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HOW TO PERFORM EMERGENCY NEONATAL RESUSCITATION IN THE DELIVERY ROOM

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ABSTRACT

Neonatal resuscitation is an essential intervention to ensure survival and minimize complications in newborns who face difficulties in the transition from intrauterine to extrauterine life. Approximately 10% of newborns require some level of respiratory assistance at birth, and around 1% need advanced resuscitation measures. Well-conducted resuscitation, based on clear protocols and rapid identification of clinical signs, significantly reduces neonatal morbidity and mortality, preventing neurological damage and improving long-term outcomes. Successful neonatal resuscitation depends on structured steps, such as warming up and positioning the newborn, effective ventilation, chest compressions and, in more serious cases, the administration of

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medication. In addition, continuous monitoring of vital signs and post-resuscitation management are crucial to stabilizing the baby and preventing further complications. The application of evidence-based guidelines, such as those recommended by the American Academy of Pediatrics (AAP) and the Brazilian Society of Pediatrics (SBP), is indispensable for ensuring standardized and effective interventions. Continuous training of the healthcare team, through regular training and practical simulations, is an essential component for improving performance in emergency situations. The standardization of protocols in hospitals and the integration of multidisciplinary teams strengthen the clinical response and reduce intervention times. In conclusion, well-conducted neonatal resuscitation is a central element in newborn care, with a direct impact on reducing neonatal mortality and promoting a better quality of life for survivors.

Keywords: Neonatal Resuscitation. Resuscitation Protocol. Training. Neonatal Morbidity and Mortality. Newborn Care.

INTRODUCTION

Immediate neonatal resuscitation is one of the most crucial procedures for the survival and long-term health of newborns in a situation of asphyxia or respiratory compromise at birth. Data from the World Health Organization (WHO) indicate that approximately 10% of newborns require some assistance to start breathing, and around 1% require advanced resuscitation measures. Failure to act promptly in these cases can lead to serious consequences, such as hypoxic-ischemic brain damage, chronic morbidity or neonatal death (WHO, 2018).

The transition period from intrauterine to extrauterine life is highly dependent on rapid and efficient physiological adaptation, especially in relation to the respiratory and cardiovascular systems. Immediate interventions, such as positive pressure ventilation and circulation support, are essential to restore adequate oxygenation and prevent irreversible damage to vital organs. Studies show that effective ventilation in the first 60 seconds after birth, known as the “Golden Minute”, is the most decisive factor in the success of resuscitation and the reduction of neonatal mortality (Niermeyer et al., 2020).

In addition, well-conducted neonatal resuscitation is essential to avoid long-term complications such as cerebral palsy, cognitive deficits and neurological problems. Updated guidelines from the Brazilian Society of Pediatrics (SBP) and the American Academy of Pediatrics (AAP) emphasize the importance of team preparation, continuous training and standardization of protocols to ensure that interventions are carried out quickly and accurately (Sociedade Brasileira de Pediatria, 2023).

Immediate neonatal resuscitation plays a fundamental role in reducing neonatal mortality and morbidity, and is indispensable in emergency situations in the delivery room. The technical preparation of the healthcare team and the availability of suitable equipment are crucial factors for successful management (Shankaran et al., 2017).

Perinatal asphyxia is one of the main causes of neonatal mortality and long-term morbidity, especially in low- and middle-income countries. The World Health Organization (WHO) estimates that every year around 1 million newborns die from birth asphyxia, representing approximately 25% of global neonatal deaths.

In addition, many survivors face severe neurological consequences, such as cerebral palsy, delayed neuropsychomotor development and cognitive deficits (WHO, 2018).

The interruption of oxygen supply to the fetus during labor, resulting in hypoxia

and metabolic acidosis. This condition can cause hypoxic-ischemic brain damage, compromising vital functions and leading to permanent complications. Studies show that rapid interventions, such as adequate ventilation in the first minutes of life, can significantly reduce morbidity and mortality rates, reinforcing the importance of neonatal resuscitation (Perlman et al., 2015).

Neonatal mortality due to asphyxia is directly associated with factors such as lack of access to quality obstetric care, lack of professionals trained in neonatal resuscitation and inadequate infrastructure in delivery rooms. In regions where neonatal resuscitation protocols are widely implemented and professionals receive regular training, neonatal mortality rates due to asphyxia are considerably lower (Lawn et al., 2014).

The morbidity associated with asphyxia is also significant. Newborns who survive severe episodes of asphyxia often present with hypoxic-ischemic encephalopathy (HIE), which can evolve into intellectual disability, seizures, and motor and behavioral difficulties throughout life. Studies reinforce that early diagnosis and appropriate management, such as the use of therapeutic hypothermia, can significantly improve outcomes in affected newborns (Shankaran et al., 2017).

In summary, birth asphyxia is a critical public health problem, impacting the survival and quality of life of newborns. Implementing resuscitation protocols, investing in team training and improving hospital infrastructure are fundamental measures to reduce mortality and morbidity associated with the condition.

OBJECTIVES

- To identify the main signs of need for neonatal resuscitation in newborns immediately after birth.
- Describe the critical stages of neonatal resuscitation, including initial assessment, ventilation, cardiac massage and drug administration.
- Present the techniques and equipment essential for carrying out effective resuscitation in the delivery room.
- Discuss the importance of training and organizing the healthcare team in order to optimize the management of neonatal emergencies.
- Provide guidelines for post-resuscitation monitoring and subsequent care of the newborn.

METHODOLOGY

TYPE OF STUDY

This is a descriptive literature review with a qualitative approach, based on guidelines and protocols from recognized organizations such as the Brazilian Society of Pediatrics (SBP), the American Academy of Pediatrics (AAP) and the World Health Organization (WHO).

METHODOLOGICAL STEPS

data collection

Review of scientific publications, clinical protocols and practical guides from reference institutions.

Search in databases such as PubMed, Scielo and Medline using keywords: “neonatal resuscitation”, “delivery room”, “neonatal asphyxia” and “resuscitation protocols”.

selection of sources

- Inclusion criteria:
  Publications from the last 10 years (except classics relevant to the topic).
  Texts in Portuguese, English or Spanish.
  Studies based on clinical evidence and systematic reviews.
- Exclusion criteria:
  Works with an exclusively experimental approach or focused on scenarios outside the delivery room environment.

RESULTS AND DISCUSSION

Neonatal mortality in the delivery room, defined as newborn deaths in the intrapartum period or immediately after birth, is an important indicator of the quality of obstetric and neonatal care. In Brazil, approximately 8.3 deaths per thousand live births occurred in the neonatal period in 2021, of which a significant proportion are related to intrapartum events and preventable complications, such as perinatal asphyxia and early infections.

Studies show that around 74% of neonatal deaths in Brazil are preventable, highlighting failures in prenatal and intrapartum management, as well as regional

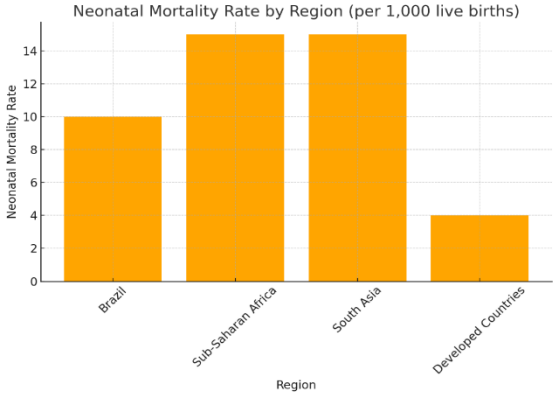
inequalities that affect the quality of care (Revista Brasileira de Saúde Materna e Infantil, 2021; Ministério da Saúde, 2023).

Globally, the intrapartum neonatal mortality rate varies between countries, reflecting differences in health systems. Data from the World Health Organization (WHO) indicate that around 1.9 million neonatal deaths occur annually, 41% of which are related to complications during childbirth, especially in low- and middle-income countries. The global prevalence of neonatal deaths in the delivery room is highest in sub-Saharan Africa and South Asia, with rates of more than 15 per thousand live births, in contrast to developed countries, where the rate is less than 3 per thousand (Lawn et al., 2014; WHO, 2022).

In Brazil, studies such as the “Birth in Brazil” survey (2011-2022) have identified that complications related to perinatal asphyxia and inadequate care during childbirth are responsible for a significant proportion of intrapartum neonatal deaths. Factors such as prematurity, low birth weight and maternal health conditions are critical determinants of adverse outcomes (Leal et al., 2023). In addition, the saturation of unnecessary caesarean deliveries in Brazilian urban centers also contributes to the increase in avoidable neonatal complications. GRAPHS 1 and 2 show the most relevant data cited in this text.

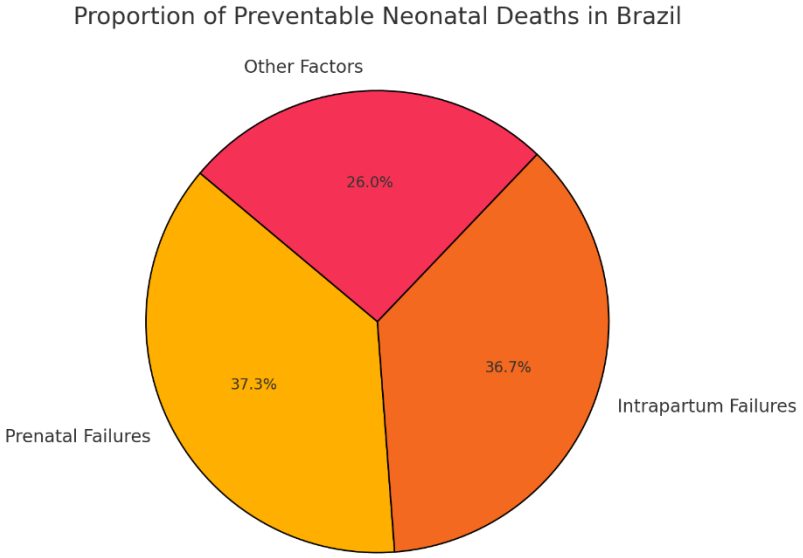
Globally, strategies to reduce neonatal mortality in the delivery room include the implementation of emergency obstetric care, training in neonatal resuscitation, and improvements in hospital infrastructure. Initiatives such as the WHO's “Helping Babies Breathe” program have demonstrated a positive impact in low-income countries by significantly reducing birth asphyxia deaths.

GRAPHIC 1. Neonatal Mortality Rate by Region (per thousand live births): Shows neonatal mortality rates in Brazil, Sub-Saharan Africa, South Asia, and developed countries (2021).



Source: (WHO, 2021).

GRAPHIC 2. Proportion of Preventable Neonatal Deaths in Brazil: Represents the percentage breakdown of preventable causes, highlighting prenatal failures, intrapartum failures, and other factors.



Source: (Ministry of Health, 2023).

INDISPENSABLE MATERIALS AND PRIOR CHECKS IN EMERGENCY NEONATAL RESUSCITATION

Neonatal resuscitation in the delivery room requires the availability of specific equipment and its prior verification, considering the emergency nature of the procedure and the importance of rapid and precise interventions. The absence of adequate materials or technical failures can significantly compromise the effectiveness of the maneuvers and increase the risk of neonatal morbidity and mortality (Perlman et al., 2015; Lawn et al., 2014; Sociedade Brasileira de Pediatria, 2023).

According to the Brazilian Society of Pediatrics (2023), the American Academy of Pediatrics (AAP) and the World Health Organization (WHO), the essential materials are;

Ventilation devices:

- Self-inflating bag (with a capacity of 240-750 mL, depending on the weight of the newborn).
- Face masks of different sizes, suitable for term and pre-term newborns.
- Mechanical or “T” ventilator (optional, but preferred for more precise ventilation).

Oxygen supply and administration devices:

- Oxygen supply with flow regulator.
- Gas mixing circuit for adjusting the fraction of inspired oxygen (FiO2).

Aspiration and Airway Cleaning:

- Suction catheters of varying sizes (6 to 10 Fr).
- Tracheal probes and laryngoscope (with size 00 and 0 blades).

Circulatory support devices:

- Cardiac monitor or pulse oximeter to assess heart rate and oxygen saturation.
- Adrenaline for administration in cases of persistent bradycardia.

Heating and temperature control:

- Heated field or radiant heat source.
- Polyethylene cap and thermal blankets.

Monitoring Equipment:

- Clock or stopwatch to control the time between steps.
- Neonatal stethoscope.

PRE-CHECK OF EQUIPMENT

Preparing the delivery room before the birth is essential to ensure the functionality of the equipment and the readiness of the team. Steps include:

Functional Test: Check the oxygen flow and FiO2 setting. Check the working pressure of the ventilator and the functioning of the self-inflating bag (including valves and seal).

Visual Inspection: Make sure that the masks and catheters are in good condition, with no cracks or obstructions.

Organization and Accessibility: Arrange materials logically, facilitating immediate access during resuscitation.

Laryngoscope test: Confirm the operation of the lamp and the integrity of the blades.

Proper maintenance and regular checks ensure that all devices are ready for immediate use, reducing response time and increasing the chances of successful neonatal resuscitation.

DEFINING ROLES AND RESPONSIBILITIES

The team's actions must be coordinated, with each member taking on specific roles to avoid delays or confusion during resuscitation. The following division of responsibilities is recommended:

resuscitation leader

Coordinates the team, makes decisions and ensures compliance with the protocol.

Monitors vital signs and adjusts the approach according to the newborn's response.

responsible for ventilation

Performs ventilation with bag and mask or other respiratory support devices.

Ensures proper sealing and monitors the effectiveness of ventilation.

circulation supporter

Performs chest compressions if necessary.

Monitors heart rate and adjusts interventions as necessary.

equipment and medication assistant

Prepares and administers medication (e.g. adrenaline).

Ensures that all devices are operational and easily accessible.

observer and timekeeper

Controls the time between steps and provides continuous feedback to the team leader.

PRIOR COMMUNICATION IN HIGH-RISK DELIVERIES

In scenarios of increased risk, such as extreme prematurity, congenital malformations or serious maternal complications, prior communication is indispensable to prepare the team. The main practices include:

advance planning

Hold prior meetings to discuss the action plan based on the obstetric risk assessment.

Identify potential complications and specific strategies to deal with them.

briefing at the time of delivery

Reinforce the division of roles and review resuscitation protocols.

Communicate the anticipated need for ventilation or other advanced procedures.

use clear and standardized language

Employ direct and concise commands during resuscitation.

Ensure that all members understand the instructions and can react promptly.

previous simulations

Promote regular training, including simulations based on high-risk scenarios, to strengthen team cohesion and identify areas for improvement.

impact of organization on neonatal resuscitation

Studies show that well-organized and trained teams have a higher success rate in resuscitation, with shorter response times and fewer complications. Clearly defined roles and efficient communication are key to a positive neonatal outcome.

INITIAL ASSESSMENT OF THE NEWBORN IN NEONATAL RESUSCITATION

The initial assessment of the newborn at birth is a critical step in determining the need for immediate interventions or routine care. The process must be rapid and based on objective criteria to identify signs of vitality and the newborn's degree of impairment.

RAPID IDENTIFICATION

Identification of the newborn's signs of vitality should take place within the first few seconds after birth, assessing three main parameters:

breathing (present or absent)

A healthy newborn starts breathing spontaneously within 30 seconds of birth.

Irregular breathing or apnea suggests the need for stimulation and/or ventilatory support.

muscle tone

A vigorous newborn has good limb flexion and spontaneous movements.

Hypotonia may indicate neurological impairment or asphyxia.

heart rate

This is the most important parameter for determining the need for resuscitation.

Heart rate < 100 bpm indicates the need for positive pressure ventilation (PPV).

Heart rate < 60 bpm, after effective PPV, requires chest compressions.

IMMEDIATE DECISION

After the initial assessment, the newborn must be classified into one of two groups in order to define the course of action:

- Good Vitality:

Characteristics: regular breathing, good muscle tone and heart rate ≥ 100 bpm.

Management: routine care, including: drying and warming.

Positioning in skin-to-skin contact with the mother. Continuous assessment during transition.

1.Risk of suffocation

Characteristics: absent or irregular breathing, hypotonia, heart rate < 100 bpm.

Conduct: immediately start the resuscitation steps: tactile stimulation.

Positive pressure ventilation (if necessary). Chest compressions and/or administration of medication in severe cases.

The decision must be made in less than 30 seconds, based on previously established protocols, such as those described in the American Academy of Pediatrics (AAP) Neonatal Resuscitation program.

Rapid identification and early decision-making are essential to prevent the progression of neonatal asphyxia and minimize the risk of hypoxic-ischemic injuries. '

Studies highlight that effective ventilation in the first 60 seconds after birth (Golden Minute) is associated with a significant reduction in neonatal mortality and long-

term neurological complications.

Neonatal resuscitation is carried out systematically, following stages that prioritize the respiratory and cardiovascular stabilization of the newborn. These interventions must be started quickly, according to the clinical signs presented.

WARMING, POSITIONING AND CLEARING THE AIRWAY

1. maintaining body temperature:

Newborns have a higher risk of hypothermia, especially premature infants, due to their large body surface area and limited fat reserves.

Measures:

Use of heated field.

Immediate drying and changing of wet fields.

For premature infants (< 32 weeks), wrap the baby in a sterile plastic bag or use a polyethylene cap.

2.Positioning the head:

A neutral or slightly extended head position facilitates airway patency.

Care should be taken to avoid flexion or hyperextension, which can hinder ventilation.

3.Aspiration of secretions:

Only indicated if the newborn has obstructive secretions or if there is meconium associated with respiratory difficulty.

Oral suction followed by nasal suction to avoid vagal reflexes and bradycardia.

VENTILATION

1. Indications for Bag and Mask Ventilation:

Heart rate < 100 bpm or absent/irregular breathing after initial steps.

First line of intervention for newborns with signs of asphyxia.

2.Adequate technique:

Ensure complete seal of mask over nose and mouth.

Use the “C-E” technique to hold the mask and maintain adequate pressure.

Provide positive pressure ventilation at 40-60 movements/minute.

3.Use of Supplemental Oxygen:

Start with room air (21% O2) and adjust according to O2 saturation monitoring

with pulse oximeter.

Supplementary oxygen should be used as necessary to avoid hyperoxia.

CARDIAC MASSAGE

1. Indications:

Heart rate < 60 bpm after 30 seconds of effective ventilation.

2.Correct technique:

Location: lower third of the sternum.

Chest compressions with a depth of 1/3 of the anteroposterior diameter of the chest.

Rhythm: 3 compressions to 1 ventilation (3:1 ratio), totaling around 120 events/minute.

MEDICATION ADMINISTRATION

1. Indications:

Persistent heart rate < 60 bpm after 30 seconds of effective ventilation and chest compressions.

2.Use of Adrenaline:

Recommended dose: 0.01-0.03 mg/kg intravascularly.

Repeat every 3-5 minutes as necessary.

3.Route of administration:

Preferably via the umbilical vein.

If this is not possible, consider the endotracheal route as a temporary alternative.

CLINICAL RELEVANCE

A structured approach to neonatal resuscitation significantly increases the chances of survival and reduces the risk of long-term complications, such as cerebral palsy and neurological deficits. The proper application of the steps depends on the preparation of the team and the availability of equipment.

NEONATAL POST-RESUSCITATION MONITORING: IMPORTANCE AND CHALLENGES

Neonatal post-resuscitation monitoring is a critical step in ensuring the

stabilization and survival of the newborn after emergency interventions. This process involves the continuous assessment of vital signs, including heart rate, oxygen saturation, respiration and temperature. Changes in these parameters can indicate clinical instability and the need for additional interventions. Studies show that careful monitoring reduces complications and favors a safer transition to continuous care in the neonatal unit (Wyckoff et al., 2020).

The transfer of the newborn to the neonatal unit must be carefully planned, taking into account the maintenance of ventilation, body temperature and hemodynamic support during transportation. Newborns who require resuscitation usually need continuous specialized monitoring, which requires trained professionals and appropriate equipment, such as ventilation and cardiac monitoring devices. Successful transition to the neonatal unit is essential to prevent additional morbidities, such as hypothermia and hypoglycemia (Sociedade Brasileira de Pediatria [SBP], 2023).

Communication with the family is an essential component of post-resuscitation management. Parents should be informed in a clear and empathetic way about the newborn's current state, the interventions carried out and the next steps. This moment is also important to offer emotional support, especially in cases of uncertain prognosis, and to build trust in the care provided by the healthcare team. Proper management during and after neonatal resuscitation has a significant impact on neonatal outcomes.

Effective interventions and appropriate monitoring reduce mortality and minimize long-term neurological sequelae, such as cerebral palsy and cognitive deficits. Studies indicate that the implementation of evidence-based protocols improves survival rates and the quality of life of newborns. quality of life (WHO, 2018).

Despite advances, challenges are still faced in the delivery room, including a lack of resources, the high workload of healthcare teams and variability in access to specialized training. These factors can limit the ability to provide optimal care in emergencies. To overcome these barriers, it is essential to invest in the continuous training of healthcare teams. Training programs based on simulations and periodic reviews of protocols, such as those developed by the AAP and SBP, have proven effective in improving team coordination and performance.

In summary, post-resuscitation neonatal monitoring is an indispensable component of emergency care, with a direct impact on clinical outcomes and the newborn's quality of life. The combination of continuous assessment, effective

communication with the family and team training is essential to meet the challenges of clinical practice and improve neonatal outcomes.

CONCLUSION

Well-conducted neonatal resuscitation is an essential intervention for reducing neonatal morbidity and mortality, especially in cases of birth asphyxia. The implementation of clear, evidence-based protocols and the standardization of clinical practices in hospitals are fundamental strategies for ensuring efficient and safe care in the first minutes of the newborn's life. In addition, proper management during resuscitation has a significant impact on preventing long-term complications, such as neurological deficits and compromised quality of life.

Continuous training of healthcare teams is equally crucial, considering that technical competence and coordination during neonatal emergencies depend on the adequate preparation of professionals. Regular training programs, including simulations and updates to guidelines, strengthen the team's performance and reduce errors in high-pressure situations. This investment in professional training not only improves clinical outcomes, but also promotes greater confidence and safety in the care provided.

This reinforces the need for hospital institutions to prioritize training and the standardization of neonatal resuscitation protocols as central elements of their care strategies. This integrated approach, which combines technical training, organization and continuous monitoring, is decisive in saving lives and ensuring a healthier start to life for newborns in emergency situations.

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