Best Practices for Infection Prevention and Control in Perinatology

In All Health Care Settings that Provide Obstetrical and Newborn Care

Provincial Infectious Diseases
Advisory Committee
(PIDAC)

Ontario Agency for Health Protection and Promotion
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NOTES

This document is intended to provide best practices only. Health care settings are encouraged to work towards these best practices in an effort to improve quality of care

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Abbreviations

ABHR	Alcohol-Based Hand Rub
AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
BSI	Bloodstream Infection
CLABSI	Central Line-associated Bloodstream Infection
CMV	Cytomegalovirus
CRBSI	Catheter-related Bloodstream Infection
EBM	Expressed Breast Milk
ESBL	Extended-Spectrum Beta Lactamase
GBS	Group B Streptococcus
HAI	Health Care-Associated Infection
HBIG	Hepatitis B Immune Globulin
HBeAg	Hepatitis B 'e' antigen
HBsAg	Hepatitis B Surface Antigen
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HMBANA	Human Milk Bank Association of North America
HSV	Herpes Simplex Virus
HTLV	Human T-Lymphotropic Virus
IAP	Intrapartum Antibiotic Prophylaxis
ICP	Infection Control Professional
IPAC	Infection Prevention and Control
MOHLTC	Ministry of Health and Long-Term Care (Ontario)
MRSA	Methicillin-Resistant *Staphylococcus aureus*
NICU	Neonatal Intensive Care Unit
OHS	Occupational Health and Safety
PHO	Public Health Ontario
PCR	Polymerase Chain Reaction
PHAC	Public Health Agency of Canada
PHDM	Pasteurized Human Donor Milk
PIDAC	Provincial Infectious Diseases Advisory Committee
PIF	Powdered Infant Formula
PPE	Personal Protective Equipment
RSV	Respiratory Syncytial Virus
TB	Tuberculosis
VRE	Vancomycin-Resistant Enterococci
ZDV	Zidovudine

Glossary of Terms

Additional Precautions: Precautions (i.e., Contact Precautions, Droplet Precautions, Airborne Precautions) that are necessary in addition to Routine Practices for certain pathogens or clinical presentations. These precautions are based on the method of transmission (e.g., contact, droplet, airborne).

Alcohol-Based Hand Rub (ABHR): A liquid, gel or foam formulation of alcohol (e.g., ethanol, isopropanol) which is used to reduce the number of microorganisms on hands in clinical situations when the hands are not visibly soiled. ABHRs contain emollients to reduce skin irritation and are less time-consuming to use than washing with soap and water.

Body Substances: These include blood, body fluids (including breast milk), secretions, excretions, wound drainage and tissue.

Catheter-related Bloodstream Infection (CRBSI): A clinical definition, used when diagnosing and treating patients, that requires specific laboratory testing that more thoroughly identifies the catheter as the source of the BSI. It is not typically used for surveillance purposes.

Central Line-associated Bloodstream Infection (CLABSI): A surveillance definition relating to a primary BSI in a patient that had a central line within the 48-hour period before the development of the BSI and is not related to an infection at another site.

Cluster: A grouping of cases of a disease within a specific time frame and geographic location suggesting a possible association between the cases with respect to transmission.

Continuum of Care: Across all health care sectors, including settings where emergency (including pre-hospital) care is provided, hospitals, complex continuing care, rehabilitation hospitals, long-term care homes, mental health facilities, outpatient clinics, community health centres and clinics, physician offices, dental offices, offices of allied health professionals, public health clinics and home health care.

Direct Care: Provision of hands-on care (e.g., bathing, washing, turning patient, changing clothes, continence care, dressing changes, care of open wounds/ lesions, toileting).

Donor Breast Milk: Milk that comes from donors other than the newborn's mother. The only acceptable donor breast milk is pasteurized human donor milk (PHDM) from an accredited milk bank. The Canadian milk bank follows the guidelines set by the Human Milk Bank Association of North America (HMBANA). Donor breast milk is pooled from a maximum of four lactating women who have met rigid screening criteria that include a medical referral, physical exam and blood testing for HIV, HTLV, hepatitis B, hepatitis C and syphilis.

Environment of the Patient: The immediate space around a patient that may be touched by the patient and may also be touched by the health care provider when providing care. In a single room, the patient environment is the room. In a multiple-bed room, the patient environment is the area inside the individual's curtain. In an ambulatory setting, the patient environment is the area that may come into contact with the patient within their cubicle. In a nursery/ neonatal setting, the patient environment includes the inside of the bassinette or isolette, as well as the equipment outside the bassinette or isolette used for that newborn (e.g., ventilator, monitor). **Recognizing that in Ontario home births take place, this definition is not intended to include the home environment.**

Hand Hygiene: A general term referring to any action of hand cleaning. Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands. Hand hygiene may be accomplished using an alcohol-based hand rub or soap and running water. Hand hygiene includes surgical hand antisepsis.

Hand Washing: The physical removal of microorganisms from the hands using soap (plain or antimicrobial) and running water.

Health Care-Associated Infection (HAI): A term relating to an infection that is acquired during the delivery of health care (also known as *nosocomial infection*).

Health Care Provider: Any person delivering care to a patient. This includes, but is not limited to, the following: emergency service workers, physicians, dentists, nurses, midwives, respiratory therapists and other health professionals, personal support workers, clinical instructors, students and home health care workers. In some settings, volunteers might provide care and would be included as a health care provider. For the purposes of this document, the parents of a newborn are not considered to be health care providers. See also *Staff*, below.

Health Care Setting: Any location where health care is provided, including settings where emergency care is provided, hospitals, complex continuing care, rehabilitation hospitals, long-term care homes, mental health facilities, outpatient clinics, community health centres and clinics, physician offices, dental offices, offices of health professionals, public health clinics and home health care.

Infection Prevention and Control (IPAC): Evidence-based practices and procedures that, when applied consistently in health care settings, can prevent or reduce the risk of transmission of microorganisms to health care providers, other newborns/ patients and visitors.

N95 Respirator: A personal protective device that is worn on the face and covers the nose and mouth to reduce the wearer's risk of inhaling airborne particles. A NIOSH-certified N95 respirator filters particles one micron in size, has 95% filter efficiency and provides a tight facial seal with less than 10% leak.

Neonatal Intensive Care Unit: A unit of a hospital specializing in the care of ill or premature newborn infants.

Occupational Health and Safety (OHS): Preventive and therapeutic health services in the workplace provided by trained occupational health professionals, e.g., nurses, hygienists, physicians.

Ontario Agency for Health Protection and Promotion (OAHPP): An arm's-length government agency dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. OAHPP was created by legislation in 2007 and began operations in July 2008 with a mandate to provide scientific and technical advice to those working to protect and promote the health of Ontarians. It's vision is to be an internationally recognized centre of expertise dedicated to protecting and promoting the health of all Ontarians through the application and advancement of science and knowledge. OAHPP's operating name is Public Health Ontario (PHO).

Outbreak: For the purposes of this document, an outbreak is an increase in the number of cases above the number normally occurring in a particular health care setting over a defined period of time.

Personal Protective Equipment (PPE): Clothing or equipment worn by staff for protection against hazards.

Provincial Infectious Diseases Advisory Committee (PIDAC): A multidisciplinary scientific body within the OAHPP, that provides evidence-based advice regarding multiple aspects of infectious disease identification, prevention and control. More information is available at: http://www.pidac.ca.

Public Health Ontario (PHO): Created June 14, 2011, Public Health Ontario is the operating name for OAHPP.

Routine Practices: The system of infection prevention and control practices to be used with all patients during all care to prevent and control transmission of microorganisms in all health care settings. For a full description of Routine Practices, refer to PIDAC's *Routine Practices and Additional Precautions for all Health Care Settings* [available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html].

Staff: Anyone conducting activities in settings where health care is provided, including health care providers. See also, *Health Care Providers*.

Vertical Transmission: The transmission of an infection from mother to child during pregnancy or parturition.

Preamble

This document is targeted to those providing perinatal care at all levels (primary, secondary, tertiary), including physicians (neonatologists, obstetricians, family physicians, pediatricians); nurses (obstetrical, neonatal, pediatric, public health); midwives; lactation consultants; as well as infection control professionals (ICPs).

About This Document

The purpose of this document is to provide evidence-based infection prevention and control (IPAC) recommendations for perinatology, including:

- principles of Routine Practices and Additional Precautions
- infectious diseases of significance to mothers and their newborns
- acquisition, preparation, storage and handling of breast milk and infant formula
- prevention of intravascular line-associated infections
- outbreak management
- the provision of sample policies and procedures for use in perinatology settings.

Evidence for Recommendations

The best practices in this document reflect the best evidence and expert opinion available at the time of writing. As new information becomes available, this document will be reviewed and updated.

➢ See Appendix A, *Ranking System for Recommendations*, for the grading system used for these recommendations.

How and When to Use This Document

This document deals with IPAC best practices related to perinatal care and neonatology. It is not meant to supersede other best practice documents provided by the Provincial Infectious Diseases Advisory Committee (PIDAC), but should be used in conjunction with these.

FOR RECOMMENDATIONS IN THIS DOCUMENT:

Shall indicates mandatory requirements based on legislated requirements or national standards (e.g., Canadian Standards Association – CSA).

Must indicates best practice, i.e., the minimum standard based on current recommendations in the medical literature.

Should indicates a recommendation or that which is advised but not mandatory.

May indicates an advisory or optional statement.

Assumptions and Best Practices in Infection Prevention and Control

The best practices in this document are based on the assumption that health care settings in Ontario already have basic IPAC systems and programs in place, such as those outlined in the following document:

- PIDAC's *Best Practices for Infection Prevention and Control Programs in Ontario in All Health Care Settings*,[1] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/infection-prevention-and-control-programs-in-ontario.html.

These settings should work with organizations that have IPAC expertise, such as academic health science centres, regional infection control networks, public health units that have professional staff certified in IPAC and local IPAC associations (e.g., Community and Hospital Infection Control Association (CHICA) – Canada chapters), to develop evidence-based programs.

In addition to the general assumption (*above*) about basic IPAC, these best practices are based on the following additional assumptions and principles:

1. Best practices to prevent and control the spread of infectious diseases are routinely implemented in all health care settings, including:
    a) PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings*,[2] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html.
    b) Health Canada's *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care* (Can Commun Dis Rep. 1999; 25 Suppl 4:1-142) [**under revision**]),[3] available at: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99vol25/25s4/index.html.
2. Adequate resources are devoted to IPAC in all health care settings. See PIDAC's *Best Practices for Infection Prevention and Control Programs in Ontario*,[1] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/infection-prevention-and-control-programs-in-ontario.html.
3. Programs are in place in all health care settings that promote good hand hygiene practices and ensure adherence to standards for hand hygiene. See:
    a) PIDAC's *Best Practices for Hand Hygiene in All Health Care Settings*,[4] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/hand-hygiene.html.
    b) Ontario's hand hygiene improvement program, *Just Clean Your Hands*,[5] available at: http://www.oahpp.ca/services/jcyh/.
4. Programs are in place in all health care settings that ensure effective disinfection and sterilization of used medical equipment according to PIDAC's *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings*,[6] available online at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/cleaning-disinfection-and-sterilization.html.
5. Adequate resources, including human resources, are devoted to Environmental Services/Housekeeping in all health care settings to enable written procedures for cleaning and disinfection of patient rooms and equipment; education of new cleaning staff and continuing education of all cleaning staff; increased capacity for outbreak management; and ongoing review of procedures. See PIDAC's *Best Practices for Environmental Cleaning in All Health Care Settings*,[7] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/environmental-cleaning-for-prevention-and-control-of-infections.html.

6. Regular education (including orientation and continuing education) and support is provided in all health care settings to help staff consistently implement appropriate IPAC practices. Effective education programs emphasize:

   - the risks associated with infectious diseases, including acute respiratory infection and gastroenteritis
   - hand hygiene, including the use of alcohol-based hand rubs and hand washing
   - principles and components of Routine Practices as well as additional transmission-based precautions (Additional Precautions)
   - assessment of the risk of infection transmission and the appropriate use of personal protective equipment (PPE), including safe application, removal and disposal
   - appropriate cleaning and/ or disinfection of health care equipment, supplies and surfaces or items in the health care environment
   - individual staff responsibility for keeping patients, themselves and co-workers safe
   - collaboration between professionals involved in IPAC and Occupational Health and Safety (OHS).

   NOTE: *Education programs should be flexible enough to meet the diverse needs of the range of health care providers and other staff who work in the health care setting. The local public health unit and regional infection control networks may be a resource and can provide assistance in developing and providing education programs for community settings.*

7. Collaboration between professionals involved in OHS and IPAC is promoted in all health care settings, to implement and maintain appropriate IPAC standards that protect workers.

8. There are effective working relationships between the health care setting and local public health. Clear lines of communication are maintained and public health is contacted for information and advice as required and the obligations (under the *Health Protection and Promotion Act*, R.S.O. 1990, c.H.7)[8] to report reportable and communicable diseases is fulfilled. Public health provides regular aggregate reports of outbreaks of reportable diseases in facilities and/ or in the community to all health care settings.

9. Access to ongoing IPAC advice and guidance to support staff and resolve differences is available to the health care setting.

10. There are established procedures for receiving and responding appropriately to all international, national, regional and local health advisories in all health care settings. Health advisories are communicated promptly to all affected staff (e.g., those responsible for reprocessing medical equipment/ devices) and regular updates are provided. Current advisories are available from local public health units, the Ministry of Health and Long-Term Care (MOHLTC), Health Canada and Public Health Agency of Canada (PHAC) websites and local regional IPAC networks.

11. Where applicable, there is a process for evaluating personal protective equipment (PPE) in the health care setting, to ensure it meets quality standards.

12. There is regular assessment of the effectiveness of the IPAC program and its impact on practices in the health care setting. The information is used to further refine the program.[1]

Occupational Health and Safety requirements shall be met:

Health care facilities are required to comply with applicable provisions of the *Occupational Health and Safety Act* (OHSA), R.S.O. 1990, c.0.1 and its Regulations. Employers, supervisors and workers have rights, duties and obligations under the OHSA. Specific requirements under the OHSA and its regulations are available at:

- http://www.e-laws.gov.on.ca/index.html

- http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o01_e.htm.

The *Occupational Health and Safety Act* places duties on many different categories of individuals associated with workplaces, such as employers, constructors, supervisors, owners, suppliers, licensees, officers of a corporation and workers. A guide to the requirements of the *Occupational Health and Safety Act* is available at: http://www.labour.gov.on.ca/english/hs/pubs/ohsa/index.php.

The OHSA section 25(2)(h), the '*general duty clause*', requires an employer to take every precaution reasonable in the circumstances for the protection of a worker.

Specific requirements for certain health care and residential facilities may be found in the *Regulation for Health Care and Residential Facilities*, available at: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_930067_e.htm. Under that regulation there are a number of requirements, including:

- Requirements for an employer to establish written measures and procedures for the health and safety of workers, in consultation with the joint health and safety committee or health and safety representative, if any. Such measures and procedures may include, but are not limited to, the following:
  - safe work practices
  - safe working conditions
  - proper hygiene practices and the use of hygiene facilities
  - the control of infections
  - immunization and inoculation against infectious diseases.
- The requirement that at least once a year the measures and procedures for the health and safety of workers shall be reviewed and revised in the light of current knowledge and practice.
- A requirement that the employer, in consultation with the joint health and safety committee or health and safety representative, if any, shall develop, establish and provide training and educational programs in health and safety measures and procedures for workers that are relevant to the workers' work.
- A worker who is required by his or her employer or by the *Regulation for Health Care and Residential Facilities* to wear or use any protective clothing, equipment or device shall be instructed and trained in its care, use and limitations before wearing or using it for the first time and at regular intervals thereafter and the worker shall participate in such instruction and training.
- The employer is reminded of the need to be able to demonstrate training, and is therefore encouraged to document the workers trained, the dates training was conducted, and the information and materials covered during training.
- Under the *Occupational Health and Safety Act*, a worker must work in compliance with the Act and its regulations, and use or wear any equipment, protective devices or clothing required by the employer.
- The Needle Safety Regulation (O.Reg 474/07) has requirements related to the use of hollow-bore needles that are safety-engineered needles. The regulation is available at: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_070474_e.htm.

➢ Additional information is available at the Ministry of Labour Health and Community Care Page: http://www.labour.gov.on.ca/english/hs/topics/healthcare.php.

I. Best Practices for Infection Prevention and Control in Perinatology

TERMS USED IN THIS DOCUMENT (see glossary for details and examples)

Health Care Provider: Any person delivering care to a patient.

Staff: Anyone conducting activities within a health care setting (includes health care providers).

1. Background

The challenge of current obstetrical infection prevention is to decrease the risk for health care-associated infection (HAI) while supporting family-centred maternity care. Mothers and their newborns are usually at low risk of HAI, unless the newborn is born prematurely or has other complications or conditions. Newborns hospitalized in neonatal intensive care units (NICUs) are at risk for HAIs because of their physiologic instability and exposure to invasive devices and broad-spectrum antibiotics. In addition, this group of newborns has some unique host risk factors that make them particularly vulnerable for acquiring HAIs, as well as experiencing more severe illness as a result of these infections.

Host risk factors for infection in newborns include[9]:

- low birth weight[10]
- acuity of underlying illness
- immature immune system
- permeable skin.

Vertical transmission, also known as mother-to-child transmission, is the transmission of an infection from mother to child during pregnancy or parturition.

Congenital Infections

A congenital infection is an infection of the newborn that is acquired *in utero* and is present at birth. A congenital infection may or may not be clinically apparent at birth. The use of universal prenatal screening and appropriate management has greatly reduced the incidence of these infections in Ontario.

Infections Acquired During Parturition

Newborns may be colonized or infected by microorganisms acquired during the delivery. Microorganisms found in the maternal birth canal may result in infection of the newborn based on the pathogenicity of the microorganism and the susceptibility of the newborn.

Postpartum and Health Care-associated Infections (HAIs)

Postpartum infections and HAIs are acquired after birth. Colonization of mucous membranes and skin of newborns occurs rapidly after birth. In healthy newborns, the majority of colonizing microorganisms are acquired from the newborn's mother and other family members. However, newborns hospitalized within an NICU setting are likely to be colonized with endemic microorganisms already present in the NICU or acquired from contact with health care providers.

Risk factors for HAI acquisition include:

- exposure to invasive devices[11, 12]
- exposure to broad-spectrum antibiotics[11]
- over-crowding[13, 14]
- poor staffing ratios.[13]

Administration of breast milk from either the newborn's mother or donor breast milk provides an opportunity for the transmission of agents found in breast milk and on the skin of the breast milk donor. If the newborn's mother's milk is not available, or cannot be used, the only acceptable donor breast milk is pasteurized human donor milk (PHDM) from an accredited milk bank. Donor screening and pasteurization of donor breast milk has made this product relatively safe for use in even the most critically ill newborn.[15, 16] See Table 1 for examples of common and/ or important infections that may be acquired by newborns.

The Provincial Infectious Diseases Advisory Committee (PIDAC) has developed a number of IPAC best practices documents (*see box, below*), focusing on various elements of health care infection prevention and control practices. It is not the intent of this document to supersede these best practices, but rather to provide an additional resource with information tailored to the perinatology population.

LIST OF PIDAC BEST PRACTICES IN INFECTION PREVENTION AND CONTROL

The following infection prevention and control best practices for all health care settings are available from the Public Health Ontario website at http://www.oahpp.ca/resources/pidac-knowledge/index.html:

- Routine Practices and Additional Precautions
  - Annex A: Antibiotic-Resistant Organisms
  - Annex B: Acute Respiratory Infection
  - Annex C: *Clostridium difficile*
- Hand Hygiene
- Infection Prevention and Control Programs in Ontario
- Environmental Cleaning
- Cleaning, Disinfection and Sterilization
- Surveillance of Health Care-Associated Infections
- Sexually Transmitted Infections Case Management and Contact Tracing

Table 1: Common and/ or Important Infections Acquired by Newborns

Agent	Congenital Infection	Infection Acquired During Parturition	Health Care-Associated Infection
BACTERIA			
Listeria monocytogenes	✓	✓	✓
Treponema pallidum (syphilis) not adequately treated	✓	✓	
Enterobacteriaceae (e.g., *E. coli, Klebsiella* spp.)		✓	✓
Chlamydia trachomatis		✓	
Group B streptococcus (GBS)		✓	
Neisseria gonorrhoeae		✓	
Antibiotic-resistant organisms (e.g., MRSA, VRE, ESBL)		✓	✓
Pseudomonas species			✓
VIRUSES			
Herpes simplex virus (HSV)	✓	✓	✓
Varicella-zoster	✓	✓	✓
Enterovirus	✓	✓	✓
Human immunodeficiency virus (HIV)	✓	✓	
Cytomegalovirus (CMV)	✓		✓
Parvovirus B19	✓		
Rubella	✓		
Hepatitis B virus (HBV)		✓	
Hepatitis C virus (HCV)		✓	
Enteric viruses (e.g., Rotavirus, Norovirus)			✓
Respiratory viruses, especially RSV			✓
FUNGI			
Candida species	✓	✓	✓
Malassesia species			✓
PROTOZOA			
Toxoplasma gondii	✓		

2. Routine Practices in Perinatology

Routine Practices are based on the premise that all patients are *potentially* infectious, even when asymptomatic, and that the same safe standards of practice should be used **routinely** with **all** patients to prevent exposure to blood, body fluids, secretions, excretions, mucous membranes, non-intact skin or soiled items and to prevent the spread of microorganisms.

Routine Practices refer to the infection prevention and control practices that are to be used with all patients during all care, to prevent and control transmission of microorganisms in all health care settings.

The basic elements that comprise Routine Practices are:

- risk assessment
- hand hygiene
- environmental controls
- administrative controls
- personal protective equipment (PPE).

A. Risk Assessment and Screening

The first step in the effective use of Routine Practices is to perform a risk assessment.[2] In perinatology, the risk assessment must include both mother and newborn, as well as primary care givers and others who have close contact with the newborn. There are three types of risk assessment in perinatology:

1. interventions and preventive practices that are dealt with prior to birth (see *Perinatal Infections*)
2. screening protocols for infectious illnesses (see *Perinatal Infections*)
3. point-of-care risk assessment to guide use of personal protective equipment and patient placement.

A point-of-care risk assessment is applied **before every interaction** with the mother or newborn, throughout the continuum of care (antenatal, care at birth, postnatal and newborn care). Infection risk is assessed based on symptoms of infection,[17] in order to determine which interventions or avoidance procedures are required to minimize risk and prevent transmission of infection during the interaction. The risk assessment is performed prior to every interaction because the mother's/ newborn's status can change. See Figure 1 for questions to be asked as part of a point-of-care risk assessment.

A point-of-care risk assessment must be applied before every interaction with a mother or newborn, throughout the continuum of care.

Based on the results of the risk assessment, interventions and barriers may be put into place to reduce one's risk of acquiring or transmitting infection. While hand hygiene and the Four Moments are always required, the risk assessment may indicate that extra barriers be put into place. For example:

- exposure of hands → WEAR GLOVES
- exposure of clothing or forearms → WEAR A GOWN
- exposure to mucous membranes of the eyes, nose, mouth → WEAR A MASK AND EYE PROTECTION
- exposure to contaminated equipment or surfaces → WEAR GLOVES and possibly GOWN.

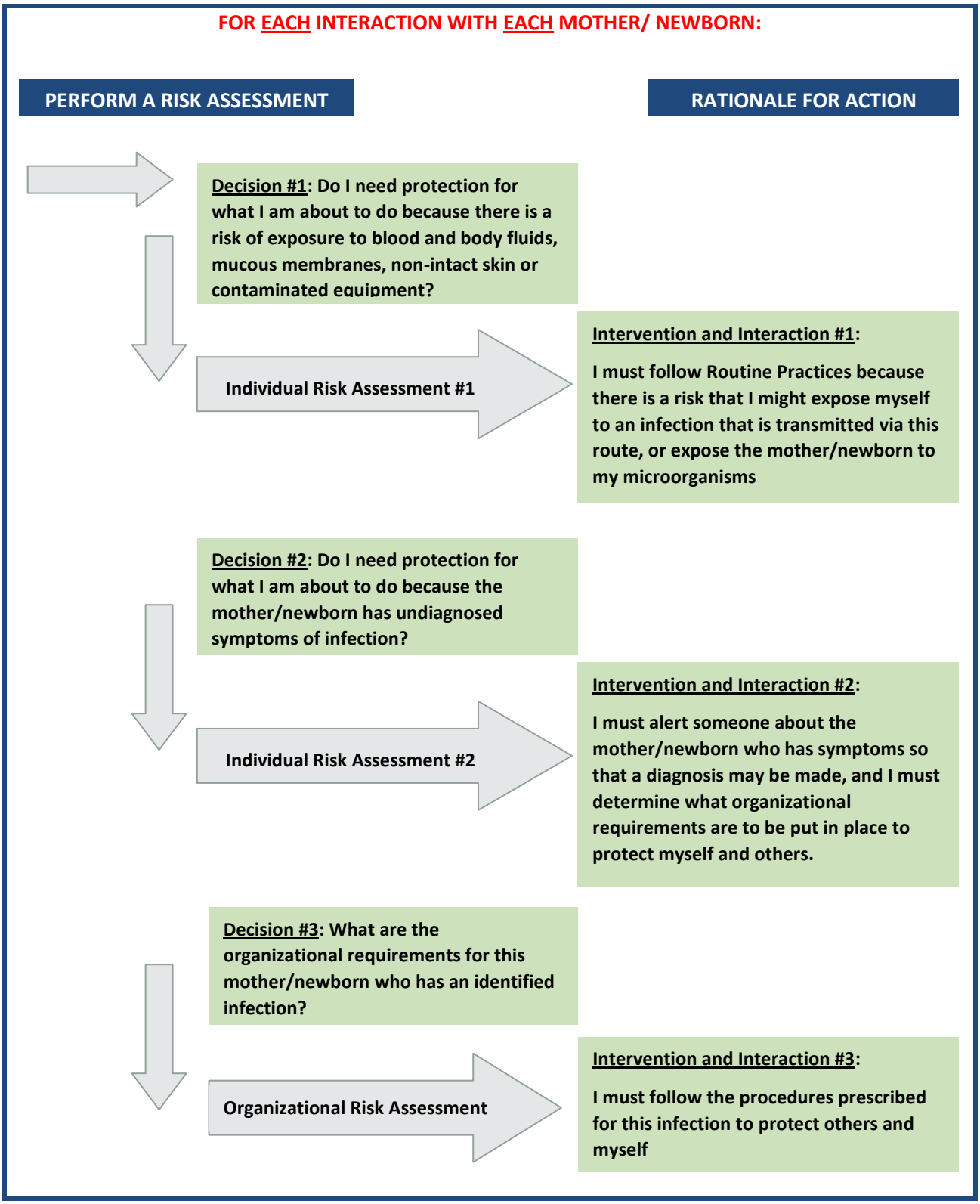


Figure 1: Point-of-Care Risk Assessment

Where there is a risk of transmission of infection based on the risk assessment, appropriate controls must be put into place and appropriate PPE must be used to protect the health care provider, other staff, other mothers, newborns and visitors.

- For more information about performing a point-of-care risk assessment, refer to PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings*,[2] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html.

Health care providers must assess their risk of exposure to body substances, such as:

- blood

- body fluids, including breast milk

- secretions, including vaginal secretions

- excretions, including meconium

and identify the strategies that will decrease exposure risk and prevent the transmission of microorganisms.

B. Hand Hygiene

Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands while maintaining good skin integrity. Hand hygiene is the single most important and effective IPAC measure to prevent the spread of health care-associated infections. In the neonatal intensive care unit (NICU) setting, improved adherence to hand hygiene practice has been shown to reduce infection rates.[18-21]

Each health care setting should have in place a hand hygiene program that includes easy access to alcohol-based hand rub (ABHR) at point-of-care, dedicated hand washing sinks in patient care areas, a hand care program and a program to monitor hand hygiene compliance with feedback to staff and management.[4]

- For more information about Ontario's evidence-based hand hygiene program visit the MOHLTC's '*Just Clean Your Hands*' evidence-based hand hygiene program for hospitals,[5] available at: http://www.oahpp.ca/services/jcyh/.

To make it possible for health care providers to clean their hands at the right time, ABHR s*hould be available at* the point-of-care.[22] There should also be adequate sinks with soap and water to allow for hand washing. ABHR is the **preferred method** to routinely decontaminate hands in clinical situations when hands are not visibly soiled,[4] as it provides for a rapid kill of most transient microorganisms, is less time-consuming than washing with soap and water and is easier on skin.[23-27] Hand washing with soap and running water must be performed when hands are visibly soiled.[4]

Hand hygiene is the single most important and effective infection prevention and control measure to prevent the spread of health care-associated infections.

Effective **hand hygiene** is reflected by the four moments that are part of Ontario's *Just Clean Your Hands* program:

1. BEFORE initial contact with each patient or their environment
2. BEFORE performing an aseptic procedure
3. AFTER care involving body fluid exposure risk
4. AFTER contact with a patient or their environment.

Hand Hygiene in the Neonatal Intensive Care Unit (NICU)

For the purposes of hand hygiene, there are three distinctive environments in the NICU (see Figure 2):

1. **Neonate Environment**: the environment inside an isolette/ warmer that includes the neonate
2. **Immediate Care Environment**: the environment immediately outside the isolette/ warmer that includes equipment used in the care of the neonate (e.g., monitors, ventilators, supplies)
3. **NICU Environment**: the remainder of the NICU (e.g., nursing station, hallways, lounges, storage rooms, preparation rooms, utility rooms).

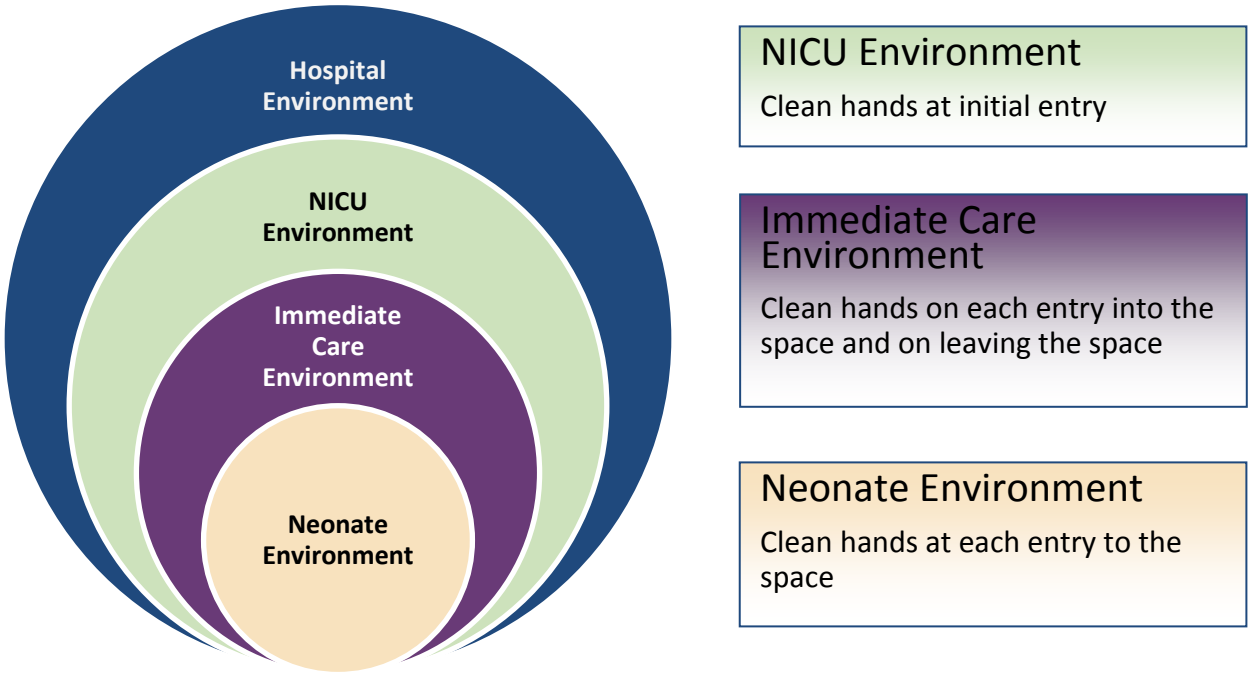


Figure 2: The Environment of the Neonatal Intensive Care Unit and Adaptation of Hand Hygiene Moments

Effective hand hygiene in the NICU environment necessitates the addition of an extra hand hygiene 'moment' on each entry to the isolette/ warmer that holds the neonate.

For the purposes of the 4 moments for hand hygiene, the Immediate Care Environment and the Neonate Environment may be considered to be distinct (see Figure 2), presenting **an additional opportunity** for hand hygiene. Hand hygiene in the NICU would then be performed:

1.A BEFORE contact with the Immediate Care Environment
1.B BEFORE contact with the neonate or the Neonate Environment
2. BEFORE performing an aseptic procedure
3. AFTER care involving body fluid exposure risk
4. AFTER contact with the Immediate Care Environment

Jewellery

Jewellery is hard to clean and hides bacteria and viruses from the action of the hand hygiene agent.[28-33] Rings increase the number of microorganisms present on hands[28, 29, 32, 34-36], although this has not been linked to increases in infections.[37, 38] Rings may increase the risk of tears in gloves.[39]

It is recommended that rings and bracelets not be worn by those with direct contact with mothers or newborns. If the health care setting policy allows health care providers to wear hand and/ or arm jewellery, it must be limited to a smooth wedding band without projections or mounted stones[29, 40] and/ or a watch.

In the NICU setting, for provision of direct patient care, arms should be bare below the elbows, i.e., no bracelets, rings, or watches.

Impediments to effective hand hygiene:

- *jewellery*
- *nail conditions*
- *nail polish*
- *artificial nails*

In the NICU setting, for provision of direct patient care, arms should be bare below the elbows.

Nails, Nail Polish and Artificial Nails

Long nails are difficult to clean, can pierce gloves[41] and harbour more microorganisms than short nails.[42] Natural nails should be kept clean and short.[24] The nail should not show past the end of the finger.[43]

Studies have shown that chipped nail polish or nail polish worn longer than 4 days can harbour microorganisms that are not removed by hand washing, even with surgical hand scrubs.[44, 45] Freshly applied nail polish does not result in increased numbers of bacteria around the nails. Fingernail polish, if worn, must be fresh and in good condition.

Acrylic nails harbour microorganisms and are more difficult to clean than natural nails.[46] Artificial nails and nail enhancements have been implicated in the transfer of microorganisms such as *Pseudomonas* species,[42, 47] *Klebsiella pneumoniae*[48] and yeast[49]; and in outbreaks, particularly in neonatal nurseries.[42, 48] Artificial nails and nail enhancements are also associated with poor hand hygiene practices and result in more tears to gloves.[50] For these reasons, artificial nails and nail enhancements must not be worn by those having direct contact with mothers/ newborns.

Artificial nails and nail enhancements must not be worn by those having direct contact with mothers or newborns.

- For more information about hand hygiene, refer to PIDAC's Best Practices for Hand Hygiene in All Health Care Settings,[4] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/hand-hygiene.html.

C. Personal Protective Equipment (PPE)

Personal protective equipment (PPE) is worn to prevent transmission of microorganisms from patient-to-patient, from patient-to-staff and from staff-to-patient, by placing a barrier between a potential source of infection and one's own mucous membranes, airways, skin and clothing.[3, 17] The selection of PPE is based on the nature of the interaction with the mother or newborn and/ or the likely mode(s) of transmission of infectious agents, according to the risk assessment. PPE includes gloves, gown and facial protection.

PPE should be put on just prior to the interaction with the mother/ newborn. When the interaction for which the PPE was used has ended, PPE should be removed immediately and disposed of in the appropriate receptacle. The process of PPE removal requires strict adherence to a formal protocol to prevent recontamination.[51]

- For more information about the appropriate use of PPE, refer to PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings*,[2] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html.
- Refer to Appendix E, *Putting On and Taking Off Personal Protective Equipment (PPE)*, for more information.

Gloves

Gloves are worn for contact with mucous membranes, non-intact skin, blood, body fluids, secretions, excretions or equipment and environmental surfaces contaminated with any of these.[2] Gloves are not a substitute for hand hygiene, which must be performed before putting on gloves and after glove removal.

Appropriate glove use:

- Perform hand hygiene before putting on gloves.
- Put on gloves immediately before the activity for which they are indicated.
- Remove gloves and discard immediately after the activity for which they were used.
- Change gloves between care for each patient, including the mother and her newborn.
- Wear gloves when handling the newborn after delivery prior to bath or adequate removal of the mother's body substances.
- Wear gloves for all diaper changes.
- Wear gloves for contact with an undiagnosed rash, lesion or non-intact skin.
- Do not re-use or wash gloves.
- Perform hand hygiene after gloves are removed.

Gowns

A gown is worn when a procedure or care activity is likely to generate splashes or sprays of blood, body fluids, secretions or excretions.[2] Long-sleeved gowns protect the forearms and clothing from contamination with potentially infectious material, for example, holding newborns outside of the isolette or bassinet.[9] Gowns are not required for parents holding their newborn.

A gown should be worn or other appropriate barrier used when holding a newborn against the chest.

Appropriate gown use by staff[2]:

- Wear a gown when providing care that may contaminate skin or clothing.
- Put gown on immediately before the activity for which it is indicated.
- Remove gown immediately after the activity for which it is used.
- Change gown between care for each mother or newborn.
- Wear gown properly, i.e., appropriately tied at neck and waist.
- Discard gown into an appropriate receptacle after each use and do not re-use.
- Perform hand hygiene after gown is removed.

Facial Protection

A mask and eye protection are used to protect the mucous membranes of the eyes, nose and mouth from care activities likely to generate splashes or sprays of blood, body fluids, secretions or excretions, or within two metres of a coughing mother.[2, 52] A mask is also used when performing some aseptic procedures, such as central line insertions and wound dressings. A mask should be worn by a coughing mother, if tolerated, when she goes outside her room.

Eye protection may be disposable or, if reusable, should be cleaned and disinfected after each use. Prescription eye glasses are not acceptable by themselves as eye protection, but they may be worn underneath face shields and some types of eye protection.

Appropriate use of eye protection[2]:

- Put on eye protection immediately before the activity for which it is indicated.
- Remove eye protection immediately after the activity for which it is used.
- Discard eye protection after use or place into an appropriate receptacle for cleaning and disinfection.
- Ensure eye protection is comfortable.
- Ensure eye protection does not interfere with vision.
- Ensure eye protection fits securely.

Appropriate mask use[2]:

- Put on mask immediately before the activity for which it is indicated.
- Remove mask immediately after the activity for which it is used.
- Secure mask over the nose and mouth.
- Change mask if it becomes wet.
- Do not touch mask while being worn.
- Do not allow mask to hang around the neck.
- Do not fold mask or store in a pocket.
- Do not re-use mask.
- Perform hand hygiene after removing mask.

Appropriate use of N95 respirator[2]:

- Put on respirator immediately before the activity for which it is indicated.
- Remove respirator as soon as it is safe to do so.
- Use only a fit-tested respirator.
- Perform a seal-check each time a respirator is applied.
- Change respirator if it becomes wet or soiled.
- Remove respirator correctly and discard immediately after use.
- Perform hand hygiene after removing the respirator.

➢ For more information about PPE, refer to PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings*,[2] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html.

D. Environmental Cleaning in Perinatal Care

Maintaining a clean and safe health care environment is an essential component of IPAC and is integral to the safety of mothers, newborns, staff and visitors.[53-55] Some studies have shown that environmental strains of microorganisms are identical to those of the patient occupying the environmental space.[12, 56, 57] In some instances, HAI outbreaks have been brought under control when the intensity of environmental cleaning was increased.[58, 59]

Frequency of Cleaning

Environmental cleaning and disinfection should be performed on a routine and consistent basis to provide for a safe and sanitary environment. Cleaning recommendations for hospitals in Ontario are described in PIDAC's *Best Practices for Environmental Cleaning for Prevention and Control of Infections*, available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/environmental-cleaning-for-prevention-and-control-of-infections.html.

According to PIDAC recommendations[7]:

- Clean labour and birthing rooms after each patient AND additionally as required.
- Clean well baby observation areas at least daily according to a fixed schedule AND additionally as required.
- Clean mother's room at least once daily AND additionally as required.
- Clean NICU at least twice per day AND additionally as required.
- Clean isolettes/ warmers according to a schedule AND additionally as required.
- Terminally clean NICU isolette/ warmer and environment on discharge of the newborn.
- Terminally clean transport equipment after each newborn transport.

Frequent audits of practice should be included as part of the organization's responsibility for maintaining a clean environment.[7]

Isolettes and Warmers

When choosing isolettes or warmers, the ability to clean the equipment should be considered. There should be a written policy and procedure for cleaning isolettes/ warmers that includes frequency of cleaning (e.g., weekly and when visibly soiled) and methodology for cleaning. Cleaning should follow the manufacturer's instructions for the equipment being cleaned.

When cleaning an isolette or warmer, all detachable parts should be removed and scrubbed. If the isolette has a fan, it should be cleaned and disinfected according to the manufacturer's instructions. The air filter should be maintained as recommended by the manufacturer. Mattresses should be replaced when the surface covering is broken. Isolette portholes, cuffs and sleeves are easily contaminated and should be cleaned and disinfected frequently. Disposable cuffs should be replaced according to a regular schedule.

- Refer to Appendix C, *Sample Routine Cleaning of an Isolette*, for a sample cleaning protocol.

Milk Preparation Areas

Milk preparation areas should be separate and not used for other purposes. Milk preparation areas may become contaminated and must be cleaned daily and between the preparations of milk from different mothers. Refrigerators and freezers used for breast milk should have a regular cleaning schedule and must not be used for preparing or storing other items such as food, specimens or medications.

Cleaning and Disinfecting Products

Cleaning and disinfecting products used in the health care setting must be approved by IPAC and OHS.[6] Low-level disinfectants such as quaternary ammonium compounds, peroxides, iodophors and hypochlorite ('bleach') may be used for general disinfection. **Phenolics should not be used** in nurseries or the NICU because absorption through the skin can cause hyperbilirubinemia.[60] Cleaning and disinfecting agents may be combined into a single product, thus saving a step in the process. Cleaning and disinfecting protocols should allow for the full contact time specified for the product used.

Products that leave no toxic residues should be selected for cleaning and disinfecting newborn areas and equipment.

Birthing Pools, Tubs and Tanks

Health care-associated infections have been linked to the use of birthing tanks, whirlpools and whirlpool spas for birthing.[61, 62] Potential routes of infection include incidental ingestion of the water, sprays and aerosols, and direct contact with wounds and non-intact skin.[54]

There should be stringent policies and procedures for cleaning and disinfection of hydrotherapy equipment that include:

- Remove parts in contact with contaminated water for cleaning and disinfection (e.g., jets).
- Drain equipment after each use.
- Thoroughly clean all surfaces and removable parts of the equipment.
- Disinfect surfaces and removable parts with a chemical germicide and disinfection method recommended by the equipment manufacturer.

Equipment manufactured for home use (e.g., whirlpool spas, hot tubs) is not designed or constructed for birthing purposes and manufacturers are not obligated to provide cleaning and disinfecting instructions to the same standard that is required for medical equipment. There should be a careful evaluation of this equipment and its use in a health care setting before purchase and this review should include the involvement of IPAC.

Linen

Newborn care items (e.g., mattress covers, positioning aids) should be cleanable or disposable. Items that are laundered in-house must be laundered according to established standards and best practices, including[63]:

- clear separation of clean and soiled laundry during transportation, sorting, folding and storage
- written procedures for washing, conditioning, rinsing and drying each type of material[63]:
  - There is a defined washing formula that controls the steps in the washing process, including the timing and amount of chemicals added to the load and includes flushing, washing, bleaching, rinsing, finishing (e.g., souring) and extraction of water.
    - Linen is washed at a high temperature (>71°C) with a hot water detergent for a complete wash cycle (≥ 25 minutes).
    - If low temperature (<70°C) water is used for laundry cycles, detergents suitable for low temperature washing at the appropriate concentration are used for a complete wash cycle.
    - Damp laundry is dried thoroughly in a commercial dryer and is not left in machines overnight.
- daily pH testing of water used for washing.

All linen should be handled with minimum agitation to prevent the generation of aerosols. Heavily soiled linen, where there is a risk of soiling hands, should be handled wearing gloves. Soiled linen:

- is held away from the body
- is bagged or contained at the site of collection in bags that are tied securely and not over-filled
- is contained in leak-proof bags or containers
- is not double-bagged unless the outside of the bag is visibly soiled or leaking.

Clean linen:

- is transported, sorted and stored in a manner that prevents contamination
- is handled only by staff with clean hands
- is stored out of the path of normal traffic in a clean, dry area
- is stored in a manner that allows stock rotation.

Waste

- Waste is segregated at the point where it was generated into either a plastic bag or a rigid container with a lid.
- Double-bagging of waste should only be necessary if the first bag becomes stretched or damaged, or when waste has spilled on the exterior.
- Waste bags are closed when three-quarters full and tied in a manner that prevents contents from escaping.
- Waste is removed to central holding areas at frequent intervals.
- Soiled diapers are disposed of immediately into a covered receptacle.

Sharps

Sharps are devices that are capable of causing a cut or puncture wound and include needles, sutures, lancets, blades and clinical glass. Prevention of sharps-related injuries in health care staff may be achieved by:

- using safety-engineered needles and medical devices
- never recapping, bending, or breaking needles
- never reaching into waste or sharps containers
- providing rigid, puncture-resistant sharps containers at or near the point-of-use
- replacing sharps containers when sharps have reached the fill line and securely closing the lid
- handling laundry with care
- educating staff regarding the risks associated with unsafe procedures such as recapping.

For more information related to environmental cleaning, refer to:

- PIDAC's *Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings*,[7] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/environmental-cleaning-for-prevention-and-control-of-infections.html
- the Regional Infection Control Networks' *Environmental Cleaning Best Practices Educational Toolkit*, available at: http://ricn.on.ca/environmentalcleaningtoolkitc5102.php.

E. Equipment Reprocessing

Reusable medical equipment must be cleanable and be able to be disinfected or sterilized.

- For more information on equipment reprocessing, see PIDAC's *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings*,[6] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/cleaning-disinfection-and-sterilization.html.

F. Accommodation and Placement

Mothers

Single rooms with single bathrooms and sink are preferred for all mothers.[64, 65] In health care settings that do not have sufficient single rooms available for all routine care, decisions must be made regarding room assignments and selection of roommates for IPAC purposes based on:

- mode of transmission of any known or suspected infectious agent
- risk factors for transmission (e.g., soiling the environment)
- risk factors for acquisition of infection from other mothers in the unit (e.g., compromised immunity)
- availability of single rooms.

- For more information about accommodation, refer to PIDAC's Routine Practices and Additional Precautions in All Health Care Settings,[2] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html.

Healthy Term Newborns

- Whenever possible, rooming-in is encouraged. In new construction, rooming-in private rooms for mothers and their newborns is recommended.
- In multiple-bed rooms, there should be sufficient space to accommodate bassinettes associated with each mother. There should be at least two metres between each mother/ newborn space.
- Point-of-care ABHR should be available in each mother/ newborn space.

Preterm Newborns

Suboptimal space leading to crowding and lack of hand hygiene facilities has been associated with outbreaks of infection.[13, 14, 66] Single rooms are the preferred option.[64, 65, 67]

It is optimal for each newborn space to contain at least 11.2 square metres (120 square feet) of clear floor space, excluding hand washing stations, columns and aisles.[68, 69] There should be an aisle adjacent to each newborn space with a minimum width of 1.2 metres (four feet) in multiple bed rooms.[68, 69] When single newborn rooms or fixed cubicle partitions are utilized in the design, there should be an adjacent aisle of not less than 2.4 metres (eight feet) in clear and unobstructed width to permit passage of equipment and personnel.[68, 69] In multiple bed rooms, there should be a minimum of 2.4 metres (eight feet) between isolettes/ warmers.[69]

Hand washing stations should be readily accessible. Each newborn bed space should have facilities for hand hygiene[64] (e.g., point-of-care ABHR). NICUs should have access to negative-pressure airborne infection isolation rooms.[9, 68]

Newborns with known or suspected transmissible infections should be placed on Additional Precautions. During an outbreak, cohorting newborns who are colonized or infected with the same microorganism may be necessary.[9]

Co-bedding of multiples is not good practice if:

- there are invasive devices (e.g., intravascular lines, ventilation)
- one newborn harbours a demonstrated pathogen
- a newborn is unwell.

G. Readmission or Transfer of Mothers/ Newborns

Transfer In - Mothers

Mothers who are transferred in from other hospitals should be screened for antibiotic-resistant organisms (AROs) according to protocols in PIDAC's *Annex A: Screening, Testing and Surveillance for Antibiotic-Resistant Organisms (AROs)*,[70] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/screening-testing-and-surveillance-for-antibiotic-resistant-organisms-aros.html.

Transfer Out - Mothers

Receiving facilities should be notified about any known infection, colonization or exposure.

Transfer In - Newborns

Receiving sites should screen newborns that are transferred in for the presence of AROs and consider putting the newborn on Additional Precautions until results are known, dependent on the assessed level of risk (e.g., outbreak in the transferring unit, maternal colonization risk). For transfers from units with outbreaks of AROs, re-screening should occur seven to ten days after admission.

Newborns transferred from nurseries/ NICUs with a known exposure/ cluster/ outbreak should be screened or clinically assessed for infection/ colonization with the outbreak organism as soon as possible. Newborns should be managed using Additional Precautions appropriate to the outbreak organism, pending screening results, where screening is appropriate for the organism. For infectious syndromes where screening is not available (e.g., pertussis, norovirus), newborns should be managed using Additional Precautions until one complete incubation period has passed after the last exposure.

If a newborn is transferred in and the mother is known to be positive for an ARO, the newborn should be managed using Additional Precautions.

The presence of an ARO or an outbreak should not preclude the appropriate transfer of a newborn to another facility.

Transfer Out - Newborns

When an exposure/ cluster/ outbreak has been identified in a nursery, hospitals should promptly notify receiving units of newborns that were transferred and that may have been exposed.

Hospitals to which newborns are transferred should be notified of any known exposure, colonization or infection in the transferred newborn or any current outbreak in the NICU or nursery.

H. Families and Visitors

Visitation policies should be flexible but safe. Parents should be encouraged to spend as much time with their newborn(s) as possible. Allowing others to visit should be based on the benefits and risks of these exposures.[9] While respecting the principles of family-centred care, consideration should be given to limiting the number of visitors.

Perinatal programs should have policies that will identify family members and potential visitors with infectious illnesses.[9] Family members and others should not visit if they are unwell with signs and symptoms that are possibly infectious in aetiology, including:

- fever
- cough or influenza-like symptoms
- runny nose
- vomiting or diarrhea
- rash
- conjunctivitis.

Level II and Level III nurseries and high-risk antenatal units should have an active screening program to identify and exclude ill families and visitors as well as staff. This is particularly important during periods of community outbreaks, such as influenza and respiratory syncytial virus (RSV). Parents should be advised not to bring siblings for visiting if they have been exposed to, and are in the incubation period for, an infectious illness (e.g., chickenpox).

Although visitors are less likely than staff to transmit infection to multiple patients in the health care setting, they should receive instruction before they visit a mother and/ or newborn, to ensure compliance with IPAC measures[2]:

- Visitors should not enter the health care setting if they are sick or unable to comply with hand hygiene and other precautions that might be required.
- Hand hygiene before and after visiting should be emphasized.
- If PPE is required by the visitor, this should be accompanied by instruction in its correct application, use and disposal.

Instructional materials may be provided to families and visitors on recommended immunizations, hand hygiene and respiratory etiquette practices.

I. Occupational Health

To protect the health of their patients and themselves, it is particularly important that obstetrical and neonatal staff be immune to measles, mumps, rubella, pertussis, varicella, hepatitis B and receive influenza vaccine annually. Several vaccine-preventable diseases are of particular risk to pregnant women and their newborns. Staff vaccination plays an important role in preventing outbreaks and is effective in preventing transmission of these high risk diseases from staff to pregnant women and their newborns. In particular:

- rubella vaccine, to prevent congenital rubella syndrome[71-73]
- varicella vaccine, to prevent severe varicella during pregnancy, congenital varicella syndrome and introductions of varicella into the nursery by staff
- annual influenza vaccine, to prevent severe influenza in both mothers and infants[74-77]
- acellular pertussis vaccine, to prevent outbreaks of pertussis in NICUs.[78-80]

There should also be a 'look back' process in place to ensure that existing staff are provided with current immunizations, if required (e.g., acellular pertussis). All staff must comply with the facility's OHS policies regarding tuberculosis (TB).

Staff who have an acute, transmissible, infectious illness should be excluded from work. This includes not working when acutely ill with signs and symptoms likely due to a transmissible infection, such as fever, cough, influenza-like symptoms, runny nose, sore throat, vomiting, diarrhea, rash or conjunctivitis. Common cold symptoms in otherwise healthy adults can be caused by respiratory viruses that may be a risk for severe illness in neonates, such as respiratory syncytial virus (RSV). Staff with herpes zoster ('shingles') should not work in the NICU until lesions are dry and crusted and should not work with pregnant women unless lesions are contained.

Susceptible staff who have been exposed to a communicable disease should be assessed and, if indicated, furloughed from work for the appropriate incubation period.

All persons carrying out activities in the hospital are bound by the Communicable Disease Surveillance Protocols developed jointly by the OHA/ OMA/ MOHLTC under the authority of the *Public Hospitals Act*, Regulation 965, Section 4.

- The Communicable Disease Surveillance Protocols are available at: http://www.oha.com/SERVICES/HEALTHSAFETY/Pages/CommunicableDiseasesSurveillanceProtocols.aspx.

Obstetrical and neonatal staff must be immune to measles, mumps, rubella, pertussis, varicella, hepatitis B and receive influenza vaccine annually.

Staff vaccination plays an important role in preventing outbreaks and is effective in preventing transmission of these high risk diseases from staff to pregnant women and their newborns.

J. Surveillance

Surveillance is the ongoing, systematic collection, collation and analysis of data with timely dissemination of information to those who require it in order to take action. *Process surveillance* (i.e., ongoing audit of practice) is done to verify that procedures and/or standards of practice are being followed and an action plan is in place to improve practice. *Outcome surveillance* monitors definable events or outcomes, such as surgical site infections, in a specific population. Results should be accompanied by an action plan that will lead to quality improvement.[1]

Both process and outcome surveillance related to HAIs in perinatology are important quality assurance measures to maintain a safe environment and contribute to safer health care. Monitoring infection rates can lead to the identification of trends and clusters as well as the impact of interventions. If resources are limited, it may not be possible to monitor rates of all infections. In the NICU, surveillance efforts should be focused on those infections with the highest morbidity and mortality, those that are the most common and those that may result in improvement. The indicators in Table 2 are recommended for perinatology surveillance.

Outcome surveillance requires objective, valid, standardized definitions of infection that are applied consistently within the health care setting. If the definitions that are used to categorize an infection are not standardized, a health care setting's infection rates cannot be accurately compared to either their own historical infection rates or to external benchmarks.

Table 2: Examples of Surveillance Indicators for Perinatology

Indicator	Obstetrics	Neonatology
PROCESS INDICATORS:	▪ Adherence to hand hygiene ▪ Adherence to Routine Practices ▪ Adherence to prenatal screening ▪ Adherence to recommendations for immunization in mothers ▪ Staff influenza vaccination rates ▪ Appropriate antibiotic prophylaxis for Caesarian deliveries ▪ Appropriateness of antibiotic use	▪ Adherence to hand hygiene ▪ Adherence to Routine Practices ▪ Adherence to recommendations for immunization in neonates ▪ Staff influenza vaccination rates ▪ Appropriateness of antibiotic use ▪ Central line insertion and maintenance
OUTCOME INDICATORS:	▪ Caesarian delivery SSI rates ▪ GAS infections postpartum	▪ Central line-associated BSI ▪ BSI ▪ NEC ▪ Health care-acquired AROs
Abbreviations: ARO = Antibiotic-resistant Organism BSI = Bloodstream Infection GAS = Group A Streptococcus		NEC = Necrotizing Enterocolitis SSI = Surgical Site Infection

HAI rates may be compared to both the facility's own previous HAI rates and benchmarks, or to external standards or benchmarks. Benchmarking against other similar hospitals should only be done if the surveillance

system is based on established case definitions that have been widely reviewed and validated, such as those of the Canadian Neonatal Network, the Canadian Nosocomial Infection Surveillance Program (CNISP), or the National Healthcare Safety Network (NHSN) of the U.S.

In any effort to compare infection rates in NICUs, the data should be expressed as rates stratified by:

- birth weight (e.g., ≤750g; 751 to 1,000g; 1,001 to 1,500g; 1,501 to 2,500g; and ≥ 2500g.)
- device days (e.g., central line days, ventilator days)
- acuity of illness.

➢ For more information about the principles of surveillance, refer to PIDAC's *Surveillance of Health Care-Associated Infections in Patient and Resident Populations*,[81] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/surveillance-of-health-care-associated-infections.html.

Recommendations for Routine Practices:

1. ***All health care settings providing maternal/ newborn care should follow PIDAC's best practices for Routine Practices. In particular:***
   a) ***A point-of-care risk assessment must be performed before each interaction with a mother or newborn to determine which interventions are required to reduce transmission of microorganisms. [BIII]***
   b) ***All health care settings must implement a comprehensive hand hygiene program that follows best practices. [AI]***
   c) ***Health care providers must wear personal protective equipment (PPE) based on their risk assessment to prevent exposure to body substances such as blood, body fluids (including breast milk), secretions (including vaginal secretions) and excretions (including meconium). [AI]***
2. ***All health care settings should have policies, procedures and practices to maintain a clean and safe environment. [AI]***
3. ***Maternal newborn programs should perform both process and outcome surveillance related to health care-acquired infections in perinatology with analysis and feedback. [AI]***

3. Additional Precautions in Perinatology

Additional Precautions (AP) are IPAC interventions (e.g., PPE, environmental controls) that are used in addition to Routine Practices to protect staff and patients by interrupting the transmission of infectious agents that are suspected or identified in a particular patient.[2] In some instances, specialized engineering controls may be required (e.g., negative pressure room for a patient with tuberculosis) or enhanced cleaning protocols for the patient environment (e.g., VRE, *Clostridium difficile – C. difficile*).

Additional Precautions are based on the mode of transmission (e.g., direct or indirect contact, droplet or airborne). There are three categories of Additional Precautions: Contact Precautions, Droplet Precautions and Airborne Precautions.

Effective communication regarding Additional Precautions is essential when a mother goes to another department for testing, to another unit or to other health care settings/ facilities. This communication must include Emergency Medical Services (EMS) staff and other transport staff. Any infection identified in the mother should be promptly communicated to neonatology/ nursery staff.

Any registered health professional should be able to initiate AP at onset of symptoms.

The health care setting should have a policy that permits **discontinuation of Additional Precautions only in consultation with the Infection Prevention and Control Professional** (ICP) or designate. The attending physician should be notified when Additional Precautions are being initiated or discontinued. If there is disagreement between the ICP and the attending physician regarding the discontinuation, then the higher level of precautions will remain in effect with daily review until there is a definitive diagnosis or expert consultation.

Additional Precautions should remain in place until there is no longer a risk of transmission of the microorganism or illness. In some instances expert consultation may be required. Where the periods of communicability are known, precautions may be discontinued after the period of communicability has passed.

➢ See Appendix F, *Summary of Infectious Diseases in Perinatology*, for recommendations related to the duration of Additional Precautions for specific illnesses.

A. Contact Precautions

Contact Precautions are used in addition to Routine Practices for microorganisms where contamination of the environment or intact skin is a particular consideration, such as MRSA and VRE. There are two types of contact transmission:

- **Direct contact** occurs through touching; for example, a colonized or infected individual may transmit microorganisms to others by touching them.
- **Indirect contact** occurs when microorganisms are transferred from patient to patient via contaminated objects or the contaminated hands of a health care provider.

Elements of Contact Precautions include:

- single room accommodation for adults
- Contact Precautions signage affixed to the door, bassinette or isolette
- gloves for all activities in the room/ bed space or newborn environment
- gown for all activities in the room/ bed space or newborn environment according to the risk of contamination of skin or clothing

- dedicated equipment, wherever possible
- policies and practices that ensure thorough cleaning and disinfection of equipment between uses, when sharing of equipment cannot be avoided
- special routine and discharge cleaning, if required (e.g., VRE, C.difficile infection)
- possible restriction of visitors.

B. Droplet Precautions

Droplet Precautions are used in addition to Routine Practices for mothers or newborns known or suspected of having an infection that can be transmitted by large respiratory droplets.[2] Recent work suggests that droplets forcibly expelled from a cough or sneeze travel for up to two metres.[82] For newborns who cannot cough forcibly, the distance that droplets travel will be less. Examples of microorganisms transmitted by droplet transmission include: respiratory tract viruses (e.g., adenovirus, influenza and parainfluenza viruses, rhinovirus, RSV), rubella, mumps and *Bordetella pertussis*.

Elements of Droplet Precautions include:

- single room accommodation preferred for mothers or, if a single room is not available, curtain closed between beds in a multiple-bed room
- Droplet Precautions signage affixed to the door, bassinette or isolette
- facial protection within two metres of the mother/ newborn
- mothers with droplet-borne infections to wear a mask when it is necessary to leave the room
- possible restriction of visitors.

C. Droplet/ Contact Precautions

In many cases, microorganisms contained in droplets are deposited on surfaces in the immediate environment after a cough or sneeze, and some microorganisms remain viable for extended periods of time (e.g., influenza, parainfluenza, RSV). Contact transmission can then occur by touching surfaces and objects contaminated with respiratory droplets.[3] In these cases, a combination of Droplet and Contact Precautions should be used (i.e., gloves, gown and facial protection).

D. Airborne Precautions

Airborne Precautions are used in addition to Routine Practices for mothers and newborns known or suspected of having an illness transmitted by the airborne route.[2] Airborne transmission occurs when airborne particles remain suspended in the air, travel on air currents and are then inhaled by others who are nearby or who may be some distance away from the source mother/ newborn, in a different room or ward (depending on air currents) or in the same room that a mother/ newborn has left, if there have been insufficient air exchanges.[3] Control of airborne transmission requires control of air flow through special ventilation systems and the use of respirators.[3] The only microorganisms transmitted by the airborne route are *Mycobacterium tuberculosis* (TB), varicella virus (chickenpox virus) and measles virus.

Effective control of airborne microorganisms hinges on maintaining a high degree of suspicion for those who present with compatible symptoms of an airborne infection,[83] early isolation in an appropriate environment and rapid diagnosis. For measles and varicella, immunization is the primary means of control.

An isolette does not provide protection from airborne microorganisms. For Airborne Precautions, the isolette must be placed in an airborne infection isolation room (i.e., negative pressure room).

Controls for preventing the transmission of airborne infections include:

- immunity against measles and varicella (immunization, natural immunity)
- early identification of potential cases
- prompt isolation in negative pressure airborne infection isolation room
- appropriate treatment of mother/ newborn, where applicable
- the use of a fit-tested, seal-checked N95 respirator when indicated
- identification and follow-up of exposed mothers, newborns and staff.

An isolette does not provide protection from airborne microorganisms.

For Airborne Precautions, the isolette must be placed in an airborne infection isolation room.

Elements of Airborne Precautions include:

- accommodation in an airborne infection isolation room, or transfer to a facility that has an airborne infection isolation room
- keeping the door closed
- Airborne Precautions signage affixed to the door
- for measles and varicella, only immune staff to enter the room; N95 not necessary for immune staff
- for TB, a fit-tested, seal-checked N95 respirator worn by staff on entry to the room
- routine cleaning of the environment and equipment
- ill mother to wear a mask when it is necessary to leave the room
- limiting transport, unless required for diagnostic or therapeutic procedures.

➢ For more information about Additional Precautions see PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings*[2], available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/routine-practices-and-additional-precautions.html.

Recommendations for Additional Precautions:

4. ***All health care settings providing maternal/ newborn care should follow PIDAC'S best practices for Additional Precautions based on the mode of transmission.[BII]***

4. Perinatal Infections

Infections that occur in the antepartum or intrapartum period may result in serious complications for the fetus and newborn. Appropriate antepartum and intrapartum care of the mother and subsequent care of the newborn soon after birth can have significant benefits. Communication and cooperation among all perinatal care personnel are essential to have the most impact.

A. Immunization

Immunization programs are among the most cost-beneficial health interventions. Immunization can significantly reduce the occurrence of preventable diseases, benefiting not only the mother and her newborn, but also the rest of the obstetrical population. The overall objective of immunization before and during pregnancy is to induce a state of immunity such that the woman and the fetus are protected following exposure to the organism for which the immunization is given. In addition, this offers an opportunity for protection of the neonate for the first six to 12 months of life through transfer of antibody transplacentally and in breast milk.

For women entering childbearing age, susceptibility to rubella, varicella and pertussis should be determined and vaccination offered pre-pregnancy, if indicated. Any contact with health care should be viewed as an opportunity to ensure that women are protected before they become pregnant (e.g., family planning clinics, family physician visits).

In order to further protect pregnant and postpartum women and their infants, household and family members should have up to date immunization to pertussis[84] and varicella and receive annual influenza vaccine.

The following recommendations are adapted from The Society of Obstetricians and Gynaecologists of Canada (SOGC)[85], the National Advisory Committee on Immunization (NACI)[86] and the Advisory Committee on Immunization Practices (ACIP)[87]:

- All women of childbearing age should be evaluated for the possibility of pregnancy before immunization.
- Health care providers should obtain a relevant immunization history from all women accessing prenatal care.
- Non-pregnant women immunized with a live or live-attenuated vaccine should be counselled to delay pregnancy for at least four weeks.
- Live and/ or live-attenuated virus vaccines should not be administered during pregnancy, as there is a theoretical teratogenic risk to the fetus; this includes measles, mumps, rubella and varicella vaccines.
- Inactivated viral vaccines, bacterial vaccines and toxoids are generally considered to be safe in pregnancy; these include diphtheria, tetanus, polio, hepatitis A and B, pneumococcus and influenza vaccines.
- Women who are breastfeeding can be immunized. Women who are not immune to rubella should be vaccinated before they go home.
- Pregnant women should be strongly encouraged to receive the annual influenza vaccine at any time during their pregnancy to protect themselves and their newborns, as soon as it is available in the fall.
- Pregnant women who have not previously been vaccinated with acellular pertussis vaccine should be encouraged to be vaccinated88-90; if antepartum vaccination is not given, vaccine should be administered postpartum to protect the mother and, indirectly, her newborn.[84]

In the event of an exposure to some infectious diseases (e.g., hepatitis B, varicella), immune globulin may be administered to provide passive immunization (e.g., hepatitis B immune globulin or HBIG, varicella immune globulin or VarIg). In passive immunization, antibody is obtained from the serum of a person already adequately immunized or previously infected. Administering these antibodies to the exposed individual can confer immediate, temporary protection.

Palivizumab is a monoclonal antibody that is highly effective against RSV.[86] Palivizumab is effective in preventing RSV in neonates as well as infants and young children with chronic lung disease or congenital heart disease.[91] Palivizumab is not effective in the treatment of RSV disease and is not recommended for this use.[15, 86] Palivizumab is expensive, but the Ontario Public Drug Program supplies this drug to infants and young children at high risk who qualify. More information and enrolment forms are available at: http://www.health.gov.on.ca/english/providers/program/drugs/funded_drug/fund_respiratory.aspx.

B. Group B Streptococcus (GBS)

Before the advent of Group B streptococcus (GBS) screening and prophylaxis, GBS, or *Streptococcus agalactiae,* was the most common cause of neonatal sepsis and meningitis in North America. Vertical transmission of GBS occurs from the mother's colonized vagina to the newborn at delivery. Maternal colonization rates of GBS in Canada range from 10%[92] to 20%[93] and GBS carriage may be transient or intermittent during pregnancy. At birth, 50% of infants of colonized mothers will be colonized themselves,[94] and 2% of these will develop early-onset GBS infection within seven days of birth.[94] Late-onset disease can develop more than seven days after birth, usually within three months.

Prevention of early-onset GBS disease relies on detection of maternal GBS colonization and the use of intravenous intrapartum antibiotic prophylaxis (IAP), when indicated. Late-onset disease is not preventable.

Prenatal Screening for GBS

A number of studies have shown the merit of a universal screening approach to GBS detection over a risk-based approach.[95-97] One large study conducted in 1998 – 1999[98] showed that universal screening was superior to a risk-based approach to prevent early-onset GBS disease. In 2002, the Centers for Disease Control's (CDC) guidelines for GBS prevention recommended universal screening to guide intrapartum GBS chemoprophylaxis.[99] These guidelines were further updated in 2010.[100]

Current guidelines from the SOGC recommend that all women be offered screening for group B streptococcus disease at 35 to 37 weeks' gestation.[94] It has been shown that, in most cases, GBS that is present at 35 to 37 weeks' gestation is highly predictive of GBS colonization at term and delivery.[101, 102]

*All women should be screened for group B streptococcal disease at 35 to 37 weeks' gestation with culture done from one swab **first** to the vagina **then** to the rectum.*

All GBS-positive mothers should receive IAP during labour.

There are a number of challenges associated with a universal screening program:

- Screening should take place at 35 to 37 weeks' gestation.
- Screening results should be available at the time of labour.

- Suboptimal laboratory procedures or inadequate specimen collection may result in false-negative culture results.
- Failure to make provision for women whose GBS colonization status is unknown at the time of delivery, including those who deliver before 35 to 37 weeks.[103]

GBS Prophylaxis

Use of IAP in high-risk situations[104] decreases the risk of early-onset GBS disease in neonates and decreases perinatal morbidity in colonized women.[105] A meta-analysis reported a 30-fold reduction in early-onset GBS disease with use of IAP for GBS-colonized women.[106]

IAP is indicated for[100, 104]:

- all mothers colonized with GBS during the current pregnancy, unless a planned Caesarian delivery in the absence of labour and with intact amniotic membrane is performed
- GBS status is unknown and any one of the following risk factors exists:
  - delivery <37 weeks gestation
  - amniotic membrane rupture ≥ 18 hours
  - intrapartum temperature ≥ 38°C
- mothers with GBS bacteriuria during current pregnancy, regardless of GBS screening result (if done)
- mothers with a previous newborn with neonatal invasive GBS disease, regardless of GBS screening result (if done).

IAP is <u>not</u> indicated for[100]:

- previous pregnancy with positive GBS screen during the previous pregnancy (unless a culture was also positive during current pregnancy)
- Caesarian delivery performed in the absence of labour and membrane rupture, regardless of maternal GBS status
- negative vaginal and rectal GBS screening culture in late gestation during the current pregnancy regardless of intrapartum risk factors (e.g., < 37 weeks' gestation, duration of rupture of membranes ≥ 18 hours, temperature ≥ 38°C).

Mothers with fever during labour (temperature ≥38°C) may have chorioamnionitis and therapeutic treatment (e.g., ampicillin and gentamicin) should be considered, regardless of GBS status.

Each case of early-onset GBS should be reviewed for process improvement purposes.

Beta-lactam antibiotics (e.g., penicillin, ampicillin) for GBS prophylaxis administered for ≥4 hours before delivery are highly effective at preventing early-onset GBS disease. In some regions, resistance to clindamycin and erythromycin is increasing and these antibiotics cannot be used for GBS prophylaxis unless the mother's isolate is documented to be susceptible.[93, 107-109]

Because of the risks of antimicrobial resistance, penicillin is preferred over ampicillin. For mothers with allergy to penicillin[100]:

- If there is a low risk for anaphylaxis (no previous immediate hypersensitivity reaction, including anaphylaxis, angioedema, respiratory distress or urticaria), cephazolin is the antibiotic of choice.
- If there is a high risk for anaphylaxis, clindamycin or erythromycin is recommended if the isolate is known to be susceptible. If the isolate is resistant to clindamycin or erythromycin, or when the susceptibility is unknown, vancomycin should be used.

➢ See Section II, Sample Policies and Procedures for Perinatology, *Group B Streptococcus (GBS)*, for a sample policy relating to the care of pregnant women with GBS.

GBS-colonized mothers with term prolonged rupture of membranes should be considered for induction of labour, as expectant management is associated with increased neonatal infection rates. Intravenous oxytocin may be preferred over prostaglandin for induction. [110] They should also receive IAP during labour.

GBS Specimen Collection

Cultures should be taken at 35 to 37 weeks' gestation to achieve greatest accuracy in predicting GBS status and availability of results at delivery.[94, 100] Negative cultures taken more than 5 weeks before delivery do not offer a reliable indication of colonization with GBS at delivery as colonization is transient and intermittent.[100]

Rectovaginal sampling is more sensitive for the detection of GBS than either vaginal or rectal sampling alone.[111] The recommended screening specimen for GBS is a single swab inserted first into the vagina and then into the rectum.[94, 100] Swabs may be collected by a health care provider or the pregnant woman, with instruction. Specimens should remain at room temperature during transport and be cultured within 24 hours of collection using a selective enrichment broth prior to plating to optimize recovery.[100, 112]

Rapid tests based on polymerase chain reaction (PCR) with a turnaround time of 1.5 to 2.5 hours are in development and show promise in evaluating GBS status in labour, particularly when an enrichment step is used first.[100, 113, 114] PCR assays are more sensitive than conventional cultures[114-116] and risk factor-based screening[117] and, where available, may be used for women who present in labour with unknown GBS status or who deliver preterm.[118-120]

➢ For management of newborns born to GBS-positive mothers, refer to the Canadian Paediatric Society's Management of the infant at increased risk for sepsis (Position Statement FN 2007-03),[121] available at: http://www.cps.ca/english/statements/FN/FN07-03.pdf.

C. Herpes Simplex Virus (HSV)

Maternal HSV

The incidence of genital herpes in pregnant women is Canada ranges from 7% to 28%, with an age-adjusted rate of 17%.[122] Maternal HSV infection appears to play a significant role in first trimester pregnancy loss[123] and, although uncommon, can result in neonatal HSV (5.9 cases per 100,000 live births in Canada in 2006)[124].

Maternal screening for HSV during pregnancy is not recommended.[15, 125] During labour, suspicious lesions should be cultured to assist in subsequent management of the newborn.[15] Rapid PCR assays to detect HSV in the genital secretions of women in labour are showing promise as a means to identify neonates at risk of infection.[126]

In women with active genital HSV infection, avoidance of scalp monitors and fetal scalp sampling is recommended,[15, 127, 128] as this may act as an entry point for the virus. The use of any intrauterine monitoring devices should be considered carefully. Caesarean delivery is indicated for all women with active genital HSV lesions or with a typical herpetic prodrome at the time of delivery.

Mothers with genital or oral herpes simplex infection are of minimal risk to other mothers and should be managed with Routine Practices. Individuals with active, nasolabial disease (i.e., 'cold sore') should be counselled to avoid contact with the newborn, if possible. If there is contact with the newborn, hand hygiene must be performed prior to the contact. Education should be provided for mothers and family members who have active oral herpes, e.g., hand hygiene, avoiding touching the lesions, avoiding kissing the newborn. Transmission to newborns from infected spouses has been documented.

Parents with herpetic hand lesions ('herpetic whitlow') should use recommended hand hygiene measures and wear gloves before handling their newborns. However there is no evidence that gloves are effective in preventing transmission in this instance. Other household members with herpetic whitlow should not have direct contact with the newborn until the lesion is healed.

Newborn HSV

Congenital HSV infection is rare, and results from fetal acquisition of HSV *in utero*. Congenital infections are severe and may result in intrauterine death.

Neonatal HSV is the acquisition of infection at or near the time of delivery through exposure to the virus from the maternal genital tract. The risk for neonatal infection is greatest when maternal primary infection occurs in the third trimester.[128] In this case, the mother acquires infection but is unable to develop protective antibodies prior to delivery. This results in a 25% to 60% risk of neonatal herpes infection.[15] Most women who deliver newborns with neonatal HSV infections have no history of such infections and no lesions at the time of delivery.

HSV in the newborn may also occur from contact with open lesions after birth. If the mother has active lesions on the breast, breastfeeding is contraindicated from the affected breast. The mother may nurse or provide expressed milk from the unaffected breast. The mother must be instructed in hand hygiene before handling her newborn or collecting breast milk.

Newborns born vaginally, or by Caesarean delivery after membranes have ruptured, to women with active genital HSV lesions should room in with the mother, if feasible. The newborn should be physically separated from other newborns and managed with Contact Precautions if they must go to the nursery during the incubation period.[15] Alternatively, the newborn may stay with the mother in a single room after the mother has been instructed on proper preventive care to prevent postpartum transmission.[127]

Manifestations of neonatal infection usually occur more than 48 hours after delivery and can be as late as six weeks after birth. Newborns that are asymptomatic at birth should be observed closely for clinical or laboratory findings consistent with herpes infection. These include fever, vesicular rash, hypothermia, lethargy, seizures, severe respiratory distress, liver dysfunction, thrombocytopenia, CSF pleocytosis and proteinosis.[15, 129, 130] Asymptomatic newborns born to women with active genital HSV lesions should be tested for HSV 12 to 24 hours after birth.

Newborns that are infected with HSV and exhibit symptoms should be physically segregated and managed with Contact Precautions for the duration of the illness.[15]

Antiviral therapy should be initiated promptly if HSV is suspected. Intravenous acyclovir is the drug of choice for the treatment of neonatal HSV infection. For current treatment recommendations, refer to The American Academy of Pediatrics' *Red Book*.[15]

- See Section II, Sample Policies and Procedures for Perinatology, *Herpes Simplex Virus (HSV)* for a guide to developing a policy relating to the care of pregnant women with HSV, including recommendations for investigation of newborns born to mothers with HSV.

D. Hepatitis B Virus (HBV)

Maternal HBV

Routine prenatal testing for Hepatitis B surface antigen (HBsAg) is recommended for all women. Pregnant women are at higher risk for spontaneous preterm birth if they have circulating HBsAg.[131] Transmission of HBV to infants is more likely to occur in mothers who are HBV carriers with high HBV DNA.[132, 133] Consideration should be given to referring HBeAg-positive mothers to a specialist for consideration of antiviral therapy.

General recommendations for maternal HBV include:

- serological testing for HBsAg should be done for all pregnant women as part of routine prenatal care[15, 127, 134]
- pregnant women with chronic HBV should be informed about transmission risks and ways to prevent newborn infection[127]
- women who are HBsAg-negative and are not already immune, but who have risk factors for HBV, should be offered HBV vaccination during pregnancy[15, 127]
- breastfeeding is not contraindicated for mothers who have hepatitis B[15]
- Routine Practices should be used for mothers who have hepatitis B.[2, 15]

Newborn HBV

Newborns born to hepatitis B surface antigen (HBsAg)-positive mothers are at risk of developing hepatitis B virus infection from exposure to maternal blood during labour and delivery. The risk of perinatal infection is 70-90% when the mother is both HBsAg-positive and hepatitis B 'e' antigen (HBe-Ag)-positive if appropriate and timely prophylaxis is not instituted.[127]

Studies have documented significant reductions in HBV acquisition with the administration of hepatitis B immune globulin (HBIG) and HBV vaccine after birth. If HBV vaccine and HBIG are administered immediately after birth, less than 5% of newborns become chronically infected, a reduction in transmission of nearly 90%. Immediate protection and long-lasting immunity can be conferred with simultaneous administration of HBIG and HBV vaccine.

➢ See Section II, Sample Policies and Procedures for Perinatology, *Hepatitis B Virus (HBV)*, for a guide to developing a policy relating to the care of pregnant women with HBV.

General recommendations for newborns include:

- Newborns of HBsAg-positive mothers should receive hepatitis B immune globulin (HBIG) and HBV vaccine, given concurrently at different anatomic sites, within 12 hours of birth; public health should be notified to ensure that subsequent doses of HBV vaccine are given.[15, 127, 134-137] If the newborn weighs less than two kilograms, a fourth dose of HBV vaccine is required and maternal status should be assessed within 12 hours.[15]
- Newborns of mothers whose HBsAg status is unknown and cannot be determined within 12 hours should receive HBV vaccine (and HBIG if baby weighs less than 2 kilograms). Consideration should be given to administering vaccine and HBIG, taking into account the mother's risk factors.[15, 86, 127]
- Test for anti-HBs and HBsAg at nine to 18 months.[15]

- Newborns of HBsAg-positive mothers should be bathed to completely remove maternal blood before injection medications are given, if safe to do so. In emergency situations, injection sites must be thoroughly cleansed prior to administering medications.
- Routine Practices should be used for newborns who have been exposed to hepatitis B.[2]

E. Hepatitis C Virus (HCV)

Hepatitis C virus (HCV) is spread primarily by injection drug use and parenteral exposure to blood and blood products from hepatitis C virus (HCV)-infected persons. The prevalence of HCV in the pregnant population in Canada is low (0.68-4.5%), with maternal-fetal transmission of HCV estimated at 5-6%.[138] The vertical transmission rate of HCV from women with co-infection with human immunodeficiency virus (HIV) may be as high as 60%.[138]

Maternal HCV

No effective interventions have been identified to decrease the risk of mother-to-infant transmission of HCV.[139] Universal screening for HCV is not recommended.[15, 127, 138, 140] The incidence of perinatal HCV transmission from mothers to newborns is not decreased by Caesarian delivery and it is not recommended for that purpose.[141-144] Treatment of HCV is contraindicated during pregnancy.[145]

General recommendations for mothers include:

- Offer HCV screening for mothers at high risk for hepatitis C,[127, 138, 140] i.e., injection drug users, recipients of blood components or solid organs prior to 1992, HIV-positive individuals, individuals with tattoos and those on haemodialysis.[15]
- Breastfeeding is not contraindicated.[15, 127, 138, 139] Consideration should be given to abstaining from breast feeding if nipples are cracked and bleeding.[15, 142]
- Routine Practices should be used for mothers who have hepatitis C.[138]

➢ See Section II, Sample Policies and Procedures for Perinatology, *Hepatitis C Virus (HCV)*, for a guide to developing a policy relating to the care of pregnant women with HCV.

Newborn HCV

Maternal HCV carrier status is a risk factor for adverse perinatal outcome and careful surveillance is warranted.[146] Newborns that develop hepatitis C have a high likelihood of becoming chronically infected.[138, 145]

Recommendations for newborns include:

- Newborns born to HCV-positive mothers should be evaluated for evidence of hepatitis C infection after 18 months of age.[15, 127, 138, 142]
- Newborns of HCV-positive mothers should be bathed to completely remove maternal blood before injection medications are given, if safe to do so. In emergency situations, injection sites must be thoroughly cleansed prior to administering medications.
- Routine Practices should be used for newborns born to HCV-positive mothers.[138]

F. Human Immunodeficiency Virus (HIV)

Women account for 26% of individuals with human immunodeficiency virus (HIV) infection in Canada; the majority of these women are of childbearing age.[147] Early diagnosis and management of HIV infection in these women, and expert management of pregnant HIV-infected (and at-risk) women and their newborns, can significantly reduce the risk of perinatal HIV transmission.[148] The number of newborns born to HIV-infected mothers in Canada has increased progressively since 1996, but the proportion of HIV-exposed newborns who have become infected has decreased from 33% in 1996 to <1.7% in 2009.[147]

Pregnant women at high risk for HIV include:

- those with geographic risks[149] related to recent immigration from:
  - sub-Saharan Africa
  - south and southeast Asia
- those with behavioural risks:
  - unprotected sexual intercourse with multiple partners
  - injection drug users.

Maternal HIV

Routine screening increases identification of pregnant women who are infected and, with appropriate treatment, the rate of vertical transmission can be decreased. Maternal, perinatal and neonatal management may include the use of antiretroviral therapy for both mother and newborn. Antiretroviral therapy can be safely administered to the mother during pregnancy and delivery, and to the newborn, with minimal risk of toxicity to the newborn.

General recommendations for mothers include:

- All pregnant women should be screened for HIV at their first prenatal visit, with appropriate counselling.[15, 127, 148, 150, 151]
- Women who test negative for HIV and who continue to be at high risk of exposure to HIV should be retested in each trimester.[148, 151-153]
- Women with no prenatal care and unknown HIV status:
  - should have an HIV risk-assessment
  - should be tested for HIV when admitted to hospital for labour and delivery[127, 148]
  - should be offered HIV prophylaxis in labour if risk is high and rapid testing is not available. Ideally, all facilities that provide obstetrical care should have rapid HIV testing available for high risk women in labour.
- Women who are HIV-positive whose viral load is greater than 1000 copies per mL, regardless of antiviral therapy, should be recommended to have elective Caesarean delivery at 38 weeks of gestation.[15, 127, 154-156]
- Women who test positive for HIV should be followed in consultation with practitioners who are knowledgeable in the care of HIV-positive women (e.g., obstetrician and an HIV specialist).[148, 150, 154]
- During labour, scalp fetal heart monitoring, scalp pH sampling, intrauterine pressure measurements and artificial rupture of membranes should be avoided, to reduce the risk of transmission to the newborn.[154]
- Breastfeeding is contraindicated for HIV-positive mothers.[15, 127, 150, 154]
- Routine Practices should be used for mothers who are positive for HIV.[127, 150, 154]

For more information:

- See Section II, Sample Policies and Procedures for Perinatology, *Human Immunodeficiency Virus (HIV),* for a guide to developing a policy relating to the care of pregnant women with HIV.
- Refer to the U.S. Department of Health and Human Services' *Recommendations for Use of Antiretroviral Drugs in Pregnant HIV-1-Infected Women for Maternal Health and Interventions to Reduce Perinatal HIV Transmission in the United States,* available at: http://aidsinfo.nih.gov/ContentFiles/PerinatalGL.pdf.

Newborn HIV

Recommendations for newborns include:

- Newborns of HIV-positive mothers should be bathed to completely remove maternal blood before injection medications are given, if safe to do so. In emergency situations, injection sites must be thoroughly cleansed prior to administering medications.[150, 154]
- Consultation with the pediatric HIV team at a pediatric HIV center is recommended for all newborns where the mother is known to be HIV-positive or considered to be at high risk of being HIV-positive.[150]
- Newborns of HIV-positive mothers, or of mothers for whom the HIV status is unknown and who are considered to be high risk based on the mother's risk assessment, should be given HIV prophylaxis as soon as possible after birth.[148, 154]
- Newborns of HIV-positive mothers should be tested for HIV DNA within 14 to 21 days after birth[127] using a rapid PCR testing method.[15] If negative, repeat at one to two months of age[15, 127] and at four to six months.[15, 157]
- Routine Practices should be used for newborns born to HIV-positive mothers.[127]

G. Varicella (Chickenpox)

Although varicella is relatively uncommon in the pregnant population, it can result in very significant maternal and fetal morbidity and mortality. In pregnant women, 28% of varicella infections may be complicated by pneumonia, which carries a risk of mortality. In the absence of intervention, maternal varicella with onset five days before to two days after delivery, is associated with severe neonatal varicella in 17% to 30% of newborns and has a case fatality rate as high as 31%. Varicella infection may result in congenital varicella syndrome in 1-2% of cases.

Maternal Varicella

- Immunity to varicella (previous history of chickenpox or receipt of varicella vaccine) should be determined prior to pregnancy, and vaccination should be recommended to non-pregnant women of reproductive age.[86] Varicella vaccine should not be administered during pregnancy.[85, 86]
- Breastfeeding is not a contraindication to vaccination with varicella vaccine.[15, 85, 86]
- Exposed susceptible pregnant women should be offered varicella immune globulin (VarIg) within 96 hours of exposure in an attempt to prevent the disease or reduce the severity of infection in the mother[86] and the risk of congenital varicella syndrome.[158]
- Exposed susceptible pregnant women hospitalized during the period of communicability should be managed with Airborne Precautions.

- Mothers who develop chickenpox should be placed on Airborne Precautions for a minimum of five days after onset of rash and until all lesions are crusted.[15]
- Care to be provided only by immune staff.[2]
- Only parents and visitors who are immune may visit.

Newborn Varicella

- Exposed newborns* should be placed on Airborne Precautions from eight to 21 days after exposure (or until 28 days after exposure if VarIg was given).[15]
- Exposed newborns* should be given VarIg.[86]
- Newborns that develop chickenpox should be placed on Airborne Precautions for a minimum of five days after onset of rash and until all lesions are crusted.[15]
- Newborn care to be provided only by immune staff.[2]
- Only parents and visitors who are immune may visit.

*** Exposed newborn:** Onset of varicella in the mother five days or less before delivery or within 48 hours after delivery OR nursery/ NICU exposure.

➢ See Section II, Sample Policies and Procedures for Perinatology, *Varicella zoster (Chickenpox and shingles)*, for a guide to developing a policy relating to the care of pregnant women with HBV.

H. Influenza

Pregnant women have been shown to be at increased risk of severe illness, hospitalizations and death from complications of influenza.[15, 74, 86] Maternal influenza immunization is a strategy with substantial benefits for both mothers and infants. Vaccination of mothers will protect both themselves and their newborns from acquiring influenza[77] and reduce the risk of both pre-term birth and. hospitalization of mothers and newborns due to influenza.[74] Influenza vaccine is safe for women at all stages of pregnancy and lactation.[15, 86] Pregnant women should be encouraged to receive influenza vaccination.[85] Breastfeeding is safe following immunization.[15, 86] Household and other close contacts of pregnant women and newborns should also receive influenza vaccination.

Maternal Influenza

Prior to delivery, a hospitalized pregnant woman with acute respiratory infection [159]:

- should be placed in a single room on Droplet/ Contact Precautions
- should be tested for influenza
- should receive instruction on respiratory etiquette and hand hygiene
- should wear a mask if being transported outside of her room.

During labour and delivery, mothers with influenza should remain on Droplet/ Contact Precautions. Precautions should be continued for 5 days after illness onset or until 24 hours after the resolution of fever and respiratory symptoms, whichever is longer.[159]

After delivery, it is recommended that mothers be educated regarding the risks of contact with their newborn and be offered the option of having the newborn room in with the mother or receive care in the nursery. If the

mother chooses to have her newborn room in, she should be instructed in ways to reduce transmission (e.g., hand hygiene, respiratory etiquette, wearing a mask).

Family and visitors should receive instruction regarding respiratory etiquette, hand hygiene and the use of a mask when within two metres of the mother.[159] Visitors should limit their movement within the facility. Individuals with an acute respiratory infection should not visit.

If a newborn of a mother with suspected or confirmed influenza is housed in the nursery instead of in the mother's room, the mother should not enter the nursery or NICU until five days after onset.[159] Symptomatic care givers or family members should not visit or enter the nursery or NICU.

Newborn Influenza

A newborn that develops symptoms of influenza should be placed on Droplet/ Contact Precautions.[159]

Recommendations for Perinatal Infections:

5. ***All maternal/ newborn programs should have a process in place to ensure women of childbearing age receive appropriate immunization.***
6. ***All maternal-newborn programs should have policies and procedures in place to prevent vertical transmission of Group B streptococcus (GBS), herpes simplex (HSV), hepatitis B (HBV), human immunodeficiency virus (HIV) and influenza.***

5. Nutrition

A. Expressed Breast Milk (EBM)

Breast milk is the optimal feeding choice for most newborns. At the same time, breast milk is a body fluid and may potentially contain pathogens acquired both intrinsically (from the mother) and extrinsically (contaminated during collection and handling). Improper handling of breast milk has been shown to result in contamination with pathogens associated with health care-associated infections such as *Staphylococcus aureus*, including MRSA,[160] Group B streptococcus,[161, 162] *Klebsiella pneumoniae*[163] and *Pseudomonas* species.[164]

Safe collection, handling, thawing, storage and administration are required in order to minimize the risk of infection to newborns. Routine Practices apply when handling breast milk, as with other body fluids. Hands should be cleaned before handling EBM. Staff should wear gloves when handling EBM, if there is a risk of getting milk on the hands. Hands must be cleaned after contact with EBM.

In large centres, there may be value to creating a centralized feeding preparation room to reduce the incidence of microbial contamination of feeds.[165]

EBM Collection[166]

- The mother must receive instruction on EBM collection, the importance of hand hygiene and basic principles of asepsis when expressing and handling breast milk.
- The EBM container must be labelled with the contents, baby's name, mother's name, hospital identifier and date/ time of collection; it is strongly recommended that pre-printed labels be used.
- Parent education should be documented in the mother's medical record.
- Sterile, single-use bottles and sterile lids should be used for each pumping session, particularly for neonates or newborns requiring intensive care.[166, 167]

➢ See *Cleaning and Disinfecting Feeding Equipment* for information on reprocessing feeding equipment.

Care must be taken to ensure that the correct breast milk is fed to the correct newborn.

EBM Storage[166, 168]

- Each labelled container, if not used immediately, must also be labelled with the date/ time of freezing and date/ time of thawing.
- Fresh EBM must remain cold during transport to the hospital (e.g., using coolers or freezer packs).
- Each mother should be assigned a dedicated, labelled freezer container for her baby's milk.

See Table 3 for a summary of storage criteria for newborn feeds.

Table 3: Storage Criteria for Newborn Feeds

Refrigerator Temperature (4° C)	Room Temperature (20° C)	Maximum Allowable Time	Reference	Comments
Freshly expressed breast milk (EBM)				
	✓	4 hours	169	Discard leftover feeds. Do not re-refrigerate leftover feed that has been at room temperature.
✓		48 hours	168	Monitor the temperature of the refrigerator.
Pasteurized human donor milk				
✓		48 hours		
Thawed EBM				
✓		24 hours	168	Do not re-freeze thawed EBM.
Prepared feeds (with or without additives)				
	✓	< 2 hours		Do not leave prepared feeds at room temperature. If not used immediately, store prepared feeds at 4°C or lower.
✓		24 hours		
Frozen EBM				
Frozen (freezer compartment within refrigerator)		2 weeks	168	Freeze EBM within 24 hours of collection
Frozen (separate door freezer of refrigerator)		3 months	168	Freeze EBM within 24 hours of collection.
Frozen (deep freeze)		6 months	168	Freeze EBM within 24 hours of collection.

EBM Administration

When administering EBM, principles of Routine Practices (e.g., hand hygiene) should be followed.[166] Before administering each feeding, there should be a system in place to ensure that the correct EBM is being provided to the correct newborn. At a minimum, a double-check mechanism should be used at the time of administration, to avoid errors in administration. In facilities with large numbers of mothers who express milk, consideration should be given to automated systems, such as bar coding with positive patient identification systems (PPIDs),[166, 170] to avoid errors in administration.[166]

The maximum hang time for continuous feedings is four hours. Associated administration sets must be replaced every four hours.

Errors in Administration of EBM[166]

A comprehensive written policy, including disclosure and course of action, should be available in the event of errors involving breast milk administration. Viral testing of 'donor' and 'recipient' mothers should occur as well as recipient testing and administration of post-exposure prophylaxis to the newborn, if indicated.[166] In centres where virology results will be available quickly, i.e., within 24-48 hours, the decision may be made not to test the recipient mother unless the donor mother tests positive, at which time the recipient mother would then be tested.

➢ See Section II, Sample Policies and Procedures for Perinatology, *Errors in Administration of Expressed Breast Milk*, for a guide to developing a policy.

EBM Thawing and Warming [166, 168]

- Breast milk may be thawed in the refrigerator overnight.
- Breast milk may be thawed or warmed in:
    - waterless electric warmers
    - sterile water.
- Untreated tap water (tap water that has not been treated by filtration and/ or ultraviolet light) should not be used for thawing.
- Electric water-filled baths and/ or microwave ovens should not be used for thawing or warming breast milk.
- Reusable warming containers, if used, must be dried between uses and cleaned according to a schedule (e.g., daily).

Withholding Breast Milk[166]

There are very few indications for withholding breast milk. Contraindications to feeding with EBM include certain maternal infectious diseases and maternal medications. Endometritis or mastitis that are being treated with antibiotics are not a contraindication to breastfeeding.

Mothers who have infections that may be passed to the newborn via breast milk will be advised against breastfeeding their newborn. See Table 4 for a list of maternal infections that may require withholding of maternal breast milk.

Donor Breast Milk Feeding

Human breast milk is the best nutrition for newborns. When a newborn's mother's breast milk is not available, the only acceptable human milk alternative is the use of pasteurized human donor milk (PHDM) from an accredited milk bank.[171, 172] The only organization currently accrediting milk banks is the Human Milk Banking Association of North America (HMBANA).

- For more information on HMBANA, go to: http://www.hmbana.org/.
- For the Canadian Paediatric Society's position statement on Human Milk Banking, go to: http://www.cps.ca/english/statements/N/N10-01.pdf.

EBM must not be acquired directly from individuals, including family members, or through the Internet.[172] Pathogenic viruses such as CMV, HIV and hepatitis may be carried asymptomatically, sometimes without the individual being aware that she is harbouring the virus. These viruses can be excreted in breast milk and, without the rigid donor screening established at accredited milk banks, newborns may be at risk for acquisition of these

pathogens. If a newborn does receive breast milk from someone other than the mother or an accredited milk bank, this is an administration error.

ONLY donor breast milk from a milk bank accredited by HMBANA can be offered to eligible newborns.

Table 4: Maternal Infections That May Require Withholding Maternal Breast Milk

Infection	Pre-Term Newborns (NICU)	Full-Term Healthy Newborns
Breast Abscess	▪ May nurse or provide EBM from the unaffected side. ▪ Do not nurse or provide EBM from the affected side. ▪ If breast abscess is surgically drained, do not nurse or provide EBM from the affected side until 48 hours post drainage.	▪ May nurse or provide EBM from the unaffected side. ▪ May nurse or provide EBM from the affected side.
Abscess caused by TB	▪ Do not nurse or provide EBM until infection has been treated.	▪ Do not nurse or provide EBM until infection has been treated.
Hepatitis C	▪ Breast feeding should be discussed with a physician. Risk of transmission is low. ▪ Consider abstaining from breast feeding if nipples are cracked and bleeding.	
Herpes Simplex lesions **on the breast**	▪ May nurse or provide EBM from the unaffected side. ▪ Use careful hand hygiene and cover lesions that may be exposed to the newborn.	
Human Immunodeficiency Virus (HIV)	▪ Do not nurse or provide EBM.	
Herpes zoster (shingles) **on the breast**	▪ May nurse or provide EBM from the unaffected side.	
Human T-cell Lymphotropic virus Type I/ II	▪ Do not nurse or provide EBM.	
Pulmonary or laryngeal tuberculosis (TB)	▪ Delay contact with mother for nursing until she has received 2 weeks of effective anti-TB therapy, 3 smear negative sputum specimens **and** clinical improvement. ▪ May provide EBM. EBM to be administered to the newborn by someone other than the mother	

Abbreviations:
EBM: Expressed Breast Milk NICU: Neonatal Intensive Care Unit TB: Tuberculosis

B. Cleaning and Disinfecting Feeding Equipment

Infant feeding equipment is classified as semi-critical medical equipment, requiring high-level disinfection (at a minimum) or sterilization between each use, if used by multiple mothers. Contamination of breast pumps and supplies has been reported in the medical literature to cause neonatal infections and outbreaks.[173-175]

Breast pump kits/ milk collection systems can be reusable or disposable. Care should be taken to ensure that all equipment intended for reuse by the same mother is appropriately labelled to avoid mix-up between mothers. Hospitals reusing breast pump kits must have adequate facilities for mothers and staff to reprocess them after use.

Reusable breast pump kits must be cleaned, rinsed and dried between uses by the same mother and undergo high-level disinfection between uses by different mothers. Reusable breast pump kits used by multiple mothers require a closed system to eliminate the possibility of pump contamination from overflow.[174]

Reprocessing Reusable Breast Pump Kits[167]

1. Disassemble reusable components on the mother's side of the filter membrane.
2. Wash all reusable components (except filter membrane) with detergent, followed by thorough rinsing.
3. If used by multiple mothers, disinfect reusable components with high-level disinfection (e.g., pasteurization).
4. Dry components completely.
5. Rinse the filter with water and air dry between uses (the filter should not come in contact with detergent); replace filter according to manufacturer's instructions.
6. Discard breast pump tubing and membrane filters that are exposed to breast milk, as they are difficult to clean effectively.

Shared breast pump machines require cleaning and low-level disinfection between mothers.[166, 167] Breast pump tubing and filters can be difficult to clean adequately, depending on the make of pump and facility reprocessing expertise. In general, they should be discarded if they come in contact with breast milk.[167] If re-used, high-level disinfection is required.

Single-use, sterile bottles with sterile lids should be used for each pumping session.[167] Dispensing equipment used to deliver EBM should also be sterile.

Reusable breast pump kits must be cleaned, rinsed and dried between uses on the same mother and also undergo high-level disinfection between uses by different mothers.

- See Appendix D, *Recommended Minimum Cleaning and Disinfection Level and Frequency for Nursery and NICU Equipment*, for recommendations regarding reprocessing perinatal equipment.
- For more information about equipment reprocessing in health care, refer to PIDAC's *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings*,[6] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/cleaning-disinfection-and-sterilization.html.

C. Fortifiers and Additives

Powdered fortifiers and other additives that are added to feeds or EBM are not intrinsically contaminated, but may become contaminated during preparation.[176] Although no outbreaks of infection have been observed with these products,

Preparation of Feeds

In a hospital setting, fortifiers and additives must be added to feeds in a dedicated, adequately spaced preparation area, not at the bedside. Consideration should be given to incorporating additives in a laminar flow hood by trained personnel.

- Clean hands prior to preparing feeds.
- Dispense single-dose quantities of fortifiers and additives.
- Appropriate action should be taken in the case of a product recall.

D. Powdered Infant Formula (PIF)

For newborns that cannot be breastfed or fed donor breast milk, commercial infant formula is recommended. Commercially-produced *liquid* infant formulas should **always** be used over powdered infant formula (PIF), unless there are medical contraindications, as liquid preparations are sterile.

PIF is not sterile and may be either intrinsically contaminated when opened or become contaminated during preparation. Powdered formula should not be used in an NICU setting unless required to provide added nutritional support.

PIF has been implicated in outbreaks, particularly with *Enterobacter sakazakii* [*Chronobacter sakazakii*][177] and *Salmonella enterica*.[178] *E. sakazakii* contamination of PIF can lead to meningitis,[179-181] necrotizing enterocolitis,[177] cerebral damage, neurological impairment and death.[182] Preterm and immunocompromised newborns are at greatest risk for infection with *E. sakazakii*. It is prudent to use aseptic procedures that are recommended for the preparation and handling of powdered infant feeds. Report and document any suspected infectious illness attributed to the use of powdered formulas to Infection Prevention and Control.

Based on these characteristics, the procedures recommended in *Fortifiers and Additives* should be followed when preparing and storing PIF.[181, 183-188]

For more information on preparing and handling powdered infant formula, refer to:

- Health Canada's '*Preparing and Handling Powdered Infant Formula*', available at: http://www.hc-sc.gc.ca/fn-an/securit/kitchen-cuisine/pif-ppn-eng.php;
- World Health Organization's '*Guidelines for the Safe Preparation, Storage and Handling of Powdered Infant Formula*', available at: http://www.who.int/foodsafety/publications/micro/pif2007/en/index.html.

E. Probiotics

The use of probiotics to prevent necrotizing enterocolitis in preterm neonates has been studied and shows promise.[189-191] At the present time, however, licensed probiotics are not readily available and lack standardization. They should only be used as part of a clinical trial.[192, 193]

Recommendations for Nutrition:

7. ***Breast milk is the optimal feeding choice for newborns. Only the mother's breast milk or milk from an accredited milk bank should be used. [AI]***
8. ***All health care settings that provide maternal/ newborn care should have processes in place for the safe collection, handling, thawing, storage and administration of expressed breast milk.[AIII]***
9. ***A comprehensive written policy, including disclosure and course of action, should be available in the event of errors involving breast milk administration.[AIII]***
10. ***Commercially-produced liquid infant formulas should always be used over powdered infant formula, unless there are medical contraindications.[AII]***
11. ***Fortifiers and additives should be added to infant feeds using aseptic procedures and should be dispensed in single dose quantities. [AIII]***
12. ***Facilities should have a policy as to which infections require not breastfeeding, withholding of maternal breast milk, separation of mother and her newborn. [AI]***

6. Prevention of Central Venous Catheter (CVC) Infections

Catheter-related bloodstream infections (CRBSIs) are a serious complication for neonates with central venous catheters (CVCs). In the U.S., CRBSI are the most common health care-associated infection in neonates in the NICU.[194]

Consistent reduction in infection rates related to central venous catheters (CVCs) may be achieved by implementing a program that is multidisciplinary,[195, 196] includes leadership commitment[197] and uses evidence-based recommendations for preventing intravascular catheter-related infections.[195, 197, 198]

TERMINOLOGY RELATED TO CVC INFECTIONS

CRBSI (catheter-related bloodstream infection)

A clinical definition, used when diagnosing and treating patients, which requires specific laboratory testing that more thoroughly identifies the catheter as the source of the BSI. It is not typically used for surveillance purposes.

CLABSI (central line-associated bloodstream infection)

A surveillance definition relating to a primary BSI in a patient that had a central line within the 48-hour period before the development of the BSI and is not related to an infection at another site.

A successful quality improvement program for catheter care includes[194-196, 198]:

- education and training healthcare personnel who insert and maintain CVCs
- a hand hygiene program
- surveillance for CLABSI
- appropriate selection of devices including caps, administration sets and add-on devices, with characteristics that help ensure maintenance of a closed system
- implementation of central line bundles for care, including:
  - insertion bundle
  - maintenance bundle
  - removal/ replacement bundle
- audits of practice related to use of bundles.

Each CVC-related infection should be reviewed for quality improvement purposes.

A. Education and Training

Many studies now demonstrate that education-based preventative programs can reduce CLABSI when combined with specific measures.[197] Health care personnel should receive education regarding the indications for CVCs, procedures for the insertion and maintenance of CVCs and infection prevention and control measures to prevent intravascular catheter-related infections.[195, 196]

Only trained personnel who demonstrate competence for the insertion and maintenance of CVCs should be designated to do so.[195] Knowledge of, and adherence to, guidelines for personnel involved in the insertion and maintenance of CVCs should be assessed periodically.[195, 196]

B. Surveillance for CLABSI

Clinical Surveillance

Each NICU should implement a regularly scheduled, standardized process to assess each CVC daily to see if it can be removed.[195, 196] Signs of infection and dressing integrity should be assessed each shift.[196]

Standardized criteria should be used to determine CLABSI.

CLABSI Surveillance

Surveillance should be conducted by trained individuals, e.g., ICPs, to determine CLABSI rates in the NICU[195, 196]:

- Express data as the number of central line-associated bloodstream infections (CLABSIs) per 1,000 catheter-days.
- Stratify CLABSI rates by birth weight category to facilitate comparisons with national and international data.
- Report CLABSI rates per catheter type or combined for all CVCs.
- Report CLABSI rates for umbilical catheters separately from other CVC rates.
- Monitor trends in CLABSI rates to assist in identifying lapses in IPAC practices.
- Report CLABSI rates back to staff in the NICU.

C. Hand Hygiene

See Section I for information on hand hygiene for Routine Practices.

When caring for central lines, additional instances for hand hygiene include:[198]

- before and after palpating catheter insertion sites (note: palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained)
- before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter.

The use of checklists that includes hand hygiene for all central line bundles will ensure consistent practice.[198]

D. Central Line Bundles

Insertion bundle

- Use a checklist for all line insertions.[198]
- Select the optimal site for CVC insertion:
  - Use upper or lower extremities or the scalp as preferred catheter insertion sites.[195]
  - Avoid femoral sites.[195]
  - Limit each clinician to two attempts to achieve vascular access.[196]
- Select the type of CVC based on the intended use:
  - Use a midline catheter or peripherally inserted central catheter (PICC) when the duration of IV therapy will likely exceed six days.[195]
  - Consider a multilumen catheter if parenteral nutrition will be administered along with other therapies.
  - There are insufficient data to recommend the use of antimicrobial-impregnated catheters in neonates.[195, 196]

- Use maximal sterile barrier precautions and sterile technique during CVC insertion[195, 198]:
  - Each person within one metre of the sterile field wears a cap, mask, sterile gown and sterile gloves.
  - Use a large sterile drape.
- Use a 2% chlorhexidine gluconate-containing skin antiseptic for skin preparation[196] prior to CVC insertion. In newborns less than 28 weeks gestation and who are less than one week old, do not use solutions containing 70% alcohol. Use of any skin antiseptic should be done sparingly to reduce the risk of skin irritation and breakdown.
- Allow antiseptic to dry before CVC insertion.[195]

Maintenance bundle

- CVC hubs/ ports:
  - Scrub the access port for 15 to 30 seconds with either 70% alcohol or chlorhexidine/ alcohol preparation.[198]
  - Access the port only with sterile devices.[195]
- CVC site dressings[195, 196]:
  - Use either sterile gauze or sterile, transparent, semi-permeable dressing to cover the catheter site.
  - If the site is bleeding or oozing, a gauze dressing is preferable to a transparent, semi-permeable dressing.
  - Routine dressing changes are not necessary. Replace catheter site dressing if the dressing becomes damp, loosened, visibly soiled or when inspection of the site is necessary.
  - Do not use topical antibiotic ointment or creams on insertion sites because of their potential to promote fungal infections and antimicrobial resistance.
  - There are insufficient data to recommend the use of chlorhexidine sponge dressings in neonates at this time.

Removal/ replacement bundle

- CVC Removal:
  - Promptly remove any CVC that is no longer essential.[195, 198]
  - Remove CVC if the newborn develops signs of phlebitis, infection or if the catheter malfunctions.[195]
  - Avoid routine replacement of CVCs as a strategy to prevent infection[195]:
    - The species of microorganism, the degree and scope of systemic inflammatory response and co-existing morbidities should all be part of the decision-making as to whether to retain or remove any and all catheters.
    - In general, infections with *Staphylococcus aureus*, *Enterococcus sp., Candida sp.* and most Gram-negative organisms require immediate catheter removal.
    - Infections with coagulase-negative staphylococci may be successfully treated with the catheter still in place, unless the blood culture is positive three or more days.[196]
  - Umbilical venous catheters should be removed as soon as possible once no longer needed, but can be used up to 14 days if managed aseptically.[195]
  - Umbilical artery catheters should be removed as soon as they are no longer needed to monitor the newborn, preferably within 5 days.[195]

- Administration Set Replacement:
  - Replace administration sets using aseptic technique. Ideally, utilize a dedicated team for connecting new infusion sets.
  - Replace administration sets, including secondary sets and add-on devices, no more frequently than at 96-hour intervals,[199] but at least every 7 days,[195] unless CLABSI is suspected or documented.[195]
  - Replace tubing used to administer blood, blood products, or lipid emulsions within 24 hours of initiating the infusion. If the solution contains only dextrose and amino acids, the administration set does not need to be replaced more frequently than every 96 hours.[195]
- Needleless Intravascular Catheter Systems:
  - Change needleless components at least as frequently as the administration set.[195]
  - Change caps no more frequently than every 96 hours or according to manufacturers' instructions.

Parenteral fluids

- Designate one port exclusively for hyperalimentation if a multilumen catheter is used to administer parenteral nutrition.[198]
- Complete the infusion of lipid-containing solutions (e.g., 3-in-1 solutions) within 24 hours of hanging the solution.[195]
- Complete the infusion of lipid emulsions alone within 12 hours of hanging the emulsion. If volume considerations require more time, the infusion should be completed with 24 hours.[195]
- Complete infusions of blood or other blood products within 4 hours of hanging the blood.

Recommendations for Prevention of CVC Infections:

13. ***Every NICU should have a quality improvement program for central line-associated bloodstream infection prevention that includes education and training, surveillance, insertion and maintenance bundles, removal and replacement criteria and audits of practice. [AI]***

7. General Principles of Outbreak Prevention and Management

A. Outbreak Prevention

Early intervention to prevent outbreaks or limit the spread of infections once an exposure or outbreak has been identified will interrupt transmission of disease, decreasing the impact on patient health, patient care and cost.[1]

Surveillance programs should target infectious agents of concern in the facility in addition to those listed in Table 1. Examples include rotavirus, respiratory syncytial virus (RSV), *Enterobacteriaceae* and *Staphylococcus aureus*.

B. Outbreak Management

Each facility should have a program with the capacity to identify the occurrence of clusters or outbreaks of infectious diseases and have appropriate resources to manage an outbreak.[1] The facility should assess its capabilities for the management of different types of infections and the implementation of different types of precautions systems.

Each facility should have an administrative policy for dealing with infectious disease outbreaks that includes[1, 70]:

- formation of a multidisciplinary committee
- review and audit of IPAC policies and practices
- surge capacity
- authority to:
  - relocate patients
  - cohort patients and staff
  - confine patients to their rooms
  - restrict admissions and transfers
  - restrict visitors
  - obtain cultures
  - administer relevant prophylaxis or treatment.

Gastroenteric outbreaks in institutions, respiratory outbreaks in institutions and *Clostridium difficile*-associated outbreaks in public hospitals shall be reported to public health.

- For more information about management of an outbreak, refer to PIDAC's *Best Practices for Infection Prevention and Control Programs in Ontario in All Health Care Settings*,[1] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/infection-prevention-and-control-programs-in-ontario.html.
- For more information about management of outbreaks of antimicrobial resistant bacteria, refer to PIDAC's Annex to Routine Practices and Additional Precautions, *Annex A: Screening, Testing and Surveillance for Antibiotic-Resistant Organisms (AROs) in All Health Care Settings*,[70] available at: http://www.oahpp.ca/resources/pidac-knowledge/best-practice-manuals/screening-testing-and-surveillance-for-antibiotic-resistant-organisms-aros.html.

II. Sample Policies and Procedures for Perinatology

The following policies and procedures are examples of how a local hospital may implement these best practices in their facility. They are samples only, which may be adapted and used as required in perinatal health care settings. These policies and procedures are generic and are based on the best practices described in this document.

List of Sample Policies and Procedures:

THE FOLLOWING POLICIES AND PROCEDURES ARE SAMPLES ONLY

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Expressed Breast Milk (EBM)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To prevent the transmission of infectious diseases to newborns via expressed breast milk (EBM).

POLICY

It is the policy of [*facility name*] to reduce the risks associated with neonatal nutrition.

PROCEDURE

The following general practices will be followed with regard to the handling, collection, storage, thawing and administration of EBM and the use of shared or donor breast milk:

1. **EBM Handling:**
    - Use Routine Practices, including proper hand hygiene, when handling EBM.
    - Provide a single-use, sterile bottle with sterile lid to the mother for each pumping session.
    - Provide instruction on labelling the container to include contents, newborn's name, mother's name, hospital identifier, date/ time of pumping, date/ time of freezing, and date/ time of thawing. Provide pre-printed labels.
    - Wear gloves when handling EBM if there is a risk of getting milk on the hands.
    - Clean hands after contact with EBM.
    - Ensure that the correct EBM is fed to the correct newborn. If a newborn does receive EBM from someone other than their mother or an accredited milk bank, treat this as an administration error. See policy: *Errors in Administration of Expressed Breast Milk*.
2. **EBM Collection:**
    - Explain EBM collection to the mother and review instructions for the type of pumping device to be used.
    - Teach the mother the importance of hand hygiene and basic principles of asepsis when expressing and handling EBM.
    - Instruct the mother to use a sterile plastic container and lid for each pumping session, leaving adequate air space in container to allow for expansion of contents during freezing.
    - Document parent education in the mother's medical record.
3. **EBM Storage:**
    - Use unrefrigerated EBM within 4 hours.

- Instruct the mother to keep EBM cold during transportation to the hospital (e.g., using coolers or freezer packs).
- Keep fresh EBM in a refrigerator and use within 48 hours.
- Freeze EBM within 24 hours of collection.
- Label each container of frozen EBM with the date/ time of freezing and the date/ time of thawing.

4. EBM Thawing and Warming:

- Thaw frozen EBM in the refrigerator and use within 24h.
- Warm EBM in a waterless electric warmer OR in warm, sterile water in a disposable warming container. Do not use tap water for warming.
- Clean and dry reusable warming containers between uses.
- Do not use electric warming water baths and/ or microwave ovens for thawing or warming EBM.

5. EBM Administration:

- Have a system in place to ensure that the correct EBM is being provided to the correct infant, (e.g., double check and sign off with another health care professional or the infant's parent, or bar coding) before each feed.
- Discard leftover EBM.
- Replace continuous EBM feedings and associated administration sets every 4 hours.

6. Shared EBM and Donor EBM Feeding:

- When maternal EBM is not available, use only donor breast milk from a milk bank accredited by the Human Milk Banking Association of North America (HMBANA).
- The medical team will determine valid medical indications for using donor EBM.
- Document all discussion between the parent(s) and the responsible physician/ delegate about the risks and benefits of using pasteurized human donor EBM for their newborn.
- The responsible physician/ delegate must obtain parental consent for donor EBM and document this in the newborn record.

7. Cleaning and Disinfecting Feeding Equipment:

- Clean reusable breast pump kits between each use by the same mother.
- Clean and disinfect reusable breast pump components prior to use by another mother, using a high-level disinfectant.
- Clean and disinfect shared breast pump machines between mothers, using a low-level disinfectant.
- Discard breast pump tubing and membrane filters that are exposed to breast milk.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Errors in Administration of Expressed Breast Milk (EBM)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To assess and respond to the possibility of a blood-borne pathogen being transmitted to a newborn if expressed breast milk (EBM) from another newborn's mother is inadvertently ingested.

POLICY

It is the policy of [*facility name*] to minimize the risks associated with potential exposure of a newborn to a blood-borne pathogen through accidental ingestion of EBM from someone other than the newborn's mother.

DEFINITION(S):

Donor Mother:	the mother who expressed the EBM
Recipient Mother:	the mother of the newborn who ingested the EBM
Recipient Newborn:	the newborn who ingests the EBM

PROCEDURE

Human milk is a body fluid capable of transmitting blood-borne pathogens. In the event that a newborn has inadvertently ingested EBM from another newborn's mother, or it is suspected that this has occurred, the following procedure should be taken:

1. Confirm that the newborn has ingested the wrong EBM.
2. Notify the responsible physician about the event.
3. Complete an incident report with details of the event.
4. Inform the recipient newborn's parents/ guardians of the event as soon as possible. Maintain confidentiality at all times, i.e., do not share donor and recipient parent's names, ethnic background or underlying medical conditions of newborns.
5. Inform the donor newborn's parents/ guardians of the event as soon as possible.
6. Review donor and recipient mothers' antenatal sheets for hepatitis B virus (HBV) and human immunodeficiency virus (HIV) status.
7. Obtain consent for testing and document consent in the health record. If recipient and/ or donor newborn's mother refuses testing, document in both newborns' health records. During the consent process, inform the donor mother that the test results will be released to the recipient mother without disclosure of identity.
8. Send blood from the donor mother for the following laboratory tests:
    - Hepatitis B surface antigen (HBsAg) [STAT*]
    - Antibody to hepatitis C virus (HCV)

- Antibody to human immunodeficiency virus (HIV) [STAT]
- Antibody to human T-cell lymphotropic virus I and II (HTLV I/ II)
- Antibody to cytomegalovirus (CMV)

NOTE: HIV antibody and HBsAg are ordered STAT so that post-exposure prophylaxis can be administered in a timely manner. The testing laboratory should be contacted by telephone to expedite testing and specimen requisitions should be clearly labelled **STAT**. If laboratory results cannot be obtained within 48 hours, test the recipient mother at the same time.

9. If the donor mother tests positive for any bloodborne pathogen, test the recipient mother.

10. If the donor mother refuses consent or cannot be tested, arrange for the recipient newborn to have follow up blood work drawn to rule out infection with hepatitis B, hepatitis C and HIV. An acceptable alternative is testing for HBsAg, HIV antibody and HCV antibody at six months. There are newer testing modalities that may rule out these pathogens in shorter time periods. Consider seeking expert advice if the situation warrants this.

11. Discuss the results of laboratory tests with both sets of parents independently, when available. Document the results of the donor mother's laboratory tests on both newborns' health records, coded to maintain confidentiality.

12. If the donor is known to be HIV-positive, a decision needs to be made immediately regarding anti-viral prophylaxis, as it should be initiated within 1-2 hours after the exposure. Urgent consultation with a pediatric infectious disease specialist is recommended.

13. If the donor mother is HBsAg-positive and the recipient mother is HBsAg-negative, hepatitis B immune globulin (HBIG) and vaccine should be given to the newborn as soon as possible, preferably within 48 hours of the incident.

14. Document the course of action taken in the recipient newborn's medical record once all laboratory tests are reported.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Group B Streptococcus (GBS)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To prevent early-onset group B streptococcal (GBS) disease in newborns.

POLICY

It is the policy of [*facility name*] to reduce the risk of early-onset GBS disease in newborns through effective maternal and newborn management before and during delivery.

PROCEDURE

The following general practices will be followed with regard to the screening and prophylaxis of GBS during pregnancy and delivery:

Management of Mother:

1. Treat GBS bacteriuria during pregnancy, as GBS bacteriuria is associated with premature labour and delivery.
2. Screen all pregnant women for GBS carriage at 35-37 weeks' gestation, unless the mother had GBS bacteriuria during the current pregnancy or has had a previous newborn with invasive GBS disease. Re-screening is necessary in each pregnancy and is independent of the anticipated mode of delivery.
3. Screening procedure:
   - Use the same swab for both sites **but take them in this order**:
     - swab the lower vagina (vaginal introitus), **THEN**
     - swab the rectum (insert swab through the anal sphincter).
   - Do not take cervical cultures.
   - Clearly indicate on the label that the specimen is for GBS culture.
   - If the mother is allergic to penicillin, clearly indicate this on the label and request susceptibility testing for clindamycin and erythromycin.
4. Obtain GBS culture for women with threatened preterm birth (<37 weeks gestation). If a substantial risk of preterm delivery is present, provide prophylaxis pending culture results. Repeat screening weekly if hospitalized, until delivery or until a positive result is obtained, whichever comes first.
5. Provide intrapartum antibiotic prophylaxis (IAP) for:
   - all mothers colonized with GBS during the current pregnancy, unless a planned Caesarian delivery in the absence of labour and with intact amniotic membrane is performed
   - GBS status is unknown and any one of the following risk factors exists:
     - delivery <37 weeks gestation
     - amniotic membrane rupture ≥ 18 hours

- intrapartum temperature ≥ 38°C
- mothers with GBS bacteriuria during current pregnancy, regardless of GBS screening result (if done)
- mothers with a previous newborn with neonatal invasive GBS disease, regardless of GBS screening result (if done).

6. IAP is not indicated for:

- previous pregnancy with positive GBS screen during the previous pregnancy (unless a culture was also positive during current pregnancy)
- Caesarian delivery performed in the absence of labour and membrane rupture, regardless of maternal GBS status
- negative vaginal and rectal GBS screening culture in late gestation during the current pregnancy regardless of intrapartum risk factors (e.g., < 37 weeks' gestation, duration of rupture of membranes ≥ 18 hours, temperature ≥ 38°C).

7. The treatment of choice is penicillin. For mothers with allergy to penicillin:

- If low risk for anaphylaxis (no previous immediate hypersensitivity reaction, including anaphylaxis, angioedema, respiratory distress or urticaria), cephazolin is the antibiotic of choice,
- If high risk for anaphylaxis, clindamycin or erythromycin is recommended, if isolate is known to be susceptible; if isolate is resistant to clindamycin or erythromycin, or when the susceptibility is unknown, vancomycin should be used.

Management of Newborn:

1. Newborns should be assessed and managed by a pediatrician or neonatologist if:

- the newborn is pre-term
- the newborn is symptomatic
- there has been inadequate IAP
- there are maternal risk factors, such as maternal chorioamnionitis or fever.

2. In all other cases, term newborns do not require therapy, but should be observed for 48 hours.

➢ For management of newborns born to GBS-positive mothers, refer to the Canadian Paediatric Society's Management of the infant at increased risk for sepsis (Position Statement FN 2007-03), available at: http://www.cps.ca/english/statements/FN/FN07-03.pdf.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Herpes Simplex Virus (HSV)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To prevent neonatal herpes simplex virus (HSV) infection.

POLICY

It is the policy of [*facility name*] to reduce the risk of neonatal HSV infection through effective maternal and newborn management before, during and after delivery.

PROCEDURE

Management of Mother

1. Mother has symptomatic HSV (history of HSV but no lesions):
   - Do not screen the mother for HSV in the absence of genital lesions.
   - Do not perform Caesarean delivery unless indicated for medical reasons.
2. Mother has active genital HSV lesions present with or without positive virus culture or direct test, antepartum and intrapartum period:
   - Manage mother with Routine Practices.
   - Perform Caesarean delivery.
   - Counsel mother regarding protective measures she should use when handling her newborn, particularly hand hygiene.
   - Avoid the use of fetal scalp monitors and fetal scalp sampling.
   - Collect maternal specimens for viral testing if direct test and/ or virus culture have not been carried out previously.
   - Specimens for HSV testing include:
     - genital lesions, if present
     - cervix
3. Mother has active genital and extragenital HSV lesions (including cold sores), postpartum period:
   - Wear gloves for direct contact with lesions and perform hand hygiene after glove removal.
   - Educate parents and other infected family members in protective measures, emphasizing hand hygiene and covering extragenital lesions. Maternal understanding of spread of virus is necessary to prevent the spread of virus to her own newborn or other newborns.
   - Instruct parents not to handle other newborns.
   - Allow rooming-in when the mother demonstrates knowledge of protective measures.
   - Encourage breastfeeding unless lesions are present on the breast (direct contact between lesion and newborn could infect newborn).

- Provide a mask or dry dressing to parents with oral herpes to cover her/ his lesion(s) while handling the newborn, to prevent parent touching lesion and to prevent parent kissing newborn with open lesions. Provide education for mothers and family members who have active oral herpes lesions (e.g., hand hygiene, avoiding touching lesions, avoiding kissing newborn).
- Evaluate parents with extensive lesion(s) for possible exclusion from newborn contact and/ or admission to the nursery.
- Counsel parents with herpetic whitlow in hand hygiene measures and wearing gloves before handling their newborns. Restrict other household members with herpetic whitlow from direct contact with the newborn until the lesion is healed.

Management of Newborn

1. Mother has asymptomatic HSV (history of HSV, no lesions):

- Observe newborn for signs and symptoms of infection.
- Educate parents/ caregivers about signs and symptoms of neonatal HSV infection during the first six weeks of life and return for immediate evaluation if signs and symptoms of infection develop.

2. Mother has active genital HSV lesions:

- Asymptomatic newborn:
  - Encourage rooming-in in a single room.
  - Manage newborn with Contact Precautions.
  - Observe newborn closely for signs of sepsis, skin or mucous membrane lesions, convulsions, respiratory distress, i.e. pneumonia.
  - Report suspicious lesions or symptoms to the responsible physician immediately.
  - Take samples for HSV culture from asymptomatic newborns 12 to 24 hours after birth, including:
    - urine
    - rectum or stool
    - mouth
    - conjunctiva
    - nasopharynx
- Symptomatic newborn:
  - For the diagnosis of HSV Infection in the symptomatic newborn, take all of the following specimens for virology:
    - Fluid from vesicles
    - Scrapings from base of vesicles
    - Swab of mouth and nasopharynx
    - Swab of conjunctiva
    - Urine
    - Rectal swab or stool
    - Cerebrospinal fluid (CSF) (should be obtained before antiviral therapy is given)
  - Manage with Contact Precautions if lesions are present.
  - Initiate antiviral therapy.
- Initiate antiviral therapy if culture results from the newborn are positive or if HSV is strongly suspected clinically.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Hepatitis B Virus (HBV)**	
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To prevent the acquisition of hepatitis B virus (HBV) by newborns.

POLICY

It is the policy of [*facility name*] to prevent transmission of HBV infection to newborns born to mothers who have HBV through effective maternal and newborn management before, during and after delivery.

PROCEDURE

1. **Management of Mother with HBV**
   - Test all mothers prenatally for hepatitis B surface antigen (HBsAg).
   - Document HBsAg status in the mother's medical record.
   - Educate mothers with HBV about the risks of transmission to their newborn and preventive measures.
   - Mothers with HBV may breastfeed.
   - Use Routine Practices for mothers with HBV.
2. **Management of Newborn**
   - Bathe newborn completely to remove maternal blood before injection medications are given; in emergencies, thoroughly cleanse injection sites prior to administering medications.
   - Use Routine Practices for newborns born to mothers with HBV.
   - Administer hepatitis B immune globulin (HBIG) and HBV vaccine within 12 hours of birth, at different anatomic sites.
   - If there is no indication of HBsAg status on the mother's medical record:
     - Assess the mother for HBsAg within 12 hours of delivery.
     - If results of HBsAg testing cannot be available within 12 hours or if testing cannot be done:
       - Newborns >2 kg.: Administer hepatitis B vaccine within 12 hours of birth. Consider administering vaccine and HBIG dependant on mother's risk factors.
       - Newborns <2 kg.: Administer both HBIG and hepatitis B vaccine within 12 hours of birth.
     - If the mother's HBsAg result is positive, administer HBIG (if not previously given).
   - Repeat hepatitis B vaccine at one and six months of age. Note: For preterm newborns who weigh less than 2 kg. at birth, the initial vaccine dose should not be counted in the required 3 dose schedule and the subsequent three doses should be given in accordance with schedule for immunization of preterm newborns, i.e. four doses are recommended for the preterm newborn.

- If the mother is HBsAg-negative and the father is HBsAg-positive, the newborn should receive Hepatitis B vaccine as a household contact of a carrier.
- Provide the parents with a record of immunizations given.
- Notify local public health of newborns born to known HBsAg positive mothers to ensure appropriate follow-up doses of vaccine are received.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Hepatitis C Virus (HCV)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	1	

PURPOSE

To appropriately manage and minimize transmission of hepatitis C virus (HCV) to newborns.

POLICY

It is the policy of [*facility name*] to minimize transmission of HCV infection to newborns born to mothers who have HCV.

PROCEDURE

1. **Management of Mother with HCV**
   - Test mothers at high risk for HCV prenatally.
   - Mothers who are found to be HCV-positive should be referred to a hepatologist, gastroenterologist or infectious diseases physician for medical assessment.
   - Mothers infected with HCV should be advised that transmission of HCV by breastfeeding has not been documented and breastfeeding is not contraindicated. The decision to breastfeed should be based on an informed discussion between the mother and the health care professional.
   - If nipples are cracked and bleeding, consider abstaining from breastfeeding.
   - Use Routine Practices for mothers with HCV.

2. **Management of Newborn**
   - Bathe newborn completely to remove maternal blood before injection medications are given; in emergencies, thoroughly cleanse injection sites prior to administering medications.
   - Use Routine Practices for newborns born to mothers with HCV.
   - Evaluate infants of HCV-positive mothers at 18 months of age.
   - Refer children found to be HCV-positive to a pediatric hepatologist, gastroenterologist or infectious diseases physician.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Human Immunodeficiency Virus (HIV)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To prevent the acquisition of human immunodeficiency virus (HIV) by newborns.

POLICY

It is the policy of [*facility name*] to prevent transmission of HIV infection to newborns born to mothers who have HIV(or whose HIV status is unknown) through effective maternal and neonatal management before, during and after delivery.

PROCEDURE

1. **Management of Mother with HIV: Antenatal Care**
    - Strongly recommend HIV testing to all pregnant women, regardless of results of prior testing, with appropriate counselling and consent.
    - Retest women who test negative for HIV and who continue to be at high risk of exposure to HIV in each trimester.
    - Refer HIV-infected pregnant women to practitioners who are knowledgeable in the care of HIV-positive women (e.g., obstetrician and an HIV specialist) to facilitate care; provide advice on management during pregnancy, labour/ delivery and the postpartum period.
    - An HIV specialist in conjunction with an obstetrician experienced in caring for HIV-infected women will determine the mode of delivery. If viral load is greater than 1000 copies per mL, elective Caesarian delivery at 38 week gestation is recommended. If viral load is between 50 and 999 copies per mL, elective Caesarian delivery should be considered. If viral load is less than 50 copies per mL, routine Caesarian delivery is not recommended.[150]
    - Provide information regarding the mother's HIV status to both the delivery suite and to the health care providers who will care for the newborn immediately after birth.
2. **Management of Mother with HIV: Intrapartum Care**
    - Use Routine Practices for the mother with HIV.
    - Avoid scalp fetal heart monitoring, scalp pH sampling, intrauterine pressure measurements and artificial rupture of membranes during labour, to reduce risk of transmission to newborn.
    - Offer women with no prenatal care and unknown HIV status HIV prophylaxis in labour if they are high risk and rapid testing is not available (e.g., intravenous zidovudine).
    - Obtain direction from practitioners who are knowledgeable in the care of HIV-positive women regarding antiretroviral therapy during labour and delivery. In addition to the antiretroviral therapy being given, intravenous zidovudine should be administered during labour until delivery.

3. Management of Mother with HIV: Postpartum Care

- Use Routine Practices for the mother with HIV.
- Breastfeeding and use of EBM is contraindicated. Provide support to mother regarding other options.
- Consult with an HIV specialist prior to discharge regarding continuation of antiretroviral therapy and for follow-up.

4. Management of Newborn

- Bathe newborn completely to remove maternal blood before injection medications are given; in emergencies, thoroughly cleanse injection sites prior to administering medications.
- Use Routine Practices for newborns born to mothers with HIV.
- Consult with a pediatric HIV specialist as soon as possible (if not already done).
- Provide HIV antiretroviral prophylaxis (i.e., zidovudine) as soon as possible, and within 12 hours, after birth.
- Zidovudine is usually continued for six weeks. Other antiretrovirals may be necessary depending on maternal status.
- Test newborn for HIV DNA within 14 to 21 days after birth; if negative, repeat at one to two months of age and at four to six months of age.
- Provide follow-up with pediatric HIV specialist prior to discharge.

PERINATAL CARE POLICIES AND PROCEDURES MANUAL		
SECTION:	Infection Prevention and Control	EFFECTIVE DATE:
TITLE:	**Varicella zoster (chickenpox and shingles)**	REVIEW DATE:
NUMBER:		REVISION DATE:
PAGES:	2	

PURPOSE

To prevent the acquisition of varicella (chickenpox) by newborns.

POLICY

It is the policy of [*facility name*] to prevent transmission of varicella infection to newborns born to mothers who have varicella through effective maternal and neonatal management before, during and after delivery.

PROCEDURE

1. **Management of Mother**
   - Assess mother for varicella immunity during pregnancy, i.e., history of varicella, zoster or receipt of two doses of varicella vaccine.
   - Do not administer varicella vaccine during pregnancy.
   - If mother is susceptible to varicella, offer her vaccine post-partum.
   - Offer exposed susceptible pregnant women varicella immune globulin (VarIg) within 96 hours of exposure.
   - Manage exposed susceptible pregnant women hospitalized during the period of communicability with Airborne Precautions from day 8 to day 21 after exposure. If VarIg is given, extend the period to 28 days after exposure. Ensure that all care providers are aware if mother is due to deliver during the period of communicability. If newborn is in nursery/ NICU, mother may not enter the nursery/ NICU until all lesions are dry and crusted.
   - Place mothers with varicella on Airborne Precautions for a minimum of five days after onset of rash, until all lesions are crusted. If newborn is in nursery/ NICU, mother may not enter the nursery/ NICU until all lesions are dry and crusted.
   - Mothers with varicella may breastfeed or provide EBM.
   - Only immune staff are to provide care to mothers with varicella.
   - Only immune individuals may visit a mother with varicella.
2. **Management of Newborn**
   - Exposed newborns (i.e., onset of varicella in the mother five days or less before delivery or within 48 hours after delivery OR nursery/ NICU exposure):
     - Placed on Airborne Precautions beginning eight days before until 28 days after exposure.
     - Administer VarIg to exposed newborns as soon as possible and within 96 hours of exposure.

- For newborns born during this high risk period, consultation with a pediatric infectious disease physician should be considered.

- Place newborns that develop varicella on Airborne Precautions for a minimum of five days after onset of rash until all lesions are crusted.
- Only immune staff are to provide care to newborns with varicella, or newborns who have been exposed to varicella.
- Only immune parents and visitors may visit a newborn with varicella.

3. Localized Zoster in the Mother

- VarIg is not required for the newborn if born after 28 weeks gestation.
- Manage mother in a single room. Only immune staff should enter.
- If lesions are contained, mother may visit the NICU but may only touch her own newborn.

III. Summary of Recommendations for Best Practices For Infection Prevention and Control In Perinatology

This summary table is intended to assist with self-assessment internal to the health care setting for quality improvement purposes. See complete text for rationale.

	Recommendation	Compliant	Partial Compliance	Non-compliant	Action Plan	Accountability
	Routine Practices					
1.	**All health care settings providing maternal/ newborn care should follow PIDAC's best practices for Routine Practices. In particular:** **a) A point-of-care risk assessment must be performed before each interaction with a mother or newborn to determine which interventions are required to reduce transmission of microorganisms. [BIII]** **b) All health care settings must implement a comprehensive hand hygiene program that follows best practices. [AI]** **c) Health care providers must wear personal protective equipment (PPE) based on their risk assessment to prevent exposure to body substances such as blood, body fluids (including breast milk), secretions (including vaginal secretions) and excretions (including meconium). [AI]**					

Recommendation		Compliant	Partial Compliance	Non-compliant	Action Plan	Accountability
2.	All health care settings should have policies, procedures and practices to maintain a clean and safe environment. [AI]					
3.	Maternal/ newborn programs should perform both process and outcome surveillance related to health care-acquired infections in perinatology with analysis and feedback. [AI]					
Additional Precautions						
4.	All health care settings providing maternal/ newborn care should follow PIDAC'S best practices for Additional Precautions based on the mode of transmission.[BII]					
Perinatal Infections						
5.	All maternal/ newborn programs should have a process in place to ensure women of childbearing age receive appropriate immunization. [AI]					
6.	All maternal-newborn programs should have policies and procedures in place to prevent vertical transmission of Group B streptococcus (GBS), herpes simplex, hepatitis B, human immunodeficiency virus (HIV) and influenza. [AI]					

Recommendation		Compliant	Partial Compliance	Non-compliant	Action Plan	Accountability
Nutrition						
7.	**Breast milk is the optimal feeding choice for newborns. Only the mother's breast milk or milk from an accredited milk bank should be used. [AI]**					
8.	**All health care settings that provide maternal/ newborn care should have processes in place for the safe collection, handling, thawing, storage and administration of expressed breast milk.[AIII]**					
9.	**A comprehensive written policy, including disclosure and course of action, should be available in the event of errors involving breast milk administration.[AIII]**					
10.	**Commercially-produced liquid infant formulas should always be used over powdered infant formula, unless there are medical contraindications.[AII]**					
11.	**Fortifiers and additives should be added to infant feeds using aseptic procedures and should be dispensed in single dose quantities. [AIII]**					
12.	**Facilities should have a policy as to which infections require not breastfeeding, withholding of maternal breast milk, separation of mother and her newborn. [AI]**					

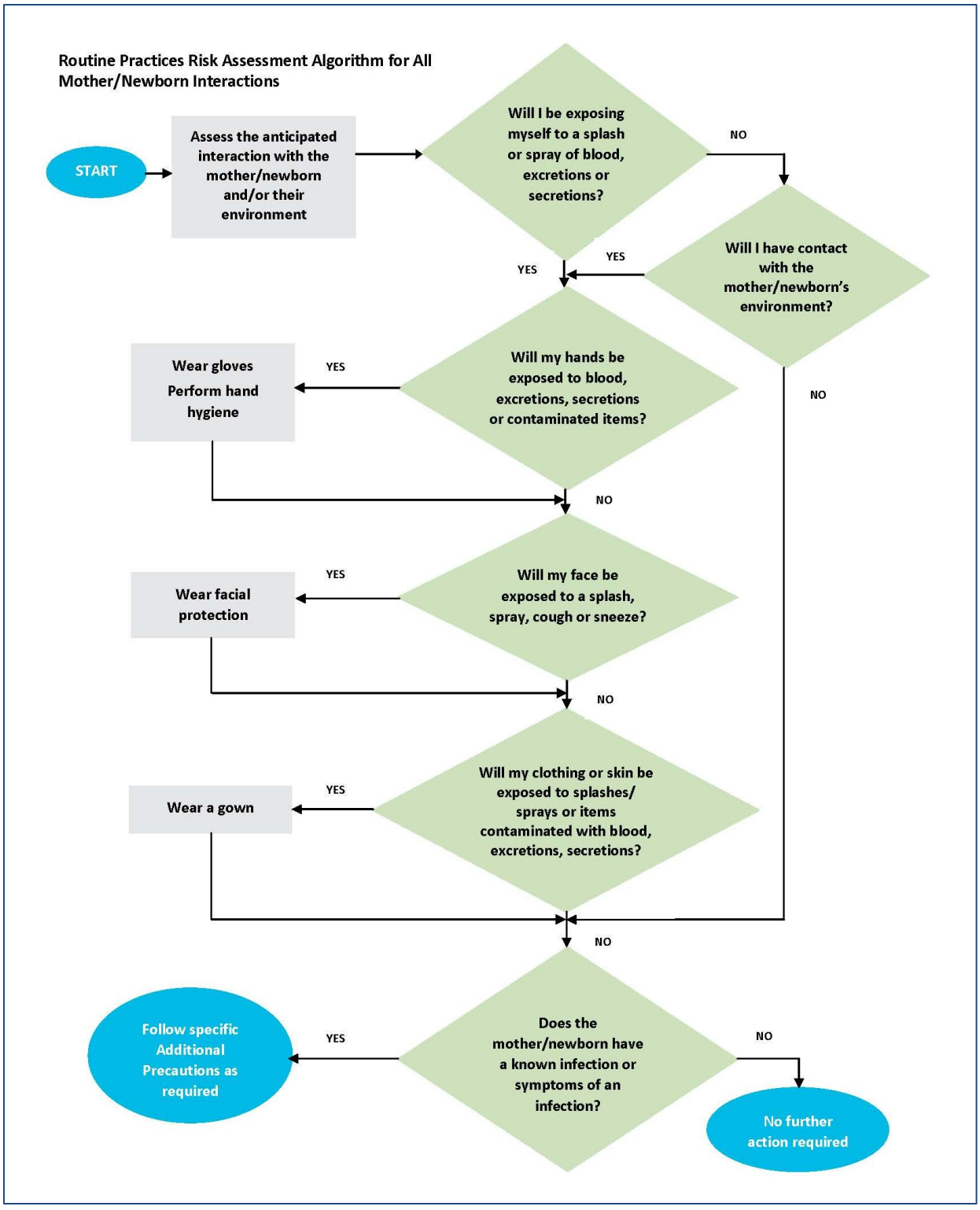
Recommendation		Compliant	Partial Compliance	Non-compliant	Action Plan	Accountability
Prevention of Infections Related to Central Venous Catheters						
13.	**Every NICU should have a quality improvement program for central line-associated bloodstream infection prevention that includes education and training, surveillance, insertion and maintenance bundles, removal and replacement criteria and audits of practice. [AI]**					

Appendix A: Ranking System for Recommendations

Categories for strength of each recommendation	
CATEGORY	**DEFINITION**
A	Good evidence to support a recommendation for use.
B	Moderate evidence to support a recommendation for use.
C	Insufficient evidence to support a recommendation for or against use
D	Moderate evidence to support a recommendation against use.
E	Good evidence to support a recommendation against use.
Categories for quality of evidence on which recommendations are made	
GRADE	**DEFINITION**
I	Evidence from at least one properly randomized, controlled trial.
II	Evidence from at least one well-designed clinical trial without randomization, from cohort or case-controlled analytic studies, preferably from more than one centre, from multiple time series, or from dramatic results in uncontrolled experiments.
III	Evidence from opinions of respected authorities on the basis of clinical experience, descriptive studies, or reports of expert committees.

NOTE: When a recommendation is based on a regulation, no grading will apply.

Appendix B: Risk Assessment for Routine Practices



Appendix C: Sample Routine Cleaning of an Isolette

Nursing Staff

- Detach medical gas lines and other external equipment from the isolette
- Remove medical equipment from inside the isolette and disinfect or send for reprocessing

Environmental Services/ Housekeeping Staff

DO NOT USE PHENOLIC DISINFECTANTS

- Check for sharps inside isolette and items in the isolette.
- Remove all items from inside the isolette.
- Remove grommets and door rings; clean and disinfect for required contact time.
- Remove tape from glass with alcohol, then wash off.
- Clean and disinfect glass.
- Detach all removable parts from inside of isolette, clean and disinfect, allowing sufficient contact time with the disinfectant.
- Clean outside of isolette completely, including wheels.
- After appropriate disinfectant contact time, surfaces may be wiped with a clean cloth dampened with clean, fresh water to remove any residue from the disinfectant.
- Replace pieces of isolette.
- Cover isolette and indicate cleaning date.

Scheduled Cleaning

- Clean isolettes on a regular schedule, e.g., weekly, and when visibly soiled, and between newborns.
- Change filters every three months (or according to manufacturer's recommendations), when wet or if newborn was on Contact Precautions.
- Humidity trays are reprocessed in central processing department (CPS/ SPD) after use.

Adapted from PIDAC's *Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings*.[7]

Appendix D: Recommended Minimum Cleaning and Disinfection Level and Frequency for Nursery and NICU Equipment

* NOTE: It is important to follow the manufacturer's instructions regarding cleaning and disinfection of medical equipment.

* NOTE: Do not use phenolics for disinfection in nursery and NICU

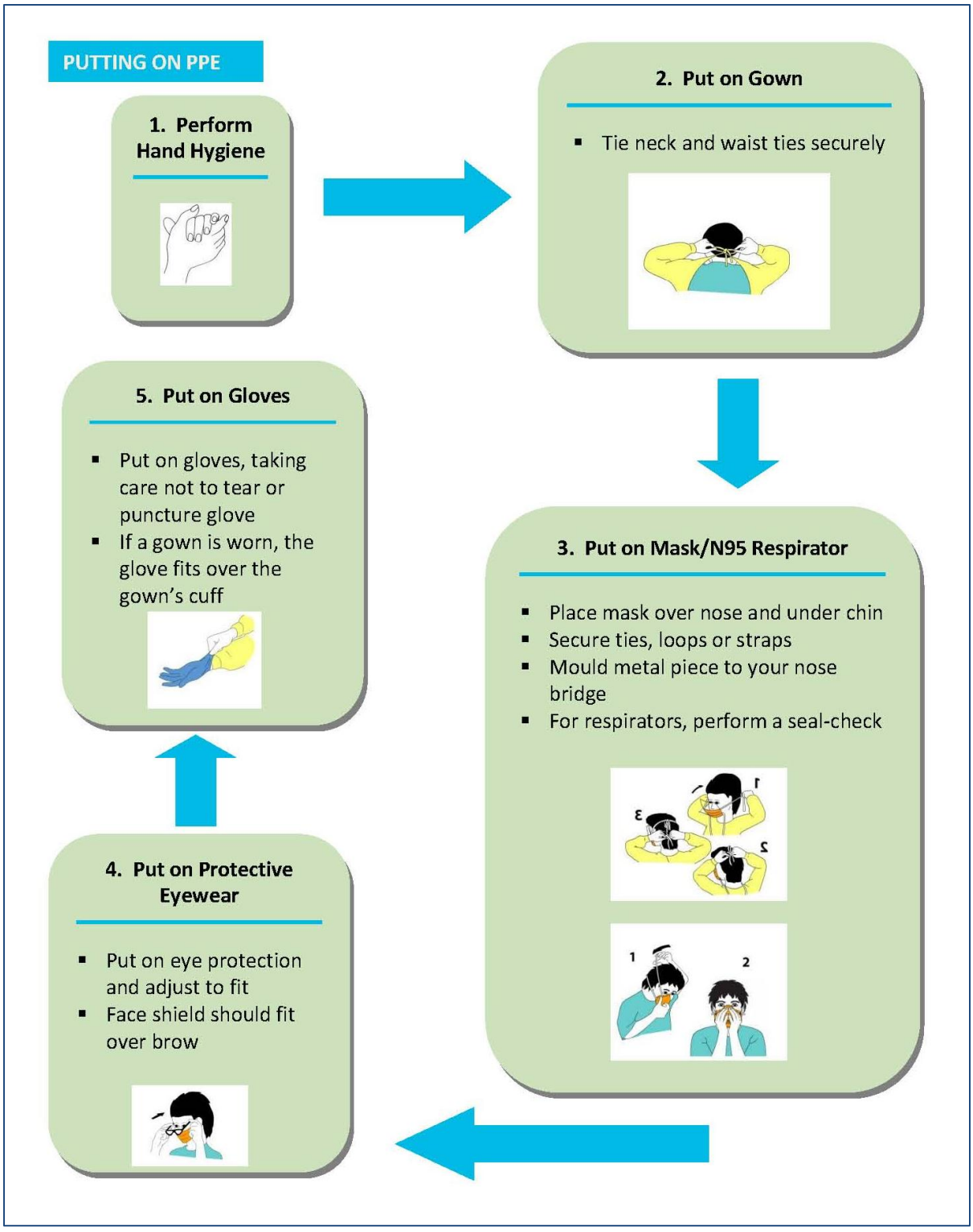
Item	Minimum Cleaning and Disinfection Level: CL = Clean only HLD = Clean + High-level Disinfection LLD = Clean + Low- level Disinfection	Minimum Frequency	Remarks
Apnoea Monitor		▪ between newborns ▪ when soiled	
Monitor/ Sensor Pad	LLD		
Basin			
Bath or Wash	LLD	▪ after each use	▪ dry completely before use
Bassinette	LLD	▪ weekly ▪ when soiled ▪ between newborns	
Blood Pressure Cuff	LLD	▪ between mothers/ newborns ▪ when soiled	▪ ideally stays with mother /newborn until discharge
Chart Cover			▪ charts and clipboards should not go into rooms on Additional Precautions
Binder and/ or clipboard	CL	▪ when soiled	▪ replace worn binders
Cord Clamp			▪ must be single-use, disposable and discarded after use
Diagnostic Imaging			
Portable - Machine	LLD	▪ between patients	
Portable - portable grid/ film cassette	LLD	▪ between patients	
Dopplers			
Transducers	LLD	▪ after each use	▪ wipe immediately after use to remove residual ultrasound gel before cleaning

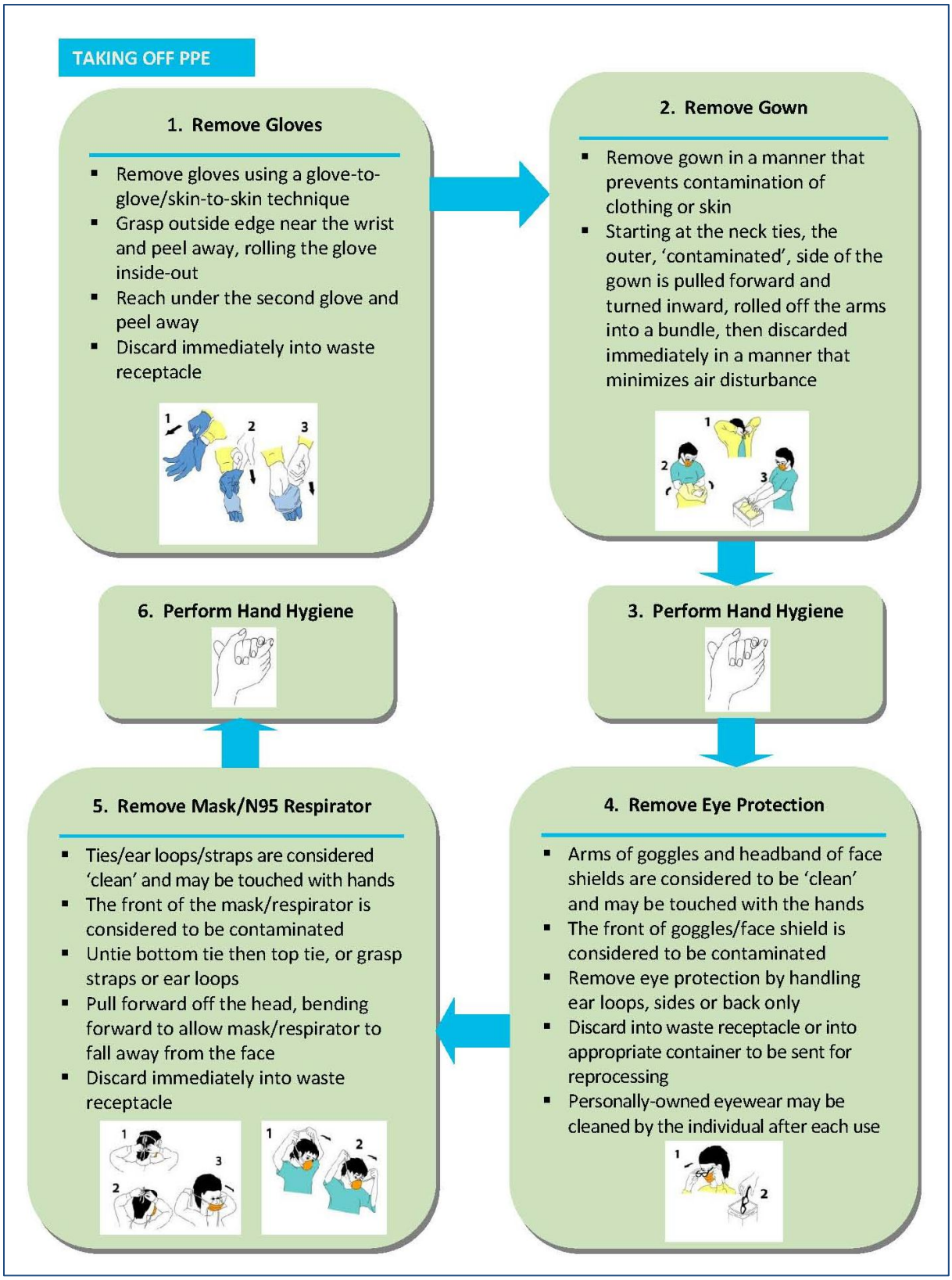
Item	Minimum Cleaning and Disinfection Level: CL = Clean only HLD = Clean + High-level Disinfection LLD = Clean + Low- level Disinfection	Minimum Frequency	Remarks
Dopplers, con't.			▪ probes that contact mucous membranes or non-intact skin require high-level disinfection
Probes	LLD	▪ after each use	
ECG			
Machine and Cables	LLD	▪ between patients	
Intravenous (IV) Pumps, Poles, Warmers	LLD	▪ between patients ▪ when soiled	
Isolette	LLD	▪ weekly ▪ when soiled	▪ see Appendix C
Laryngoscope			
Handle	LLD	▪ between patients	
Blade	HLD	▪ between patients	
Ophthalmoscope	LLD	▪ between patients	
Otoscope			
Handle	LLD	▪ between patients	
Ear speculum	Disposable or HLD	▪ between patients	
Otoacoustic Emission (OAE) screening tips	Disposable or HLD	▪ between patients	
Oximeter Probes	LLD	▪ between patients	▪ if single-use, discard after use
Reflex Hammer	LLD	▪ between patients	
Scales			
Diaper	LLD	▪ after each use	
Newborn	LLD	▪ after each use	
Stethoscope	LLD	▪ after each use	▪ preferably dedicate to single patient

Item	Minimum Cleaning and Disinfection Level: CL = Clean only HLD = Clean + High-level Disinfection LLD = Clean + Low- level Disinfection	Minimum Frequency	Remarks
Suction Machines	LLD	▪ between patients ▪ when soiled	
Telemetry Equipment Monitor and Cables	LLD	▪ between patients ▪ when soiled	
Ultrasound Transducers Handle and Cable External	 LLD LLD	▪ between patients	▪ use high-level disinfection for transducer probes if they touch mucous membranes or non-intact skin
Wall-mounted Oxygen and Suction Fixtures	LLD	▪ between patients ▪ when soiled	

Adapted from PIDAC's *Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings.*[7]

Appendix E: Putting On and Taking Off Personal Protective Equipment (PPE)





Source: PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings.*

Appendix F: Summary of Infectious Diseases in Perinatology

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Acquired Immune Deficiency Syndrome (AIDS) - See HIV infection					
Antibiotic Resistant Organisms (AROs) *Examples: MRSA, VRE, ESBL* Mother	Contact Precautions	Contact Precautions	Permitted	Permitted	***Notify Infection Prevention and Control***. ▪ Newborn to room with mother. ▪ If newborn needs to go to NICU, the newborn should be kept on Contact Precautions.
Newborn	Mother uses Routine Practices	Contact Precautions	Permitted	Permitted	
Campylobacter - see Diarrhea					
Candida Mother	Routine Practices	Routine Practices	Permitted	Permitted	
Newborn	Routine Practices	Routine Practices	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Chickenpox Mother ill – healthy term newborn	Airborne Precautions Only immune staff	Newborn room in with mother	Permitted	Permitted	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Provide Varicella zoster immune globulin (VarIg) to newborns where onset of maternal disease is ≤5 days prior to delivery or within 48 hours after delivery. ▪ Precautions remain in place until lesions are crusted. ▪ Exclude susceptible staff. ▪ Only parents and visitors who are immune may visit. ▪ Immunity is defined as a previous history of chickenpox or shingles, or having received chickenpox vaccine. ▪ Chickenpox vaccine is 70% - 90% effective in preventing chickenpox. Therefore, persons who have been vaccinated against chickenpox must be counselled that they may develop chickenpox. Recent recommendations are two doses for all eligible age groups. ▪ Refer to Section I.4.G for more information on chickenpox.
Mother ill – newborn in NICU	▪ Airborne precautions ▪ Only immune staff ▪ Mother may not go to NICU	▪ Routine Practices until day 8 ▪ Airborne Precautions from day 8 up to, and including, day 21 if VarIg not given, or up to and including day 28 if VarIg given ▪ Only immune staff	Not Permitted	Permitted as EBM	
Mother susceptible – contact of chickenpox	▪ Airborne Precautions from day 8 up to, and including, day 21 if VarIg not given, or up to and including day 28 if VarIg given ▪ Only immune staff	Routine Practices	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Chickenpox, con't. Newborn in NICU – chickenpox or contact of chickenpox	Only parents and visitors who are immune may visit	▪ Airborne Precautions ▪ Only immune staff	Permitted, if mother is immune	Permitted	
Chlamydia Mother	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE** ▪ Treat mother and her partner before discharge.
Newborn conjunctivitis and/or pneumonia	Routine Practices	Routine Practices	Permitted	Permitted	
Chorioamnionitis	Routine Practices	Routine Practices	Permitted	Permitted	
Cold Sore - see Herpes simplex					
Conjunctivitis Bacterial	Routine Practices	Routine Practices	Permitted	Permitted	▪ Emphasize hand hygiene. ▪ Check for Chlamydia, viral and bacterial pathogens. ▪ If in doubt as to aetiology, use Contact Precautions until aetiology defined.
Adenovirus Mother	▪ Contact Precautions ▪ No sharing of towels, face cloths, pillows etc.	Routine Practices	**Healthy Term Newborn:** ▪ Room in ▪ Extreme care with hand hygiene ▪ No sharing of towels, linens etc. **Newborn in NICU:** Mother **NOT** to go to NICU for 14 days after onset in 2nd eye	Permitted Permitted as EBM	
Newborn	Routine Practices	Contact Precautions		Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Cytomegalovirus					
Mother	Routine Practices	Routine Practices	Permitted	Permitted	
Newborn	Routine Practices	Routine Practices	Permitted	Permitted	
Diarrhea not yet diagnosed	Contact Precautions until *C.difficile* or viral gastroenteritis ruled out	Routine Practices	Permitted	Permitted	***Notify Infection Prevention and Control***
Diarrhea					**REPORTABLE DISEASE**
Mother - bacterial (including Salmonella, Shigella, Campylobacter, *E. coli O:157*, Yersinia)	▪ Routine Practices ▪ Single room with toilet	Routine Practices	**Healthy Term Newborn:** Permitted	Permitted	▪ Precautions in place until asymptomatic for 48 hours. ▪ Emphasize hand hygiene with mother as shedding may be prolonged.
			Newborn in NICU: Not permitted until asymptomatic for 48 hours	Permitted as EBM	
Mother - *C. difficile*	▪ Contact Precautions ▪ Single room with toilet	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE IF PART OF OUTBREAK** ***Notify Infection Prevention and Control*** ▪ Enhanced cleaning with sporicidal agents may be required for *C. difficile*. ▪ Note: *C. difficile* is normal flora in newborns. ▪ Emphasize hand hygiene with mother.
Mother - *viral (e.g. norovirus)*	▪ Contact Precautions ▪ Single room with toilet	Routine Practices	**Healthy Term Newborn:** Permitted	Permitted	
			Newborn in NICU: Mother is **not** permitted in NICU until asymptomatic for 48 hours	Permitted as EBM	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Diarrhea Newborn - bacterial (suspected or confirmed	Routine Practices	Contact Precautions	Permitted	Permitted	
Newborn - viral (e.g. norovirus, rotavirus)	Routine Practices	▪ Contact Precautions ▪ Ensure immediate disposal of diapers into leak proof bag	Permitted	Permitted	
Endometritis	Routine Practices	Routine Practices	Permitted	Permitted	▪ If infection is due to Group A Streptococcus, see *Streptococcal Disease - Group A.*
Enterovirus Mother	Routine Practices	Routine Practices	**Healthy Term Newborn:** Permitted	Permitted	▪ Emphasize hand hygiene with mother. ▪ Ensure immediate disposal of diapers into leak-proof bag.
			Newborn in NICU: Mother is **not** permitted in the NICU until asymptomatic	Permitted as EBM	
Newborn	Routine Practices	Contact Precautions	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Gonococcal Infections Mother	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE** ▪ If mother has gonococcal infection, notify the newborn's physician. ▪ Treat mother and her partner before discharge. ▪ Examine newborn for clinical and / or laboratory evidence of infection. If there is no evidence of infection, newborn will require antibiotic prophylaxis. Physician consult required.
Newborn - conjunctivitis, scalp abscess, sepsis	Routine Practices	Routine Practices	Permitted	Permitted	
Hand, Foot and Mouth Disease - see Enterovirus					
Hepatitis Mother - Hepatitis A	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE** ▪ Asymptomatic hepatitis A infection in newborns can occur. ▪ Excretion of virus in stool can be prolonged.
Mother - Hepatitis B (Hepatitis B surface antigen positive)	Routine Practices	Routine Practices	Permitted	Permitted if newborn receives HBIG and Hepatitis B vaccine	**REPORTABLE DISEASE** if new case ▪ Newborn must receive HBIG and first dose of Hep B vaccine within 12 hours of birth. Follow up for second and third dose of vaccine must be arranged. ▪ Refer to Section I.4.D for more information on Hepatitis B.
Mother - Hepatitis C	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE** if new case ▪ Immune serum globulin is of no benefit to prevent transmission. ▪ Transmission of Hepatitis C via breast milk has not been documented. ▪ Refer to Section I.4.E for more information on Hepatitis C.

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Herpes simplex – active disease Mother - genital – delivered by vaginal or Caesarean delivery	Routine Practices	See *Newborn – Asymptomatic*	Permitted	Permitted	▪ If mother has genital herpes, notify the newborn's physician. ▪ Refer to Section I.4.C for more information on Herpes simplex.
Mother - oral or mucocutaneous (i.e., cold sore)	Routine Practices	Routine Practices	▪ Permitted ▪ Rooming-in preferred	Permitted if there are no herpetic lesions on the breast	▪ Instruct the mother on hand hygiene, to wear a mask or cover lesion when around her newborn, not kiss newborn while lesion is present and to avoid touching affected area. ▪ Refer to Section I.4.C for more information on Herpes simplex.
Mother - Whitlow	Routine Practices	Routine Practices	Observe strict hand hygiene and wear gloves for direct contact with newborn	Permitted if strict hand hygiene observed and gloves are worn	
Newborn - asymptomatic (possibly exposed during delivery)	Routine Practices	Contact Precautions: For duration of incubation period (up to 6 weeks)	Permitted	Permitted	
Newborn - symptomatic	Routine Practices	Contact Precautions	Permitted	Permitted	**REPORTABLE DISEASE**

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Herpes zoster (*shingles*) Mother – localized	▪ Routine Practices ▪ Single room recommended ▪ Immune staff only	Routine Practices	Permitted Rooming-in preferred. If lesions are contained or fully crusted, mother may go to nursery / NICU	Permitted if lesions are not on breast	***Notify Infection Prevention and Control if disseminated*** ▪ Care must be provided by immune staff only. ▪ Only immune visitors/ siblings to visit. ▪ Precautions remain in place until lesions are crusted. ▪ VarIg is not generally indicated for newborns born after 28 weeks gestation if the mother has zoster. ▪ If newborn is <28 weeks, VarIg should be given. ▪ No special precautions are needed for the newborn as the newborn has passive immunity to virus by maternal transfer of antibodies (only applies if newborn is >28 weeks gestation). ▪ For more information for health care providers, refer to Communicable Disease Surveillance Protocols, available at: http://www.oha.com/Services/HealthSafety/Documents/Protocols/Varicella%20Protocol%20-%20Reviewed%20and%20Revised%20November%202010.pdf
Mother – disseminated	▪ Airborne precautions ▪ Immune staff only	**Term Newborn Rooming-in:** Routine Practices **Newborn in NICU:** ▪ Airborne Precautions from day 8 from first exposure to day 21 of last exposure (or day 28 if newborn has been given VarIg) ▪ Immune staff only	Permitted Rooming-in preferred. Mother may not go to nursery or NICU until lesions are crusted	▪ Permitted if lesions are not on breast ▪ If newborn in NICU, permitted as EBM	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
HIV Infection	Routine Practices	Routine Practices	Permitted	No	**REPORTABLE DISEASE** if new case ▪ If mother has HIV infection, notify newborn's physician. ▪ Assess each mother for possibility of other infections. ▪ Refer to Refer to Section I.4.F for more information on HIV.
Human T-Cell Lymphotrophic Virus I/II (HTLV I/II)	Routine Practices	Routine Practices	Permitted	No	
Influenza Mother	Droplet/ Contact Precautions	Routine Practices	**Healthy Term Newborn:** Permitted. Mother must wear a surgical mask within 2 metres of newborn. Emphasize hand hygiene	Permitted	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Consider acute respiratory infection (ARI) to be influenza during influenza season. ▪ Pregnant women and newborns are at high risk for complications of influenza. ▪ Women who are or will be pregnant or who will deliver during influenza season are a priority group for receiving inactivated influenza vaccine. ▪ Provide education to mothers in risks of contact with their newborn and instruction in ways to reduce transmission (e.g., hand hygiene, respiratory etiquette, wearing a mask).
			Newborn in NICU: Mother is not permitted to go to NICU	Permitted as EBM	
Newborn	Routine Practices	Droplet/ Contact Precautions	Permitted	Permitted	▪ During outbreak situations, additional precautions and cohorting of newborns may be required.

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Lice *(Pediculosis-* *Head Lice)*	▪ Routine Practices	Routine Practices	**Healthy Term Newborn:** Permitted	Permitted	▪ Combs and hairbrushes can be washed with pediculicide shampoo or soaked in hot water. ▪ Temperatures greater than 53.5°C for 5 minutes are lethal for lice and eggs. ▪ Launder bedding in hot water and dry in a hot dryer. After treatment, provide mother with fresh bedding. ▪ Gloves should be worn for contact with affected areas until treatment with pediculicide is completed.
			Newborn in NICU: Permitted once mother has been appropriately treated	Permitted as EBM until mother has been appropriately treated	
Listeria					**REPORTABLE DISEASE**
Mother	Routine Practices	Routine Practices	Permitted	Permitted	
Newborn	Routine Practices	Routine Practices	Permitted	Permitted	
Mastitis - see *Staphylococcus aureus*					
Measles (Rubeola)					**REPORTABLE DISEASE - *Notify Infection Prevention and Control***
Mother ill – term healthy newborn	▪ Airborne Precautions ▪ Immune staff only ▪ Only immune family and visitors permitted	Routine Practices	Room in with mother	▪ Permitted if rooming in with mother ▪ May provide EBM if not rooming in	▪ Newborn should receive immune globulin as soon as possible. ▪ Immunity to measles should be a condition of employment for health care staff. *Families & Visitors: Immunity is defined as a previous history of measles or having received measles vaccine or born before 1970.*

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Measles, con't. Mother ill – newborn in NICU	▪ Airborne Precautions ▪ Immune staff only ▪ Only immune family and visitors permitted	▪ Airborne Precautions from 7 days from first exposure to 21 days from last exposure ▪ Immune staff only ▪ Only immune family and visitors permitted	Mother **not** permitted in NICU until 4 days after the appearance of the rash, or if immuno-compromised for duration of illness	Permitted as EBM only until 4 days after the appearance of the rash, or if immuno-compromised for duration of illness	
Newborn - ill or exposed	Routine Practices	▪ Airborne Precautions ▪ Immune staff only ▪ Only immune family and visitors permitted	**Mother immune**: permitted to see newborn	Permitted	
			Mother susceptible: not permitted to see newborn until immunized	Permitted as EBM for duration of illness	
Multi-resistant Organisms - See "Antibiotic Resistant Organisms (ARO)"					
Mumps Mother	▪ Droplet Precautions ▪ Immune staff only ▪ Only immune family and visitors permitted	Routine Practices	**Term Newborn:** Permitted	**Term Newborn:** Permitted	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Non-immune persons are to stay out of the room. ▪ Precautions are to remain in place until 5 days after the onset of parotid swelling. ▪ Families & Visitors: Immunity is defined as a previous history mumps or having received mumps vaccine.
			Newborn in NICU: Mother is not to go in the NICU until 5 days after onset of parotid swelling	**Newborn in NICU:** EBM until 5 days after onset of parotid swelling	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Mumps, con't. Newborn in NICU - exposed or ill	Routine Practices	▪ Start Droplet Precautions from 10 days from first exposure to 26 days from last exposure ▪ Only immune staff, family and visitors permitted	**Mother immune**: Permitted	Permitted	
			Mother susceptible: permitted if mother uses Droplet Precautions Susceptible mother should be vaccinated	Permitted as EBM	
Pertussis Mother	Droplet Precautions until 5 days of appropriate antimicrobial therapy has been completed	Routine Practices	**Healthy Term Newborn:** Not permitted until five days of effective therapy or newborn on chemoprophylaxis	Permitted if newborn on chemo-prophylaxis or as EBM if not on prophylaxis	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ No staff, family members or visitors are to enter hospital with an acute respiratory infection. ▪ Prompt use of chemoprophylaxis in household contacts is effective in limiting secondary transmission. ▪ Consider chemoprophylaxis for mothers of newborns with pertussis. ▪ Persons who have been in contact with an infected individual should be monitored for 21 days after last contact with the infected individual. ▪ All mothers who have not previously received a dose of acellular pertussis vaccine should be offered a dose postpartum to protect the mother and her infant.
			Newborn in NICU: Not permitted in NICU until 5 days of effective therapy has been completed	Permitted as EBM	
Newborn	Routine Practices	Droplet Precautions until completion of 5 days of effective antimicrobial therapy	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Respiratory Viral Infections (other than influenza) Mother ill	Droplet/ Contact Precautions	Routine Practices	**Healthy Term Newborn:** Permitted Reinforce hand hygiene and wear a surgical mask when within 2 metres of newborn	**Newborn rooming-in:** Permitted	▪ No staff, family members or visitors are to enter hospital with an acute respiratory infection.
			Newborn in NICU: Not permitted in NICU until recovered	**Newborn in NICU:** Permitted as EBM	
Newborn ill	Routine Practices	Droplet/ Contact Precautions	Permitted	Permitted	**REPORTABLE DISEASE** if respiratory outbreak in a hospital – ***Notify Infection Prevention and Control*** ▪ During outbreak situations, additional precautions and cohorting of newborns may be required.

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Rubella Mother	▪ Droplet Precautions ▪ Single room ▪ Immune non-pregnant staff only	▪ Droplet/ Contact Precautions ▪ Assume newborn is congenitally infected ▪ Immune non-pregnant staff only	**Healthy Term Newborn:** Permitted **Newborn in NICU:** Mother cannot go into the NICU until 7 days after the onset of the rash	**Healthy Term Newborn**: Permitted **Newborn in NICU:** Permitted as EBM	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Additional Precautions remain in place for mother until 7 days after the onset of the rash. ▪ Immunity to Rubella should be a condition of employment for healthcare staff. ▪ No susceptible persons to enter room. ▪ Pregnant staff, in first or second trimester, are not to provide care regardless of immune status. ▪ Families & Visitors: Immunity is defined as having received rubella vaccine or laboratory evidence of immunity.
Newborn - congenital	Routine Practices	▪ Droplet/ Contact Precautions ▪ Immune non-pregnant staff only	Permitted	Permitted	▪ Congenitally infected newborns may shed virus for up to 2 years.
Scabies	Contact Precautions until after mother has been appropriately treated	Routine Practices	**Healthy Term Newborn:** Permitted once mother has been appropriately treated **Newborn in NICU:** Permitted once mother has been appropriately treated	Permitted once mother has been appropriately treated or may provide EBM	▪ Bedding and clothing worn next to the skin during the 4 days before treatment must be laundered using hot water and dried in a hot dryer. ▪ After treatment, provide mother with fresh clean clothes and bedding.

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Staphylococcus aureus – see Antibiotic Resistant Organisms (AROs) for methicillin-resistant *Staphylococcus aureus* (MRSA)					
Staphylococcus aureus Mother - mastitis	Routine Practices	Routine Practices	Permitted	Permitted	▪ For premature newborns it may be prudent to withhold milk from the breast with mastitis.
Mother - breast abscess	Routine Practices	Routine Practices	Permitted	**Healthy Term Newborn:** Permitted **Newborn in NICU:** Permitted on the unaffected breast	
Mother - minor wound infection (contained) or toxic shock syndrome	Contact Precautions until 24 hours of effective therapy	Routine Practices	Permitted if drainage is adequately contained	Permitted	***Notify Infection Prevention and Control*** ▪ Change dressing and mother's gown, and have mother perform hand hygiene prior to contact with newborn.
Mother - major wound (not contained)	Contact Precautions	Routine Practices	Permitted if drainage can be adequately contained (see Comments)	Permitted	
Newborn - pneumonia	Routine Practices	Routine Practices	Permitted	Permitted	▪ During outbreak situations, Additional Precautions and cohorting of newborns may be required.

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Staphylococcus aureus, con't. Newborn - skin lesions (localized)	Routine Practices	Routine Practices	Permitted	Permitted	
Newborn - major wound (not contained) or 'scalded skin'	Routine Practices	Contact Precautions	Permitted	Permitted	
***Staphylococcus epidermidis* and other coagulase-negative staphylococcal infections**	Routine Practices	Routine Practices	Permitted	Permitted	
Streptococcal Disease **Group A (GAS)** Mother - minor wound infection (contained)	Single room until 24 hours after effective therapy	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE *if invasive GAS; notify newborn's physician and Infection Control*** ▪ It may be advisable to withhold milk from breast with mastitis until 24 hours of effective therapy. ▪ Two or more cases of postpartum GAS infection should be promptly investigated for source (e.g., health care worker, family, patient-to-patient).
Mother - major wound infection or Endometritis	Single room until 24 hours after effective therapy	Routine Practices	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Streptococcal Disease **Group A (GAS), con't.** Mother - invasive disease	Droplet Precautions until 24 hours of effective therapy	Routine Practices	Permitted after 24 hours of effective therapy	Permitted after 24 hours of effective therapy	▪ Chemoprophylaxis should only be offered to close contacts of a confirmed case of invasive GAS if the close contacts, including the newborn, have been exposed to the case during the period from 7 days prior to onset of symptoms in the case to 24 hours after the case's initiation of antimicrobial therapy. ▪ Chemoprophylaxis should be administered as soon as possible – preferably within 24 hours of case identification but is still recommended for up to 7 days after the last contact with an infectious case. ▪ Close contacts of all confirmed cases of invasive GAS regardless of severity, should be alerted to signs and symptoms of invasive GAS disease and be advised to seek medical attention immediately should they develop febrile illness or any other clinical manifestations of GAS infection within 30 days of diagnosis in the index case.
Mother - pharyngitis (strep throat)	Droplet Precautions until 24 hours of effective therapy	Routine Practices	Permitted after 24 hours of effective therapy OR mask and hand hygiene	Permitted after 24 hours of effective therapy OR Mask and hand hygiene	
Newborn	Routine Practices	Contact Precautions until 24 hours of effective therapy	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Streptococcal Disease **Group B** Mother	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE *in newborn if invasive*** ▪ If invasive GBS in the mother, notify the newborn's physician. ▪ Refer to Section I.4.B for more information on Group B streptococcal disease.
Newborn	Routine Practices	Routine Practices	Permitted	Permitted	
Syphilis Mother - mucocutaneous	Routine Practices	Routine Practices	Permitted after 24 hours of effective therapy	Permitted after 24 hours of effective therapy	**REPORTABLE DISEASE** ▪ If mother has syphilis, notify the newborn's physician. ▪ Direct contact with lesions is highly contagious; wear gloves for contact with skin lesions until 24 hours of effective therapy.
Newborn - congenital		Routine Practices + gloves for contact with newborn until 24 hours of effective therapy	Permitted	Permitted	
Toxic Shock Syndrome - see *Staphylococcus aureus*					
Toxoplasmosis Mother	Routine Practices	Routine Practices	Permitted	Permitted	
Newborn	Routine Practices	Routine Practices	Permitted	Permitted	

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Tuberculosis					
Mother - positive tuberculin skin test – asymptomatic	Routine Practices	Routine Practices	Permitted	Permitted	
Mother – active pulmonary or laryngeal	Airborne Precautions	Routine Practices	Not permitted until mother is no longer infectious	Mother may provide EBM	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Wear an N95 respirator for all entries to the room. ▪ Continue Airborne Precautions until the mother is no longer considered infectious. ▪ Discharge of newborn: If a newborn is going home to a household where there is a potential for exposure to TB, the discharge should be delayed until consultation with public health has been done to ensure the household will not present a risk to the newborn.
Mother - pulmonary or laryngeal on effective treatment and no longer infectious	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ No longer infectious: 2 weeks of effective treatment AND 3 AFB (acid fast bacilli) smear-negative sputum specimens AND clinical improvement.
Mother - extrapulmonary	Routine Practices	Routine Practices	Permitted	▪ Permitted ▪ Not permitted if breast abscess due to TB, until successfully treated	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Newborns of mothers with endometrial tuberculosis should be assumed to be infected, assessed and managed on Airborne Precautions until infection is ruled out.

Infection/ Organism	Precautions for Mother	Precautions for Newborn	Mother/Newborn Contact	Breast Feeding	Comments
Abbreviations:	**EBM = Expressed Breast Milk**		**NICU = Neonatal Intensive Care Unit**		
Tuberculosis, con't. Newborn - maternal source	Airborne Precautions until non-infectious	Airborne Precautions	Permitted	Permitted	**REPORTABLE DISEASE - *Notify Infection Prevention and Control*** ▪ Wear an N95 respirator for all entries to the room.
Urinary Tract Infection	Routine Practices	Routine Practices	Permitted	Permitted	
Varicella - see Chickenpox					
Varicella-Zoster (Shingles), Localized - see Herpes Zoster (Shingles)					
West Nile Virus	Routine Practices	Routine Practices	Permitted	Permitted	**REPORTABLE DISEASE**
Wound Infections - see Streptococcal Disease, *Staphylococcus aureus*					

Appendix G: Search Strategy for Best Practices for Infection Prevention and Control in Perinatology

SEARCH RESULTS: Safe Collection, Storage, Handling and Administration of Breast Milk

Search Strategy:

MEDLINE Search Strategy:

((collect$ or handl$ or stor$ or administer$ or manag$ or transport$ OR transfer$ or preserv$ or infect$ or contaminat$ or disinfect$ or hygien$ or sterili$ or sanit$ or freez$ or froz$ or cool$ or cold or hot or heat$ or boil$ or warm$ or rewarm$ or re-warm$ or temperature or cryoperserv$ or refrigerat$ or safe$ or prepare$ or cytomegalovir$ or strep$ or bacteri$ OR disease$ OR pasteuri$ OR express$ OR pump$ OR equipment$ OR practice$ OR guideline$ OR policy OR policies OR process$ OR prepar$) AND ((breast adj1 milk) or (human adj1 milk) or breastmilk))).mp.

Limits: In-Process & Other Non-Indexed Citations, Published 2006-2011

OR

(((donor OR donat$ OR share$ OR bank$) adj3 ((breast adj1 milk) or (human adj1 milk) or breastmilk))).mp.

Limits: In-Process & Other Non-Indexed Citations, Published 2006-2011

OR

(*Milk, Human/ OR *Breast Feeding/ OR *Bottle Feeding/ OR *Enteral Nutrition/ OR *Milk Ejection/) AND (Milk Banks/ or exp Disease Outbreaks/ pc or exp Cytomegalovirus Infections/ pc or exp Infant, Premature, Diseases/ pc or exp Infant, Newborn, Diseases/ pc or exp Infectious Disease Transmission, Vertical/ pc or exp Bacterial Infections/ pc or Infection Control/ or Disinfection/ or Equipment Contamination/ or Sterilization/ or Specimen Handling/ or Hygiene/ or Communicable Disease Control/ or Food Contamination/ or Food Handling/ or Food Preservation/ or Cryopreservation/ or Refrigeration/ or Freezing/ or Cold Temperature/ or Hot Temperature/ or Preservation, Biological/ or Intensive Care Units, Neonatal/ or Intensive Care, Neonatal/ or Quality Control/ or Cross Infection/ or Disinfectants/ or Specimen Handling/ or Colony Count, Microbial/ or Food Microbiology/ or Medical Errors/ or Bacteria/)

Limits: Published 2006-2011

CINAHL Search Strategy:

MH (("Milk, Human" or "Breast Feeding" or "Bottle Feeding" or "Enteral Nutrition" or "Milk Banks" or "Milk Expression" or "Breast Pumps") AND ("Cross Infection" OR "Cytomegaloviruses/TM" or "Staphylococcal Infections/PC/TM" or "HIV Infections/PC/TM" or "Herpesvirus Infections/PC/TM" or "Enterocolitis, Necrotizing/PC/TM" or "Hepatitis/PC/TM" or "Disease Outbreaks/PC" or "Infant, Premature, Diseases/PC/TM" or "Infant, Newborn, Diseases/PC/TM" or "Disease Transmission, Vertical/ PC" or "Bacterial infections/PC/TM" or "Communicable Diseases/PC/TR" or "Infection/PC/TR" or "Infection Control" or Hygiene or "Quality Improvement" or "Treatment Errors" or "Health Care Errors" or "Adverse Health Care Event" or "Patient Safety" or "Quality of Health Care" or "Food Microbiology" or "Food Contamination" or "Bacterial Contamination" or "Pasteurization" or "Sterilization and Disinfection" or "Equipment Contamination" or "Specimen Handling" or

"Food Handling" or "Food Preservation" or "Preservation, Biological" or Cryopreservation or Refrigeration or Freezing or Cold or Heat))

Limits: Published 2006-2011

OR

MH (("Infant Nutrition" or "Hospitals, Pediatric" or "Infant, Hospitalized" or "Infant, Low Birth Weight+" or "Infant, Newborn" or "Infant, High Risk" or "Intensive Care Units, Neonatal" or "Neonatal Nursing" or "Pediatric Critical Care Nursing" or "Premature") AND ("Food Microbiology" or "Food Contamination" or "Pasteurization" or "Food Handling" or "Food Preservation"))

Limits: Published 2006-2011

SEARCH RESULTS: Safe Preparation, Storage, Handling and Administration of Infant Formula

Databases: MEDLINE, CINAHL (+ Web Search for Grey Literature)

Search Strategy: ((Infant Food[majr] OR Infant Formula[mh] OR Bottle Feeding[majr] OR Enteral Nutrition) AND (Food Contamination[mh] OR Food Handling[mh:noexp] OR Hygiene[mh:noexp] OR Sterilization[mh:noexp] OR Disinfection[mh:noexp] OR Preservation, Biological[mh] OR Freezing[mh:noexp] OR Cold Temperature[mh:noexp] OR Hot Temperature[mh:noexp] OR Salmonella Infections[mh:noexp] OR Salmonella Food Poisoning[mh:noexp] OR Enterobacter sakazakii[mh:noexp] OR Intensive Care Units, Neonatal[mh:noexp] OR Intensive Care, Neonatal[mh:noexp] OR Infection Control[mh:noexp] OR Communicable Disease Control[mh:noexp] OR Disease Outbreaks/ pc[mh:noexp])) OR (Infant[tiab] AND Formula[tiab] AND (Prepar*[tiab] OR Stor*[tiab] OR Handl* OR Transport*[tiab] OR Reheat*[tiab] OR Re-warm[tiab] OR Freez*[tiab] OR Froze*[tiab] OR Steril*[tiab] OR Safe*[tiab] OR Refrigerat*[tiab] OR Hygien*[tiab] OR Infect[tiab] OR Infection*[tiab] OR Boil*[tiab] OR Salmonella[tiab] OR Sakazakii[tiab] OR Contaminat*[tiab] OR Bacteria[tiab] OR Disinfect*[tiab] OR Temperature[tiab] OR Hot[tiab] OR Heat[tiab] OR Cool[tiab] OR Cold[tiab]) NOT Medline[sb]) AND ("2006/01/01"[PDat] : "2011/02/01"[PDat])

SEARCH RESULTS: Hepatitis B & C in Perinatology, Pregnancy, Newborns and Neonates

Search Strategy:

("Hepatitis B virus"[MeSH] OR "Hepatitis B"[MeSH] OR "Hepatitis B Surface Antigens"[Mesh] OR "Hepatitis C"[MeSH] OR "Hepacivirus"[Mesh]) AND ("infant, newborn"[MeSH Terms] OR "pregnancy"[MeSH Terms] OR "perinatology"[MeSH Terms] OR "intensive care, neonatal"[MeSH Terms] OR "intensive care units, neonatal"[MeSH Terms] OR "neonatal nursing"[MeSH Terms] OR "milk, human"[MeSH Terms] OR "breast feeding"[MeSH Terms] OR "Infant, Newborn, Diseases"[Mesh] OR "Infectious Disease Transmission, Vertical"[Mesh] OR "Pregnancy Complications, Infectious"[Mesh] OR "Premature Birth"[Mesh] OR "Prenatal Care"[Mesh] OR "Nurseries, Hospital"[MeSH Terms] OR "Hospitals, Maternity") AND (English[lang] AND "2006/03/03"[PDat] : "2011/03/01"[PDat])

SEARCH RESULTS: Group B Strep in Pregnancy / Neonates

Search Strategy:

(("streptococcal infections"[MeSH Major Topic] OR "streptococcus agalactiae"[MeSH Major Topic]) AND ("infant, newborn"[MeSH Terms] OR "pregnancy"[MeSH Terms] OR "perinatology"[MeSH Terms] OR "intensive care, neonatal"[MeSH Terms] OR "intensive care units, neonatal"[MeSH Terms] OR "neonatal nursing"[MeSH Terms] OR "milk, human"[MeSH Terms] OR "breast feeding"[MeSH Terms] OR "Infant, Newborn, Diseases"[Mesh] OR "Infectious Disease Transmission, Vertical"[Mesh] OR "Pregnancy Complications, Infectious"[Mesh] OR "Premature Birth"[Mesh] OR "Prenatal Care"[Mesh]) AND ("group b"[tiab] OR GBS[tiab])) AND (English[lang] AND "2006/02/20"[PDat] : "2011/02/18"[PDat])

SEARCH RESULTS: Herpes Simplex in Perinatology, Pregnancy, Newborns and Neonates

Search Strategy:

MEDLINE:

("herpes simplex"[mesh] AND ("infant, newborn"[mesh terms] OR "pregnancy"[mesh terms] OR "perinatology"[mesh terms] OR "intensive care, neonatal"[mesh terms] OR "intensive care units, neonatal"[mesh terms] OR "neonatal nursing"[mesh terms] OR "milk, human"[mesh terms] OR "breast feeding"[mesh terms] OR "infant, newborn, diseases"[mesh] OR "infectious disease transmission, vertical"[mesh] OR "pregnancy complications, infectious"[mesh] OR "premature birth"[mesh] OR "prenatal care"[mesh] OR "nurseries, hospital"[mesh terms] OR "hospitals, maternity") AND (english[lang] AND "2006"[pdat] : "2011"[pdat])) OR ((herpes[tiab] AND (infant[tiab] OR neonat*[tiab] OR pregnan*[tiab] OR perinat*[tiab] OR newborn*[tiab]) AND (english[lang] AND "2006"[pdat] : "2011"[pdat])) not medline[sb])

CINAHL:

(MH "Herpes Simplex+") AND ((MH "Pregnancy") OR (MH "Perinatology") OR (MH "Intensive Care, Neonatal") OR (MH "Intensive Care Units, Neonatal") OR (MH "Neonatal Intensive Care Nursing") OR (MH "Neonatal Nursing") OR (MH "Milk, Human") OR (MH "Breast Feeding") OR (MH "Disease Transmission, Vertical") OR (MH "Pregnancy Complications, Infectious") OR (MH "Prenatal Care") OR (MH "Prenatal Diagnosis") OR (MH "Childbirth, Premature") OR (MH "Nurseries, Hospital") OR (MH "Hospitals, Pediatric") OR (MH "Infant, Hospitalized") OR (MH "Infant, Low Birth Weight+") OR (MH "Infant, Newborn") OR (MH "Infant, Premature") OR (MH "Infant, High Risk") OR (MH "Infant, Premature, Diseases"))

SEARCH RESULTS: Varicella in Perinatology, Pregnancy, Newborns and Neonates

Search Strategy:

MEDLINE:
("Chickenpox"[Mesh] OR "Herpesvirus 3, Human"[Mesh]) AND ("infant, newborn"[MeSH Terms] OR "pregnancy"[MeSH Terms] OR "perinatology"[MeSH Terms] OR "intensive care, neonatal"[MeSH Terms] OR "intensive care units, neonatal"[MeSH Terms] OR "neonatal nursing"[MeSH Terms] OR "milk, human"[MeSH Terms] OR "breast feeding"[MeSH Terms] OR "Infant, Newborn, Diseases"[Mesh] OR "Infectious Disease

Transmission, Vertical"[Mesh] OR "Pregnancy Complications, Infectious"[Mesh] OR "Premature Birth"[Mesh] OR "Prenatal Care"[Mesh] OR "Nurseries, Hospital"[MeSH Terms] OR "Hospitals, Maternity"[Mesh] OR "Maternal-Fetal Exchange"[Mesh] OR "Immunity, Maternally-acquired"[Mesh]) AND (English[lang] AND "2006/03/03"[PDat] : "2011/03/01"[PDat])

CINAHL:
(MH "Chickenpox" OR "Herpes Zoster" OR "Herpesviruses") AND (MH "Pregnancy" OR "Perinatology" OR "Intensive Care, Neonatal" OR "Intensive Care Units, Neonatal" OR "Neonatal Intensive Care Nursing" OR "Neonatal Nursing" OR "Milk, Human" OR "Breast Feeding" OR "Disease Transmission, Vertical" OR "Pregnancy Complications, Infectious" OR "Prenatal Care" OR "Prenatal Diagnosis" OR "Childbirth, Premature" OR "Nurseries, Hospital" OR "Hospitals, Pediatric" OR "Infant, Hospitalized" OR "Infant, Low Birth Weight+" OR "Infant, Newborn" OR "Infant, Premature" OR "Infant, High Risk" OR "Infant, Premature, Diseases" OR "Maternal-Fetal Exchange" OR "Immunity, Maternally Acquired")

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