

ESTABLISHING AND ORGANISING NEONATAL INTENSIVE CARE UNIT

**RUPINDER DEOL
ASSISTANT PROFESSOR
COLLEGE OF NURSING
AIIMS RISHIKESH**

INTRODUCTION

- Neonatal Intensive Care is defined as, “ care for medically unstable and critically ill newborns requiring constant nursing, complicated surgical procedures, continual respiratory support, or other intensive interventions.”
- A NICU is a unit that provides high quality skilled care to critically ill neonates by offering facilities for continuous clinical, biochemical and radiological monitoring and use of life support systems with the aim of improving survival of these babies.

- Intermediate care includes care of ill infants requiring less constant nursing care , but does not exclude respiratory support.
- When an intensive care nursery is available, the intermediate nursery serves as a “step down unit” from the intensive care area.
- In other words, neonatal intensive care means, maximal intensive care and high dependency intensive care.

Modern NICU is the product of two main factors:

1. The development of an understanding that the pathophysiologic phenomenon associated with neonates are so distinctive that they require an appropriate setting where the critically ill infant can be managed.
2. Convergent advances in electronics and biochemistry which made such a setting feasible.

These advances include:

1. Methods for continuous evaluation of numerous parameters of fetal and neonatal illness.
2. Methods of continuous monitoring of cardio respiratory function.
3. Micro techniques for rapid biochemical determinations from minute blood samples.
4. Servo controlled radiant heat incubators.

FUNCTIONS OF NICU.

NICU's perform the following functions:

1. Observe critical infants.
2. Monitor critical infants electronically.
3. Carry out advanced therapeutic procedures.
4. Promote maternal child contact to the fullest extent possible.

CLASSIFICATION

Level 1. Newborn Nursery

- Neonatal resuscitation at every delivery
- Care for healthy term newborns, and for infants 35-37 weeks gestation who remain physiologically stable.

Level 2a. Special Care Nursery.

Level 1 care + infants > 32 weeks gestation and > 1500 grams

Level 2b. Special Care Nursery

Level 2a + mechanical ventilation for brief duration (<24 hours) or CPAP.

Level 3a. Neonatal Intensive Care

Infants > 28 wks and > 1000 g birth weight

Sustained life support and mechanical ventilation

Minor surgical procedures

Level 3b. Neonatal Intensive Care Unit.

Infants < 28 weeks and < 1000 g birth weight.

Advanced respiratory support – HFV/ iNO

Major surgical procedures

Level 3c. Neonatal Intensive Care Unit

Level 3b NICU +

ECMO and surgical repair of complex

CHD requiring cardiopulmonary bypass.

ASSESSMENT OF NEWBORN CARE

Each Neonatal Intensive Care Cot should have the following:

- a. Incubator or radiant warmer (servo).
- b. Ventilator with humidifier.
- c. Syringe/ Infusion pumps.
- d. Facilities for monitoring the following variables on continuous basis – Vital data monitoring, Oxygen saturation, Blood pressure monitoring – non invasive and if possible, invasive.

LOCATION OF NICU

The NICU should be a distinct area within the hospital with controlled access and a controlled environment.

The NICU should be located within space designed for that purpose.

It should provide good visibility of infants and circulation of staff, family and equipment.

Traffic to other services should not pass through the unit.

The NICU should be in close proximity to the area of the hospital where births occur.

When perinatal and neonatal services must be on separate floors of the hospital, an elevator located adjacent to the units with priority should be provided for service between the birthing unit and the NICU.

Location

- Close proximity to LR separate staff
- Neonatal perinatal services separate floors
– elevator
- Outborn babies – free access to the reception
- Not on the top floor

MINIMUM AREA, CLEARANCE AND PRIVACY REQUIREMENTS FOR THE INFANT CARE SPACE.

- Each infant care space shall contain a minimum of 120 square feet (11.2 square meters), excluding sinks and aisles.
- There should be an aisle adjacent to each infant care space with a minimum width of 4 feet (1.2 meters) in multiple beds.
- The unit should have 50 sq.feet patient care space per baby in the Level II.
- For level III, patient care area of 80 -100 sq feet, support services area of 80-100 sq.feet, and circulation area of about 80 sq. feet is considered as appropriate.

Area

- 500-600 ft² per bed
- 100-120 ft² per patient care area
- 8 ft difference in between the incubators

Availability of mother's room in the nursery is desirable for level II and essential for Level III.

ELECTRICAL, GAS SUPPLY & MECHANICAL NEEDS.

Mechanical requirements at each infant care bed, such as electrical and gas outlets, should be organised to ensure safety, easy access and maintenance.

There shall be a minimum of 20 simultaneously accessible electrical outlets.

Minimum number of simultaneously accessible gas outlets:

- a. Air:3
- b. Oxygen: 3
- c. Vacuum: 3

CEILING FINISHES AND WALL SURFACES

- Ceilings shall be easily cleanable and constructed in a manner to prohibit the passage of particles from the cavity above the ceiling plane into the clinical environment.
- Wall surfaces shall be easily cleanable and provide protection at points where contact with movable equipment is likely to occur.

FAMILY ENTRY AND RECEPTION AREA

- The NICU shall have a clearly identified entrance and reception area for families.
- Families shall have immediate and direct contact with staff when they arrive in this entrance and reception area.

AMBIENT TEMPERATURE AND VENTILATION

- The NICU should be designed to provide an air temperature of 72⁰F to 78⁰F (22-26⁰C) and a relative humidity of 30-60%, while avoiding condensation on wall and window surfaces.
- The ventilation pattern should inhibit particulate matter from moving freely in the space, and intake and exhaust vents should be situated as to minimize drafts on or near the infant bed space.

General support space

- 8 ft³ for secondary storage of syringes, needles, intravenous infusion sets, and sterile trays.
- 18 ft² (1.7 m²) of floor space allocated for equipment storage per infant in intermediate care, and 30 ft² (2.8 m²) for each infant in intensive care.
- Bedside cabinet storage – at least 16 ft³ intermediate care area and 24 ft³ in the intensive care area.

- Clerical Areas – near entrance to supervise traffic & for holding charts, comp, forms
- Soiled UtilityRoom - for storing used and contaminated material before removal

Isolation room

- A separate room for handwashing and dirty linen near the entrance
- Ventilation – negative suction 100 % efficacy
- Self closing devices on all doors
- Min space of 150 ft²

INFECTION CONTROL

1. Availability of uninterrupted water supply for 24 hours a day.
2. At least one wash basin for every five beds with elbow/foot operated tap.
3. Adequate quantity of disinfectants. Eg. Hypochlorite solution, Cidex, Polysan, Savlon etc.
4. Availability of disposable equipments for patient care. Eg. Needles, syringes etc.
5. Facilities and written indications for isolation of infected babies and a written down unit antibiotic policy should be available.

INFECTION CONTROL

6. Handwashing sinks should be large enough to control splashing and designed to avoid standing or retained water.
7. Space should also be provided for soap and towel dispensers and for appropriate trash receptacle.
8. Separate receptacles for biohazardous and non biohazardous waste shall be available.

Sinks for handwashing should not be built into counters used for other purposes.

9. Minimum dimensions for a handwashing sink are 24 inches wide×16 inches front to back×10 inch deep (61 cm×41 cm×25 cm) from bottom of sink to top of its rim.

INFECTION CONTROL

10. Pictorial handwashing instructions should be provided above all sinks.
11. Distinct facilities shall be provided for clean and soiled utilities; medical equipment storage, and unit management services.

CLEAN UTILITY/ HOLDING AREA

For storage of supplies frequently used in the care of newborns.

The clean utility area may also be used for storage of medications, formulas and breast milk.

SOILED UTILITY/HOLDING ROOM: Essential for storing used and contaminated material before its removal from the care area. The ventilation room in the soiled utility/holding room should be engineered to have negative air pressure with air 100% exhausted to the outside.

EQUIPMENT

There must be access to equipment for:

- a. Resuscitation.
- b. Blood gas analysis (on the Neonatal Unit, by unit staff)
- c. Phototherapy
- d. Non invasive blood pressure measurement.
- e. Trans-illumination by cold light.
- f. Portable X-Rays
- g. Ultrasound scanning
- h. Expression of Breast Milk
- i. Transport (including mechanical ventilation)

There must also be access to a 24 hour laboratory service oriented to neonatal service needs.

STAFF

NURSING STAFF:

All those undertaking Neonatal Intensive Care should be able to demonstrate adequate numbers of appropriately trained and qualified nurses.

NICU should have a senior nurse with neonatal experience and managerial responsibility, together with a designated nurse responsible for further education and in service nurse training.

A nurse should not have responsibility for more than two infants receiving NICU care .

A nurse should not have responsibility for more than 4 babies who are receiving special care.

DOCTORS

There should be at least one consultant pediatrician/neonatologist with specialized training in neonatal medicine.

Each unit should have at least one consultant who is designated as responsible for the direction and management of the unit.

There must be 24 hour resident cover in NICU, by a doctor who has completed at least 1 year general professional training in Pediatrics, which includes six months experience of NICU.

Ancillary space

- Space for radiology, lab services etc if routinely performed in the unit
- On call rooms
- Staff rooms

Floor surfaces

- suitable to this criteria
 - resilient sheet flooring (medical grade)
 - carpeting with an impermeable backing, chemically welded seams
 - Not suitable around the sinks & holding areas

Electrical gas and mechanical needs

- minimum of 20 simultaneously accessible electrical outlets
- Minimum number of simultaneously accessible gas outlets:
 - Air, Oxy & Vac – 3 each
- mixture of emergency and normal power for all electrical outlets

Staff

- Consultant
- One neonatal physician/ 6-10 patients
- One resident doctor each shift for 8-10 patients with reliever

Nursing staff

- 1:1 ratio for babies on multisystem support
- 1:2 ratio for babies not on ventilator but sick
- SCNU 1:3 ideal 1:5 acceptable
- 30% provision for leaves & offs
- Hence 4 trained nurses per NICU beds

Lighting

- Adjustable thru a range of 1-60 foot candles
- Avoid use of UV/ IR radiation by app. filters
- Control of lights accessible at bedside
- Master switch

Procedure lighting

- Separate procedure lighting at bedside
- Highly framed – adj beds not illuminated
- Directed away from the baby – safety on retina not clear

Day lighting

- Windows – source of daylight
- Min distance 2 feet from the patient bed to minimize radiant heat loss
- Glazed with insulating glass
- Shading devices to allow flexibility at all times of day

Ambient temperature and ventilation

- Air temp of 22-26°C and relative humidity of 30-60% (avoiding condensation on window walls)
- Min 6 air exchanges / hour
- Air delivered filtered 90% efficiency
- Inlets and outlets above patients level

Acoustics

- Background sound not to exceed 50dB and transient not to exceed 70 dB
- Building design
- Equipment (NC ratio < 40)
- Acoustic ceiling systems with a noise reduction coefficient of at least 0.9

Gentle and friendly

NICU environment