

Levels of neonatal care



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OBJECTIVE

The objective of the present guideline is to establish a common classification system for neonatal-perinatal care facilities that can be used in all provinces and territories in Canada.

BACKGROUND

Canada has a highly regionalized neonatal-perinatal care system (1). In each region, hospitals are divided into three levels of care, and patients are referred to the facility with the appropriate level of care, depending on their condition: level 1 (normal newborn care), level 2 (high-dependency care) and level 3 (intensive care). However, because health care delivery is the responsibility of the provincial and territorial governments, the definitions for levels of care vary across jurisdictions. This has resulted in difficulties in the interpretation of resources and services available, access to care and costs of care.

CONCEPT OF REGIONALIZATION

In 1970, a Canadian neonatologist, Paul Swyer (2), first advocated regionalization of neonatal-perinatal care after observing that the neonatal mortality rate was higher in small hospitals delivering small numbers of infants than in larger hospitals with neonatal referral units and suggested that hospitals should be classified into three levels within each region: regional neonatal-perinatal centres (level 3) associated with university centres provide care for high-risk pregnancies and intensive care for severely ill infants; district hospitals (level 2) provide care for low-risk pregnancies and infants with less complicated neonatal problems; and community hospitals (level 1) provide care for normal births and healthy newborn infants. Level 1 and 2 hospitals were required to have the ability to resuscitate and stabilize ill newborn infants for transfer to an appropriate higher level facility using an integrated transport system. This system was implemented in Canada, which now has a regionalized system of perinatal care.

Following Swyer's proposal, in 1976, the March of Dimes Committee on Perinatal Health in the United States issued a report that proposed three levels of increasing complexity of maternal and neonatal care within an integrated regional system (3). In 1997, the Committee expanded on these definitions and issued the Guidelines for Perinatal Care (4). The three levels of care were designated as basic, specialty

and subspecialty. Level 1 (basic) units provide care for normal newborn infants but must have the personnel and equipment to perform neonatal resuscitation, evaluate healthy newborns and provide postnatal care, and stabilize newborn infants until transfer to an appropriate higher level facility. Level 2 (specialty) units can provide care to moderately ill infants with problems that are expected to resolve rapidly or who are convalescing after intensive care treatment. Level 3 (subspecialty) units provide comprehensive care for all critically ill newborn infants, including those who require surgical intervention.

VARIATION IN CLASSIFICATION SYSTEMS AMONG CANADIAN PROVINCES

Facilities are designated by the highest level of care provided. In 2002, Lee et al (5) reported significant variation in the classification of neonatal units among different jurisdictions in Canada. Neonatal units that provided similar services were classified as level 2 in some provinces and level 3 in others. Several provinces have also developed subclassifications within each level of care that further complicate interpretation of what the levels mean. In addition, some hospitals provide services of a higher level for which they have not been officially approved or funded. Consequently, their designated level of care may differ from the actual level of service provided. This has led to confusion about the relative capabilities and access to neonatal services among the provinces, and complicated decisions concerning planning and patient care (eg, appropriateness of patient transfer).

IMPORTANCE OF THE CLASSIFICATION SYSTEM

Standardization of the system of classification of neonatal units in Canada is important for several reasons. First, it permits articulation and examination of standards that must be met for provision of specified levels of care. Second, it facilitates orderly transfer of patients from one facility to another through common understanding of their relative capabilities and expectations. Third, it streamlines planning and allocation of resources, and facilitates examination of comparative regional resource use and outcomes. Finally, it can be used to ensure that appropriate funding is available for neonatal care facilities. Some studies (6-9), including

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one from Canada (6), have shown that centres designated at a higher level have lower mortality and morbidity rates for infants with comparable degrees of illness, showing that provision of care at the appropriate level through regionalization of care continues to be important.

PROPOSED CLASSIFICATION OF NEONATAL LEVELS OF CARE

Because newborn infants may be born with depressed respiration or circulatory impairment without warning, and unexpected deterioration of an initially healthy newborn may be rapid and catastrophic, all health care facilities providing care for newborn infants must be able to resuscitate and stabilize such infants until transfer to another appropriate facility, including the initiation of intravenous access and assisted respiration. Readiness to intervene for such infants must take into account the geographical location and the duration of time before assistance and transfer is likely. Some units providing lower levels of care must be capable of supporting infants for several hours while awaiting assistance.

Level 1: Basic neonatal care (normal newborn nursery)

Level 1a

- Evaluation and postnatal care of healthy newborn infants; and
- Phototherapy.

Level 1b

- Care for infants with corrected gestational age greater than 34 weeks or weight greater than 1800 g who have mild illness expected to resolve quickly or who are convalescing after intensive care;
- Ability to initiate and maintain intravenous access and medications;
- Gavage feeding; and
- Nasal oxygen with oxygen saturation monitoring (eg, for infants with chronic lung disease needing long-term oxygen and monitoring).

Level 2: High-dependency neonatal care (special care newborn nursery)

Level 2a

- Care of infants with a corrected gestational age of 32 weeks or greater or a weight of 1500 g or greater who are moderately ill with problems expected to resolve quickly or who are convalescing after intensive care;
- Peripheral intravenous infusions and possibly parenteral nutrition for a limited duration;
- Resuscitation and stabilization of ill infants before transfer to an appropriate care facility; and
- Nasal oxygen with oxygen saturation monitoring (eg, for infants with chronic lung disease needing long-term oxygen and monitoring).

Level 2b

- Mechanical ventilation for brief durations (less than 24 h) or continuous positive airway pressure; and
- Intravenous infusion, total parenteral nutrition, and possibly the use of umbilical central lines and percutaneous intravenous central lines.

Level 3: Intensive neonatal care (neonatal intensive care nursery)

Level 3a

- Care of infants of all gestational ages and weights;
- Mechanical ventilation support, and possibly inhaled nitric oxide, for as long as required; and
- Immediate access to the full range of subspecialty consultants.

Level 3b

- Comprehensive on-site access to subspecialty consultants;
- Performance and interpretation of advanced imaging tests, including computed tomography, magnetic resonance imaging and cardiac echocardiography on an urgent basis; and
- Performance of major surgery on site but not extracorporeal membrane oxygenation, hemofiltration and hemodialysis, or surgical repair of serious congenital cardiac malformations that require cardiopulmonary bypass.

Level 3c

- Extracorporeal membrane oxygenation, hemofiltration and hemodialysis, or surgical repair of serious congenital cardiac malformations that require a cardiopulmonary bypass.

STANDARDS FOR HOSPITALS PROVIDING NEONATAL CARE

Multidisciplinary approach to neonatal care

Neonatal care has led to the development of a multidisciplinary approach to providing care for infants with complex health needs (10-24). Nurses, respiratory therapists, physiotherapists, occupational therapists, pharmacists, dietitians and others are integral members of the neonatal care team, and have evolved specialized and enhanced practice roles and responsibilities.

Medical staff

Level 1: A family physician or paediatrician should be available on call at all times.

Level 2: A paediatrician should be available on call at all times. When mechanical ventilation is in progress, the paediatrician should be available in-house or must assure that skilled staff, capable of immediately responding to potential emergency complications, are continually present. The medical staff of level 2b units should include a paediatrician with postresidency neonatal intensive care training.

Level 3: A qualified neonatologist should be available on call at all times. There should be 24 h in-house coverage by appropriately trained and supervised staff (eg, paediatrician, paediatric trainee or neonatal nurse practitioner) certified to perform the full range of resuscitation and intensive care roles (1).

Nursing staff

Units should provide patients with care from appropriately trained nursing staff. The number of nurses available should be sufficient to provide the following coverage:

Level 1: The unit should provide nursing care for both mothers and their babies. Each nurse may provide care for up to four mothers and their babies.

Level 2: The unit should provide a nurse to care for up to four babies, but this depends on the specific illnesses and circumstances. For sick babies, a nurse may be required to care for fewer than four babies.

Level 3: The unit should provide a nurse to care for one to two patients.

In addition, all units should have a designated nurse responsible for further education and training, including in-service experience. In collaboration with physicians, advanced practice nurses with specialized preparation, including clinical nurse specialists and neonatal nurse practitioners, may provide comprehensive care for patients (10-13).

Respiratory therapy staff

Respiratory therapy services should be available for units providing neonatal care at level 2b or higher. The role of respiratory therapists includes ventilation management, pulmonary function measurement and monitoring, newborn resuscitation and transport, and facilitation in the development of specialized aspects of care, such as the administration of nitric oxide during transport (14-16).

Level 2b: A registered respiratory therapist should be available in-house whenever an infant is receiving continuous positive airway pressure or mechanical ventilation support.

Level 3: The unit should have 24 h coverage by respiratory therapy services.

Radiology

Portable radiology services should be available for units providing neonatal care at level 2 or higher.

Level 2a: Portable x-rays should be available.

Level 2b: Portable x-rays should be available 24 h a day without delay. Head ultrasound should be available with radiology consultation.

Level 3: Portable x-rays should be available 24 h a day without delay. Ultrasound should be available seven days a week with rapid radiology consultation (17). Computed tomography, and preferably also magnetic resonance imaging, should be accessible.

Subspecialties

Units providing level 1b or higher care should have access to appropriate laboratory services, including clinical chemistry, microbiology and hematology.

Units providing level 2b or higher care should have access to radiology, ophthalmology and laboratory services (clinical chemistry, microbiology, hematology and transfusion, and pathology).

Units providing level 3 care should have defined lines of communication and access to obstetrics and perinatal medicine, neonatal surgery and anesthesia, paediatric cardiology, specialist consultations (eg, child developmental medicine; clinical genetics; paediatric infectious diseases; gastroenterology; endocrinology; neurology and neurophysiology; paediatric nephrology; and audiology), other surgical specialties (eg, ear, nose and throat; orthopedics; neurosurgery; plastic surgery; and urology), radiology, ophthalmology and laboratory services (eg, clinical chemistry; microbiology; hematology and transfusion; and pathology).

Other staff

Units providing level 3 care should have supporting staff that have appropriate training with respect to the care of newborn infants and their parents (10-25). They provide specialized neonatal assessments and treatments, and assist in the development of integrated treatment plans that optimize treatment efficacy and enhance patient safety. They include radiology and ultrasonography technologists, pharmacists, physiotherapists, occupational therapists, dietitians, infection control staff, administrative and clerical staff, phlebotomists, research assistants, pastoral caregivers, social workers, psychologists and community health workers.

Transport

An organized transport team trained in neonatal care, resuscitation and transport care with appropriate equipment must be available for the transfer of patients in each region. A system for managing transport requests around the clock must be clearly defined and easily accessible by medical teams at all regional units requesting transfer.

Parents

There should be appropriate facilities for parents, who should be encouraged to participate in the care of the infants. Facilities should include private breast pump rooms, refrigeration and storage facilities for breast milk, and parent rooms for overnight rooming in with the infant before discharge from hospital. A quiet room should be available for consultations and for families who may need privacy to deal with emergent circumstances.

Clinical standards

Clinical protocols: Written protocols should be available for key procedures and practices, including resuscitation and stabilization of babies, and should be reviewed and updated regularly.

Quality assurance: Units should longitudinally monitor mortality, morbidity, workload, resource use, practices and policies using a prospective database with well-defined items. These should be regularly reviewed and benchmarked

against national standards. An audit program and critical incident reporting program should be in place.

Developmental follow-up assessment: Each unit should enrol high-risk infants in a developmental follow-up program that can longitudinally assess infants after discharge home.

Quality improvement: Each unit should have a multidisciplinary team trained to motivate, initiate and support quality improvement initiatives. Ideally, this team should work in coordination with similar teams in other hospitals.

Annual report: Each unit should produce an annual report summarizing their activity and performance in a standardized form. The report should also benchmark individual

unit activity and performance against other units nationally, and against national criteria for service provision.

CONTINUING EDUCATION AND PROFESSIONAL DEVELOPMENT

Staff members of the unit should receive appropriate orientation and training before starting duties. Appropriate personnel should have training in neonatal resuscitation and stabilization. Unit staff members should attend regular continuing education activities, including conferences, clinical care rounds, journal clubs and other similar activities.

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The recommendations in this statement do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate. Internet addresses are current at time of publication.