

Neonatal Resuscitation: History and Vital Updates

Two (2.0) contact hours

Course expires: 8/31/2017

First published: 6/29/2011

Updated: 6/27/2014

Reproduction and distribution of these materials are prohibited without an RN.com content licensing agreement.

Copyright © 2014 by RN.com.
All Rights Reserved.

Conflict of Interest and Commercial Support

RN.com strives to present content in a fair and unbiased manner at all times, and has a full and fair disclosure policy that requires course faculty to declare any real or apparent commercial affiliation related to the content of this presentation. Note: Conflict of Interest is defined by ANCC as a situation in which an individual has an opportunity to affect educational content about products or services of a commercial interest with which he/she has a financial relationship.

The author of this course does not have any conflict of interest to declare.

The planners of the educational activity have no conflicts of interest to disclose.

There is no commercial support being used for this course.

Acknowledgements

Material protected by Copyright

RN.com acknowledges the valuable contributions of...

...Kim Maryniak, RNC-NIC, BN, MSN. Kim has over 21 years staff nurse and charge nurse experience with medical/surgical, psychiatry, pediatrics, and neonatal intensive care. She has been an educator, instructor, and nursing director. Her instructor experience includes med/surg nursing and physical assessment. Kim graduated with a nursing diploma from Foothills Hospital School of Nursing in Calgary, Alberta in 1989. She achieved her Bachelor in Nursing through Athabasca University, Alberta in 2000, and her Master of Science in Nursing through University of Phoenix in 2005. Kim is certified in Neonatal Intensive Care Nursing and is currently pursuing her PhD in Nursing. She is active in the National Association of Neonatal Nurses and American Nurses Association. Kim's current role in professional development includes nursing peer review and advancement, teaching, and use of simulation.

...Nadine Salmon, MSN, BSN, IBCLC the Clinical Content Manager for RN.com. She is a South African trained Registered Nurse, Midwife and International Board Certified Lactation Consultant. Nadine obtained an MSN at Grand Canyon University, with an emphasis on Nursing Leadership. Her clinical background is in Labor & Delivery and Postpartum nursing, and she has also worked in Medical Surgical Nursing and Home Health. Nadine has work experience in three countries, including the United States, the United Kingdom and South Africa. She worked for the international nurse division of American Mobile Healthcare, prior to joining the Education Team at RN.com. Nadine is the Lead Nurse Planner for RN.com and is responsible for all clinical aspects of course development. She updates course content to current standards, and develops new course materials for RN.com.

Purpose and Objectives

The purpose of this course is to prepare nurses for upcoming program and practice changes to the Neonatal Resuscitation Program (NRP) 6th edition.

Upon successful completion of the course, you will be able to:

- 1.
2. Describe how research studies and outcomes are used as evidence to create guidelines for NRP.
3. Identify three changes to the NRP guidelines from the 5th edition to the 6th edition.
4. List initial questions asked at the delivery of an infant.
5. Identify two levels of care for infants according to the NRP algorithm.
6. List two indications for ventilatory assistance including continuous airway pressure and ventilation.
7. Discuss the use of pulse oximetry with neonatal resuscitation.
8. Identify two indications for circulatory assistance including compressions and medications.
9. List three potential complications of neonatal resuscitation.
10. Describe two factors of consideration to determine withholding or discontinuing resuscitation.
11. Discuss rationale for using simulation scenarios with NRP courses.

Introduction

The knowledge and skills to perform neonatal resuscitation can make the difference between life and death for infants.

There have been many changes throughout history in techniques to resuscitate infants.

With the ever-growing research and evidence based on studies, actions of the healthcare team with newborns will continue to evolve.

Neonatal Resuscitation Before 1927

In the late nineteenth and early twentieth century, newborn resuscitation consisted of basic techniques of cleaning mucus from the mouth and providing warmth. If this was not successful, infants were deemed “asphyxiated”.

If it was determined the infant was too small or “weak” it would be left alone.

If providers felt the infant was an adequate size, they could work for hours attempting to resuscitate a newborn.

Techniques at that point either focused on providing a counter stimulus to infants to counteract asphyxia (methods similar to adult resuscitation), or other concepts.

Methods of Resuscitation Used Before 1927

Methods used as counter stimulus included:

- Hot and cold contrast baths- placing infants into alternate water temperatures to stimulate breathing
- Rubbing infants forcefully and placing them near a fire- stimulation and temperature to promote breathing
- Placing infants into baths of brandy or mustard, or rubbing the substance on them- the noxious stimuli was thought to trigger breathing
- Dilation of the anus including blowing air or smoke into the rectum- sensory experience and increase pressure to stimulate breathing
- Vigorous rubbing or slapping the infants’ buttocks- the shock was believed to rouse breathing

Methods based on principles of adult resuscitation included:

- Swinging infants up and over shoulders of the provider- believed this assisted in extension and compression of the thorax, causing passive inspiration and expiration
- Holding infants in the provider’s lap, folding and unfolding them- based on the principle believed as above
- Abduction and adduction of shoulders, arms, or thighs- to increase and decrease the intra-thoracic capacity
- Mouth to mouth- based on resuscitation of drowned adults

Methods based on other concepts:

- Grabbing and pulling on the tongue up to a dozen times- thought that the reflex reaction would

- cause the infant to breathe
- Drawing blood from the umbilical vein- believed that this released pressure on the right side of the heart, which would relieve asphyxia

History of Neonatal Resuscitation Between 1927-1950

Research was conducted to study respiratory physiology, and specifically fetal development and neonatal physiology. There was a discovery of fetal transition to newborn, and a realization that principles of adult resuscitation could not be applied to the neonate.

Studies were conducted on animals using blood gas analysis to provide data to assist with ventilation methods in newborns. There was debate between researchers as to the method that effectively assisted ventilation.

Methods Used Between 1927-1950

Methods of resuscitation during this time period included:

- Clearing the airway of obstruction such as mucus suctioning
- Inhalation of oxygen and carbon dioxide, either through a mask or endotracheal intubation
- Positive pressure ventilation with oxygen alone or with carbon dioxide
- Negative pressure ventilation
- Many forms of resuscitation from earlier methods existed in practice

History of Resuscitation Between 1950-1970

Research continued to thrive, with discoveries of vaccinations, antibiotics, and blood transfusions. Neonatology developed into a specialization, neonatal intensive care units were created, and surfactant was discovered.

The use of carbon dioxide with neonatal resuscitation was dismissed, and the use of oxygen was the focus.

It was identified that compromised newborns needed clear airways, stimulation, warmth, and assisted ventilations.

Methods Used Between 1950–1970

Methods of resuscitation used during this time period included:

- Use of a rocking device to tilt the infant up and down
- Incubators were designed to deliver oxygen to the infant, preferably with the rocking table
- Electrophrenic stimulation was trialed- electrodes placed on the necks of infants to stimulate the phrenic nerve, which would stimulate the diaphragm
- An incubator-type device was developed to provide cycled pressurization to the infant to simulate the pressure of contractions in utero
- Positive pressure ventilation by either face-mask or endotracheal intubation- either “blind” or with

direct visualization

- Use of direct visualization and endotracheal intubation increased with time based on study results
- Focus on the amount of pressure needed to ventilate newborn's lungs, using up to 40-50 cm H₂O
- Use of Apgar scores to determine need for resuscitation

History of Resuscitation Between 1970-1990

There were continued studies of pathophysiology, use of fetal monitoring to anticipate neonatal outcomes, development of continuous positive airway pressure (CPAP) prongs, increasing awareness of lung barotraumas, and use of high-frequency ventilators.

Regionalization of neonatal education, guidelines, and recommendations were developed.

Test Yourself

Based on what we have learned from the past, an appropriate method of resuscitation is:

- A. Use of hot and cold stimuli.
- B. Swinging the infant over the shoulder.
- C. Drying, warming, and clearing the airway.
- D. Positive pressure ventilation with carbon dioxide.

The correct answer is: C.

Swinging an infant, use of carbon dioxide, and hot and cold baths produced negative outcomes for infants in the past. Today's resuscitation still includes drying, warming, and clearing the infant as an appropriate method. (McAdams, 2008).

Use of Evidence-based Guidelines

The National Institutes of Health (NIH) funded opportunities for neonatal education in the 1970s which was initially known as the Neonatal Education Program (NEP).

Then, under the direction of the American Academy of Pediatrics (AAP), and in collaboration with the American Heart Association (AHA), the focus centered on resuscitation.

Currently there is a five-year process in evaluating material and creating guidelines for NRP. Studies that are conducted and published are reviewed for reliability and validity through the International Liaison Committee on Resuscitation (ILCOR). ILCOR is comprised of councils representing the US, Canada, Asia, South Africa, Europe, Australia, and New Zealand.

Volunteers review literature that is peer-reviewed and develop summaries, including levels of evidence. These summaries are discussed and open to public comment. Then, international consensus for guidelines is made through the International Consensus on Cardiopulmonary Resuscitation (CPR) and External Chest Compression (ECC) Science with Treatment Recommendations.

Use of Evidence-based Guidelines

Each resuscitation council that comprises ILCOR creates guidelines for practice in their represented country. The AHA and the AAP formulate the guidelines for the United States. The Neonatal

Resuscitation Program Steering Committee then designs education based on these guidelines.

The Neonatal Resuscitation Program (NRP) has grown to incorporate standards of resuscitation at all levels of care.

Test Yourself

The review of evidence that is done for resuscitation:

- A. Occurs in North America only.
- B. Is done through trial and error.
- C. Is done over a period of a few months.
- D. Is a rigorous process that has international volunteers.

The correct answer is: D.

The review of evidence occurs over a five-year period, beginning with the ILCOR. Volunteers examine peer-reviewed research and evidence to determine revisions for resuscitation guidelines. (American Academy of Pediatrics, 2009).

Changes in Editions

With the 6th edition of NRP in 2010, the newborn resuscitation guidelines changed from previous editions. These changes will be reviewed in more detail in consequent sections of this course.

Changes to the 6th edition NRP:

- There are now three questions instead of four asked at the birth and the question “Amniotic fluid clear?” has been removed
- The algorithm is no longer broken down into 30 second “blocks” of time
- There is consideration for use of CPAP with labored breathing
- A targeted preductal SpO₂ is included for the first 10 minutes of life
- Levels of care changed from three levels to two identified levels of care: “Routine care” and “post resuscitation care” only
- IV epinephrine is strongly encouraged

Neonatal Resuscitation Algorithm

Note that although the new algorithm focuses on newborn infants transitioning to extrauterine life, it also applies to neonates in the first few weeks to months of life.

Equipment Check

Equipment for resuscitation must be checked prior to the delivery.

Enter this link into your browser to access a brief YouTube video:

<http://www.youtube.com/watch?v=Rco94ggPgso>

The Delivery

Studies demonstrate that most infants are born vigorous. Only 10% of infants born in the U.S. require some form of assistance, with less than one percent requiring intensive resuscitation (Raghuveer & Cox, 2011).

Each and every delivery requires one person whose sole responsibility is the care of the newborn. This person must be able to initiate resuscitation, including positive-pressure ventilation and chest compressions. Someone who can perform a complete resuscitation, including endotracheal intubation and administering IV medications, must be immediately available.

Research has shown that a term infant without risk factors born via cesarean section with regional anesthesia does not increase the necessity for endotracheal intubation.

The focus of the NPR continues to be ventilation.

“Helping Babies Breathe,” is a global initiative that centers on assessing infants who need assisted ventilation and intervening quickly.

The Golden Minute

There are three critical questions that need to be addressed during an assessment at birth. These questions are:

- Is this a term gestation?
- Is there crying and / or breathing?
- Is good muscle tone present?

If the answer to any of the above questions is “no”, then the infant needs to be taken to a warmer for further evaluation and intervention.

Initial steps involve providing warmth, drying, stimulating, and clearing the airway as necessary.

Interventions for ventilation are required based on assessment of respirations (apnea, gasping, or labored breathing) and heart rate of less than 100 beats per minute (bpm).

The *Golden Minute* rule requires that initial steps, re-evaluation, and initiation of ventilation, if needed, are performed within 60 seconds.

Test Yourself

The most important intervention for neonatal resuscitation is:

- A. Medication
- B. Stimulation
- C. Ventilation
- D. Chest compressions

The correct answer is: C.

The focus of the Neonatal Resuscitation Program continues to be ventilation. Interventions for assisting ventilation are required within the first minute of life (American Heart Association & American Academy of Pediatrics, 2010a & 2010b).

Initial Steps: Temperature

Actions for infants requiring intervention include providing warmth, drying, stimulating, placing them in the “sniffing” position to open the airway, and clearing the airway as necessary.

Temperature control is important in premature infants, compromised infants and very low birth weight (VLBW) neonates.

Additional strategies for providing warmth include:

- Use of radiant heat
- Providing a warming mattress
- Using a plastic wrap to cover the infant

These strategies have demonstrated a reduction in hypothermia.

Hyperthermia can also increase seizures, respiratory depression, cerebral palsy, and progression of cerebral damage.

A normothermic environment produces the best infant outcomes.

Initial Steps: Suctioning

Suctioning of infants is no longer recommended as routine practice in relation to the incidence of bradycardia and reduced oxygenation.

The suctioning of clear amniotic fluids immediately after birth, using a suction catheter or bulb syringe, should be performed only on infants with an obstruction that impairs spontaneous breathing or when positive-pressure ventilation is required.

There have been many studies that continue to examine the results of tracheal suctioning of infants born with meconium-stained amniotic fluid (MSAF). Even though newborns born through MSAF who are depressed have an increased risk of meconium aspiration syndrome (MAS), there is controversy in the value of direct tracheal suctioning.

Currently there is not enough evidence to change current practice of endotracheal suctioning of the non-vigorous newborn with MSAF.

If there is prolonged and/or unsuccessful intubation of these infants, especially with persistent bradycardia, then bag-mask ventilation should be used.

Test Yourself

Which of the following statements is TRUE?

- A. Every step in resuscitation takes 30 seconds.
- B. Newborns should be kept cool to prevent brain damage.
- C. Routine suctioning of every infant is no longer recommended.
- D. There are no additional risks for infants with meconium-stained amniotic fluid.

The correct answer is: C.

Suctioning of infants is no longer recommended as routine practice in relation to the incidence of bradycardia and reduced oxygenation. With clear amniotic fluids, suctioning immediately after birth, whether through use of a suction catheter or a bulb syringe, should be performed only on infants with an obstruction impairing spontaneous breathing or if positive-pressure ventilation is required (Kattwinkel, et al., 2010a & 2010b).

Initial Steps: Oximetry

Blood oxygen levels in newborns take approximately ten minutes after birth to reach extrauterine values.

A pulse oximeter applied preductally (on the upper right extremity such as the wrist or palm) is recommended whenever resuscitation is anticipated. It is best to use a pulse oximeter when using positive-pressure ventilation, administering supplemental oxygen, or in the presence of persistent cyanosis.

Through a variety of studies, it has been shown that pulse oximeters give reliable readings within one to two minutes after birth, providing that the newborn has sufficient cardiac output and skin blood flow.

The use of skin color (i.e. cyanosis) is not a dependable predictor of oxygenation.

Initial Steps: Oxygen

The use of oxygen with resuscitation has implications for both hypoxia and hyperoxia in infant outcomes. Multiple studies have been reviewed comparing use of 100% oxygen, 21% oxygen, and a blend of oxygen for initiation of resuscitation in term and pre-term infants.

Targeted preductal SpO₂ values are included in the new NRP algorithm, based on term newborn studies. These levels are defined as:

- 1 min- 60-65%
- 2 min- 65-70%
- 3 min- 70-75%
- 4 min- 75-80%
- 5 min- 80-85%
- 10 min- 85-95%

If blended oxygen is not available, then room air should be used to begin initiation of resuscitation.

If the newborn has a heart rate of <60 bpm after 90 seconds, then oxygen should be increased to 100% until the heart rate stabilizes over 100 bpm.

What are the recommendations?

Recommendations are that resuscitation should be started with either room air (21%) or a blended concentration, and titrate according to the SpO₂ range defined on the algorithm.

Test Yourself

Pulse oximetry:

- A. Should be applied post-ductally.
- B. Is less reliable than assessing skin color.
- C. Provides accurate readings in all situations.
- D. Is recommended when using supplemental oxygen or positive-pressure ventilation.

The correct answer is: D.

A pulse oximeter applied preductally (on the upper right extremity, such as the wrist or palm) is recommended for anticipated resuscitation, with the use of positive-pressure ventilation, persistent cyanosis, or with administration of supplemental oxygen (Kattwinkel, et al., 2010a & 2010b).

Assisting Ventilation

Positive-pressure ventilation is indicated in infants that are apneic, gasping, or have a heart rate of less than 100 bpm after the initial steps.

The pressure required for inflation is individualized to the infant's gestational maturity. Premature lungs are more susceptible to damage from over-inflation.

The infant should have chest wall movement that demonstrates an easy breath in and out.

The best measure for sufficient ventilation is a rapid improvement in the heart rate.

The rate of ventilation remains at 40-60 breaths/minute.

Continuous Positive Airway Pressure (CPAP)

Various studies have demonstrated that using CPAP with premature infants with labored or difficulty breathing has improved outcomes.

The evidence for using CPAP with term babies is limited at this time; there is none to refute or support the use with these infants with respiratory distress.

The recommendation is to use CPAP with preterm infants with respiratory distress based on studies, and with term infants guided by clinical judgment.

Positive End-Expiratory Pressure (PEEP)

Aside from research of the use of PEEP with mechanical ventilation, no studies are currently

available for the use of PEEP during positive-pressure ventilation with resuscitation.

Implications are that PEEP is effective in keeping alveoli open, and should be used with flow-inflating bags or T-piece resuscitators.

T-Piece Resuscitators

A T-piece resuscitator offers the potential benefit of achieving controlled target Peak Inspiratory Pressure (PIP) and delivering consistent Positive End Expiratory Pressure (PEEP) to help Functional Residual Capacity (FRC) and improve lung volume.

Enter this link into your browser to view a YouTube video on using the T-Piece Resuscitator:

<http://www.youtube.com/watch?v=DTYUm0YYeaw>

Inflation Pressures

Inflation pressures are variable according to the needs of the infant, and will need modification as lung compliance changes after birth. Providing CPAP and PEEP can only be done with the flow-inflating bag or the T-piece resuscitators.

Studies of the use of laryngeal mask airways (LMA) have shown effectiveness for ventilating neonates more than 34 weeks gestation or more than 2000g. Limited research has been done at younger gestations or lower birth weights.

If using a bag and mask for ventilation is unsuccessful, or if tracheal intubation is not feasible, then an LMA can be used to provide effective ventilation.

There have been no studies for LMA use with meconium stained amniotic fluid (MSAF) during chest compressions or for administration of medications.

Test Yourself

Which of the following statements is FALSE?

- A. Inflation pressures should be between 20 and 40 cm H₂O.
- B. The use of CPAP has shown improved outcomes in preterm infants.
- C. Ventilation rates are recommended at a rate of 40-60 breaths/min.
- D. LMA is an option for difficult intubation with infants greater than 34 weeks gestation.

The correct answer is: A.

There are no longer set pressures recommended for inflation. The pressure required for inflation is individualized to the infant. Premature lungs are more susceptible to damage from over-inflation. The infant should have chest wall movement that demonstrates an easy breath in and out (Kattwinkel, et al., 2010a & 2010b).

Endotracheal Intubation

Considerations for endotracheal intubation include the following:

Material protected by Copyright

- Endotracheal intubation of non-vigorous neonates with meconium stained amniotic fluid (MSAF)
- Ineffective or prolonged bag and mask ventilation
- To coordinate with chest compressions
- With special considerations, such as extremely low birth weight infants or congenital diaphragmatic hernia

The best indicator that endotracheal intubation is successful is a rapid increase in heart rate with positive pressure ventilation.

The use of a CO₂ detector is useful in confirming placement in patients with adequate cardiac output. If there is poor or absent pulmonary blood flow or poor cardiac output, a false negative result may occur with the CO₂ detector failing to change color.

Other indicators of confirmation of correct placement include chest movement, auscultation of bilateral breath sounds that are equal, and condensation in the endotracheal tube.

Chest Compressions

Effective ventilation is the most valuable action in neonatal resuscitation, rather than chest compression, even though other programs (such as basic life support (BLS), pediatric advanced life support (PALS), and advanced cardiac life support (ACLS) programs) focus on chest compressions rather than effective ventilation.

Compressions are provided on the lower third of the sternum, with a depth of approximately one third of the anterior-posterior diameter of the infant's chest. The two-thumb technique continues to be the preferred method, as it may generate higher coronary perfusion. The two-finger technique is still an adequate method, particularly with the insertion of umbilical catheters.

Enter this link into your browser to view YouTube video of the two-thumb technique:

<http://www.youtube.com/watch?v=ltUoVJvhg7w&list=PLYCGqHUOtJOQIGAkQdyc4X-q5vV2UhnPO&index=5>

Chest compressions are to be provided when the newborn's heart rate is less than 60 bpm, following adequate positive-pressure ventilation with the use of supplementary oxygen.

Test Yourself

Which of the following statements is TRUE?

- Endotracheal intubation is not indicated when chest compressions are required.
- Effective ventilation is still the most important action in neonatal resuscitation.
- CO₂ detectors are the most reliable indicators of correct endotracheal tube placement.
- Like the changes in ACLS and PALS, the ratio of compressions to breaths in neonatal resuscitation has increased.

The correct answer is: B.

Unlike the change in practice for BLS, PALS, and ACLS that focuses on chest compressions, effective ventilation in infant resuscitation continues to be the most valuable action (American Heart Material protected by Copyright

Association & American Academy of Pediatrics, 2010a & 2010b).

Chest Compressions

The compression rate remains at 3:1, with three compressions to one ventilation. The rate then remains at 30 breaths and 90 compressions, with 120 “events” per minute.

Frequent interruptions of compressions can compromise maintenance of systemic perfusion. When chest compressions are required with ventilation, the heart rate should be checked within 45-60 seconds rather than stopping and checking at 30 seconds.

If there is a cardiac etiology causing the need for resuscitation, studies have shown that a ratio of 15:2 or 30:2 may be more effective. This is not a common cause as the majority of infants have a ventilation compromise rather than cardiac in nature.

Resuscitation should begin with the 3:1 ratio, but consider a higher ratio if resuscitation is believed to be from cardiac causes.

Medications

Hypoxemia and inadequate lung expansion are the primary reasons for neonatal bradycardia following birth. The need for medications is not very common if effective ventilation is established.

If the heart rate remains less than 60 bpm despite well-coordinated chest compressions and adequate ventilation, the use of epinephrine and/or volume expanders may be needed.

Epinephrine

Epinephrine has been studied with the use of intravenous and endotracheal administration. The research supports the use of IV doses of epinephrine as soon as an umbilical catheter is placed.

Higher doses with IV administration have shown outcomes of poor neurological function, decreased cardiac performance, and worsening hypertension.

While establishing IV access, endotracheal tube (ETT) administration of epinephrine can be considered at a higher dose of 0.5-1 mL/kg of the 1:10,000 concentration. The higher dose for ETT is currently being studied for efficacy.

The recommended IV dose remains at 0.1-0.3 mL/kg with a 1:10,000 concentration for IV administration.

Volume Expanders

Volume expanders are indicated when:

- There is known or suspected blood loss
- Assessment includes poor perfusion, weak pulses and pallor
- The infant's heart rate remains less than 60 bpm, despite resuscitative efforts

Normal saline, Ringer's Lactate, or O-negative blood continues to be recommended at 10 mL/kg, which may be repeated if needed.

Rapid administration of volume expanders with premature infants are associated with increased incidence of intraventricular hemorrhage.

Naloxone

Naloxone (Narcan) is no longer recommended for inclusion in the initial resuscitation at delivery.

Infants with respiratory depression have improvement with oxygenation and heart rate by effective ventilation.

Test Yourself

Changes in medication administration include:

- A. Normal saline is not an appropriate volume expander.
- B. Epinephrine dose is the same for IV and ETT administration.
- C. Naloxone is no longer recommended for initial resuscitation.
- D. Higher doses of IV epinephrine have shown positive outcomes.

The correct answer is: C.

Naloxone (Narcan) is no longer recommended for inclusion in the initial resuscitation at delivery. Infants with respiratory depression have improvement with oxygenation and heart rate by effective ventilation (Kattwinkel, et al., 2010a & 2010b).

Post Resuscitation Care

Anticipatory Care and Glucose Monitoring

Infants require close monitoring and anticipatory care following resuscitation. Blood pressure, oxygenation, heart rate, respiratory status, temperature stability, and electrolyte balance can be affected by resuscitative efforts.

Glucose monitoring is especially important with hypoglycemia as a risk factor for increased brain injury and poor outcomes subsequent to hypoxic-ischemic insult.

There is no current target glucose identified. However, in order to avoid hypoglycemic incidents, the use of IV glucose as soon as able after resuscitation is recommended.

Induced Hypothermia

Numerous trials have demonstrated positive effects of induced hypothermia for neonates ≥ 36 weeks gestation, resulting in reduced mortality and morbidity.

These studies have been in centers with strict criteria and protocols on infants with moderate to severe hypoxic-ischemic encephalopathy.

It is recommended that therapeutic-induced hypothermia should be provided following established

protocols in facilities that have available resources. This should occur within the six-hour time frame after birth for those infants that meet the criteria.

Intervention of induced hypothermia within six hours following birth produces the most positive outcomes.

Test Yourself

Post resuscitation care:

- A. Includes anticipatory care.
- B. Includes use of induced hypothermia in all cases.
- C. Has defined targeted guidelines for glucose levels.
- D. Is only required in cases of extensive resuscitation.

The correct answer is: A.

Infants require close monitoring and anticipatory care following resuscitation. Blood pressure, oxygenation, heart rate, respiratory status, temperature stability, and electrolyte balance can be affected by resuscitative efforts (Kattwinkel, et al., 2010a & 2010b).

Withholding Resuscitation

Considerations for withholding resuscitation include conditions with high morbidity and mortality rates, especially in collaboration with the parents.

There needs to be consistent information and coordination between team members.

Withholding and discontinuation of resuscitation efforts are supported when functional survival is highly doubtful.

What are the Guidelines?

Guidelines include:

- No resuscitation for cases of extreme prematurity (less than 23 weeks), birth weight of less than 400g, or presence of congenital anomalies (such as major chromosomal anomalies) that are associated with high morbidity and mortality.
- With high rate of survival and acceptable morbidity rates, resuscitation is almost always indicated, including gestational age ≥ 25 weeks and most congenital malformations.
- With borderline survival or relatively high morbidity rates with anticipated burden, parental desires of initiation or withholding resuscitation should be supported.

Making the Decision

Examination of infants after birth is essential prior to deciding to provide or withhold resuscitation.

In addition to visual examination of the infant immediately after birth, the use of published tools on morbidity and mortality rates (including computerized programs that calculate rates based on gestational age) is encouraged.

Estimation of gestational age with obstetric techniques may be accurate up to \pm 3-4 days if performed in the first trimester and \pm 1-2 weeks in subsequent weeks.

Estimation of fetal weight is more difficult as intrauterine growth restriction or large for gestational age affects the impact for survival.

Discontinuing Resuscitation

If the heart rate continues to be undetectable following 10 minutes of resuscitation, it is appropriate to consider discontinuing efforts.

Continuing resuscitative efforts is made in contemplation of complications, gestational age, morbidity risk, parental wishes, and the potential role of induced hypothermia.

Test Yourself

Considerations for withholding or discontinuing resuscitation include:

- A. Parental wishes.
- B. Laws mandate resuscitation in every situation.
- C. Withholding resuscitation for all congenital anomalies.
- D. Undetectable heart rate after 15 minutes of resuscitation efforts.

The correct answer is: A.

Considerations for withholding resuscitation include conditions with high morbidity and mortality rates, especially in collaboration with the parents. With borderline survival or relatively high morbidity rates with anticipated burden, parental desires of initiation or withholding resuscitation should be supported (American Heart Association & American Academy of Pediatrics, 2010a & 2010b).

Change in NRP Testing

Online Examination

Effective January, 2012, all testing for initial provider and renewal courses is done online.

Online learning provides a self-paced and flexible environment for testing.

The focus for interactions between instructors and learners is shifting from lecture to simulation and hands-on learning.

Change in NRP Testing: Simulation

Studies have shown that the use of simulation-based learning provides positive performance of resuscitation in real-life situations.

Simulation uses scenarios that are based on realistic case studies, and are followed by a debriefing session which helps solidify knowledge and skills. This allows learners the opportunity to perform resuscitative skills in a safe learning environment.

Following successful completion of the online examination, learners will perform simulated code resuscitations with NRP instructors.

Performance of skills and reaffirmation of knowledge of neonatal resuscitation will be evaluated in this setting.

Test Yourself

In regards to NRP knowledge and skills:

- A. Self-directed learning is not effective.
- B. Lecture has been shown to be the most effective teaching method.
- C. The use of simulation has not been found to be of benefit for learning.
- D. The use of simulation and debriefing increases clinical skills and knowledge.

The correct answer is: D.

Studies have shown that the use of simulation-based learning provides positive performance of resuscitation in real-life situations. Scenarios based on case studies simulated in a manner that suspends disbelief, along with debriefing following the simulation help solidify knowledge and skills (Kattwinkel, et al., 2010a & 2010b).

Conclusion

Changes continue to be made in neonatal resuscitation based on evidence from research studies and clinical trials.

Awareness of the history and evolution of recommendations provides a basis for what has been learned about patient outcomes.

It is vital to remain current with evidence-based recommendations in the continued pursuit of providing quality patient care in advocating for the infants and families.

References

American Academy of Pediatrics & American Heart Association, (2011). Textbook of Neonatal Resuscitation, 6th Edition.

American Heart Association & American Academy of Pediatrics. (2010a). Helping babies breathe global launch. NRP instructor update, 19(1), 1-12.

American Heart Association & American Academy of Pediatrics. (2010b). Summary of the AAP/AHA ECC guidelines. NRP instructor update, 19(2), 1-12.

Bloom, R., & Cropley, C. (1997). The early history and basic concepts of the Neonatal Resuscitation Program (NRP). NRP instructor update, 6(3). Retrieved February 1, 2011 from http://www.aap.org/nrp/about/about_historyconcepts.html

Kattwinkel, J., Perlman, J., Aziz, K., Colby, C., Fairchild, K., Gallagher, J., Zaichkin, J. (2010a). Part 15: Neonatal resuscitation: 2010 American Heart guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 2010, 122, S909-S919.

Kattwinkel, J., Perlman, J., Aziz, K., Colby, C., Fairchild, K., Gallagher, J., Zaichkin, J. (2010b). Special report neonatal resuscitation: 2010 American Heart guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Pediatrics*, 126(5), e1400-e1413. Retrieved February 1, 2011 and updated June 2014 from <http://pediatrics.aappublications.org/content/126/5/e1400.full.pdf+html?sid=feee4823-ed7f-4f37-a823-84fc0d1c2f84>

McAdams, R. (2008). *Learning to breathe: The history of newborn resuscitation, 1929 to 1970* (Doctoral dissertation). Glasgow, Scotland: University of Glasgow.

Nightengale, B. (2009). A lifetime of "firsts". *Advances in Neonatal Care*, 9(5), 249-251.

Neonatal Resuscitation Program, (2014). Instructor Update Newsletter. Retrieved June 13, 2014 from: http://www2.aap.org/nrp/inst_resources-resources-inst_update.html

Raghuveer, T. * Cox, A. (2011). Neonatal Resuscitation: An Update. *American Family Physician*, April 2011; 83(8): pg. 911-918. Retrieved June 17, 2014 from: <http://www.aafp.org/afp/2011/0415/p911.html>

Disclaimer

This publication is intended solely for the educational use of healthcare professionals taking this course, for credit, from RN.com, in accordance with RN.com [terms of use](#). It is designed to assist healthcare professionals, including nurses, in addressing many issues associated with healthcare. The guidance provided in this publication is general in nature, and is not designed to address any specific situation. As always, in assessing and responding to specific patient care situations, healthcare professionals must use their judgment, as well as follow the policies of their organization and any applicable law. This publication in no way absolves facilities of their responsibility for the appropriate orientation of healthcare professionals. Healthcare organizations using this publication as a part of their own orientation processes should review the contents of this publication to ensure accuracy and compliance before using this publication. Healthcare providers, hospitals and facilities that use this publication agree to defend and indemnify, and shall hold RN.com, including its parent(s), subsidiaries, affiliates, officers/directors, and employees from liability resulting from the use of this publication. The contents of this publication may not be reproduced without written permission from RN.com.

Participants are advised that the accredited status of RN.com does not imply endorsement by the provider or ANCC of any products/therapeutics mentioned in this course. The information in the course is for educational purposes only. There is no "off label" usage of drugs or products discussed in this course.

You may find that both generic and trade names are used in courses produced by RN.com. The use of trade names does not indicate any preference of one trade named agent or company over another. Trade names are provided to enhance recognition of agents described in the course.

Note: All dosages given are for adults unless otherwise stated. The information on medications contained in this course is not meant to be prescriptive or all-encompassing. You are encouraged to consult with physicians and pharmacists about all medication issues for your patients.