

How to set up a Level 2 NICU ?



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Need



- India contributes to 27% of neonatal deaths
- Current NMR 22/1000 live births (38 in 2000)
- Introduction of SCNU
- Estimated requirement of level 2 units 75,000 to 1 lakh

Mapping neonatal and under-5 mortality in India-Lancet 2020

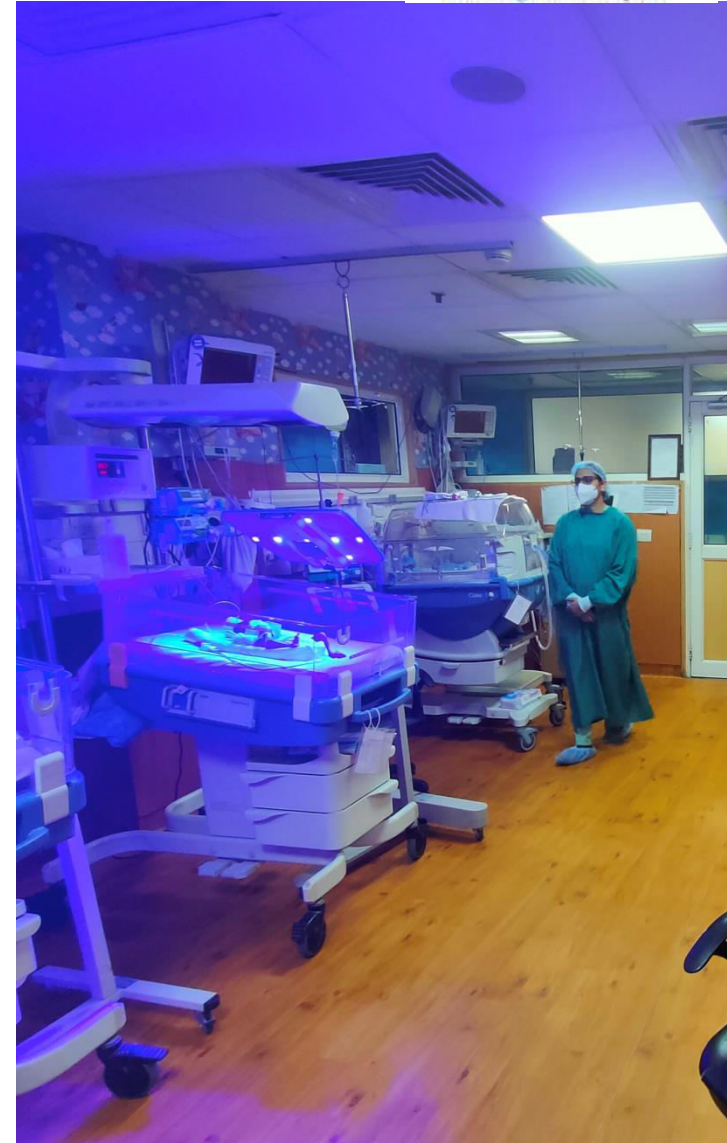


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Contents

- Initial Planning
- Infrastructure/Design
- Equipments
- Human Resources
- Others

No conflict of interest



Level 2B Services



- Understanding Levels
- Care of infants $\geq 1000\text{g}/30\text{wks}$ ($N > 300$)
- CPAP/NIV
- Short Mechanical Ventilation < 24 hrs
- Stabilization
- Follow up of NICU graduate
- Transportation
- Others
 - Surfactant/PN/DVET/OAE/BERA
 - Blood bank

Initial Planning

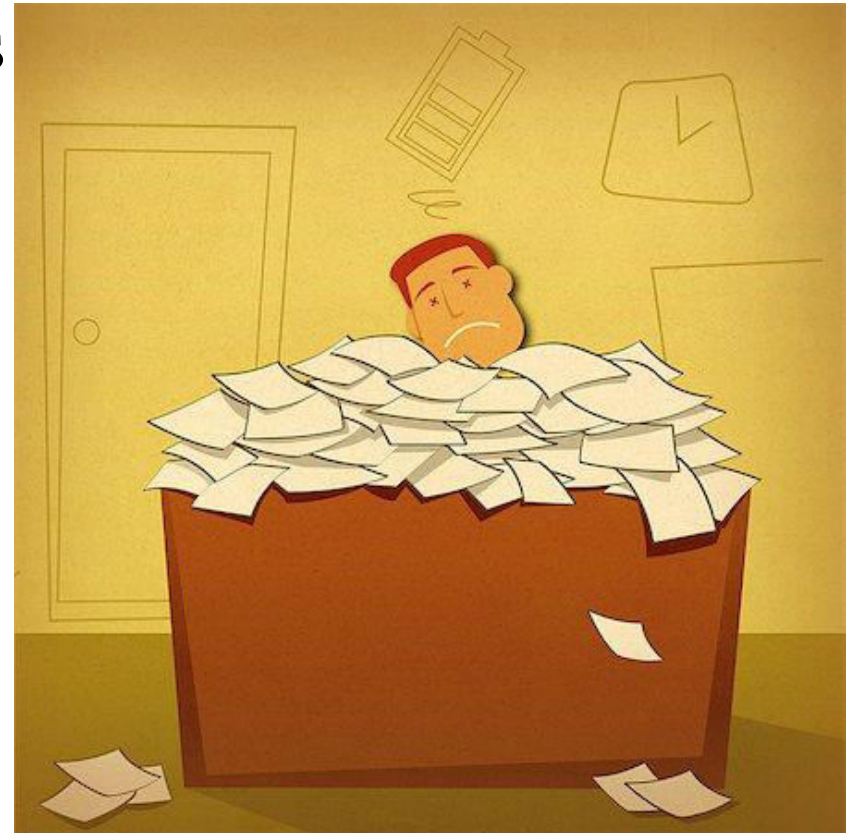
- Partners-Team
- No of beds- 3/1000 +30 %
- Budget/Loan/Funding
- Start up-Registration-Department for Promotion of Industry and Internal Trade (**DPIIT**)
- Investors-Angel investors/Venture capitalist (POC/Scale up) eg Sequoia Capital
- Investor's condition-Board of director, Anti dilution/Decision



Initial Planning



- Co-founder agreement-details
- Share certificate
- Contract-Covenants-Lock in
- Regulatory/Laws
- Clinical establishment act
- Fire/Diesel/Building
- Drugs/Spirit/X ray/PNDT



Paper work

Delivery /Resuscitation room standard

Operative delivery room

- Floor area : 80 ft² (7.5m²)
- 3 oxygen, 3 air, 3 vacuum and 12 accessible electrical outlets

Non-operative delivery room

- Floor area : 40 ft² (3.7m²)
- 1 oxygen, 1 air, 1 vacuum and 6 accessible electrical outlets

- Location/Floor
- Pass-through windows or doors
- Ambient temperature : 22 to 26 C
- Room for parents
- Wall-hung board

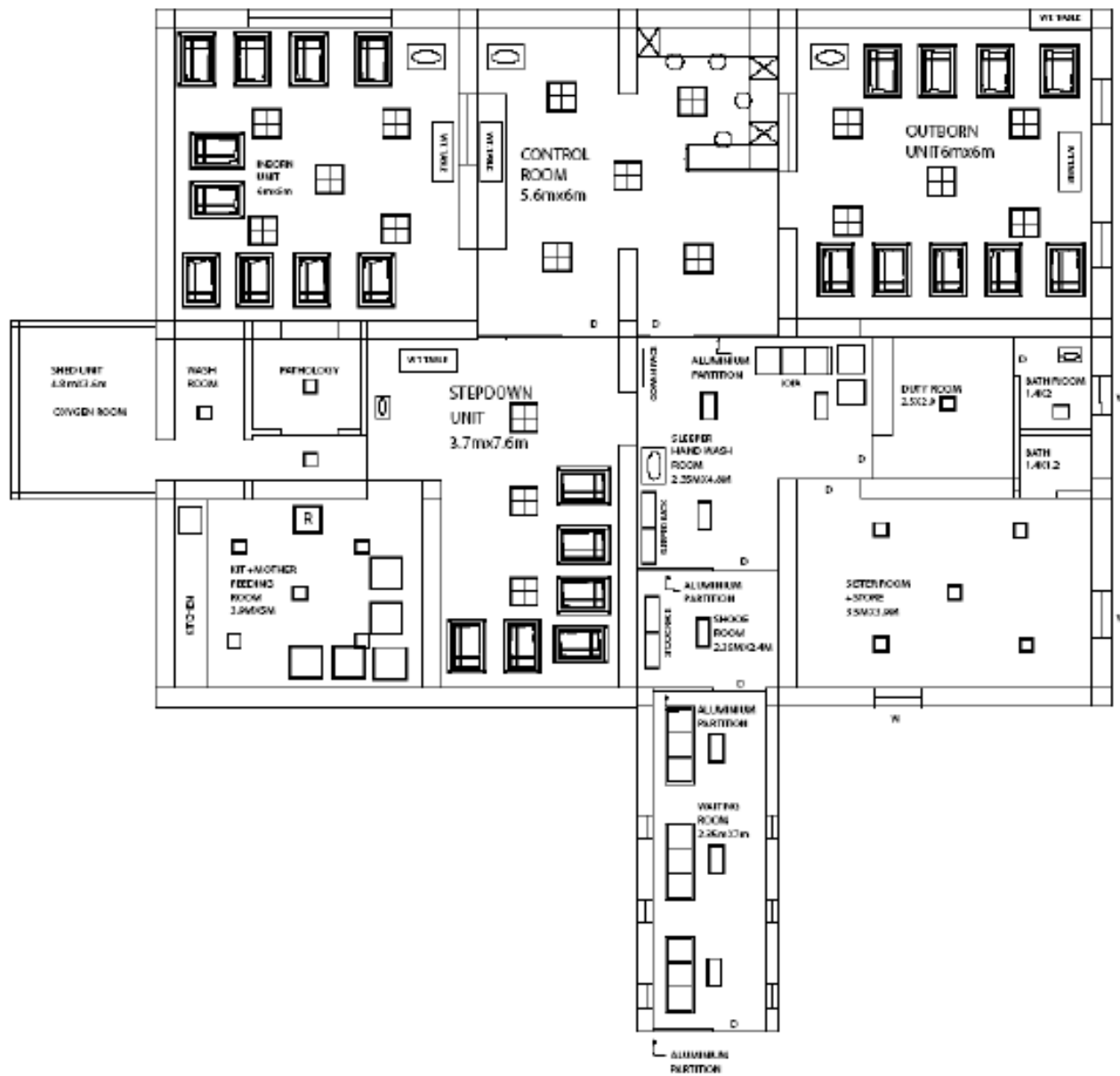


NICU Infrastructure



- Minimum 12 beds/1 Ventilated/2 NIV
- Min bed-space 100-150sq ft (4 ft aisle/in between 8 ft)
- 4-6 sockets per bed (5A and 15A)
- NICU (E+I)/Clean/Dirty Utility
- Compressed air/oxygen/suction
- Continuous water/uninterrupted electricity
- Nurses station
- Room for EBM Expression
- Others
 - Contingency unit/step down area

| NICU | Specifications |
|-----------------|---|
| Location | Close to DR, Controlled access, Not on top floors |
| Roofs and walls | Noise reduction coefficient (NRC) of at least 0.90 for 80% of entire surface area/Sustainable and safe |
| Floors | Reflectance <40 % ,Gloss value < 30 /Vitrified tiles/Kota stones/chip flooring |
| Ventilation | Laminar air flow system/12 changes of room air / hr, Filters in AC ducts (located outside the infant care area)/Constant positive air pressure needed |
| Lighting | <ul style="list-style-type: none"> •1000 lux, shadow free illumination/overhead/whitepaint/dimming •Separate procedure lighting/>2000 lux at plane of infant bed < 2% extension beyond illumination field |
| Windows | Day light illumination/cots 2 ft away/double glass pane/insulation |
| Environment | Temp 26-28 C/Humidity 30-60%/minimal draught |
| Others | Staff support/Communication/Acoustic <75db/Biomedical waste disposal/Mother's area/Doctors room/Nurses room/Utilities |



<https://www.phoenixmedicalsystems.com/design-support/>
www.babyfirst.com

Hand-washing area

Located at entrance/3-20 ft of cot

Self closing doors

Maintain positive pressure

Hand free elbow operated sink

Pictorials for handwashing

Sink dimension : 24*16*10 inches







- Within the unit
- Intercom
- Computer terminal
- Changing room
- Locker
- Lounge
- Toilet facility



Located centrally

Newborn charts

Hospital forms

Desktops

Telephone lines

Central monitors



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Equipments



| Equipments | Equipments | Equipments |
|---|------------------------------|-----------------|
| All warmers servo controlled | Phototherapy one/2 beds | BP Non-invasive |
| At least 2 weighing machines | One multipara monitor/2 beds | Infantometer |
| One stethoscope/bed | Resuscitation equipments | Laminar Flow |
| Pulse oximeter | Syringe Pumps | T Piece |
| Infusion pump 2/bed | Surgical set | Refrigerator |
| 2 glucometers | ABG/USG/X ray | Centrifuge |
| 1 thermometer/bed | Cold light | Power back up |
| Others-2D Echo, Flux Meter, Invasive BP | | |

Pulse oximeters



BPL Pulse Oximeter Bedside

- Monochrome LCD Screen
- Lithium battery with 3 hours of working time
- 100 hours data storage
- Lightweight & compact
- Rs. 30,000



Nellcor SpO2 Pulse Oximeter Bedside, PM100N

- Better precision
- Operating time 5 hours
- Rs. 82,000



Masimo Pulse Oximeter, Rad97

- Measure-through Motion and Low Perfusion
- High sensitivity and specificity in desaturation
- Touchscreen display /Operating time 4 hours
- Rs. 90,000

Phototherapy

| Phototherapy CFL Zeal | Phototherapy CFL Sunshine | LED Phototherapy Stand,Zeal | Sunshine LED |
|--|---|---|--|
| <ul style="list-style-type: none"> •Source cooling fan/Mirror coated reflector •30μw/cm²/nm •420 to 500nm, •Rs 28000/78000 | <ul style="list-style-type: none"> • >42 mw/cm²/nm •25,000 hrs •<10% change in illumination •420-480 nm •Rs 56000 | <ul style="list-style-type: none"> •Blue LEDs, 12 nos. •455 to 465nm •60 μw/cm²/nm •Upto 50,000 hrs •30% depreciation •Rs 45000 | <ul style="list-style-type: none"> 9-12 hi LED •Irr > 42 mw / cm²/nm •25,000hrs. •< 10 percent change •Rs 69000/ Rs 119000 |



Infusion Pumps

| Technocare 1509 | Sinno MDT | Fresenius Kabi | B Braun |
|--|---|--|--|
| <ul style="list-style-type: none"> • Automatic calibration • Portable • Occlusions Alarm • Water proof level • Battery : 8 hr • Rs 29000 | <ul style="list-style-type: none"> • Dual-CPU monitoring • Smart WIFI function • Syringe-5ml • Rs 33000 | <ul style="list-style-type: none"> •Flow rate: 0.1- 200 ml/h •Syringe-5 ml onwards •Manual bolus: Rate 50-1200 ml/h •Anti-bolus sys •Battery 10 hrs •Rs 60,000 | <ul style="list-style-type: none"> •Dose Rate Calculation •Ramp and Taper •Mode/Program •Automatic bolus reduction •14 Hr battery •Rs 88,000 |



Radiant Warmers

Zeal Medical 5002B Radiant Warmer

- Microprocessor based
- Manual/Skin Servo
- LCD display
- Thermistor sensor
- Accuracy of $\pm 0.2^{\circ}\text{C}$
- Observation light
- Rs.50,275

Sunshine Technomed Infant Radiant Warmer

- High-quality castors with brakes
- Rs 65000

Phoenix Medical NRC 300

- Resuscitation unit
- Suction
- Iv stand
- Examination lamp
- Easy to use control panel
- Rs 112000



Radiant Warmers

RHW 4001C Zeal Medical

- Smooth/Crevice Free surfaces
- Enclosures
- Syringe/infusion pump, monitor shelf/SS multi hook
- Fixed cradle + 3 Drawers
- Rs.1.1 lacs



Jiraffe

- Weight Up to 13.6 Kg
- Bed tilting: +/- 12 degrees
- Recessed heater.
- Integrated SPO2 and T-Piece
- Baby Susan rotating mattress
- Rs 1.6 lacs



CPAP Devices

S.S. Technomed Bubble CPAP System

- Flow regulation
- O₂% - 21% - 100%
- 3 cm H₂O - 10 cm H₂O
- Low Working noise
- Small size
- Built-in air compressor
- INR 2.9 lacs

Phoenix 300

- CPAP and HFNC
- Electronic oxygen air blender
- Large LCD screen
- Universal circuit
- INR 3,50,000

Fisher & Paykel CPAP

- Easy to use
- Pressure relief valve
- Auto levelling
- Most used worldwide
- Humidifier: Rs 1,25,000
- Blender: Rs 1,08,000
- Stand: Rs 25000



Transport incubator



Human Resources



| Mandatory | Essential |
|--|--|
| Unit in charge 3-5 yrs Neonatology | Ophthalmologist |
| Residents post graduate | ICU Technician minimum 4 |
| At least one MBBS doctor in each shift? | Lactation counselor |
| Nurse in charge | Respiratory therapist minimum 4 |
| Nursing strength 1/level 2 B shift and 1 per level 2 bed. Ratios | Dev supportive therapist 1/High risk follow up |
| One cleaner/helper/shift | Security minimum 4 |
| In house ROP screen | |

Others-Data operator/Transport team/

Other Requirements



- Protocols and processes
- Infection control policy, Audits and QI
- Transport facilities
- Record keeping-Files/Charts/Audits/Data
- Basic Labs

Equipments-12 bedded unit



| Equipment and Cost | Units | Total Cost |
|---|-------|----------------|
| Radiant warmers- <small>INR 60,000</small> | 12 | 7,20,000 |
| Pulse Ox meter- <small>INR 80,000</small> | 6 | 4,80,000 |
| Infusion Pumps- <small>INR 60,000</small> | 25 | 15,00000 |
| CPAP Devices- <small>INR 2.5 lacs</small> | 4 | 10,00000 |
| Conventional ventilator | 1 | 15,00000 |
| Neopuff- <small>INR 80,000</small> | 2 | 1,60,000 |
| Phototherapy units – <small>INR 40,000</small> | 6 | 2,40,000 |
| Multipara monitors- <small>INR 1,25,000</small> | 6 | 7,50,000 |
| Transport incubators | 1 | 3,00000 |
| Laminar Flow | 1 | 80,000 |
| Others | | 5,00000 |
| Approx total cost | | 70 lacs approx |

NICU Video Processes

Neonatal Intensive Care Unit



Key messages



- Initial Planning/Funding/Clearance is extremely important-Plan for next 5 years
- Infrastructure and design should be ergonomical, staff and baby friendly
- Invest well in equipments –always take CMC
- Human resources-Nurses
- Protocols/Audits/QI/Fellowship program
- **NNF Accreditation-Application**



Resources



- NNF Accreditation guidelines
- Recommended Standards for Newborn ICU Design, 9th ed.- Report of the Ninth Consensus Conference on Newborn ICU Design-2019
- Toolkit for Setting Up Special Care Newborn Units, Stabilization Units and Newborn Care Corners-UNICEF

*Thank
you*