


for the infant may be encouraged. However if the infant needs formula feed, the FAO/WHO expert working groups (2004& 2006) recommend that temperature of water should not be less than 70°C at the Point of reconstitution of formula& a decrease in the holding& feeding times would effectively reduce risk of contamination. If the formula is prepared in advance, it should be refrigerated to below 50°C but not for more than 24 hour Re- warming should be done immediately before feeding. Feeds should not be left warming for more than 15 minutes:

a. Infection Control Step VI:

Decreasing susceptibility of the baby to infections:
1. Early breast feeding /Use of colostrums /Minimal Enteral Nutrition: Numerous studies have linked own mother’s milk& colostrums feedings with a lower incidence& severity of nosocomial infection or late- onset sepsis in premature (<37 weeks gestation) infants. Trophic feeding has benefits which include improved milk tolerance, greater postnatal growth, reduced systemic sepsis& shorter hospital stay.
2. Immunomodulators:(22) Current evidence does not support the use of IVIG& GM- CSF for the prevention of nosocomial infections The role of probiotics is promising but careful patient selection, appropriate dose& patient appropriateness remain to be monitored.
3. Antifungal Prophylaxis: (22) Antifungal prophylaxis is recommended for all very low birth weight infants. Cochrane meta-analysis suggests one less death for every newborn treated with this intervention but the 95% confidence intervals around these effect estimates are wide. Large Randomized controlled trials are needed in the future.

b. Infection Control Protocols: (22) Preventing hospital- acquired infections is the primary responsibility of all individuals. Mutual cooperation is needed to reduce the risk of patient& staff infection. Therefore, infection control programs should be developed:

Role of hospital management: (22) The project is to establish a multidisciplinary committee that can implement appropriate resources& techniques for disease management& prevention, ensure education& training& participate in outbreak research. Physicians, microbiologists, nurse managers, resident nurses& housekeepers must play their role in infection control& outbreak prevention in the NICU.

Infection Control Committee: (22) Hospital should have an

Conclusion:
There are many challenges exist in the neonatal ICU requiring IPC protocols to deliver safe care to neonates admitted in NICUs. Multiple efforts to enhance hand hygiene, extensive cleaning of specific equipment, keeping environmental sanitation, perform surveillance dealing with HAIs& interventions are to be suggested to prevent HAIs. HAI prevention has many challenges that exist in both limited resources& limited settings.

References:

(Infection Prevention in the Neonatal Unit)
3. Prevent entry of microbes into the baby. Once inside the skin & uterus, the microorganisms enter the bloodstream if anything goes wrong with aseptic precautions. Therefore, adequate hygiene is important.\(^{(22)}\)

   a. Cord care: Cord infections can be prevented by cleaning the cord. WHO recommends cleaning the cord with soap & water if it is visible dirty.

   b. Skin Care: Skin injuries can be avoided by applying less adhesive tape. Bath should be avoided in hospitals, sponging may be done instead.

   c. Precautions during procedures: Aseptic precautions should be taken throughout the procedure. Apply alcohol, betadine & then wipe the skin again with alcohol. Disposable gloves should be worn before any surgery. Once inserted, the tube should be secured with soft tape. The tap site should be checked for signs of thrombophlebitis. In neonates, smaller catheters should be exchanged only if indicated. Insertion of catheters in an emergency situation increases the risk of noncompliance with insertion protocols & therefore, these catheters should be removed as soon as the patient’s condition stabilizes.

   d. Precautions during CVC/ PICC/ Umbilical catheter/ Handling of catheter: 1: Training & education of health professionals. 2: Observe & hygiene protocols. 3: Always allow povidone iodine to remain on the skin for at least 2 minutes before application. 4: Observe & hygiene protocols. 5: Use nonsterile gauze or a sterile transparent, semipermeable dressing to cover the catheter. 6: Check catheter locations visually or palpably with intact tape. 7: If the dressing is wet, loose, or change the dressing at the catheter site. 8: Remove any endovascular catheters that are no longer needed immediately. 9: Discontinue the PICC until completion of IV therapy, unless there is evidence of complications (e.g., phlebitis & infiltration). 10: Change pipes & bottles every 24 hours as they are used to connect the central lines i.e. non-sterile surgical dressings, masks, gowns, gloves & dressing sets. 11: Remove & do not replace the umbilical artery catheter if there are signs of catheter- related bloodstream syndrome (CRBSI), venous insufficiency, or thrombosis. 12: Ideally, the umbilical artery catheter should not be left in place for > 5 days. 13: Umbilical cord tissue should be removed as soon as it is no longer needed but can be used for up to 14 days if handled aseptically.

4. Essentials of infection control.\(^{(22)}\)

   a. Nurse to baby ratio: All units of neonatal intensive care should have appropriate number of nurses. Recommended ratios are 1:1 if the infant has multidrug- resistant microorganisms, 1:2 if the infants have the same or susceptible infections & 1:3 if the infants have drugs already adequate antibiotic.

   b. Disposable waste management: More disposal is needed to disrupt the microbial transport. Each bed should have baby items with audio, measuring tape, thermometer & light. Each medicine & each baby should have a separate syringe. A new suction catheter should be used each time to suction the lung. Separate gloves, antibiotic bottles, disposable respiratory aids, should be used for each baby. Do not add formamite e.g. Files, x- ray film & a pen in the baby crib. Stock solutions should not be used to flush the catheter. Enterobacter cloacae outbreaks have been reported in the NICU with high antibiotic use.

   c. Laminar flow system for drugs & TPN preparations: Application of laminar flow for production of TPNs etc. IV. Water reduces local complications (thrombophlebitis, gangrene & diarrhea) & sepsis. nitritobiotics, anticonvulsants & analgesics or sedatives can be stored in the NICU to facilitate timely administration. The injection should be done using aseptic technique & following recommended procedures. Multi- volume vials (MDV) should be avoided whenever possible. When in use, MDVs must be securely stored & disposed of within 28 days, the first day they are opened, unless otherwise specified by the manufacturer. When the MDV enters an emergency room, its contents must be reserved for one patient.\(^{(23)}\)

   d. Precautions during intubation & suctioning of the trachea: 1: Wear face mask, surgical scrub, wear autoclave gown, wear sterile gloves, seek assistance from nurse. 2: The endotracheal tube should remain in a sterile pack until use. 3: Do not touch the tip of the tube to the lungs. 4: Wear sterile gloves to dry off. 5: The bubbles should be sucked first & then the tip pulled out. 6: Discard the suction catheter after one use. 7: Get the nurse’s help to infuse saline (if necessary) or disconnect the ventilator.

5. Breastmilk/ Breastfeeding & preparation of Formula Milk.\(^{(24)}\) It is important to support breastfeeding & promote its benefits to infants & young children. Encourage use of colostrograms, trophic feeds with expressed breastmilk & non nutritive sucking by the infant. Mother’s entry into the NICU & pumping of milk to ensure enough breastmilk

\begin{table}[h!]
\centering
\begin{tabular}{|c|c|}
\hline
\textbf{Weekly} & \textbf{Change With A New Circuit} \\
\hline
Ventilator & Autoclave after every use & keep ready the sets \\
\hline
Procedure Sets & Surfauces & filters with soap & water \\
\hline
Window Air- Conditioners & Some & cleaned separate fridge for milk & lab samples \\
\hline
Refrigerators & Black drums (waste disposal by dumping) & Left- over food, vegetables, waste paper, packing material, empty bags etc \\
\hline
Thermometer, weighing scale, stethoscopes, BP cuff, laryngoscopes & Yellow drums (disposed by incineration) & Infected non plastic waste- human secreta, blood & body fluids \\
\hline
\multicolumn{2}{|c|}{} \\
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**Introduction:**

Neonates admitted in NICUs are susceptible to healthcare-associated infections (HAIs), which are associated with higher risk of morbidity & mortality, with possible increase time of hospital stay & health-care costs & risk of neuro-developmental poor outcome among livings. (1-3) Infection prevention & control (IPC) protocols dealing with both patients & the environment around them therefore of specific importance in neonatal care, especially in the neonatal intensive care unit (NICU). (4)

1. Prevent microorganisms from invading the NICU: (5)
   a. Environmental Cleaning: Organisms from labor & resuscitation room where vaginal flora from the mother can colonize the newborn’s skin & thus producing neonatal infection. Prevention can be done by following the 6 C’s: 1: Cleaning of the perineum, 2: Cleaning of the delivery surface, 3: Cleaning the cord, 4: The instrument used for cutting the cord, 5: Specific cord care, 6: Ensuring that nothing unclean is used. Equipment used during the steps of resuscitation should be cleaned & regular use of the autoclave.

   b. Standard design of the NICU: (6)
      - Location: The NICU has a distinct special area with controlled entry. Each neonatal space has a minimum of 120 square feet clear floor space excluding the h& washing areas & corridors. Thus there is a minimum of 4 feet between each two incubators.
      - Isolation Room: An isolation room with hands free hand washing station for hand hygiene. Areas for gowning & storage of clean material should be provided near the entrance to the room. Ventilation has negative air pressure with exhaust to the exterior. When not used for isolation, these rooms may be used for care of noninfectious infants. Relative humidity should be ranging from (30-60%). Humidity above 60% may promote growth of microorganisms. According to American Institute of Architecture (AIA) guideline, the NICU should have a minimum of 6 Air change per Hour (ACH) & 12 ACH for isolation room.

2. Daily & weekly routines in NICU: (7)

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse oximeter, multi-channel monitors, Incubators, Warmers, Syringe pump, infusion pumps, phototherapy units, Mattress, Oxygen hood, Ventilator, CPAP machine</td>
<td>Dry dusting &amp; cleaning using a moist wipe</td>
</tr>
<tr>
<td>Water in Bubble CPAP, Suction bottles, Humidifier chamber</td>
<td>Change With Distilled Water</td>
</tr>
<tr>
<td>Ventilator Filters</td>
<td>Clean Daily &amp; Dust Off</td>
</tr>
<tr>
<td>Bag &amp; Mask</td>
<td>Immerse in 2% cidex for 6 to 8 hours after cleaning with running water</td>
</tr>
<tr>
<td>Incubators/Radiant Warmers</td>
<td>Clean with 2% Bacillcid if not occupied by an infant</td>
</tr>
<tr>
<td>Laryngoscopes, masks, stethoscopes, measuring tapes, Thermometer, BP cuff, temperature &amp; Sp02 probes, Torches</td>
<td>Wipe With Spirit</td>
</tr>
<tr>
<td>Walls, floor, Washing basins</td>
<td>Clean with polyolein or phenol or lysol or 2% bacillcid oto 0.5% chlorine (for walls only) in each shift</td>
</tr>
<tr>
<td>Dust bins, buckets, waste</td>
<td>Empty during each shift &amp; clean with soap &amp; water</td>
</tr>
</tbody>
</table>

**Table (1) Daily & weekly routines in NICU Infection control**

- Hand washing station: Each incubator should be within 20 feet of a h& washing station. The h& washing should be hands free & the sink should be large enough to control splashing. H& washing instruction should be available. The wall material should be non absorbent around the sink to prevent the growth of mould. A space for soap & towel dispensers should be present.
- **Hand Hygiene** (8) According to WHO Moments of hand hygiene are: (9)
  - Before Patient Contact.
  - Before Aseptic Task.
  - After Body Fluid Exposure.
  - After Patient Contact.
  - After contact with patient surroundings.

WHO guidelines recommend using alcohol-based h& rub (ABHR) for (20-30) seconds or use of soap & water for 40-60 seconds. CDC guidelines for hand hygiene in healthcare settings recommend a duration of 20 seconds & 15 seconds, respectively. (10)(11) With the use of ABHR rather than antimicrobial soap there was increased compliance. (12) From factors that may affect h& hygiene are limited access to clean water or ABHR & the wearing of artificial nails. (13)(14)

- Visitors’ Policy to promote family-centered care, NICUs should have visitation policies aimed at limiting opportunities for potential infection. There are reports of outbreaks caused by visitors or caregivers, such as respiratory viruses during the season. (15)(16) However, restrictions may exist for parents/caregivers. (17) The strict adherence to HH can avoid restrictions, which have been shown to reduce respiratory pathogens. (18)(19) Restrictive visitation policies may specifically apply to young children, who may not be fully vaccinated & have difficulty with h& hygiene. (20) The use of influenza vaccine by parents can improve vaccination rates while preventing influenza transmission. (21) Ideally, visitors should show proof of proper vaccination.
Infection Prevention in the Neonatal Unit

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Summary

Introduction: Infection is a major concern, especially for premature newborns. Infection prevention (IPC) reflects institutional efforts & optimizing IPC practices in the neonatal intensive care unit (NICU) requires consideration of its unique demographics & environment. While neonatal sepsis is difficult to treat, infection prevention is weak. Neonates admitted in NICUs are susceptible to healthcare- associated infections (HAIs), which are associated with higher risk of morbidity & mortality, with possible increase time of hospital stay & health- cost risk of neurom- developmental poor outcome among liveborns. 1–3 Infection prevention & control (IPC) protocols dealing with both patients & the environment around them therefore of specific importance in neonatal care, especially in the neonatal intensive care unit (NICU).

Aim: To study methods of infection prevention in the neonatal intensive care unit.

Methodology: Studying the infection prevention and control infrastructure and healthcare- associated infection surveillance in the NICU.

Prevention of invasion of the NICU by microorganisms this can be done via environmental sanitation and specific NICU design to

Keywords: Healthcare- associated infections, central line- associated bloodstream infections, low & middle- income countries, environmental cleaning, disinfection

Infection Prevention in the Neonatal Unit

No line of defense is a defense in the absence of the whole line of defense. The microbiome is a major part of the defense line. Environmental cleanliness is a key factor in preventing infections in this unit.

Infection Prevention in the Neonatal Unit

uniFEF0/uniFEE4/uniFEF4/uniFEE0/uniFECC/uniFE98/uniFEDF
uniFEAE/uniFEDB/uniFE8E/uniFEB7/uniFEAA/uniFEF4/uniFEE4/uniFEA4/uniFEDF

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