

## Basic Newborn Resuscitation

### Highlights from the World Health Organization 2012 Guidelines

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#### Key Messages

- Birth asphyxia is the cause of one-quarter of all neonatal deaths globally.
- Three to 5% of all newborns need resuscitation to initiate breathing. If resuscitation is not done in a timely and effective manner, it will lead to death or irreversible damage.
- Many newborns who require resuscitation have no identifiable risk factors before birth. Therefore, resuscitation must be anticipated at every birth, and preparation must be made. Every birth must be attended by a health worker skilled in newborn resuscitation.

## Background

In this document, birth asphyxia is defined as the failure to initiate and sustain breathing at birth.

Globally, approximately one-quarter of all newborn deaths are caused by birth asphyxia. Survivors of asphyxia can suffer permanent brain damage and irreversible damage to other organs. Some maternal and foetal conditions that increase the risk of birth asphyxia can be identified and managed before birth as part of quality antenatal care. However, many of the newborns who develop birth asphyxia have no identifiable risk factor present before birth. Good management of pregnancy and labour can prevent birth asphyxia, and poor-quality intrapartum care can increase the risk. Whatever the cause of birth asphyxia, the urgent corrective action is the same: immediate newborn resuscitation. Resuscitation, if done in a timely and effective manner, can drastically reduce deaths, neurological damage, and subsequent disabilities in the newborns who fail to initiate and sustain breathing at birth. Anticipation and preparation for resuscitation before every birth is therefore essential, with immediate corrective action. This would require every pregnant woman to give birth at a health facility equipped with appropriate and functional newborn resuscitation commodities and supplies, and the presence of a trained health worker who has the required newborn resuscitation skills to assist newborns who do not breathe spontaneously at birth.

In 2012, the World Health Organization (WHO) updated the clinical guidelines on basic newborn resuscitation suitable for settings with limited resources. Details of the systematic reviews of the scientific literature and full recommendations are available in the WHO *Guidelines on Basic Newborn Resuscitation* (2012). The objective of these recommendations is to ensure that newborns in resource-limited settings who require resuscitation are effectively resuscitated.

This brief complements the WHO guidelines, and highlights key changes and best practices for newborn resuscitation in resource-limited settings. Successful implementation of these recommendations at the time of birth is intended to improve the quality of care for newborns, and contribute to better health outcomes and reduce preventable newborn deaths and disabilities due to birth asphyxia.

## Best Practices and Key Changes in Basic Newborn Resuscitation

Best practices for essential newborn care, including resuscitation when needed, should be supported. Unnecessary harmful practices should be discouraged. In some settings, incorrect information about birth asphyxia and newborn resuscitation is common, as are beliefs that may affect whether or how newborns receive resuscitation. Therefore, it is important that governments and programme managers of resource-limited settings update national guidelines and standards for newborn care, based on WHO's new recommendations, and health care providers attending births get oriented on the best practices and put them into practice.

### Key Steps in Newborn Resuscitation

1. Prepare and check equipment before each birth (i.e., bag, mask, suction device).
2. Perform immediate and thorough drying for all newborns.
3. Rub the back two to three times of newborns who do not start breathing spontaneously after drying.
4. If the newborn starts breathing, keep the baby in skin-to-skin contact and continue to assess breathing. If the newborn does not start breathing continue with step 5.
5. Place the baby on a clean, dry, flat, and firm surface.
6. Open the baby's airway and position the head correctly.
7. Start positive-pressure ventilation for nonbreathing newborns within 1 minute of birth.
8. Start positive-pressure ventilation with room air for all nonbreathing newborns born older than 32 weeks gestation and with 30% oxygen for newborns born at or before 32 weeks gestation.
9. Assess the adequacy of ventilation by checking chest rise (continuously) and heart rate (after 1 minute of effective ventilation).
10. Improve ventilation if there is inadequate chest movement with ventilation.
11. Focus on providing adequate ventilation rather than chest compressions.

**Table 1. WHO 2012 recommendations on basic newborn resuscitation**

Immediate Care after Birth
<ul style="list-style-type: none"><li>• In newborn term or preterm newborns who do not require positive-pressure ventilation, the cord should not be clamped earlier than 1 minute after birth.<sup>1</sup> When newborn term or preterm newborns require positive-pressure ventilation, the cord should be clamped and cut to allow effective ventilation to be performed.<sup>2</sup></li><li>• Newborns who do not breathe spontaneously after thorough drying should be stimulated by rubbing the back two to three times before clamping the cord and initiating positive-pressure ventilation.</li><li>• In newborns born through clear or meconium-stained amniotic fluid who start breathing on their own after birth, suctioning of the mouth and nose should not be performed.</li><li>• In newborns born through clear amniotic fluid who do not start breathing after thorough drying and rubbing of the back two to three times, suctioning of the mouth and nose should not be done routinely before initiating positive-pressure ventilation. Suctioning should be done only if the mouth or nose is full of secretions.</li><li>• In the presence of meconium-stained amniotic fluid, intrapartum suctioning of the mouth and nose at the delivery of the head on the perineum is not recommended.</li><li>• In newborns born through meconium-stained amniotic fluid who start breathing on their own, tracheal suctioning should not be performed. In newborns born through meconium-stained amniotic fluid who <b>do not</b> start breathing on their own, suctioning of the mouth and nose should be done before initiating positive-pressure ventilation. If possible, tracheal suctioning should be done before initiating positive-pressure ventilation.</li><li>• In settings where mechanical equipment to generate negative pressure for suctioning is not available and a newborn baby requires suctioning, a bulb syringe (single-use or easy to clean and sterilize) is preferable to a mucous extractor with a trap in which the provider generates suction by aspiration.</li></ul>
Positive-Pressure Ventilation
<ul style="list-style-type: none"><li>• In newborns who do not start breathing despite thorough drying and additional stimulation, positive-pressure ventilation should be initiated within 1 minute after birth.</li><li>• In term or preterm (born older than 32 weeks gestation) newborns requiring positive-pressure ventilation, the ventilation should be initiated with air.</li><li>• In newborns requiring positive-pressure ventilation, the ventilation should be initiated using a face mask interface and provided using a self-inflating bag and mask.</li><li>• In newborns requiring positive-pressure ventilation, adequacy of ventilation should be assessed by measurement of the heart rate after 60 seconds of ventilation with visible chest movements.</li><li>• In newborns who do not start breathing within 1 minute after birth, priority should be given to providing adequate ventilation rather than to chest compressions.</li></ul>
Stopping Resuscitation
<ul style="list-style-type: none"><li>• In newborns with no detectable heart rate after 10 minutes of effective ventilation, resuscitation should be stopped. In newborns who continue to have a heart rate below 60 beats per minute and no spontaneous breathing after 20 minutes of resuscitation, resuscitation should be stopped.</li></ul>

<sup>1</sup> Delayed cord clamping allows further blood flow and helps to prevent iron deficiency in the infant. Ref: McDonald SJ, Middleton P, Dowswell T, Morris PS. 2013. Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. *Cochrane Database of Systematic Reviews*. (7). doi: 10.1002/14651858.CD004074.pub3.

<sup>2</sup> "Not earlier than 1 minute" should be understood as the lower limit supported by published evidence. WHO Recommendations for the Prevention of Postpartum Haemorrhage (2012) state that the cord should not be clamped earlier than is necessary for applying cord traction, which the Guideline Development Group clarified would normally take around 3 minutes.

**Table 2. Key changes in the recommendations for newborn resuscitation**

Key Changes	Evidence and Justifications
1. Delay cord clamping to 1–3 minutes after birth, unless the newborn is not breathing and requires resuscitation.	Current evidence shows significant benefits of late cord clamping in normal term and preterm newborns in reducing anaemia, and the need for blood transfusions and increasing body iron stores. Added benefit of normal iron status is its association with better cognitive development.
2. No routine suctioning of mouth and nose should be performed.	Evidence shows that routine oral and nasal suctioning at the time of birth might be associated with potential harms—lower oxygen saturation levels and lower Apgar scores—in newborns who begin breathing spontaneously after birth. Routine suctioning may delay the start of effective positive-pressure ventilation. Oralnasal suction should be carried out only in newborns who are not breathing after thorough drying and additional stimulation, and whose nose and mouth are full of secretions.
3. Start positive-pressure ventilation using a face mask device for nonbreathing newborns within 1 minute of birth.	Ventilation is the most effective intervention for asphyxiated newborns. It ensures oxygenation of the vital organs, such as brain and heart, and also initiates spontaneous breathing. When started early after birth, it improves the chances of immediate survival and prevents long-term neurological sequelae.
4. Start positive-pressure ventilation with room air for all nonbreathing newborns born after 32 weeks gestation. In newborns born at or before 32 weeks gestation, ventilation should be started with 30% oxygen and then adjusted to infant's needs. If this is not possible, start ventilation with air.	Evidence shows that for preterm infants born after 32 weeks gestation, resuscitation using air reduces the risk of mortality and the time of onset of spontaneous breathing in newborns born when compared with resuscitation using 100% oxygen. In preterm infants born at or before 32 weeks, especially extreme preterm infants, initiation of resuscitation with 30% oxygen resulted in better clinical outcomes. Whenever possible administration of oxygen should be monitored with pulse oximeter.
5. Focus on providing adequate ventilation rather than chest compressions.	Evidence shows that in most resuscitated newborns, the heart rate increases within 30–60 seconds of effective ventilation. The addition of chest compressions to positive-pressure ventilation might be beneficial only if a second skilled provider is present and the heart rate is absent or less than 60 beats per minute after 1 minute of adequate positive-pressure ventilation.
6. Stop resuscitation a) in newborns with no detectable heart rate after 10 minutes of effective ventilation and b) in newborns who continue to have a heart rate below 60 beats per minute and no spontaneous breathing after 20 minutes of resuscitation.	Currently available evidence indicates that newborns with asystole at 10 minutes after birth are at an extremely high risk of mortality or abnormal neurological outcomes. However, in newborns who have a detectable heart rate, health care providers might want to continue resuscitation efforts if advanced care is available. Where possible, the parents' views on resuscitation should be obtained and supported.

**Table 3. Implementation considerations: How can countries achieve best practices for basic newborn resuscitation?**

Policy and Programme Changes
<ul style="list-style-type: none"> <li>• Adopt a goal that skilled resuscitation should be available at every birth.</li> <li>• Ensure national policies and plans are aligned with new recommendations for the management of a newborn baby who does not breathe spontaneously at birth.</li> <li>• Ensure local guidelines and clinical care standards for each level of care are adapted and available in all health facilities that provide maternity and newborn services.</li> <li>• Ensure that all newborns successfully resuscitated receive essential newborn care.</li> <li>• Update/adapt and use job aids and possibly computer-assisted learning tools for management of a newborn baby who does not breathe spontaneously at birth, ensuring alignment with updated guidelines.</li> <li>• Ensure professional groups/associations are oriented on the new guidelines and encourage official endorsement.</li> </ul>

<b>Policy and Programme Changes</b>
<ul style="list-style-type: none"> <li>• Ensure that appropriate equipment for newborn resuscitation is on national procurement and distribution lists and in the inventories, and is supplied to every site at which newborns are born. Also ensure systems are in place so appropriate equipment is kept in good condition and made available at all births.</li> <li>• Ensure that new recommendations are included in quality improvement tools and pre-service and in-service training curricula.</li> <li>• Work with development partners in-country to ensure that consistent messages on newborn resuscitation are provided to providers working under separately supported programs.</li> </ul>
<b>Health Worker Skills and Competencies</b>
<ul style="list-style-type: none"> <li>• Update facility-based health workers' skills and competencies in newborn resuscitation, and promote best practices according to the new recommendations.</li> <li>• Ensure that every birth is attended by a health worker who has current knowledge and competencies for newborn resuscitation.</li> <li>• Ensure supervision and continuous mentoring, including peer learning, to retain skills of health workers providing newborn resuscitation at health facilities.</li> <li>• Support health workers to use resuscitation-related data for decision-making to improve programs and meet standards/recommendations.</li> </ul>
<b>Commodities</b>
<ul style="list-style-type: none"> <li>• Ensure availability, maintenance, and cleanliness of essential equipment for basic newborn resuscitation at all health facilities that provide care during childbirth, and ensure that these supplies are prepared for every delivery. This includes: <ul style="list-style-type: none"> <li>– Partograph (as a decision-making tool during labour)</li> <li>– Dry cloths/towels to dry and cover the baby</li> <li>– Supplies for clamping and cutting the cord</li> <li>– Firm, flat, clean, and dry surface with a heat source (radiant heater) to perform resuscitation</li> <li>– A suction device: bulb syringes (single-use or easy to clean) or mechanical equipment generating negative pressure and single-use catheters</li> <li>– A self-inflating bag (200–320 mL) and mask (size 0 and 1) for normal and small newborns</li> <li>– A clock or watch to measure heart rate and length of time that ventilation was required</li> <li>– Stethoscope to check heart rate</li> <li>– Charts for documentation of resuscitation, progress, and outcomes, as well as birth and death certificates and perinatal death review tools</li> <li>– Source of oxygen and pulse oximeter (in large birth facilities and at referral levels)</li> </ul> </li> </ul>
<b>Community Actions</b>
<ul style="list-style-type: none"> <li>• Promote increased community awareness of the risks of birth asphyxia, the importance of skilled care at birth, and the potential to prevent death and disability through basic newborn resuscitation.</li> <li>• Encourage women and their families to develop a birth plan and emergency plan in conjunction with their health providers, and deliver with assistance from a trained health provider, preferably at a health facility.</li> <li>• Encourage communities to develop support systems to help women and their families carry out birth/emergency plans (for example, community-supported transport to health facilities, revolving funds in the community).</li> </ul>

**Table 4. Recommended quality measures for monitoring basic newborn resuscitation**

<b>Quality Measures<sup>1</sup></b>
1. The health facility has written, up-to-date, clinical protocols for newborns who are not breathing spontaneously in the childbirth areas of the maternity unit that are consistent with WHO guidelines.
2. The health facility has a clean and functional self-inflating bag, at least two sizes of newborn masks, and a suction device in the childbirth and newborn areas.
3. All health care staff assisting at deliveries receive in-service training and regular refresher sessions in basic newborn resuscitation at least once every 12 months, coupled with monthly drills or simulation exercises and supportive supervision in basic newborn resuscitation.
4. All health workers assisting at deliveries can demonstrate their skills of providing effective positive-pressure ventilation with bag and mask on a manikin or a nonbreathing baby.
5. The health facility implements audit of perinatal deaths and has quality improvement protocols.

## Indicators<sup>1,2</sup>

1. The availability of clean and functional bag and mask of newborn size in the delivery area of maternity service
2. The proportion of all live newborns born at term (37 weeks or later) with no major congenital malformations, born at a health facility, who died within seven days of birth
3. The proportion of all live newborns born at term (37 weeks or later) at a health facility who were not breathing spontaneously but were breathing spontaneously 5 minutes after resuscitation

<sup>1</sup> Derived from the Standards for Improving Quality of Maternal and Newborn Care in Health Facilities (2016).

<sup>2</sup> Indicators on newborn resuscitation are currently being developed and field tested by the Every Newborn Action Plan global metrics expert panel. This document will be updated when the recommendations on indicators for newborn resuscitation have been approved.

## Additional References

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