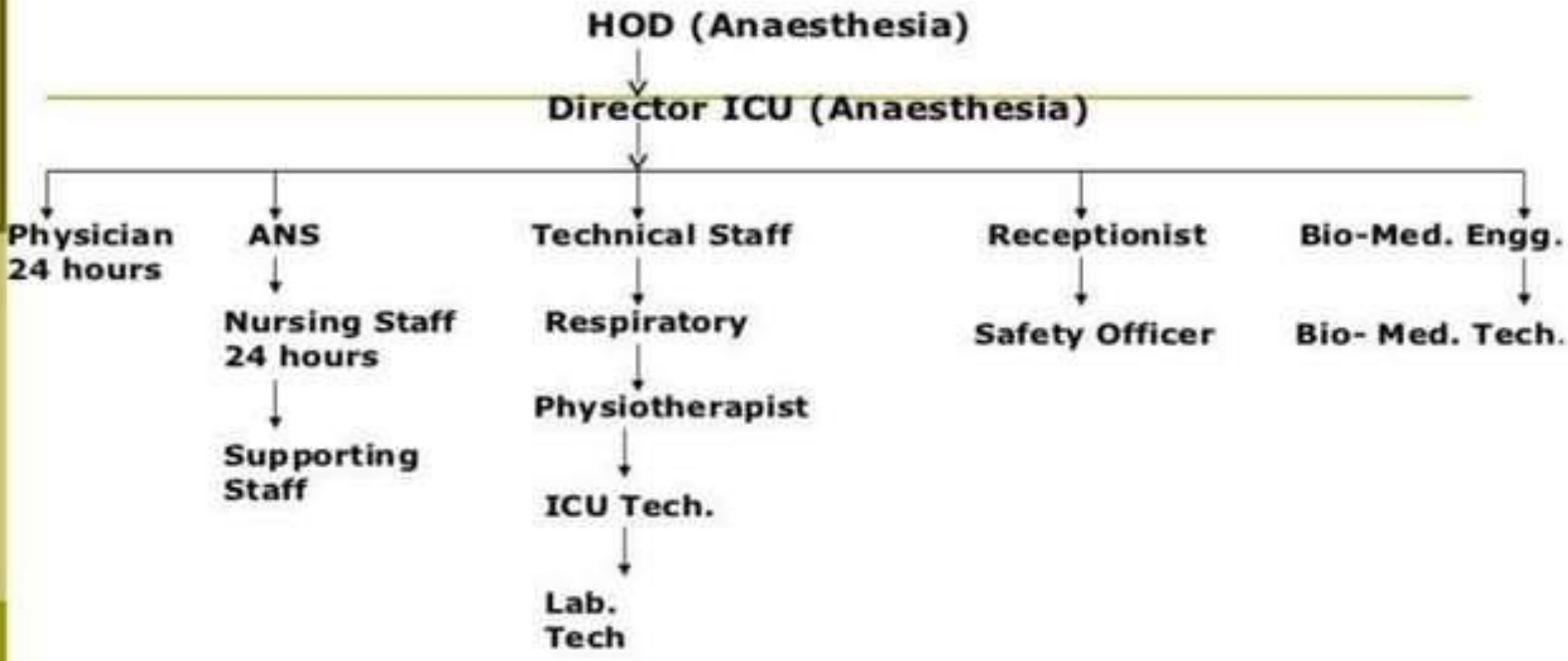
Nursing staff (only NCI Endorsed)

- Nursing – 1/1 nursing for Ventilated patients is desirable but in no circumstance the ratio should be < 2 /3 (Two nurses for 3 such patients).
- This will affect the outcome immensely.
- 1/2 to 1/3 nurse patient ratio is acceptable for less seriously sick patients who do not require above modalities

Other staff

- Respiratory Therapist looks after the patients being ventilated respiratory physiotherapy, this takes away lot of load off the duty doctor and the nurses
- Physiotherapist help in mobilisation, and Technicians who can perform simple procedures like taking samples and sending them to proper place in proper manner makes the task easy and less stressful.
- Computer person
- Biomedical engineer
- Nutritionist is also a very important professional who can contribute to outcome of patient. They have to be trained in desired practices and should be more inclined towards enteral feeding than TPN.
- Cleaning, class IV and Guards are also important to ICU particularly when they understand needs of ICU and its patients.
- One person should be responsible for observing protocols of Pollution and Infection control. Such person should act in close collaboration of Microbiology personnel

ORGANOGRAM OF ICU



THANK YOU.