

Part 7. Neonatal resuscitation: 2015 Korean Guidelines for Cardiopulmonary Resuscitation

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The following is a summary of the 2015 Korean Neonatal Resuscitation Guidelines. An extensive review of scientific evidence by experts of Neonatal Resuscitation Committee for the 2015 Korean Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care including neonatologists, nurse, obstetrician, perinatologist, and anesthesiologist was performed to update the 2011 Korean Neonatal Resuscitation Guidelines.

OVERVIEW

It has been reported that approximately 85% of term babies will start spontaneous breathing within 10 to 30 seconds after birth, an additional 10% will respond to drying and stimulation for breathing, about 3% will breathe after positive-pressure ventilation (PPV), 2% will need intubation, and 0.1% will require chest compression and/or epinephrine during transition to extra-uterine life.¹⁻³

One of the key factors for neonatal resuscitation is anticipation. Determining who will require resuscitation, what equipment needs to be prepared, whom to join, and how each members should participate in the resuscitation are all important factors in anticipating neonatal deterioration. Beginning resuscitation with antenatal counseling and a team briefing are also important.^{4,5}

Heart rate and respiration are used to identify the need for neonatal resuscitation and to assess response to resuscitation. Heart rate could be checked by either auscultating along the left

eISSN: 2383-4625

Received: 16 February 2016

Revised: 19 March 2016

Accepted: 19 March 2016

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How to cite this article:

Kim AR, Kim HS, Cho SJ, Choi YS,
Kim ES, Park HW, Cheon YH, Park MS,
Chang YS, Kim YH, Kim DY, Yoon HJ,
Kim YH, Chung SP, Hwang SO. Part 7.
Neonatal resuscitation: 2015 Korean
Guidelines for Cardiopulmonary
Resuscitation. Clin Exp Emerg Med
2016;3(S):S62-S65.

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side of chest or palpating the umbilical cord base. If the heart rate cannot be determined by auscultation/palpation and the baby is not vigorous, pulse oximetry (could underestimate heart rate) or cardiac monitoring can be used for alternatives measures.⁶⁻⁹ Oxygen saturation determined by pulse oximetry indicates color, a third vital sign. The most sensitive indicator of a successful resuscitation is an increase in heart rate. The critical factor to achieve successful neonatal resuscitation is an effective ventilation.

NEONATAL RESUSCITATION ALGORITHM

Newly born term infants who are breathing or crying and have a good tone immediately after birth should be dried and taken to the mother for routine care, with continuous evaluation (Fig. 1). However, preterm or term infants who are not breathing or crying and have poor tone should be dried and stimulated to initiate breathing, and kept in a position to open the airway effectively. It

is recommended that the temperature of newly born, non-asphyxiated infants should be maintained between 36.5°C and 37.5°C after birth through resuscitation or stabilization to admission. It is important to record of the temperature of non-asphyxiated infants, because as it is a strong predictor of mortality and morbidity for all gestations.⁹ Hypothermic infants with a temperature less than 36°C on hospital admission could be rewarmed using either the rapid (0.5°C/hr or greater) or the slow (less than 0.5°C/hr) rewarming method.

After the aforementioned "initial care," physicians should determine the heart rate. If the newborn infant's heart rate is lower than 100 beats/min or gasping or apnea is observed, physicians should provide an effective ventilation with a face mask or endotracheal intubation (recommending intubation prior to beginning chest compression). If the newly born infant has a heart rate greater than or equal to 100 beats/min and shows labored breathing or persistent cyanosis, continuous positive airway pressure will be required.¹⁰⁻¹² Only approximately 60 seconds after birth is allotted to initiate ventilation after determination of heart rate. When PPV begins, consider using electrocardiogram monitoring for accurate assessment of the heart rate. After 30 seconds of PPV that initiates chest movement, the heart rate is reassessed. If the heart rate is lower than 60 beats/min, corrective steps should be taken to ensure adequate ventilation.¹³ Alternative airways such as endotracheal intubation (if face mask was used) or laryngeal mask (if intubation is unsuccessful or not possible for late preterm infants of more than 34 weeks gestation or in case of term infants) can be used to secure airway.¹⁴ If the infant's heart rate is not recovered, perform chest compression with 100% oxygen. Compression point (lower 1/3 of the sternum) and compression-to-ventilation ratio (3:1) remains unchanged. Superimposed thumbs may be a better technique for cardiac compression in newborns and can be continued from the head of the bed while accessing the umbilical line. Reassessment of heart rate is performed after 60 seconds of chest compression, at which time medications should be administered. Medication is rarely indicated during neonatal resuscitation because bradycardia during newborn resuscitation is usually due to inadequate lung inflation or hypoxemia, and initiating ventilation is the most critical and important step to resolution. Epinephrine remains a major medication. The recommended fluid for acute hypovolemia is normal saline or type-0-negative blood via an umbilical venous catheter or via an intraosseous needle, if required, in term and preterm newborns.

A newly born infant with meconium-stained amniotic fluid does not need a routine intubation for tracheal suctioning even when non-vigorous. Instead, adequate oxygenation and ventilation should be considered first.¹⁵⁻¹⁹

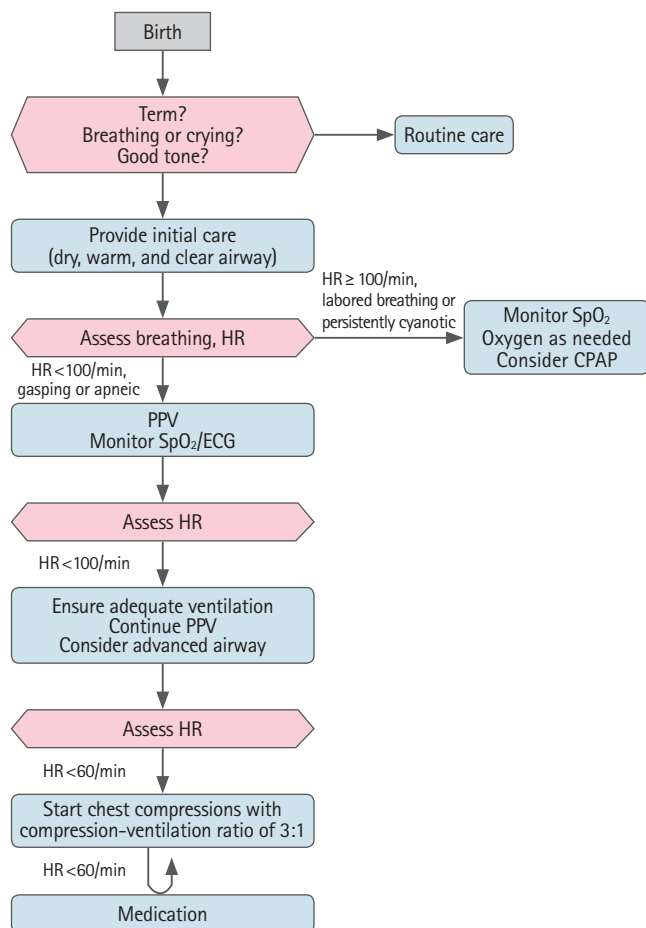


Fig. 1. Neonatal resuscitation algorithm. HR, heart rate; CPAP, continuous positive airway pressure; PPV, positive-pressure ventilation; ECG, electrocardiogram.

A few changes have been made with regard to resuscitation of preterm infants. With regard to cord clamping, delaying umbilical cord clamping for more than 30 seconds is suggested for preterm infants not requiring resuscitation. For preterm infants requiring resuscitation, there is insufficient evidence supporting a delayed cord clamping at birth. Routine use of umbilical cord milking for infants of gestational age 28 weeks or less is not recommended; however, it may be considered on individual basis or in research settings.^{4,9,20}

Maintenance of the room temperature to approximately 23°C to 25°C in preparation for the birth of preterm infants and using radiant warmer, plastic wrap, warm blankets, hat, thermal mattress, warm humidified gases are recommended for preterm infants of less than 32 weeks of gestation to reduce hypothermia.^{21,22} It is recommended that hyperthermia (38°C) should be avoided. Regarding the use of oxygen, resuscitation of newborns of 35-week gestation or greater should begin with 21% oxygen. Resuscitation of newborns of less than 35 weeks of gestation should begin with 21% to 30% oxygen.²³⁻²⁵ Free-flow oxygen administration may be initiated using an oxygen blender at 30%, and titrate oxygen to achieve preductal oxygen saturation targets for healthy term infants after vaginal delivery.²⁶ When PPV is required for resuscitating preterm infants, it is preferable to use positive end expiratory pressure devices to inflate lungs at 5 cm H₂O between the positive pressures.²⁷ The routine use of initial sustained inflation longer than 5 seconds for preterm infants without spontaneous respiration is not recommended.⁹

POST-CARDIAC ARREST CARE

Once newborns who required resuscitation are stabilized, they should be hospitalized where close monitoring is possible. Infants of more than 36 weeks of gestation with evolving moderate-to-severe hypoxic ischemic encephalopathy should be considered for therapeutic hypothermia at an institution where multidisciplinary care and well-defined protocols can be applied (i.e., cooling within 6 hours, temperature control at 33°C to 34°C for 72 hours, and rewarming over, at least, 4 hours).⁵

DISCONTINUING RESUSCITATION

Evidence for delivery prognostic score for preterm infants of less than 25 weeks of gestation is insufficient to support its use. It may be reasonable to stop resuscitation for newborns with an Apgar score of 0 after 10 minutes of optimal resuscitation; however, the decision to stop resuscitation should be individualized.²⁸ If spontaneous respiration is not seen or Apgar scores of 1 to 3 at

20 minutes of age in newborns with greater than 34 weeks of gestation, it may be reasonable to stop resuscitation in settings with limited resources.⁹ In all cases, risk and benefits of attempting resuscitation and life-sustaining treatment should be discussed with parents, and decision should be made in the best interest of the infant.

EDUCATIONAL PROGRAM

Further refinement in the current instructor program is needed to prepare instructors to train providers. It is suggested that neonatal resuscitation training for neonatal resuscitation providers be conducted as frequently as 6 months or more,^{29,30} however, the best interval for renewal is to be determined.

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