Chapter 14
Maternal - Child Health

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Key points

- Infection prevention and control strategies for mother and child are based on the principle of combined care. In many birthing centres, the mother often labours, delivers, and recovers in the same room. Wherever possible the mother and child are cared for together.
- For neonates requiring intensive care, the newborn's environment must be clearly delineated, with spatial separation between incubators.
- The sharing of equipment and supplies must be preceded by thorough cleaning, and appropriate disinfection/sterilisation.
- The blood and body fluids of mother and child are assumed to be potentially infectious and standard precautions should be applied for all patient care.
- Prevention strategies include hand hygiene, patient hygiene, environmental cleaning and immunisation.

Background

The World Health Organization (WHO) estimates that approximately 210 million women become pregnant each year and that 529,000 die from complications. In the immediate post-partum period, sepsis and haemorrhage are the commonest causes of maternal death. 99% of these maternal deaths occur in developing countries.

Similarly, 99% of the estimated 4 million annual neonatal deaths occur in developing countries. Severe infections cause more than one-third of deaths; these are not always carefully recorded, however the commonest are likely to be sepsis, pneumonia, tetanus, and diarrhoea.[1]

Neonatal Risks and Infections

Neonatal infections occur in the first 28 days of life.[2] These infections may be contracted:

- In utero, by the transplacental route.
- Intrapartum, when in contact with the maternal genital tract, blood, or stool.
- Postpartum, when in contact with the mother, family, and visitors, other neonates in the nursery, healthcare workers, or contaminated equipment.

Risk factors for neonatal infections include:

- Maternal infections
- Foetal gestational age at the time of the infection
- Complications of delivery
    - o Invasive procedures and interventions, such as foetal monitoring devices
    - o Premature rupture of membranes > 24 hours.
    - o Caesarean section delivery (associated with respiratory distress syndrome and possible infection).

Premature infants are at increased risk for infection due to:

- The absence of normal microbial flora which increases the risk of colonisation with pathogens.
- The colonisation of gastrointestinal flora (this risk differs between breast-fed babies versus formula-fed babies).

- Abnormal colonisation that occurs most often in newborns in neonatal intensive care units (NICU).
- Fragile, underdeveloped organs that normally provide a barrier to infectious pathogens, such as the skin and lining of the lung.
- A poor immune (antibody) response.

Common infections for full-term newborns are superficial infections of the skin, eye, and mucous membranes. Additional infections occur in intensive care, such as bacteraemia associated with central lines, pneumonia, and gastrointestinal infections. Microorganisms associated with neonatal infections include *Staphylococcus aureus*, coagulase negative staphylococci, Group B streptococci, *Escherichia coli*, and Candida. Other pathogens often associated with outbreaks in the nursery include *Klebsiella*, *Serratia*, *Enterobacter*, *Citrobacter*, and *Pseudomonas* species.[2]

Maternal Risks and Infections

Healthcare-associated maternal infections are acquired in hospital and did not exist before admission. These infections are typically attributable to the health care setting up to 10 days post-partum. Most surgical site infections are considered healthcare-associated up to 30 days post procedure.[3]

Maternal risk factors for infection include: 1) prolonged rupture of membranes (>24 hours), 2) obesity (interferes with wound healing), 3) diabetes mellitus, and 4) invasive tests and procedures.

Common infections include:

- Endometritis – infection of the lining and wall of the uterus (endometrium and myometrium).
- Mastitis – inflammation and infection of the breast.
- Caesarean surgical site infections.
- Episiotomy site infections – infection at the site of the incision of the perineum.
- Sepsis - bloodstream infection which causes a systemic inflammatory response.

Endometritis is often polymicrobial with both anaerobic and aerobic bacteria (e.g., Group A streptococcus, Group B streptococcus, *Staphylococcus* sp., *Escherichia coli*, *Bacteroides*, and *Clostridium* sp.). *Staphylococcus aureus* is the

pathogen most often associated with mastitis. The pathogens associated with surgical site infections are typically endogenous to the patient, most often skin flora or bacterial flora of the lower genital tract.[4]

Prevention Strategies

As with all patients, use standard precautions/routine practices. Specific practices focused on the mother and child include:

1. Gloves are worn for all contact with mucous membranes, non-intact skin, and moist body substances.
    a. Gloves are changed after each infant and/or procedure
    b. Gloves are not necessary for contact with the intact skin of an infant
    c. Gloves are worn for all diaper changes
    d. Gloves are worn when handling the infant after delivery prior to bath or adequate removal of mother's body fluid
    e. Sterile gloves are worn for the delivery
    f. Clean gloves are worn when handling soiled linen and waste
2. Gowns and/or plastic aprons are worn for holding infant to a uniform.
3. Cohorting of infants with the same infection helps prevent spread of infections in the nursery.
4. Parent/infant contact is encouraged, except for the occasional case when there is a risk of transmitting infection. Labouring mothers may shower or bathe. Post-partum, instruct patient on daily perineal care after toileting. Reviewing good hygienic policies with parents is vital to protect both mother and infant from acquiring or spreading infections.
5. Additional precautions may be indicated for infants colonised or infected with microorganism(s) epidemiologically significant to the facility.
6. Suspected or confirmed infections should be handled according to the guidelines in Table 14.1.

Mothers and infants with the following infections/microorganisms are managed using standard precautions/routine practices; mothers and infants may have contact; and breast feeding is allowed: amnionitis, Chlamydia, bacterial conjunctivitis, cytomegalovirus, endometritis (unless

group A streptococcus), gonococcal infections, hepatitis B and C, herpes simplex, listeria, *Staphylococcus epidermidis* and other coagulase negative staphylococcal infections, group B streptococci infection/colonisation, toxoplasmosis, urinary tract infection, West Nile virus, wound infection, and yeast. Also included in this group:

- tuberculosis in mother (pulmonary or laryngeal on effective treatment, extrapulmonary, or positive skin test)
- mastitis/abscess due to *S. aureus* (for premature infants it may be prudent to withhold milk from a breast with mastitis/for breast abscess, recommended to refrain from breast feeding from affected breast until treated and abscess drained)
- *S. aureus* pneumonia/skin lesions in infant (during outbreak situations, additional precautions and cohorting of infants may be required)

Patients with acquired immune deficiency syndrome, HIV or Human T-Cell Lymphotrophic Virus I/II (HTLV I/II) are cared for using standard precautions, contact is permitted; however mothers are not allowed to breast feed their child.

7. Infants and/or mothers with diagnosed or suspected infections transmitted by the airborne route must be placed in a single room with negative pressure and the door closed. Masks or respirators should be worn according to policy.
8. Priority for single room accommodation should be given to mothers who soil articles in the environment with body substances and those colonised or infected with microorganism(s) epidemiologically significant to the facility.
9. Environmental cleaning – For labour and delivery suites, post-delivery remove soiled linens using gloved hands. The delivery table/bed and the immediate patient environment should be cleaned after each use.
10. Use non-toxic disinfectants for cleaning neonatal equipment and incubators. Avoid phenolic disinfectants.
11. Breast milk is protective as it provides specific IgA antibody and helps establish normal flora in the neonate. See Table 14.1 for maternal/newborn infections and recommendations for breastfeeding.
12. Provide post-partum hygiene for the mother and infant immunisations as required.
13. For facilities with little room and overcrowding, consider kangaroo mother care. This includes skin to skin positioning of the baby on the mother's chest. Antepartum, intrapartum, and postpartum: Maintain

standard precautions with designated areas for bathing, toilet, and hand washing facilities for patients. Refrain from communal use of ointments and lotions; mother should bring in her own lotions and creams. Post-partum – Encourage mothers to perform hand hygiene before breast feeding.

Prenatal assessment

This is used to identify risk factors for maternal / newborn infection and focus prevention strategies.

Screen women for Group B streptococcus (GBS) at 35-37 weeks gestation. GBS-positive mothers should receive treatment if they are symptomatic. Colonised mothers should receive prophylactic penicillin at the time of delivery (ante-partum).

Screen for human immunodeficiency virus (HIV) and Hepatitis B virus. If a mother is Hepatitis B surface antigen positive, the infant should receive hepatitis B immune globulin and the first dose of Hepatitis B vaccine within the first 12 hours of life. HIV positive mothers should refrain from breastfeeding unless alternatives are not available.

Antepartum - Screen mothers upon admission for symptoms of infection, such as new onset of fever and other respiratory symptoms, e.g., new onset of cough, rash, or diarrhoea. If the patient responds "yes" to the any of these conditions, initiate the appropriate additional precautions and spatial separation from other patients (> 2 metres). If airborne infections are suspected, e.g., pulmonary *Mycobacterium tuberculosis* or varicella, then place patient in single room with the door closed and initiate airborne precautions.

Table 14.1. Maternal/Child Infectious Diseases and Infection Prevention and Control Management (Table adapted from Sunnybrook Health Sciences Centre, Toronto, Ontario, 2010).[5-6]

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Antibiotic Resistant Microorganisms - Mother	Vancomycin-resistant Enterococcus (VRE) or methicillin-resistant *S. aureus* (MRSA): Contact Precautions	Standard Precautions	Permitted	Permitted	MRSA - Infant to room with woman
Antibiotic Resistant Microorganisms - Infant	Standard Precautions	VRE or MRSA: Contact Precautions	Permitted	Permitted	MRSA - Single room preferred. If open concept nursery, then spatial separation from other infants required (>2 metres)
Chickenpox Mother ill – healthy term infant	Airborne Precautions	Infant room in with mother	Permitted	Permitted	Provide varicella zoster immune globulin (VarIg) to infants where onset of maternal disease is <5 days prior to delivery or within 48 hours after delivery[5]
Chickenpox Mother ill – Infant in NICU	Airborne Precautions Mother may not visit the NICU	Standard Precautions until day 10. As of day 10 through day 28 start Airborne Precautions	Not permitted	Permitted (as expressed breast milk)	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Chickenpox Infant in NICU	Only parents and visitors who are immune may visit	Airborne Precautions	Permitted if woman is immune	Permitted	Provide varicella zoster immune globulin (VarIg) to infants where onset of maternal disease is <5 days prior to delivery or within 48 hours after delivery[5]
Conjunctivitis Adenovirus - Mother	Contact Precautions No sharing of towels, face cloths, pillows, linens	Standard Precautions	Healthy term infant: Room in No sharing of towels, linens	Permitted	Check for Chlamydia, viral, and bacterial pathogens.
			Infant in NICU: Mother NOT to go to NICU	Permitted as expressed breast milk	
Conjunctivitis Adenovirus - Infant	Standard Precautions	Contact Precautions No sharing of patient care items			

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Diarrhoea Mother - Bacterial (suspected or confirmed)	Standard Precautions Single room with toilet	Standard Precautions	Healthy term infant: Permitted with Standard Precautions	Permitted	
			Infant in NICU: Not permitted until asymptomatic for 48 hours	Permitted as expressed breast milk	
Diarrhoea Mother - C. difficile	Contact Precautions Single room with toilet	Standard Precautions	Permitted	Permitted	
Diarrhoea Mother - Viral (e.g., norovirus)	Contact Precautions Single room with toilet	Contact Precautions Single room with toilet	Healthy term infant: Permitted with Standard Precautions	Permitted	
			Infant in NICU: Woman is not permitted in the NICU until asymptomatic for 48 hours	Permitted as expressed breast milk	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Diarrhoea Infant - Bacterial (suspected or confirmed)	Standard Precautions	Contact Precautions	Permitted	Permitted	Diapered infants require Contact precautions for the duration of illness
Diarrhoea Infant - Viral (e.g., norovirus)	Standard Precautions	Contact Precautions	Permitted	Permitted	Diapered infants require Contact Precautions for the duration of illness
Enterovirus Mother	Contact Precautions Single room	Contact Precautions Single room	Healthy term infant: Permitted with Standard Precautions	Permitted	
			Infant in NICU: Woman is not permitted in the NICU until asymptomatic	Permitted as expressed breast milk	
Enterovirus Infant	Standard Precautions	Contact Precautions	Permitted	Permitted	
Hepatitis, type A Mother	Standard Precautions	Standard Precautions	After prophylaxis of infant	After prophylaxis of infant	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Herpes simplex Mother - Oral or mucocutaneous (i.e., cold sore)	Standard Precautions	See Infant - Asymptomatic	Permitted Total rooming-in preferred	Permitted if there are no herpetic lesions on the breast	Instruct the woman on hand hygiene, to wear a mask or cover lesion when around her infant, not kiss infant while lesion is present, and to avoid touching affected area
Herpes simplex Mother - Whitlow	Standard Precautions	See Infant – Asymptomatic	Direct/hands-on contact is NOT permitted	May pump and discard milk until lesions are gone or may nurse if the woman does not touch her infant (i.e., someone else holds and positions the infant)	
Herpes simplex Infant - Asymptomatic	Standard Precautions	Contact Precautions For duration of incubation period (up to 4 weeks)	Permitted	Permitted	
Herpes simplex Infant - Symptomatic	Standard Precautions	Contact Precautions	Permitted	Permitted	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Herpes zoster (shingles) Mother – localised	Standard Precautions in single room Only immune staff may care for patient	Standard Precautions	Permitted Total rooming-in preferred Mother may not go to nursery until lesions are crusted	Permitted if lesions are not on breast.	Only immune visitors/ siblings to visit VarIG is not indicated for infant if the mother has zoster;[6] however, if infant is <32 weeks, VarIG is to be given
Herpes zoster (shingles) Mother – disseminated	Airborne Precautions Immune staff only	Term infant rooming-in: Standard Precautions	Permitted Total rooming-in preferred Mother may not go to nursery until lesions are crusted	Permitted if lesions are not on breast	
		Infant in NICU: Airborne Precautions day 10 from 1st exposure to day 21 of last exposure (or day 28 if infant has been given VarIG)	Infant in NICU: Woman may NOT go to the NICU until lesions are crusted.	Infant in NICU: Provide expressed milk.	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Influenza Mother	Droplet and Contact Precautions Single room preferred	Standard Precautions	Healthy term infant: Permitted Woman must wear a surgical mask when within 2 metres of infant		Consider acute respiratory illnesses to be influenza during influenza season
			Infant in NICU: Woman is not permitted to go to NICU	Infant in NICU: Permitted as expressed breast milk	
Influenza Infant	Standard Precautions	Droplet and Contact Precautions	Permitted	Permitted	During outbreak situations, additional precautions and cohorting of infants may be required
Measles (Rubeola) Mother ill – Term, healthy infant	Airborne Precautions Immune staff only Only immune family and visitors permitted	Standard Precautions	Room in with woman	Permitted if rooming in with woman May provide expressed breast milk if not rooming in	Infant should receive immune globulin (IG)

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Measles (rubeola) Mother ill – infant in NICU	Airborne Precautions Immune staff only Only immune family and visitors permitted	8 days from 1st exposure to 12 days from last exposure - Airborne Precautions	Woman not permitted in NICU until 4 days after the appearance of the rash	Permitted as expressed breast milk only until woman no longer infectious	Infant should receive immune globulin (IG). Families & Visitors: Immunity is defined as previous history of measles or having received measles vaccine
Measles (rubeola) Infant ill or exposed (i.e., exposed in NICU)	Standard Precautions	Airborne Precautions	Woman immune – permitted to see infant	Permitted	
			Woman susceptible – woman not permitted to see infant	Permitted as expressed breast milk only until infant no longer infectious	
Meningitis *Neisseria meningitidis/ Haemophilus influenzae*	Droplet Precautions until 24 hours after appropriate antimicrobial therapy				Consider infant a contact of the mother

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Mumps **Mother**	Droplet/Contact Precautions Immune staff only Only immune family and visitors permitted	Standard Precautions	Term infant: Permitted	Term infant: Permitted	Families & Visitors: Immunity is defined as a previous history of mumps or having received mumps vaccine
			Infant in NICU: Woman is not to go in the NICU until 9 days after the onset of the parotid swelling	Infant in NICU: Expressed breast milk until 9 days after the onset of the parotid swelling	
Mumps **Infant in NICU** **Exposed or ill**	Standard Precautions	Droplet/Contact Precautions starting 10 days from 1st exposure to 26 days from last exposure Single room Immune staff only Only immune family and visitors permitted	Woman immune – permitted to see infant	Permitted	
			Woman susceptible – woman not permitted to see infant	Permitted as expressed breast milk	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Pediculosis (Head Lice)	Contact Precautions Precautions remain in place until after woman has been appropriately treated	Standard Precautions	Healthy term infant: Permitted	Permitted	
			Infant in NICU: Permitted once woman has been appropriately treated	Infant in NICU: Permitted as expressed breast milk until woman has been appropriately treated	
Pertussis Mother	Droplet Precautions Single room	Standard Precautions	Healthy term infant: Permitted Reinforce hand hygiene and wear a surgical mask when within 2 metres of infant	Permitted	
			Infant in NICU: Not permitted until 5 days of appropriate antibiotic treatment completed	Permitted as expressed breast milk	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Pertussis **Infant**	Standard Precautions	Contact Precautions Consider cohorting Precautions remain in place until 5 days of appropriate antibiotic treatment has been completed	Permitted	Permitted	
Respiratory Virus Infections **Mother ill**	Droplet/Contact Precautions Single room	Standard Precautions	Healthy term infant: Permitted Reinforce hand hygiene and wear a surgical mask when within 2 metres of infant	Infant rooming-in: Permitted	
			Infant in NICU: Not permitted	Infant in NICU: Permitted as expressed breast milk	
Respiratory Virus Infections **Infant ill**	Standard Precautions	Droplet /Contact Precautions	Permitted	Permitted	During outbreak situations, additional precautions and cohorting of infants may be required.

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Rubella **Mother**	Droplet precautions Immune staff only	Droplet precautions Immune staff only	Healthy term infant: Permitted	Healthy term infant: Permitted	Families and visitors: Immunity is defined as having received rubella vaccine or laboratory evidence of immunity
			Infant in NICU: Woman cannot go into the NICU until 7 days after the onset of the rash	Infant in NICU: Expressed breast milk as the woman cannot go into the NICU until 7 days after the onset of the rash	
Rubella **Infant (Congenital)**	Standard Precautions	Droplet Precautions	Permitted	Permitted	Congenitally infected infants may shed virus for up to 2 years.
Scabies	Contact Precautions Precautions remain in place until woman has been appropriately treated	Standard Precautions	Healthy term infant: Permitted once woman has been appropriately treated	Permitted once woman has been appropriately treated or may provide expressed breast milk	
			Infant in NICU: Permitted once woman has been appropriately treated	Infant in NICU: Permitted once woman has been appropriately treated or may provide expressed breast milk	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Staphylococcus aureus **Mother - Major Wound (not contained)**	Contact Precautions	Standard Precautions	Permitted if draining can be adequately contained – see comments	Permitted	Change dressing and woman's gown, and have woman perform hand hygiene prior to contact with infant
Streptococcal Disease (Group A) Mother - Minor Wound Infection (contained)	Single room until 24 hours after effective treatment	Standard Precautions	Permitted	Permitted	It may be advisable to withhold milk from breast with mastitis until 24 hours of effective treatment
Streptococcal Disease (Group A) Mother - Major wound infection or endometritis	Single room until 24 hours after effective treatment	Standard Precautions	Permitted	Permitted	
Streptococcal Disease (Group A) Mother - Invasive Disease	Single room until 24 hours after effective treatment.	Standard Precautions	Permitted after 24 hours of effective treatment	Permitted after 24 hours of effective treatment	

Infection/ Microorganism	Maternal Precautions	Newborn Precautions	Mother/Infant Contact	Breast Feeding	Comments
Streptococcal Disease (Group A) Mother - Pharyngitis (strep throat)	Droplet Precautions Single room	Standard Precautions	Permitted after 24 hours of effective treatment	Permitted after 24 hours of effective treatment	It may be advisable to withhold milk from breast with mastitis until 24 hours of effective treatment
Streptococcal Disease (Group A) Infant	Standard Precautions	Contact Precautions	Permitted	Permitted	
Syphilis Mother - Mucocutaneous	Contact Precautions	Standard Precautions	Permitted after 24 hours effective treatment	Permitted after 24 hours effective treatment	
Syphilis Infant - Congenital	Standard Precautions	Contact Precautions	Permitted	Permitted	
Tuberculosis **Mother - Pulmonary or laryngeal – newly diagnosed, on inadequate treatment or noncompliant**	Airborne Precautions	Standard Precautions	Not permitted until woman is no longer infectious	Mother may provide expressed breast milk	Continue Airborne Precautions until the mother no longer considered infectious

References

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Further Reading

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