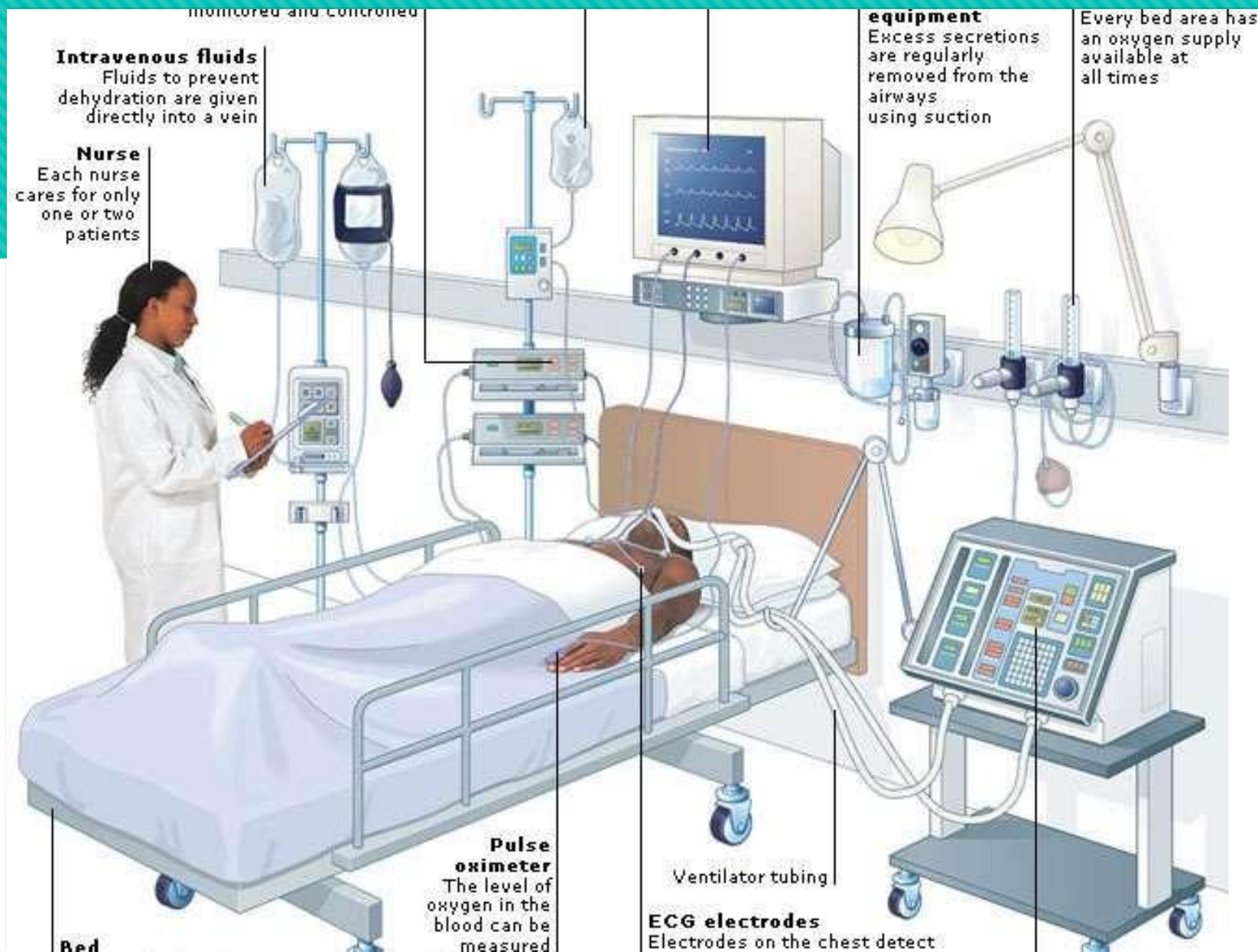


INTENSIVE CARE UNITS

How is the I.C.U different from other hospital units?

- ❑ Close observation and monitoring
- ❑ Specially Equipped





I.C.U Staff

- ❑ Intensivist/s
- ❑ Resident doctors Nurses
- ❑ Respiratory Therapists
- ❑ Dietician/s
- ❑ Physiotherapist
- ❑ Clinical Pharmacist & Other support staff like cleaning staff, guards



When are patients admitted to I.C.U?

- ❑ Major post-operative complications
- ❑ Accident
- ❑ Patients who have lung problems that require ventilator support with breathing
- ❑ Organ Failure
- ❑ Stroke
- ❑ Sepsis



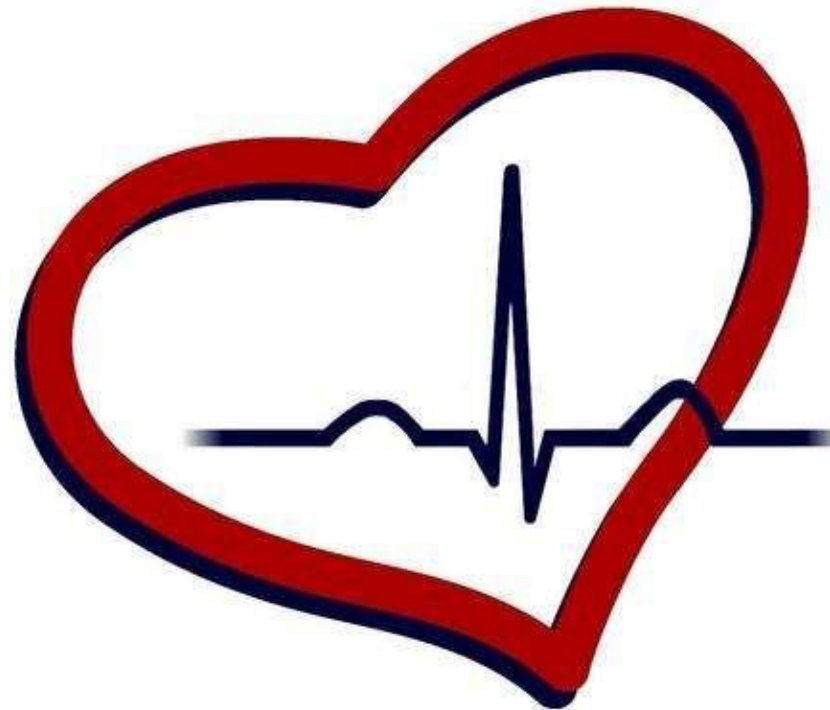
Types of Intensive Care Units

- ❑ Neonatal Intensive care unit (NICU)
- ❑ Pediatric Intensive care unit (PICU)
- ❑ Psychiatric Intensive care unit (PICU)
- ❑ Coronary care unit (CCU)
- ❑ Neurological Intensive care unit (NeuroICU)
- ❑ Post- anaesthesia care unit (PACU)



Contents

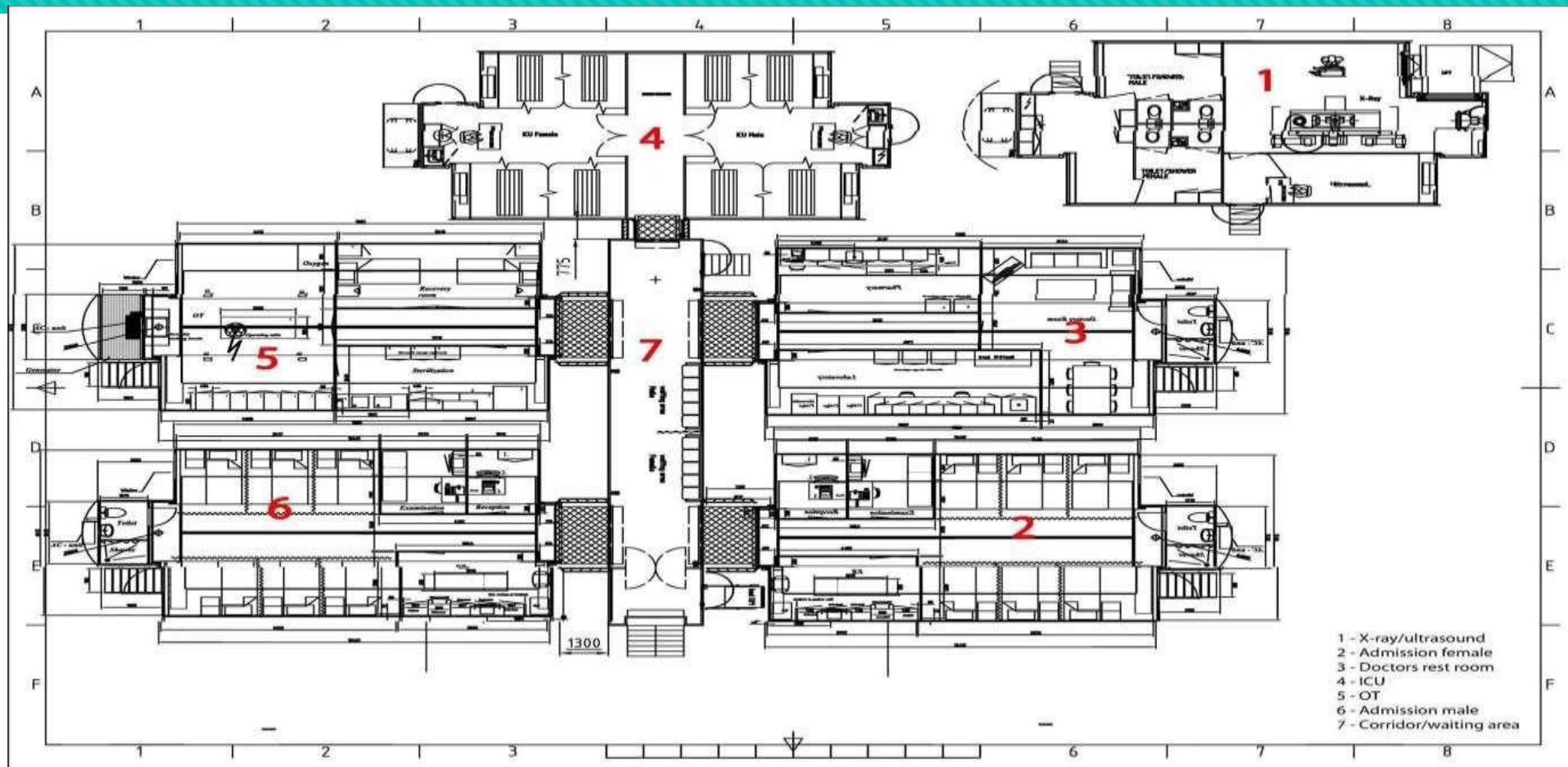
- ❑ **Design and planning**
- ❑ **Major types of I.C.U s**
- ❑ **N.I.C.U**
- ❑ **C.C.U**
- ❑ **Cost of an I.C.U**
- ❑ **I.C.U care in India**
- ❑ **Challenges**
- ❑ **Ethics**
- ❑ **Summary**



PLANNING AND DESIGN



LOCATION



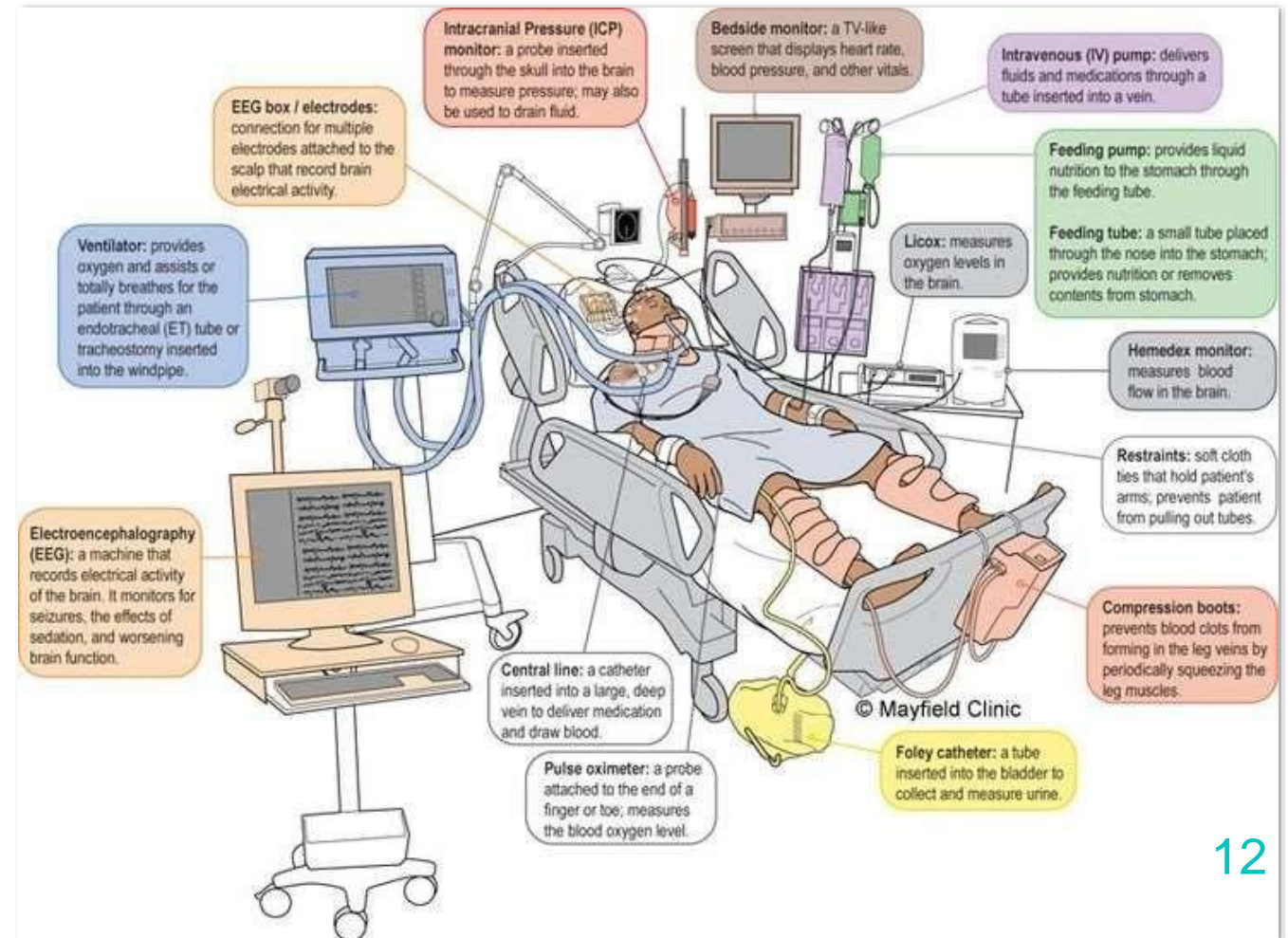
DESIGN



Facilities and Space Requirements



Equipment and Staffing



Equipments

Monitoring Equipment

- ❑ Central monitors
- ❑ ECG Recorder
- ❑ Intra vascular pressure monitoring devices
- ❑ Pulse Oximeters
- ❑ Spirometers
- ❑ EEG Monitor
- ❑ Blood Glucose meter



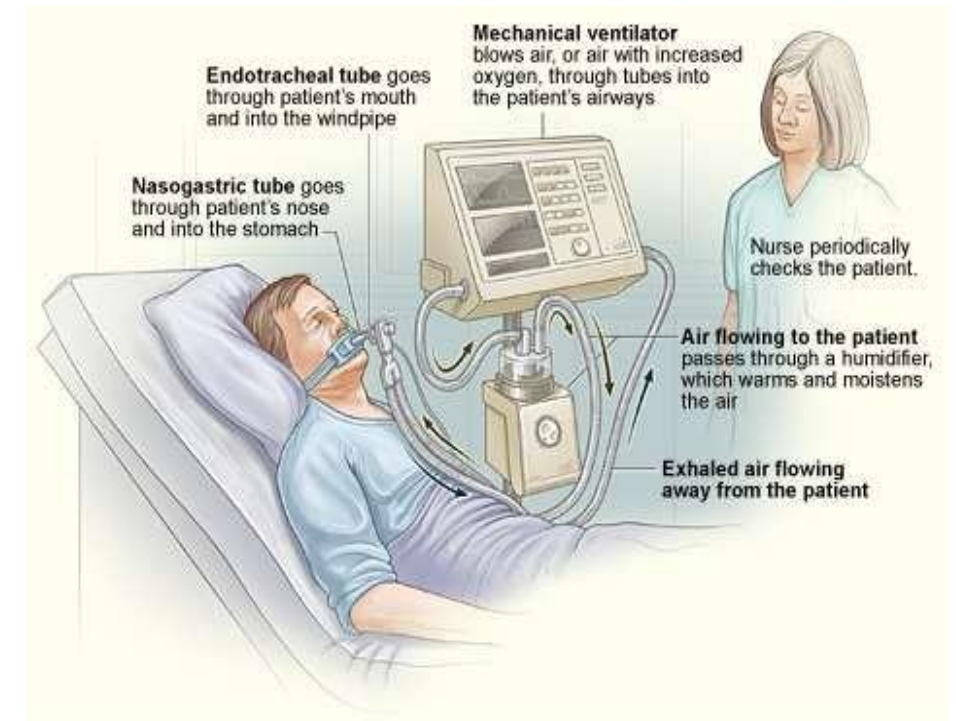
Cardiovascular equipment

- ❑ Cardiac defibrillator
- ❑ CPR Trolley
- ❑ Temporary transvenous pacemakers
- ❑ Infusion pumps and syringes



Respiratory equipment

- ❑ Ventilators
- ❑ Oxygen and compressed air and means of administration
- ❑ Nebulizers
- ❑ Intubation / Tracheostomy set
- ❑ Mechanical ventilatory assistance equipments including airways , manual breathing bags
- ❑ Fibreoptic Bronchoscope



- ❑ **Dialysis Equipment** : For Hemodialysis , Peritoneal dialysis , continuous arterio-venous haemofiltration.
- ❑ **Radiological equipment** : Portable X- ray Machine , Image intensifier
- ❑ **Miscellaneous equipment** : Tourniquet, Vascular cut down set , Thoracocentesis & Thoracotomy sets etc.



Staffing



Medical staff

- ICU Incharge /Intensivists
- Resident Doctors (senior and junior)



Nursing staff

- Highly trained and of above average competence
- Recommended Nurse patient ratio 1:1



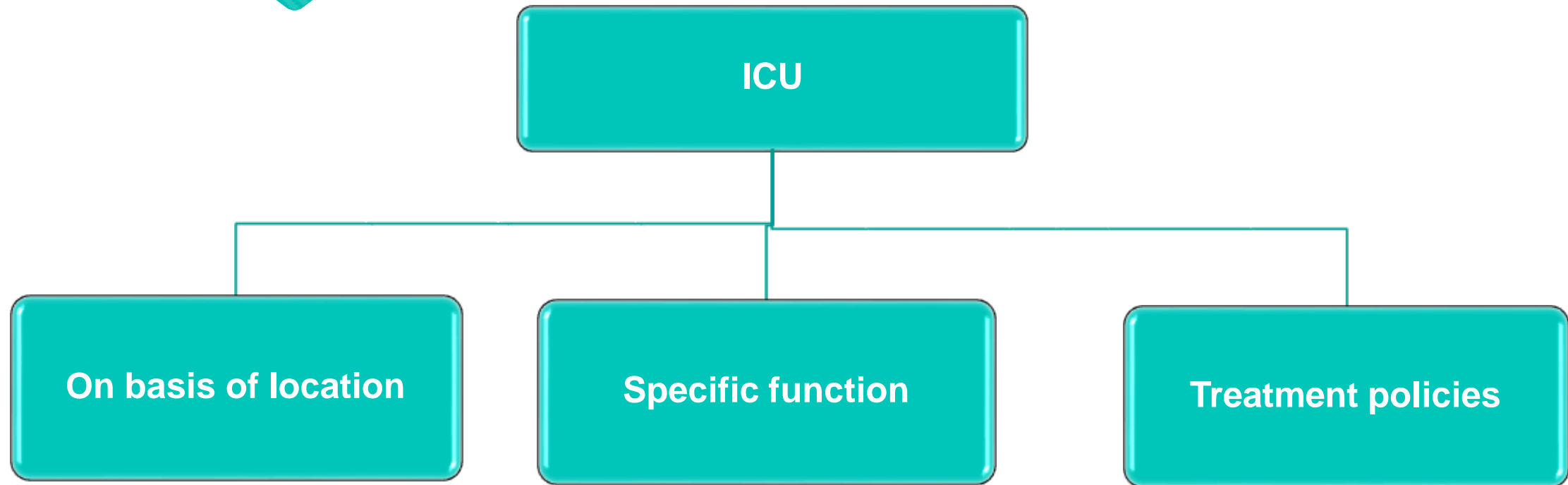
Auxillary personnel

- ICU Technicians
- Nursing orderlies (ward boys /female attendants) and Sweepers

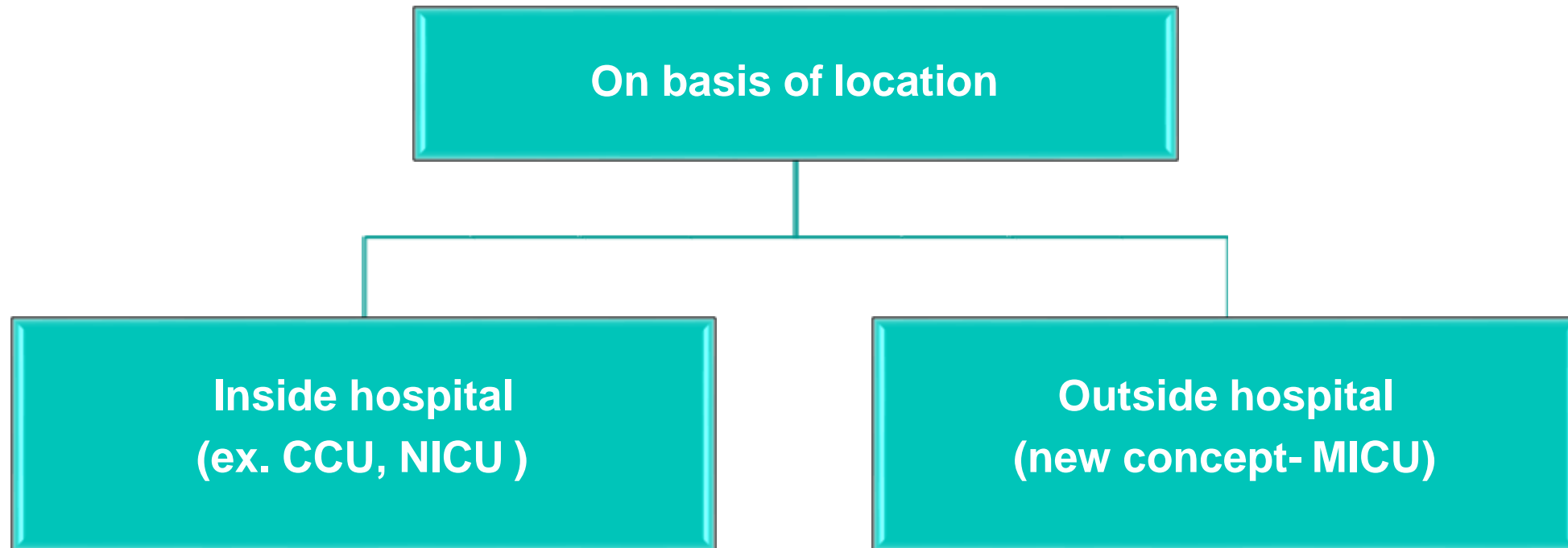
SPECIFIC TYPES OF ICU & LEVELS OF TREATMENT IN ICU



Types Of Intensive Care Units(ICU)



On Basis Of Location



❑ Inside hospital-

➤ This is type of ICU unit which is located inside hospital (ex. CCU, NICU)



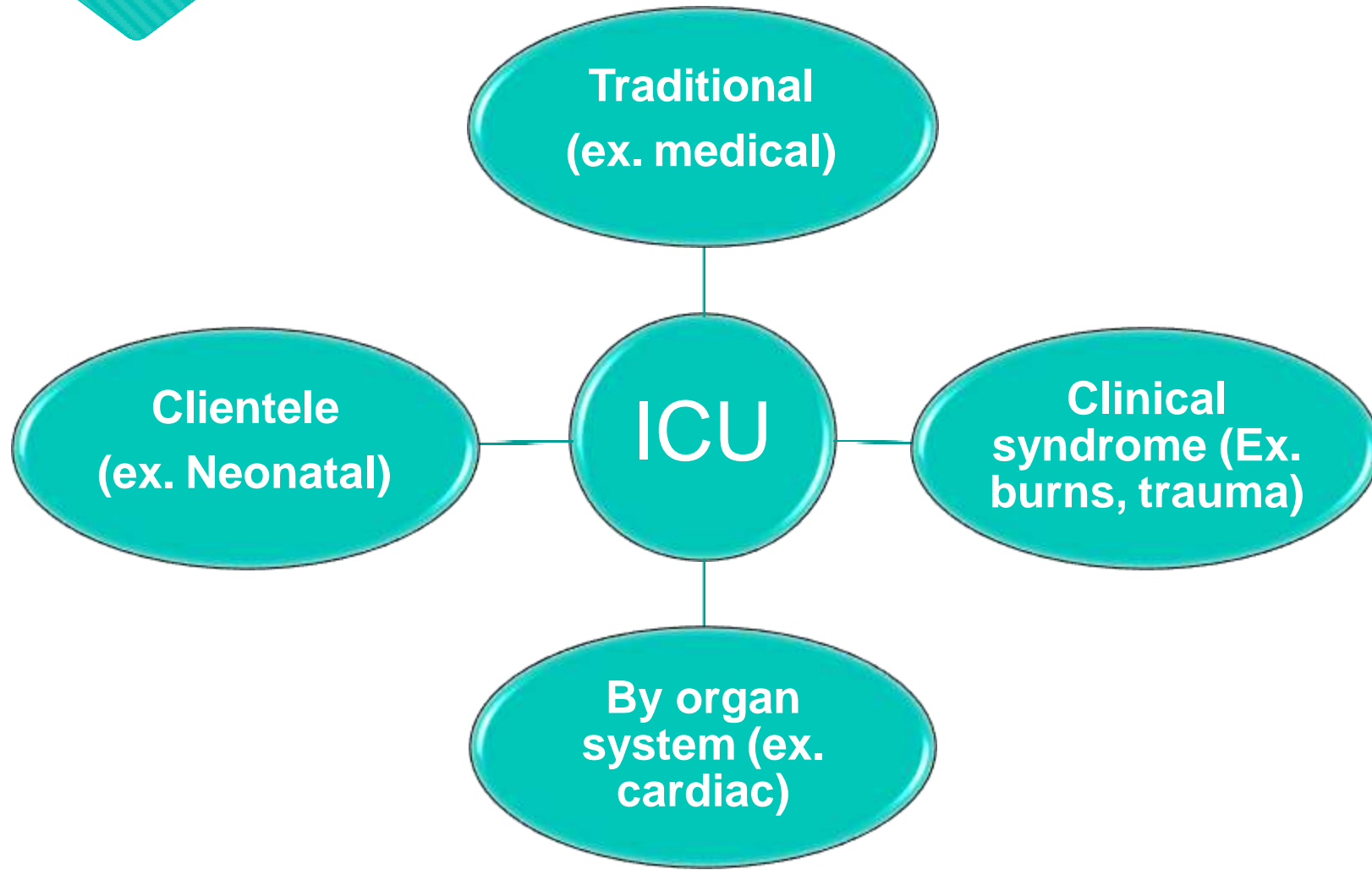
❑ Outside hospital –

Mobile Intensive Care Unit(**MICU**)

➤ This is new concept in which specialized ambulance with the staff and equipment to provide on-scene Advanced Life Support resuscitation and intensive care during transport.



On Basis Of Specific Functionality

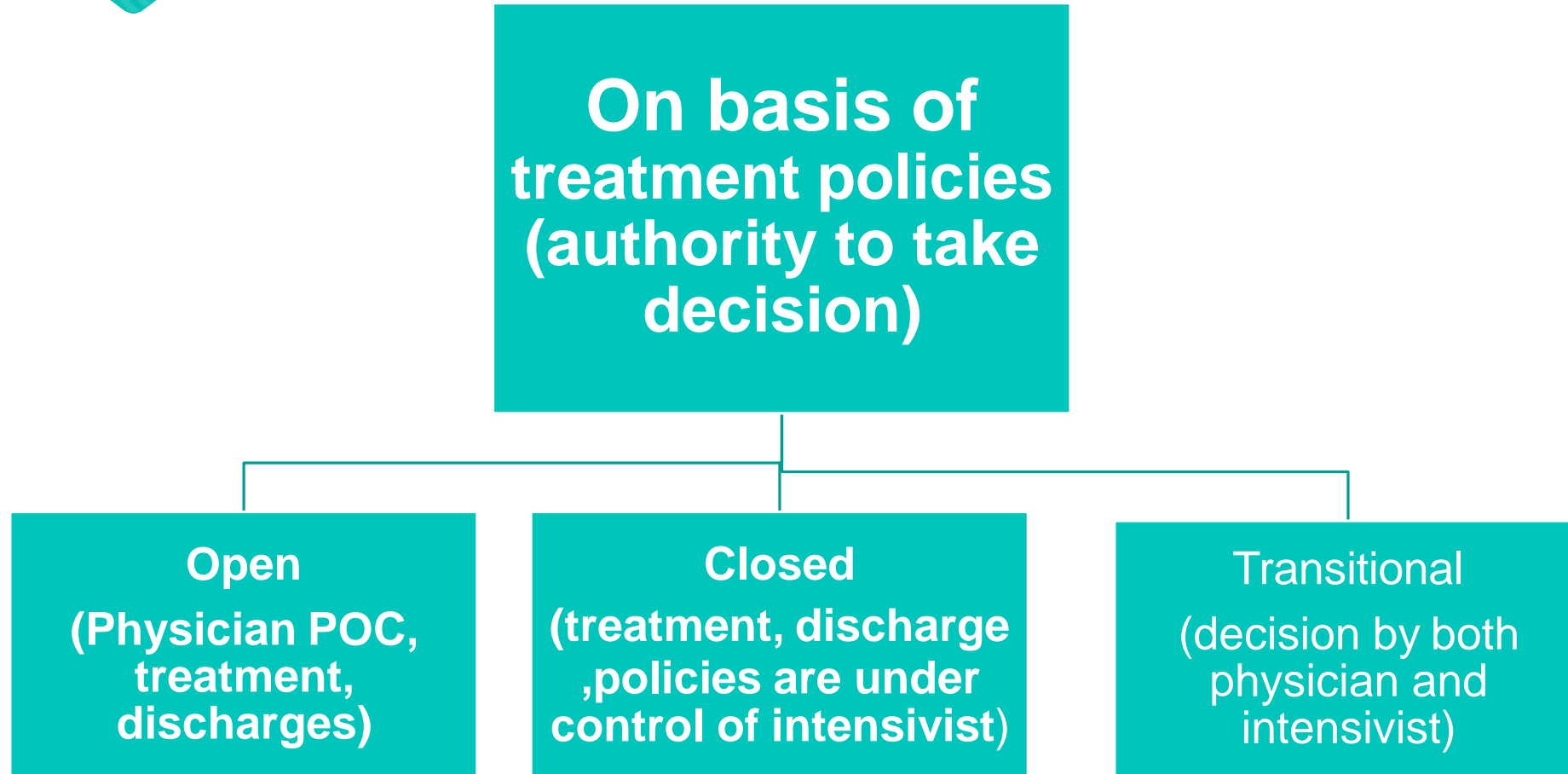


ICU: Units (specialty based)

Types of ICU units can be divided functionally and on basis of specialty they serve.

- ❑ There are mainly 4 types of ICU units found in any tertiary hospital-
 - General/surgical (ICU)
 - Coronary/ cardiac care unit (CCU)
 - Pediatric care unit (PICU)
 - Neonatal care unit(NICU)

B. On basis of treatment policies



1. **Open** – Any physician with hospital admitting privilege and can direct record and direct treatment plan.
 - ❑ Disadvantages – lack of cohesive plan, night coverage etc
2. **Closed** – An Intensivist is physician of record, also can discharge, refer patient for specialty.
 - ❑ Advantage - constant coverage, standardized protocol .
 - ❑ Disadvantage- variation in opinion, lack of physician attention.
3. **Transitional** – Intensivist is present and the plan of care is by common decision . Most of ICU work on this plan.
 - ❑ Advantage - standard policies ,awareness of physician ,etc.
 - ❑ Disadvantage – conflict in opinions , lack of immediate action plan.

ICU: Units (specialty based)

- ❑ Mainly **4 types of ICU** units are found in any tertiary hospital-
 - General/surgical (**ICU**)
 - Coronary/ cardiac care unit (**CCU**)
 - Pediatric care unit (**PICU**)
 - Neonatal care unit(**NICU**)

General ICU

- ❑ in this type of ICU usually patients with critical illness(which need special attention) and post operative cases are taken care.
- ❑ This unit mainly comprises of physician ,Intenivist, surgeons ,trained nurses.
- ❑ MICU/SICU performs intense monitoring of patients and provide care for those requiring high frequency ventilation and continuous renal replacements.
- ❑ Unit consist of Intenivist, Physician/Surgeon along with paramedical staff, trained nurses, respiratory therapist, housekeeping staff etc.
- ❑ Most common cases- Pneumonia, ARDS, Sepsis, Multiple organ failure, post hernia ,etc



Coronary/Cardiac Care Unit

- ❑ It is a comprehensive unit which deals with patients having primary cardiac diagnosis.
- ❑ It performs intense monitoring of patients and care for those requiring Intra aortic balloon pumps, external temporary pacemakers ,after Coronary Artery Bypass Grafting, etc.
- ❑ Most common cases- Congestive heart failure, coronary artery diseases etc.



Pediatric ICU- (PICU)

- ❑ It is a multidisciplinary unit which provides treatment to children and adolescent who have become critically ill or injured.
- ❑ In this unit there is Pediatrician, Pediatric surgeon specialist, specially trained nursing staff, paramedical staff, respiratory therapist ,general physician etc.
- ❑ There equipments differ in size, shape etc. example- mask for nebulisation, T-piece, stethoscope, etc and it is usually colourful ,bright for children's.
- ❑ Most common cases are –
congenital anomalies, respiratory failure, poison
Etc.



Neonatal ICU – NICU

- ❑ This is specialized unit for care of new born babies.
- ❑ This specialty unit cares for neonatal patients who have not left the hospital after birth. Common conditions cared for include prematurity and associated complications, congenital disorders such as Congenital diaphragmatic hernia, or complications resulting from the birthing process.
- ❑ Unit comprises of Neonatologist, Physician, Specialized trained nursing staff, counsellors etc.



LEVELS OF TREATMENT IN ICU

❑ LEVEL I-

- ❑ This can be referred as high dependency where close monitoring, resuscitation, short term ventilation (less than 24 hrs) care is provided .

❑ LEVEL II-

- ❑ This level there is observation, prolonged ventilation and stay is present and also there is a resident doctor, nurse, pathology ,etc.

❑ LEVEL III-

- ❑ This level provides all aspect of Intensive care along with dialysis ,monitoring and usually has Intenivist.

NEONATAL INTENSIVE CARE UNIT



- A **neonatal intensive care unit**, usually shortened **NICU** (sometimes pronounced "Nickyoo") and also called a Special Care Nursery, newborn intensive care unit, intensive care nursery (**ICN**), and special care baby unit **SCBU** [pronounced "Skiboo"], is a unit of a hospital specializing in the care of ill or premature newborn infants.
- The **NICU** is distinct from a special care nursery (**SCN**) in providing a high level of intensive care to premature infants while the **SCN** provides specialized care for medical problems

EQUIPMENTS

An ***Incubator*** is an apparatus used to maintain environmental conditions suitable for a neonate (newborn baby). It is used in preterm births or for some ill full-term babies. Possible functions of a neonatal incubator are:

- Oxygenation
- Observation
- Protection
- Maintenance of Fluid Balance





NICU Staff and Caregivers

- Neonatologists
- Nursing Staff
- Respiratory Therapists
- Occupational and Physical Therapists
- Ancillary Staff



Levels of NICU Care

- Although all NICUs care for babies who need extra help, different NICUs offer different levels of care.
- **Level I: Basic Newborn Care**
- **Level II: Special Newborn Care:** These nurseries can care for babies born at greater than 32 weeks gestation or who are recovering from more serious conditions.
- **Level IIA:** These nurseries do not provide assisted ventilation.
- **Level IIB:** These nurseries can provide assisted ventilation for less than 24 hours, and can also provide Continuous Positive Airway Pressure (CPAP)

Level III:

III Subspecialty Newborn Care: Level III NICUs care for the sickest babies and offer the greatest variety of support.

Level IIIA: These nurseries care for babies born greater than 28 weeks. They offer mechanical ventilation and minor surgical procedures such as central line placement.

Level IIIB: Level IIIB NICUs can offer different types of mechanical ventilation, have access to a wide range of pediatric specialists, can use imaging capabilities beyond x-ray, and may provide some surgeries requiring anesthesia.

Level IIIC: The most acute care is provided in level IIIC NICUs, sometimes called level IV NICUs. These nurseries can provide advanced ventilation, including ECMO, and can provide advanced surgeries including “open-heart” surgeries to correct congenital heart defects.

Coronary Care Unit



- ❑ A coronary care unit (**CCU**) or **Cardiac intensive care unit (CICU)** is a hospital ward specialized in the care of patients with heart attacks, unstable angina, cardiac dysrhythmia and (in practice) various other cardiac conditions that require continuous monitoring and treatment.

Diagnosis

- ❑ Patients normally go to the Cardiac Intensive Care Unit after or immediately before having surgery on their heart or lungs.
- ❑ They may be adults who require heart surgery or adults who were born with a congenital heart disorder. Surgery might include coronary bypass operations, heart valve replacements or aortic reconstructions – and may be highly complex. This means that in Cardiac ICU, patients normally need multi-organ support.



Equipment

The doctors and nurses can, and do, monitor more but their main priority is to support the organs that may be failing and to try to get them functioning properly again.

- ❑ There are likely to be lots of machines around the patient. This is all equipment used to help them function, including:
- ❑ Cardiovascular support, to measure the heart's output
- ❑ An external cardiac support device, to help the heart beat properly
- ❑ Respiratory ventilator, to help the patient breathe
- ❑ Kidney machine, to provide the kidney function when the organs aren't working properly

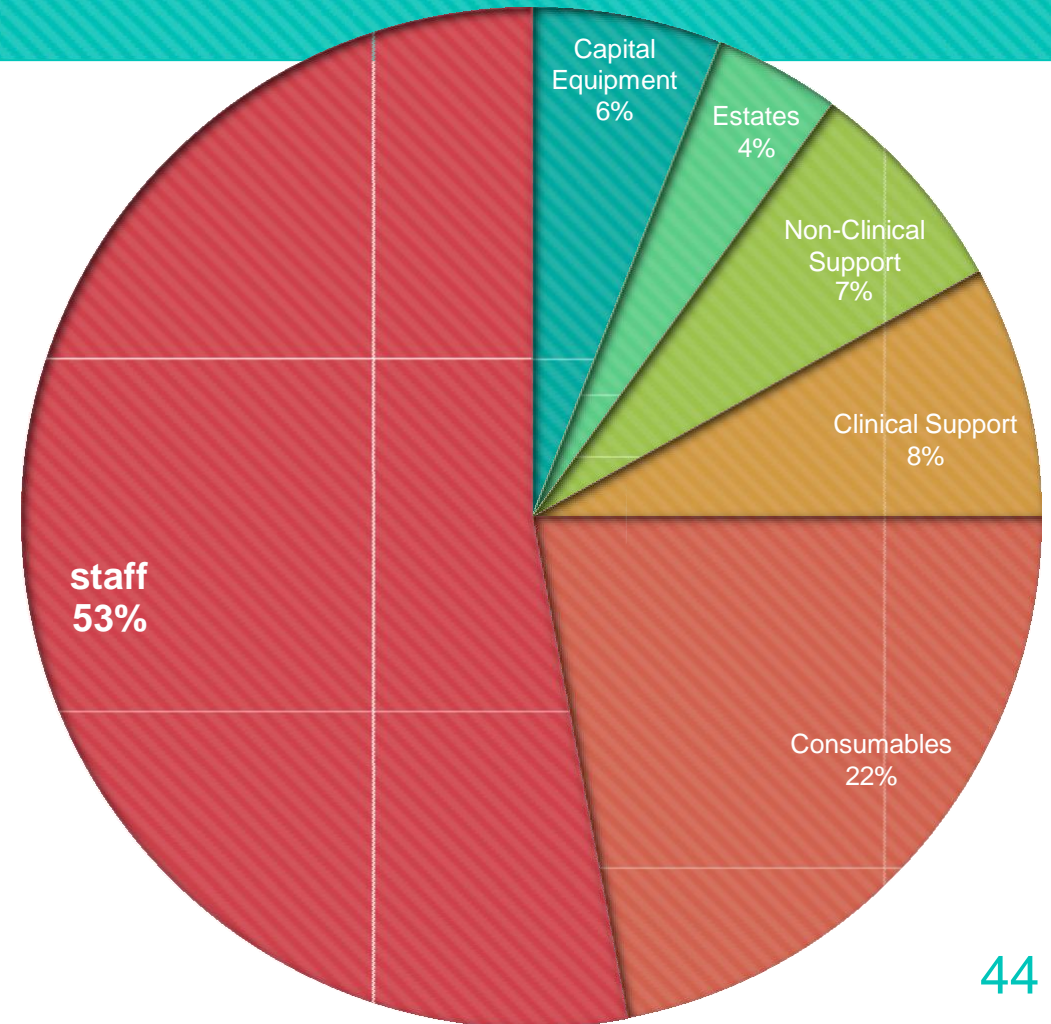
- The CCU has changed dramatically since its initial inception, and with it has changed the required skill set of the CCU cardiologist. It is no longer acceptable to assume that all cardiologists are trained in acute cardiac care and can manage the critically ill cardiac patient. Application of high quality, appropriate, evidence-based medicine to these complex, high-risk cardiac patients requires formal training in this field, and an ongoing collaboration between cardiology and intensive care medicine.

Cost of an I.C.U



Cost Blocks

- Cost Block 1 : Capital Equipment
- Cost Block 2: Estates
- Cost Block 3: Non Clinical support services
- Cost Block 4: Clinical support services
- Cost Block 5: Consumables
- Cost Block 6: Staff



“Top-down” VS “Bottom-up” Approach



The ‘Top Down’ approach divides the ICU budget by the number of patients to obtain an average cost/patient

The ‘Bottom up’ approach involves the assignment of individual patient, according to the resources used by that patient, building individual patient costs



How to overcome

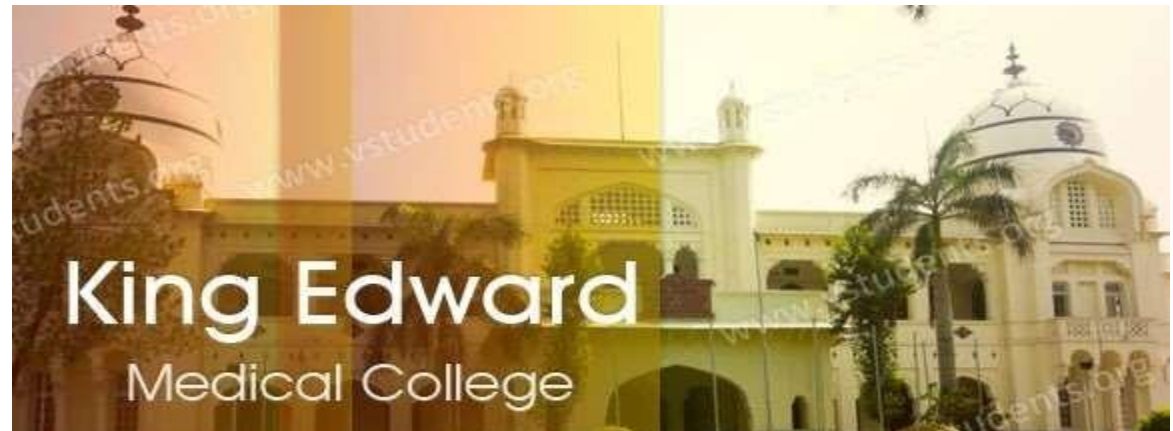
- ❑ ICU constitutes 20% of the hospital budget
- ❑ Clinicians need to allocate and utilize resources responsibly
- ❑ Accurate and comparable costing information is vital.
- ❑ Whenever costing becomes impracticable make assumptions which should be contemporary and seem logical.
- ❑ Market knowledge of equipment cost , rentals, manpower, consumables will make the costing more realistic.

I.C.U Care in India



History

- In India, First Coronary ICU was started at King Edward memorial hospital, Mumbai.
- ICU care was then followed by other big hospitals of Mumbai like Breach candy and in other large cities of India.
- All India Institute of Medical Sciences, Delhi and some corporate/chain hospitals in metropolitan cities like Apollo, Max hospitals have started different types of ICU's in India.





- It contains a combination of many specialties and technologies.
- They also manage critical care units efficiently, ensuring that the whole team of doctors, nurses and paramedics work together , using strict protocols to :
 - minimise infections
 - minimise complications
 - ensure speedy recovery.



Multidisciplinary ICU

Types of ICU in India



Neonatal ICU



Paediatric ICU



Cardiac ICU



Neuro ICU

Facilities and care

- ❑ Care of high dependency patients
- ❑ Advanced respiratory support to critically ill patients
- ❑ Intensive monitoring and support with better nurse to patient ratio
- ❑ Special visiting hours
- ❑ Continuous monitoring of food and medicines
- ❑ Sterile and organised treatment and service

Challenges

- ❑ High investment in personnel, technology, and material resources
- ❑ Extreme shortage of ICU beds in Public as well as Private hospitals
- ❑ Prevents timely admission of the patients.
- ❑ Shortage of ICU beds can increase the risk of poor outcomes.
- ❑ Difficulty in obtaining an ICU bed.
- ❑ High mortality
- ❑ Direct impact of the cadaver organ transplant
- ❑ Shortage of ICU beds limits the protocols to be followed for brain dead patients for organ harvesting.
- ❑ Exclusive ICU's for brain dead patients.
- ❑ Urgent need to increase the number of ICU beds to at least 10% of the total beds.

Ethics debate

- ❑ Ethical considerations in the intensive care unit (ICU) often involve moments of crisis marked by disagreement over decisions, such as whether to resuscitate a patient; to extubate and allow the patient to die; to hasten actively a patient's death; to withhold or withdraw unilaterally so-called *futile* treatment over a patient's or family's objections; or to allocate limited or expensive resources.
- ❑ Advances in medical technology and pharmacologic therapies that have the potential to extend life also fuel the fire of an already death-denying culture.



- Because they provide potential benefit at great personal and public cost, the intensive care unit (ICU) and the interventions rendered therein have become symbols of both the promise and the limitations of medical technology. At the same time, the ICU has served as an arena in which many of the ethical and legal dilemmas created by that technology have been defined and debated.
- In the absence of overt conflict or controversy, we may delude ourselves in thinking that ethics is either unnecessary or that the requirements of ethics are easily met. We thus may fail to see those ethical issues that exist each and every day in our interactions with patients, families, and fellow workers in the ICU.

Conclusion

- ❑ 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 operates with defined policies; protocols and procedures should have its own quality control, education, training and research programmes.

- ICU is a highly specialised part of a hospital or Nursing home where very sick patients are treated.
- It should be located near ER and OT and easily accessible to clinical Lab Imaging and Operating rooms.
- No Thorough fare can be allowed through it
- Ideal Bed strength should be 8 to 14.
- More than 14 beds may put stress on ICU staff and may also have a negative bearing on patient outcome.
- 100 sq ft , However a space of 125 to 150 sq ft per pt will be desirable .
- Additional space equivalent to 100 % of patient room area should be allocated to accommodate nursing stn, storage etc.
- 10% beds should be reserved for patients requiring isolation.
- Two rooms may be made larger to accommodate more equipment for patients undergoing multiple procedures like Ventilation, RRT Imaging and other procedures.
- There should be at least two barriers to the entry of ICU There should be only one entry and exit to ICU to allow free access to heavy duty machines like mobile x-ray, -bed and trolleys on wheels and some time other repairing machines.
- At the same time it is essential to have an emergency exit for rescue removal of patients in emergency and disaster situations

- ❑ Proper fire fighting /extinguishing machines should be there.
- ❑ It is desirable to have access to natural light as much as possible to each patient.
- ❑ 21 Head end Panels are recommended over Pendants for monitoring, delivery of oxygen, compressed air and vacuum and electrical points for equipment use for these patients
- ❑ Every ICU should have a qualified /trained Intensivist as its leader
- ❑ One doctor for five patients may be ideal ratio. 1/1 Nurse ideally but < 1/2 nurse –patient ratio is recommended for ventilated patients and patients receiving invasive monitoring and on RRT



- ❑ Other personnel needed for ICU have been listed.
- ❑ ICU should practise given protocols on all given clinical conditions.
- ❑ Proper requirement of Furniture, storage, light, Noise, flooring, walls, ceiling air conditioning, ventilation etc.
- ❑ Needs of doctors, Nurses and relatives of patients should be carefully observed
- ❑ Required standards and equipment for different levels of ICUs have been mentioned.
- ❑ Ethics debate.

