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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 700°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- waring should be done immediately before feeding. Feeds should not be left warming for more than 15 minutes:

a. Infection Control Step Vi:
   - Kangaroo Mother Care/ Early discharge: Kangaroo mother care, or provision of prolonged skin- to- skin contact& exclusive breastfeeding, was developed to support thermoregulation in low birth weight neonates in LMICs& is associated with decreased risk of sepsis& mortality.[19]
   - 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:[25] 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 infection control committee in place with the goals to review& approve promptly: 1: Annual plan of monitoring& prevention activities. 2: Identification of disease surveillance data& areas for intervention. 3: Ensure appropriate staff training in infection control& safety. 4: Provide information for epidemiological investigation& CRP should not be the guideline for antibiotic therapy. Decrease the duration of antibiotics whenever possible.

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 hygine, extnsive 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.

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Weekly	Ventilator& Cpap Circuits	Change With A New Circuit
	Procedure Sets	Autoclave after every use& keep ready the sets
	Window Air- Conditioners	Surfaces& filters with soap& water
	Refrigerators	Sorted& cleaned separate fridge for milk& lab samples
	Thermometer, weighing scale, stethoscopes, BP cuff, laryngoscopes should be cleaned& wiped with spirit after every use. Feeding utensils should be boiled for 15 minutes after each use	
Waste Disposal	Black drums (waste disposal by dumping)	Left- over food, vegetables, waste paper, packing material, empty bags etc
	Yellow drums (disposed by incineration)	Infected non plastic waste- human secreta, blood& body fluids
	Blue drums (made noninfectious by autoclaving& disposed by shredding)	Infected plastic waste like IV sets, ET tubes, catheters, urobags etc

3. Prevent entry of microbes into the baby:[5] 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 cleanng 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. Precautons during CVC/ PICC/ Umbilical catheter/ Handling of catheter: 1: Training& education of health professionals. 2: Observe h& hygiene protocols. 3: Always allow povidone iodine to remain on the skin for at least 2 minutes before application. 4: Wear sterile gloves. 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 ie. 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.
   e. 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.
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. ntibiotics, 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]
5. Breastmilk/ Breastfeeding& preparation of Formula Milk:[24] It is important to support breastfeeding& promote its benefits to infants& young children. Encourage use of colostrums, trophic feeds with expressed breastmilk& non nutritive sucking by the infant. Mother's entry into the NICU& pumping of milk to ensure enough breastmilk

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 micro- organisms. 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.
      - 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.
   c. Hand Hygiene[7][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 hygine 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& hygine are limited access to clean water or ABHR& the wearing of artificial nails.[13][14]
   d. 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& hygine.[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.

2. Daily& weekly routines in NICU:[22]

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

Daily	Pulse oximeter, multi- channel monitors, Incubators, warmers, syringe pump, infusion pumps, phototherapy units, Mattress. Oxygen hood, Ventilator, CPAP machine	Dry dusting& cleaning using a moist wipe
	Water in Bubble CPAP. S uction bottles, Humidifier chamber	Change With Distilled Water
	Ventilator Filters	Clean Daily& Dust Off
	Bag& Mask	Immerse in 2% cidex for 6 to 8 hours after cleaning with running water
	Incubators /Radiant Warmers	Clean with 2% Bacillocid if not occupied by an infant
	Laryngoscopes, masks, stethoscopes, measuring tapes, Thermometer, BP cuff, temperature& Spo2 probes, Torches	Wipe With Spirit
	Walls, floor, Washing basins	Clean with polysan or phenol or Lysol or 2% bacillocid or0.5% chlorine (for walls only) in each shift
	Dust bins, buckets, waste	Empty during each shift& clean with soap& water

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- 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).

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 together with considering hand hygiene and putting policy for the visitors. Putting specific infection prevention control and training the medical and nursing staff regarding these protocols. Decreasing susceptibility of the baby to infections which can be done by improving the baby's immunity that can be done by appropriate feeding specifically breast feeding.

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

قواعد مكافحة العدوى فى وحدة الاطفال حديثى الولاده

المقدمة: توجد العديد من التحديات الفريدة داخل وحدة العناية المركزة لحديثي الولادة والتي تتطلب استراتيجيات مكافحة العدوى مبتكرة لتقديم رعاية آمنة لحديثي الولادة المعرضين للخطر.

الوسائل: الجهود التعاونية لتعزيز غسل الايدى، وتوحيد معايير تنظيف المعدات المتخصصة، والحفاظ على التنظيف البيئي، وإجراء مراقبة العدوى المكتسبة من المستشفيات ونفيذ التدخلات المجمعة لمنع HAI هي جزء لا يتجزأ من برنامج NICU IPC.

النتائج: ستوجد تحديات الوقاية من عدوى فيروس العوز المناعي البشري في كل من الأماكن التي تتمتع بامتياز من حيث الموارد ويمكن معالجة الأوضاع المحدودة من خلال الابتكار والاستفادة من الخبرات والموارد المحلية. حالات العدوى المكتسبة في المستشفى عند حديثي الولادة هي حالات العدوى التي تحدث بعد دخول حديثي الولادة إلى الحضانة. لا تأتي هذه العدوى من الأم عندما يكون الجنين في الرحم، ولا تحدث عند الولادة. تكتسب بعض حالات العدوى بعد دخول حضانة الأطفال حديثي الولادة، وليس من الأم في الرحم أو في أثناء الولادة. وفي بعض الأحيان، لا يكون واضحا ما إذا كان المصدر هو الأم أم بيئة المستشفى. تعد حالات العدوى المكتسبة في المستشفى بشكل رئيسي من مشاكل حديثي الولادة الذين يضطرون للبقاء في المستشفى لمدة طويلة، مثل حديثي الولادة المولودين باكرا (الخدج) والمواليد الذين يعانون من اضطرابات طبية خطيرة. وأكثر أنواع العدوى المكتسبة في المستشفيات شيوعا هي الالتهاب الرئوي (عدوى الرئة) وعدوى الدم (تجرثم الدم) الناجمة عن قطار جرى إدخاله في الوريد لإعطاء حديث الولادة السوائل أو الأدوية في المولودين بتمام الحمل، تكون العدوى المكتسبة في المستشفى الأكثر شيوعا هي العدوى الجلدية الناجمة عن بكتيريا العنقودية الذهبية. لا تلاحظ العدوى غالبا حتى يصبح الأطفال في المنزل في الرضع ناقصي وزن الولادة جدا، تنجم معظم حالات العدوى المكتسبة في المستشفى عن المكورات العنقودية أيضا. ولكن تكون بعض أنواع البكتيريا والفطريات الأخرى أسبابا أيضا. وكلما انخفض وزن الولادة، ازداد خطر العدوى، خصوصا عند حديثي الولادة الذين يحتاجون إلى استخدام جهاز التنفس الصناعي أو يحتاجون إلى فتح الوريد لمدة طويلة. وكلما طالت مدة بقاء حديثي الولادة في دور الرعاية الخاصة أو وحدات العناية المركزة للولدان كلما ازدادت الإجراءات التي خضعوا لها، ازداد احتمال العدوى لديهم. وللتقليل من انتشار العدوى في أثناء تفشي المرض في المستشفى، قد يقوم الأطباء بتطبيق مراهم المضادات الحيوية على الحبل السري وفتحتي الأنف وموضع الختان عند حديثي الولادة. وللحد من انتشار العدوى في دور الرعاية الخاصة ووحدات الرعاية المركزة لحديثي الولادة مثل NICUs، يضمن موظفو المستشفى وجود مسافة كافية بين المواليد الجدد الذين هم في الحاضنات أو أجهزة التنفئة. كما أنهم يحرصون أيضا على تنظيف وتطهير أو تعقيم المعدات بدقة، واستخدام الأنابيب الوريدية والتهوية الرابعة لأقصر مدة ممكنة. يمكن لفريق المستشفى والآباء ومقدمي الرعاية الوقاية من انتشار العدوى المكتسبة في المستشفى عن طريق غسل اليدين الشامل بالماء والصابون، أو باستخدام المحاليل المعقمة لليدين.

Accepted at: 12/ 9/ 2023