

ICU Design for COVID19

Four major zones

1. The patient Care Zone
 - patient rooms
 - separate rooms for each patient preferred
 - floor area per patient: at least 125 square feet plus at least 4 feet free area at head end and foot end each
 - at least 6 feet distance between two beds
 - Negative pressure isolation rooms – 2 such rooms per 10 ICU beds or provision of negative pressure tent at the bed side for aerosol generating procedures.
 - adjacent areas
 - Medical equipment like bedside X-ray need to be placed around the patient.
 - Bedside procedures like central lines, intubation, tracheostomy, renal replacement therapy are common.
2. The clinical support zone
 - a. Central nursing station
 - b. Computers – at least 1 computer per 6 - 8 beds with printer
3. The unit support zone
 - administrative – office room 1
 - materials management
 - separate storage areas to store consumables
 - separate storage areas to store equipment
 - staff support
 - Duty rooms –
 - with facility for changing clothes, short naps, and lockers
 - separate for doctors and nurses
 - toilets
 - pantry
 - Patient family counseling room
 - Classroom/ meeting room
 - Dirty utility room
 - Clean utility room
 - Waste disposal area
 - Wash basins
4. Patient's family support zone
 - waiting area
 - toilet
 - Pantry

Size and arrangement of the unit

Single vs Multi-bed rooms

- Single rooms are superior to multi-bed rooms in terms of patient safety
- Single rooms enhance privacy
- Single rooms improve sleep quality
- If multiple beds – no more than 6 beds /room

Clear floor area: fixed room furnishings, equipment...

- Sufficient enough for services that are brought to the bedside (portable imaging, echocardiography, TCD, ECG, Nuclear medicine, dialysis equipment...)
- Single patient rooms
 - optimal clearance of not less than 4 ft at the head and foot of the bed
 - not less than 6 ft on each side of the standard critical care bed

Medical equipment requirement/bed

- ICU beds with wheels, head up, leg up, trendelenberg , reverse trendelenburg and CPR position
- Monitors – Basic 5 parameters (ECG, sPO2, NIBP, Heart Rate, Temperature), + EtCO2 + 2 IBP options
- Mechanical Ventilators –
 - one per bed + 1 additional ventilator per 10 beds
 - Invasive and non-invasive mechanical ventilation options
- 2 syringe pumps + One infusion pump/bed
- One SCD pump /bed
- Suction device
 - at least 2 vacuum outlets fixed at each bedside
 - one portable suction machine for each 6 beds
- Over bed tables – 1 for each bed
- Refrigerator – 1 per 10 beds

Equipment to be available inside ICU

- Defibrillator – 1/10 beds
- ABG machines - 2
- One portable USG machine with 3 probes
- One bronchoscope
- Emergency/Resuscitation drug cart – 1/10 beds
- Airway cart – 1/10 beds
- Drug cart – for general purpose
- Drug preparation area/ trolley – 1/10 beds

- Portable X-ray machine – 1 dedicated for ICU
- Hemodialysis machine – 1 for 10 beds
- ETO sterilization – 1
- Trays for procedures

Human Resource

1. Head of ICU –
 - a. Intensivist (trained in critical care medicine) or Anesthesiologist (trained in Critical Care Medicine/ Intensive Care Medicine)
 - b. Should be full time for ICU
2. Doctors –
 - a. MD (Anesthesiology or Internal medicine with experience in ICU) – one per 10 bed
 - b. Anesthesia Residents/Medical officers – 1 per 10 bed
3. ICU logistic manager – 1 (from hospital management)
4. Nurses
 - a. ICU incharge nurse – 1
 - b. ICU shift in-charge nurse – 1 per shift
 - c. Nurses – 1 nurse/ patient
5. Pharmacist - 1
6. Physiotherapist – 1 dedicated for 20 beds
7. Microbiologist – one dedicated for ICU
8. Nutritionist/ Dietician – one dedicated for ICU
9. Patient care attendants – 1 per 6 beds in each shift
10. Radiographer – 1 dedicated for ICU
11. Biomedical engineer – 2 dedicated for ICU
12. Cleaning staffs
13. Guards

Medical utility distribution system

- For oxygen, air, vacuum – one of the following four options
 1. fixed headwall system
 2. fixed column
 3. suspended column
 4. boom configurations
- > 50% of the electrical outlets in the room should be connected to the hospital emergency power system.
- 2 oxygen outlets for each bed/room
- one air outlet for each bed/room
- Two vacuum (suction) outlets for each bed/room
- RO water supply system for Hemodialysis

- Heating, Ventilation, and Air conditioning – central air conditioning system with appropriate filters for sterile air circulation
- Wash basins with medical grade/ RO water supply – 1 per 6 beds

Windows

- Natural light is essential to the well – being of patients and staff
- Visual access to the outdoors
- At least one window of appropriate size per patient bed area

Patient room furnishings

- Bed designed for the critically ill patient
- containers to collect trash and waste products
- containers to collect hazardous waste products
- clock, calendar

Temperature control

- to keep ambient temperature between 18 to 28 degrees centigrade

Note: Location of ICU should be convenient with easy access from Emergency and operating rooms. Laboratory and pharmacy services should also be located in the vicinity of ICU.

Policies

- Infection control policy
- Antibiotic stewardship
- Visiting policy
- Safety and protection of staff
- Treatment of ICU staff in case they acquire COVID19

Checklists for common procedures

- Donning the PPE
- Endotracheal intubation
- Central venous catheter insertion
- Patient transfer – intershospital and intra-hospital transfers
- Tracheostomy
- Bronchoscopy

Data management and auditing/ quality indicators

1. ICU specific HAI rates (VAP, CA-UTI, CA-BSI, SSI)
2. Standardized mortality rate
3. Incidence of accidental removal of tubes
4. Average length of stay
5. Compliance of accidental removal of tubes
6. Average length of stay
7. Compliance percentage to admission-discharge criteria
8. ICU re-admission rate
9. Re-intubation rate

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