Safe and Effective Infection Prevention for Inpatient Newborn Care

DO NO HARM TECHNICAL BRIEF

Infections account for about a quarter of the annual 2.8 million newborn deaths, constituting the third most important cause of neonatal mortality. They can result in several immediate and long-term complications that can, in turn, lead to significant morbidity, increased treatment cost and to approximately 3% of all disability-adjusted life-years.[1]

Why is infection prevention important?

Newborns, particularly preterm and low birth weight (LBW) babies, are very susceptible to infections because of their immature immune systems. They are also more exposed to organisms due to their total dependency on care providers. Infections may be transmitted vertically from the mother or horizontally from caregivers and the environment.

Studies have indicated that the rate of neonatal infections in low and middle-income countries (LMICs) is 3- 20 times higher than in resource-rich ones, with an alarming rate of antibiotic resistant infections. Common organisms include Klebsiella pneumonia, Escherichia coli, Pseudomonas spp and Staphylococcus aureus.[2] Documentation of Group B Streptococcus is variable, being least in South East Asia.[3] Facilities in LMICs lack basic amenities, with 38% not having a source for water, over a third not having soaps or alcohol-based hand rubs and nearly one fifth being without toilets.[4] Inadequate expertise in infection prevention, inadequate staffing, overcrowding, misuse of antibiotics and limited finances are some of the other factors contributing to infections among newborns.

In facilities, newborns needing only basic essential care are generally roomed in with their mothers in the postnatal wards. Small and sick babies are cared for in groups by health care providers in the special care baby unit (SCBU) or in the neonatal intensive care unit (NICU), often with inadequate space. At times, babies even share cots and incubators. Such babies also require extra support, including insertion of feeding tubes and cannulas, and other procedures that result in exposure to equipment. Additional challenges include inadequate single use supplies and poor reprocessing and storage of re-usable items. All of these factors expose vulnerable newborns to cross-infection and even outbreaks. The exact magnitude of the problem, however, is difficult to assess, since 66% of LMICs have no published data on neonatal infections. Challenges are even greater related to tracking health care associated infections (HCAIs).[5]

What are the clinical principles of infection prevention?

Most of the international guidelines related to HCAIs are deficient in comprehensive recommendations for newborns. In facility-based care the focus is often on small and sick babies. However, not all small babies are sick and there are also larger, term babies that may need extra observation and care. Although, the smaller babies are more vulnerable, infection prevention principles are mostly similar and apply to all inpatient newborns, notably in the special care/intensive care units. In addition, care provided in the delivery room and postnatal wards can have a significant influence on the incidence of infection and the nature of the infecting organisms.

The first principle is to “Do no harm” by ensuring that all components of care for the vulnerable newborn should not only be correctly implemented but also in a manner that prevents HCAIs. A few fundamental components of infection prevention include (i) commodities/supplies for infection prevention, including capacity building, motivation and supervision for proper hand washing; (ii) adequate space to minimize crowding with only one baby per cot or incubator; and (iii) adequate, routine cleaning of surfaces and reprocessing of re-usable items with heat, appropriate disinfectants and/or sterilants.

Each country should look into the key components of antibiotic stewardship and have guidelines for use of suitable antibiotics. Infection prevention along with rational use of antibiotics will go a long way in decreasing the emergence and spread of antimicrobial resistant bacteria.

EVERY PREEMIE SCALE

USAID FROM THE AMERICAN PEOPLE

PCI

gapps GLOBAL ALLIANCE TO PREVENT PREMATURITY AND STILLBIRTH

AMERICAN COLLEGE of NURSE-MIDWIVES With women, for a lifetime®

What are the current evidence-based practices?

Key interventions for promotion of infection prevention for newborns receiving inpatient care are shown in Table 1.

Table 1. Interventions/Clinical Practices Related to Infection Prevention

1. Overarching components

- Optimal utilization of the available budget
- Functional Infection Control Committee
- Hand hygiene including correct washing with clean water and soap, use of alcohol-based hand rub and proper disposal of sharps and waste including incineration
- Competency-based in-service and pre-service training on infection prevention with standard teaching aids and supervision/mentoring for quality improvement (QI)
- Optimal management of equipment and supplies
- Monitoring and evaluation with review and use of data for improving quality of care

2. Antenatal Care (ANC)

- Tetanus immunization for women (ideally, in women of reproductive age) and prevention, early detection and treatment of infections including HIV, syphilis and malaria
- Counseling of mothers/families on hygiene, relevant preventive care and preparation, from the family side, for a clean delivery at a facility

3. Labor and Delivery

- The WHO 6 'cleans' related to care at birth
- Early detection and treatment of maternal infecions including HIV and syphilis and institution of steps for Prevention of Maternal to Child Transmission (PMTCT) of HIV and prophylactic antibiotics (erythromycin) for PPROM
- Temperature maintenance and early initiation of breastfeeding
- Appropriate reprocessing of re-usable equipment (consisting of decontamination, cleaning, high level disinfection/ autoclaving/ chemical sterilization and proper storage)

4. Postnatal Ward/KMC Unit

- Resources for hand washing, clean linen and clean cord care
- Thermal protection including skin-to-skin contact
- Exclusive breastfeeding, optimal use of human milk with lactation support

5. Special Care Baby Unit/NICU

- Adequate space, including having only one baby per cot/incubator and ventilation
- Resources for hand washing, alcohol-based hand rub and clean/sterile linen
- Thermal protection including skin-to-skin contact, breastfeeding/use of expressed human milk (EHM), lactation support and appropriate reprocessing of feeding devices
- Availability of single-use items, cleaning of surfaces, effective reprocessing of re-usable equipment, safe administration of injections and intravenous fluids, aseptic techniques for procedures, and capability for microbial identification and susceptibility testing

Note: Needless separation of mothers and babies is not recommended. Restricting entry of mothers into the neonatal unit is not helpful. They must be counseled about hand washing and other essential safe behavior and supervised. Except during special procedures, there is no evidence that routine use of gowns or masks are helpful in infection prevention.

6. At Discharge and Subsequent Postnatal Period

- Proper evaluation of mothers and babies, counseling of mothers, fathers and relevant elder women and appointments for early review and continued post-natal visits
- Counseling for promotion of care at home: breastfeeding/use of expressed human milk, thermal protection including skin-to-skin contact, hand-washing, proper cleaning of feeding utensils, cord care, use of clean linen, identification of danger signs and appropriate care-seeking, and continued PMTCT activities for HIV

What are the current WHO recommendations for infection prevention?

The WHO six "cleans" at birth include (1) clean hands of the attendant, (2) clean surface, (3) clean blade, (4) clean cord tie, (5) clean towels to dry and wrap the baby and (6) clean cloth to wrap the mother.[7] While daily application of 7.1% chlorhexidine digluconate solution or gel, delivering 4% chlorhexidine, in the first week is recommended for home deliveries in areas with a high neonatal mortality rate (≥ 30 /1000 live births), WHO still propagates clean dry cord care at the facility level.[8] WHO emphasizes the importance of adequate, safe water, energy, sanitation, hand washing and waste disposal for staff, mothers and families. They also recommend that all women and newborns receive quality care with "standard precautions for preventing hospital-acquired infections."[9] They have provided guidelines on core components for infection prevention at the national and acute health care facility levels.[10] Recently, WHO and UNICEF jointly developed WASH-FIT, a flexible, adaptable tool for quality improvement (QI) at the health facility level in LMICs, focusing on clean water, sanitation, hygiene and management, with related targets and indicators. WASH-FIT does not have a specific focus on inpatient newborn care but rather is aimed at facility-wide strengthening of WASH services.

Routine antibiotics are not indicated for women in preterm labor with intact amniotic membrane and no signs of infection. Erythromycin, however, is recommended for preterm pre-labor rupture of membranes (PPROM).[11] WHO and UNICEF strongly promote hand washing before and after touching the newborn, early and exclusive breastfeeding, use of expressed human milk, and skin-to-skin contact as important factors in preventing infection.[12]

What are the health system requirements for infection prevention?

In order to implement the above interventions, as in all facility-based care, it is important to address key issues related to infection prevention both at the national level for development of relevant policies, standards and indicators and at individual facilities for actual implementation. Effective governance and planning, adequate finances, and a focus on equity issues are essential. This brief focuses on facility-based care. However, strategies for social and behavior change communication to promote best practices among health workers as well as families at facility and community levels and to strengthen community ownership are extremely important.

Infection Control Committee

The presence of a motivated, functional facility Infection Control Committee in the facility will be of great value in implementing suitable activities for the newborn and for monitoring and evaluating results and quality of care. Even with challenges with budget, staffing and supplies, it is important to ensure that at least the key basic tasks are undertaken in the best possible manner. The committee should have at least an administrator, clinical staff with focus on infection prevention (a physician and a nurse), microbiologist, representatives from the clinical specialties, including one from the team that looks after the neonatal unit, and some of the other sections such as the central supply, sterilization unit, pharmacy, maintenance and housekeeping. The neonatal unit and related areas, notably the delivery area and operation theaters have particular relevance, as these are the sections that are likely to have a particularly susceptible population with a higher mortality rate.

Ideally, the composition of the committee and its tasks should be defined at the national level and be functional at all levels of care including the smaller centers where emphasis will be more on basic care at deliveries and in the postnatal wards. However, in the larger hospitals dealing with increased numbers of patients with special care/intensive neonatal units, a more in-depth approach will be required.

Tasks of the Infection Control Committee[13]

Some key tasks are noted below; although individual hospitals will need to develop their own specific, detailed lists.

1) Develop/improve/review the annual plan and policies for infection prevention and control.

2) Develop antibiotic policies through consensus, based on available evidence.

3) Develop indicators that will help monitor outcomes in the hospital, ensure appropriate documentation, review and use of data for improving quality of care.

4) Provide staff training as required related to their practices, care of devices and supplies.

5) Provide supportive supervision/mentoring to improve practices and outcome.

6) Ensure availability of adequate supplies for infection prevention and control.

7) Meet regularly, preferably monthly but not less than three times a year.

8) Deal appropriately with special situations such as outbreaks and renovation projects to contain and prevent further episodes of infection.

What program actions can be taken to reduce newborn infections and improve health outcomes?

The major components of an action plan are indicated below and cover the roles of policy makers, program planners/implementers, facility managers/administrators and health care providers. Ideally the focus should be on nationally and locally-driven solutions.

Policy Makers

- Establish/strengthen newborn heath committee with representatives from key stakeholders and professional bodies with infection prevention as a key agenda issue
- Prioritize finances for commodities and activities related to infection prevention
- Ensure integration of newborn infection prevention with other programs such as maternal health, WASH and WASH-FIT dealing with facility-based care[14]
- Develop policies for procurement of commodities/supplies and avoidance of stock-outs
- Develop suitable indicators at national and subnational levels with additional indicators for hospitals admitting small/sick babies and guidelines for monitoring and evaluation
- Develop standards, guidelines, teaching aids; and establish policies for competency-based in-service and pre-service training related to infection prevention for physicians, nurses, midwives, ancillary staff and supervisors
- Develop strategies for QI

Program Planners/Implementers

- Ensure plans and activities for infection prevention are in keeping with country policies; where changes are needed, facilitate consensus with policy makers
- Promote competency-based capacity building, supply chain management, M&E and QI activities related to infection prevention

Facility Managers/Administrators

- Provide basic infrastructure (safe water, promotion of WASH-FIT, adequate space, and electricity)
- Work with health care providers to identify priorities and develop action plans
- Procure necessary equipment/supplies and facilitate optimal usage, preventing HCAIs
- Ensure quality of care with a functional Infection Control Committee, supportive supervision/mentoring, appropriate job aids and effective M&E with periodic review of data for QI
- Promote functional links between facility and community to help promote appropriate and timely utilization of services

Health Care Providers (Physicians, Nurses, Midwives, Ancillary Staff)

- Implement best infection prevention practices
- Implement QI activities such as plan, do, study and act (PDSA) cycles
- Maintain, review and transmit data to the country health information system
- At discharge, assess mothers and babies and counsel families on infection prevention practices at home

Acknowledgements

The Do No Harm Technical Series was prepared by a team led by Jim Litch and Judith Robb-McCord (Every Preemie–SCALE) and Lily Kak (USAID). We would like to acknowledge the development of the draft by Indira Narayanan (Georgetown University) with input from Jim Litch (Every Preemie/Global Alliance to Prevent Prematurity and Stillbirth), and Pavani Ram (USAID). Expert reviews were provided by the Carole Kenner (Council of International Neonatal Nurses), Judith Robb-McCord (Every Preemie/Project Concern International), Giorgia Gon and Susannah Woodd (London School of Hygiene and Tropical Medicine), Suzanne Cross (Soapbox Collaborative), Sufang Guo (Unicef), Lily Kak and Smita Kumar (USAID), Alison McIntyre (WaterAid), and Ornella Lincetto (WHO).

References

[1] Fitchett EJ, Seale AC, Vergnano S, Sharland M, Health PT et al. Strengthening the Reporting of Observational Studies in Epidemiology for Newborn Infection (STROBE-NI): an extension of the STROBE statement for neonatal infection research. Lancet Infect Dis 2016; 16: 202-13.

[2] Zaidi AKM, Huskins WC, Thaver D, Bhutta ZA, Abbas Z, Goldmann DA. Hospital-acquired neonatal infections in developing countries. www.thelancet.com March 26, 2005; 365: 1175-88

[3] Kwatra G, Cunningham MC, Merrall E, Adrian PV, IP M, Tam WH, Madhi SA. Prevalence of maternal colonization with group B streptococcus: A systematic review and meta-analysis. Lancet Infect Dis 2016; 16: 1076-84.

[4] WHO/UNICEF. Water, sanitation, and hygiene in health care facilities: status in low and middle-income countries and way forward. Report. Geneva: World Health Organization, 2015. http://apps.who.int/iris/bitstream/10665/154588/1/9789241508476_eng.pdf

[5] WHO. Report on the Burden of Endemic Health Care-Associated Infection Worldwide. Geneva: World Health Organization, 2011. http://apps.who.int/iris/bitstream/10665/80135/1/9789241501507_eng.pdf

[6] Araujo da Silva AR, Zingg W, Dramowski A, Bielicki JA, Sharland M. Most international guidelines on prevention of healthcare-associated infection lack comprehensive recommendations for neonates and children. Journal of Hospital Infection 2016; 94: 159-62.

[7] Pearson L, Larsson M, Fauveau V, Standley J. Childbirth care. Opportunities for Africa's Newborns. PMNCH 2004.

[8] WHO. Model List of Essential Medicines for Children, 3rd list. Geneva: World Health Organization, March 2011. http://whqlibdoc.who.int/hq/2011/a95054_eng.pdf

[9] WHO. Standards for improving quality of maternal and newborn care in health facilities. Geneva: World Health Organization, 2016. http://www.who.int/maternal_child_adolescent/documents/improving-maternal-newborn-care-quality/en/

[10] WHO. Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization, 2016. http://www.who.int/gpsc/cc_summary.pdf?ua=1

[11] WHO. Recommendations on interventions to improve preterm birth outcomes. Geneva: World Health Organization, 2015. http://apps.who.int/iris/bitstream/10665/183037/1/9789241508988_eng.pdf

[12] WHO. Guidelines on Maternal, Newborn, Child and Adolescent Health: Recommendations on newborn health. Geneva: World Health Organization, 2013. http://www.who.int/maternal_child_adolescent/documents/guidelines-recommendations-newborn-health.pdf?ua=1

[13] WHO Regional Office for South-East Asia, New Delhi and Regional Office for Western Pacific, Manila. Practical guidelines for infection control in health care facilities. Link- http://www.wpro.who.int/publications/docs/practical_guidelines_infection_control.pdf

[14] WHO/UNICEF. Water and Sanitation for Health Facility Improvement Tool (WASH FIT). Geneva: World Health Organization, 2017. http://apps.who.int/iris/bitstream/10665/254910/1/9789241511698-eng.pdf