

# Neonatal Guideline 7: NEONATAL RESUSCITATION:

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While every attempt has been made to ensure that the information contained herein is clinically accurate and current, the BC Perinatal Health Program and BC Prenatal Genetic Screening Program acknowledge that many issues remain controversial, and therefore may be subject to practice interpretation.

## 1.0 Introduction

### Neonatal Guideline 7:

# NEONATAL RESUSCITATION: RESOURCES AND EDUCATION

This guideline is intended to serve as a clinical resource for frontline clinicians, and is based on current evidence-based literature and expert opinion. It is to be recognized as a living document that is subject to change as needed.

The BCPHP "Neonatal Guideline 7" is the primary source of information regarding neonatal resuscitation policies in BC. This guideline also lists the most relevant national and provincial resources, documents, and recommendations related to neonatal resuscitation education.

The main content changes and Canadian adaptations of NRP and the *Neonatal Resuscitation Textbook*, 5<sup>th</sup> Edition, 2006 are found at the CPS NRP website.<sup>1</sup> These include the *CPS Scientific Review Committee Addendum to the 2006 NRP Provider Textbook Recommendations for Specific Treatment Modifications in the Canadian Context* and the *NRP Revisions 2006: A Brief Summary for Busy Canadians*.<sup>2</sup>

NRP is an educational program primarily designed to teach principles and techniques of resuscitation of babies undergoing transition from intrauterine to extrauterine life in the hospital environment. NRP concepts are directly applicable and recommended for resuscitation of any baby born out of the hospital environment, such as in home births by midwives, and for the resuscitation of babies during their initial hospitalization.<sup>3</sup>

Completion of NRP and NRP registration do not imply that an individual has the competence to perform neonatal resuscitation. Each hospital is responsible for determining the level of competence and qualifications required for someone to assume clinical responsibility for neonatal resuscitation.<sup>3</sup>

## 2.0 Neonatal Resuscitation - Guiding Principles

“The most important and effective action in neonatal resuscitation is to ventilate the baby's lungs. The primary measure of adequate ventilation is prompt improvement in heart rate.”<sup>3</sup>

“At every delivery, there should be at least one person who can be immediately available to the baby as his or her only responsibility and who is capable of initiating resuscitation. Either this person or someone else who is immediately available should have the skills required to perform a complete resuscitation, including endotracheal intubation and administration of medications.”<sup>3</sup>

All facilities and personnel delivering infants must be capable of resuscitation, post-resuscitation assessment and initial stabilization.<sup>4</sup>

It is critical that personnel skilled in neonatal resuscitation and able to function as a team be available for every birth. The size and composition of this team will vary with the birth rate and designated level of care of the birth location. Aside from the professional person responsible for the birth (i.e. the physician or midwife), a second professional should be present with primary responsibility for the baby. That second person should be able to perform neonatal cardiopulmonary resuscitation (CPR), ventilation with a bag, and mask and chest compressions. If this person cannot perform more extensive resuscitation (using endotracheal intubation and medications), someone with these skills should be available in the facility to assist immediately when called.<sup>5</sup>

One person should assume the responsibility of directing the resuscitation. Ideally this will be the person with the most experience in neonatal resuscitation.

Lines of communication and staff roles should be clearly established within individual institutions. These roles should be reviewed verbally by those present in each resuscitation and rehearsed generally on a regular bimonthly or quarterly basis.

Skills in neonatal resuscitation are obtained through NRP, as endorsed, modified, directed and coordinated by the CPS. Registration at either the provider or instructor level and periodical re-registration are essential for all personnel who may care for babies immediately after birth.<sup>5</sup>

### 3.0 Practice Changes for Implementation During the Current (5th Edition) NRP Cycle

#### Implemented in the period 2008-2009

- Universal implementation of the NRP 2006 Flow Diagram – Canadian Adaptation.<sup>6</sup>
- Universal use of CO<sub>2</sub> detectors for all intubations; the CO<sub>2</sub> detector should be used as the primary method for confirming endotracheal tube placement.<sup>4</sup>
- Universal use of food-grade transparent bags in all births ≤ 28 weeks gestation or birth weight ≤ 1000 g.<sup>4</sup>
- Universal use of servo controlled temperature probes in all babies under radiant warmers for ≥ 10 minutes.<sup>4</sup>
- Use of 21% oxygen at initiation of positive pressure ventilation; use of supplemental oxygen limited to babies who remain cyanotic or with heart rate ≤ 100 bpm at 90 seconds of age.<sup>4,6</sup>
- Use of pulse oximetry in resuscitation areas for preterm babies ≤ 32 weeks gestation; avoidance of SpO<sub>2</sub> > 95% when supplemental oxygen is used.<sup>4</sup>
- Use of PEEP (3 to 6 cmH<sub>2</sub>O) in all babies needing ongoing positive pressure ventilation; PEEP may be given with a flow-inflating bag, a T-piece resuscitator, or a self-inflating bag with a PEEP valve.<sup>4</sup>
- Availability of laryngeal mask airways (LMAs) in all delivery rooms.<sup>4</sup>
- Teaching of staff on the use of LMAs.<sup>4</sup>
- Universal use of the British Columbia Newborn Resuscitation and Stabilization Record (HLTH 1583B) for documentation in all cases requiring resuscitation.
- A continuous program supporting neonatal resuscitation and post-resuscitation stabilization<sup>8</sup> education in all centers delivering babies.<sup>4,7</sup>

#### For implementation by or before 2010-2012

- Availability of blended gases in the delivery room in ALL designated centers.<sup>4</sup>
- Availability of T-piece resuscitators in all designated centers where mechanical ventilators for newborns are not available.
- A continuous program supporting neonatal resuscitation. Refer also to ACoRN guideline for post-resuscitation stabilization education in all centers delivering babies.<sup>4,7</sup>

## 4.0 Roles and Responsibilities

### 4.1 The BCPHP Provincial NRP & ACoRN Advisory Subcommittee is the body through which BC stakeholders:

- generate, discuss and support the provincial implementation of national and provincial policies regarding neonatal resuscitation and stabilization, and
- plan and support the dissemination of these programs

The co-chairs of the BC NRP/ACoRN Committee are supported by the BCPHP to represent BC and attend the National NRP and the National ACoRN Committee meetings, and the Annual AAP NRP Education day.

### 4.2 The National NRP Steering Committee:

- manages, supports and promotes the AAP/AHA Neonatal Resuscitation Program (NRP) in the Canadian context
- establishes guidelines for training
- ensures reciprocity intra-provincially and with the U.S., and
- encourages research in neonatal resuscitation.

### 4.3 The Canadian Paediatric Society (CPS):

- coordinates and supports the activities of the National NRP Steering Committee
- publishes the Canadian Neonatal Resuscitation Textbook in English and French
- distributes all materials
- provides program information
- communicates program updates and changes
- develops and maintains a national database to track instructor trainers, instructors and courses

### 4.4 Local/Regional/Health Authority Implementation of a Neonatal Resuscitation Program:

It is recommended that hospital-based and/or regional-based multiprofessional resuscitation committees/subcommittees provide leadership and direction in the development and maintenance of neonatal resuscitation standards.

Responsibilities of these committees/subcommittees should include:

- the interpretation and implementation of existing guidelines such as this one within the context of the specific facility and community
- development of policies related to the educational needs, roles and responsibilities of the health professionals involved in delivery room and infant care
- development and ongoing revision of policies and procedures related to the care of the healthy infant and resuscitation of the compromised infant
- identification and resolution of administrative or clinical problems related to resuscitation
- consultation regarding the purchase and maintenance of appropriate equipment
- implementation and support of NRP as an ongoing educational program for personnel delivering infants within the facility and region, including registered midwives attending homebirths

A clear process should be established to identify, communicate and resolve issues related to the clinical practice or process of resuscitation. Lines of communication and appropriate documentation should be established. Concerns should be reviewed on a regular basis for the purposes of teaching and enhancing the quality of care.

## 5.0 Eonatal Resuscitation Outside an Obstetrical Unit

The National NRP Steering Committee recommends that all emergency facilities be capable of providing initial newborn resuscitation and ongoing stabilization. Smaller facilities and midwives providing homebirth services are not expected to do this in isolation but rather in consultation.

Emergency departments should have the capability to care for any unplanned event, including birth. Neonatal resuscitation equipment and supplies (Appendix) should be accessible to any emergency department, with the exception of an infant radiant warmer (as warmth can be provided by alternative sources, ex. Infant transport warming surfaces/mattresses).

In a home birth environment where there may only be two practitioners present, it is unlikely that umbilical vein catheterization and administration of intravenous epinephrine could be established before the arrival of a third practitioner.

Implementation of the above guiding principles for non-designated obstetrical facilities, emergency departments and home births and emergency health services requires additional discussion, planning and research.

The training needs of personnel in facilities which do not provide planned obstetrical service requires discussion, planning, and research.

## 6.0 Identification of Infants at Risk

Each institution should establish criteria indicating the need to summon extra help for resuscitation and stabilization, consultation and transfer. These criteria are based on maternal and fetal risk factors which are listed on the back of the provincial antenatal form; specific criteria chosen vary depending on the resources and designated level of care within an institution.

In all cases, a close working relationship is required between the various personnel within the institution, and clear communication is required between the community and referring hospitals.

## 7.0 Family Centered Care

NRP recognizes that most infants are born without any complications, while approximately 10% of low risk pregnancies will result in unanticipated difficulties at birth.

The approach to the birth of a healthy infant should incorporate a philosophy of minimal invasiveness, but maximal awareness and readiness.

In addition, support should be given as much as possible to parental choices in low risk deliveries, while maintaining vigilance in assessing the infant's condition.

These guidelines, and the references listed, recommend minimal requirements for immediate care of the infant and resuscitation interventions for those infants compromised at birth.

Even in a more prolonged resuscitative effort, the needs of the family must be considered and additional staff may be required to provide support at this time.

## 8.0 Support of Ongoing Education/Training Programs

The Provincial NRP Advisory Subcommittee recommends that Health Authorities should support the initial (full NRP course) and ongoing (biennial NRP Renewal Program) educational needs of the multiprofessional team (including physicians, nurses, midwives, respiratory therapists and paramedics) to ensure that the neonatal resuscitation guiding principles are consistently met.

The Provincial NRP Advisory Subcommittee recommends that Health Authorities should also support the registration costs of NRP instructors in the CPS database.

Each NRP provider should have ready access to the most current version of the NRP Textbook and the most current version of all CPS NRP materials.

It is advised that Health Authorities should support the availability of a minimum of one set of equipment per hospital for neonatal resuscitation education and practice sessions. This equipment should be easily accessible to providers for practice use while at the same time being secure from theft. Additional storage space is required for files, test materials, extra supplies, etc.

In addition, skills, knowledge, and roles should be rehearsed by the multiprofessional team on a regular bimonthly or quarterly basis using mock codes; mock codes also facilitate identification of equipment deficiencies.

## 9.0 Availability and Maintenance of Equipment and Supplies

Standardized neonatal resuscitation equipment should be present and functioning at all deliveries (Appendix).

It is strongly advised that Health Authorities should provide midwives and non-designated obstetrical sites with equipment and supplies needed for neonatal resuscitation.

Clear policies need to be established and communicated:

- for scheduling of equipment checks for operational fitness
- to upgrade or replace equipment
- for preventative maintenance
- for rotation of supplies prior to expiration

## 10.0 BCPHP Perinatal Database - Clinical Indicators

*The following indicators are currently collected at the time of discharge for all infants that required resuscitation at birth:*

- 1<sup>st</sup> Axilla or skin temperature within the 1<sup>st</sup> hour of life
- CPAP
- IPPV by mask
- IPPV by ETT
- Meconium
- Surfactant administration
- Oxygen administration
- Chest compressions
- Resuscitation/Stabilization medication(s)
- NICU days, Level II<sup>9</sup>
- NICU days, Level III<sup>9</sup>

## References

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9. Canadian Paediatric Society. Position Statement: Levels of Neonatal Care. Paediatric Child Health 2006 May; 11(5): 303-306.
10. American Academy of Pediatrics (2006). Neonatal Resuscitation Instructor Manual. American Academy of Pediatrics, Evanston, Illinois
11. Perlman JM, Kattwinkel J. Delivery room resuscitation past, present, and the future. Clin Perinatol. 2006 Mar;33(1):1-9, v.

## WEBSITES

British Columbia Perinatal Health Program (BCPHP); <http://www.bcphp.ca>

Canadian Paediatric Society (CPS) NRP; <http://www.cps.ca/english/prodev/NRP/index.htm>

American Academy of Pediatrics (AAP); <http://www.aap.org/nrp/nrpmain.htm>

## Appendix 1

### ACRONYMS

**BCPHP** – British Columbia Perinatal Health Program

**NRP** – Neonatal Resuscitation Program

**CPS** – Canadian Pediatric Society

**ACoRN** – Acute Care of at-Risk Newborns

**PEEP** – Peak end expiratory pressure

**LMA** – Laryngeal mask airway

**CPAP** – Continuous positive airway pressure

**IPPV** – Intermittent positive pressure ventilation

**ETT** – Endotracheal tube

**UVC** – Umbilical venous catheter

## Appendix 2

### NEONATAL RESUSCITATION SUPPLIES AND EQUIPMENT

#### 1. Establishment of airway

Laryngoscope with straight blades

No. 0 (preterm) and No. 1 (term)

Extra bulbs and batteries for laryngoscope

Endotracheal tubes

2.5-, 3.0-, 3.5-, 4.0-mm internal diameter (ID)

Stylet

Scissors

Tape or securing device for endotracheal tube

CO<sub>2</sub> detector

Laryngeal mask airway size 1

Oropharyngeal airways

0, 00, and 000 sizes or 30-, 40-, and 50-mm lengths

#### 2. Suction

Mechanical suction and tubing

Suction catheters

6F, 8F, 10F, 12F

8F feeding tube and 20-mL syringe

Meconium aspirator

### 3. Positive pressure administration

Device for delivering positive-pressure ventilation

Self inflating bag with reservoir and PEEP valve

Flow inflating bag with manometer

T-piece resuscitator

Face masks, newborn and premature sizes (cushioned-rim masks preferred)

### 4. Oxygen

Oxygen source with flowmeter (flow rate up to 10 L/min) and tubing

Air source with flowmeter (flow rate up to 10 L/min) and tubing

Oxygen-air blender

Pulse oximeter and oximeter probe

### 5. Umbilical vessel catheterization supplies

Sterile gloves (preferably latex-free)

Scalpel or scissors

2% chlorhexidine with 4% alcohol solution

Umbilical tape

Umbilical vessel securing device or tape

Umbilical catheters

3.5F, 5F

Three-way stopcock

Syringes

1, 3, 5, 10, 20, and 50 mL

Puncture device for needless system, or

Needles

25, 21, 18 gauge

### 6. Medications

Epinephrine 1:10,000 (0.1 mg/mL)

3mL or 10mL ampoules

Isotonic crystalloid (0.9% NaCl or Ringer's lactate) for volume expansion

100 or 250mL bag

Dextrose 10% (NOTE: This is not to be used for volume expansion)

250mL bag

Sodium bicarbonate 4.2% (5mEq/10 mL)

10mL syringe

## Appendix 2: continued

Naloxone hydrochloride 1.0 mg/mL

2mL ampoules

0.9% NaCl for flushes

### 7. Thermoregulation

Food-grade transparent bags (for use in all births  $\leq 28$  weeks gestation or birth weight  $\leq 1000$  g)

Radiant warmer with firm, padded resuscitation surface

Alternative heat source for births outside of delivery rooms

Warmed linens

Chemically activated warming pad (optional in delivery rooms or for transport to nursery)

Transport incubator to maintain baby's temperature during move to the nursery

### 8. Miscellaneous

Gloves, goggles, mask, long sleeved gowns for personal protection

Timer

Stethoscope with neonatal head

Tape,  $\frac{1}{2}$  or  $\frac{3}{4}$  inch

Cardiac monitor and electrodes (optional)



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