



Textbook of
**Neonatal
Resuscitation**[®]

9th Edition



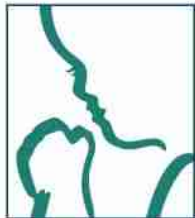
**American
Heart
Association.**

**American Academy
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DEDICATED TO THE HEALTH OF ALL CHILDREN[®]

Textbook of Neonatal Resuscitation®



9th Edition

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For nearly 40 years, the Neonatal Resuscitation Program® (NRP®) has been the trusted standard in neonatal resuscitation education, equipping health care professionals with the essential knowledge and skills to save newborn lives.

Developed by a diverse group of neonatal experts, NRP combines the latest science with real-world experience to ensure providers are prepared with the most current, evidence-based practices. With its blend of online adaptive learning, simulation-based scenarios, and hands-on skills practice, NRP delivers a flexible and practical educational experience. Its vision is simple yet powerful: to improve neonatal health by having an expert provider at every birth and an expert team at every resuscitation.

The ninth edition continues this commitment, integrating cutting-edge research, innovative learning approaches, and the collective expertise of the neonatal community to set the worldwide standard for excellence in resuscitation training.

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 - Resuscitation in the Neonatal Intensive Care Unit

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American Academy of Pediatrics

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Textbook of Neonatal Resuscitation, 9th Edition

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Contents

	Preface	ix
	Neonatal Resuscitation Program® Provider Course Overview	xi
LESSON 1:	Foundations of Neonatal Resuscitation	1
LESSON 2:	Anticipating and Preparing for Resuscitation	11
LESSON 3:	Initial Steps of Newborn Care	27
LESSON 4:	Ventilation	51
LESSON 5:	Endotracheal Intubation	93
LESSON 6:	Chest Compressions	127
LESSON 7:	Medications	143
LESSON 8:	Resuscitation and Stabilization of Infants Born Preterm	169
LESSON 9:	Post-resuscitation Care	187
LESSON 10:	Special Considerations	199
LESSON 11:	Ethics and Care at the End of Life	221

Contents

S U P P L E M E N T A L L E S S O N S :

LESSON 12:	Improving Resuscitation Team Performance	233
LESSON 13:	Resuscitation Outside the Delivery Room	243
LESSON 14:	Bringing Quality Improvement to Your Resuscitation Team	255
LESSON 15:	Resuscitation and Stabilization of Newborn Infants With Congenital Heart Disease	265
LESSON 16:	Resuscitation in the Neonatal Intensive Care Unit	289

A P P E N D I X :

Part 5: Neonatal Resuscitation: 2025 American Heart Association and American Academy of Pediatrics Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care	311
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I N D E X :	315
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Preface

Each day in the United States and Canada, nearly 1,000 newborn infants require immediate assistance to take their first breath. As a health care professional enrolled in the Neonatal Resuscitation Program® (NRP®), you are demonstrating your commitment to ensuring that every infant in your care has the best possible start. Since 1987, NRP has been the training standard for health care professionals entrusted to provide lifesaving care for newborn infants in North America and 130 countries around the world. As a participant in this gold standard program, you are joining 5 million health care professionals who have been trained or retrained to acquire the knowledge and skills necessary to save newborn infants' lives. The *Textbook of Neonatal Resuscitation*, 9th edition, has been fully updated and includes new material; however, it continues to emphasize the same basic principles that have been the foundation of NRP since its inception.

The recommendations in this textbook are developed following a rigorous and structured review process. Members of the American Academy of Pediatrics, Canadian Paediatric Society, American Heart Association, and Heart and Stroke Foundation of Canada work with resuscitation councils from around the world as partners on the International Liaison Committee on Resuscitation (ILCOR) Neonatal Life Support Task Force. This group of experts continuously reviews the most up-to-date neonatal resuscitation science and formulates international consensus statements with treatment recommendations. Based on these consensus statements, member councils develop resuscitation guidelines reflecting their regional needs. The current North American guidelines are published in the journals *Circulation* and *Pediatrics*. Finally, the NRP Steering Committee develops educational materials to help learners acquire the knowledge and skills necessary to implement the North American guidelines.

Like all previous editions, the current textbook and its associated course materials emphasize the importance of adequate preparation, effective ventilation, and quality teamwork. Reflecting the complexity of evolving resuscitation science, readers will recognize that some recommendations are not as specific as they might like. Neonatal resuscitation is an expanding field of study, and ongoing research will inform future recommendations. Based on the most current available science, practice changes incorporated in this edition include updated recommendations for umbilical cord management, changes in the rate and peak pressure used during assisted ventilation, and interim recommendations for the oxygen concentration used during ventilation of preterm newborn infants. New skills incorporated into the 9th edition include paracentesis for abdominal ascites and pericardiocentesis for cardiac tamponade. This edition includes updated versions of the previous 14 lessons and 2 new supplemental lessons. The new supplemental lessons focus on initial

Preface

stabilization and resuscitation of newborn infants with congenital heart disease (Lesson 15) and bridging the gap between neonatal and pediatric resuscitation guidelines for infants in the neonatal intensive care unit (Lesson 16). These 2 supplemental lessons are supported by 2 new courses: *NRP Cardiac* and *Resuscitation in the NICU*.

This textbook and the educational program it supports could not be completed without a highly talented and dedicated team. I want to acknowledge the tremendous effort made by the entire NRP Steering Committee and its liaison and consulting members, the primary authors of the new supplemental lessons (Anne Ades, Noorjahan Ali, Taylor Sawyer), our 9th edition photographer (Ty Gomez), the content director of the skills videos (Nathan Sundgren) and video producer (Jeremy Bloom), our copy editor (Janice Snider), the AAP staff who guided the entire process (Jessica Weglarz and Kaitlin Butterfield), and the inspiration provided by the giants in neonatal resuscitation (John Kattwinkel and Jeffrey Perlman). Most importantly, I want to acknowledge the contributions made to the entire NRP educational program by my editorial partners Christine Cooper and Henry Lee.

On behalf of everyone involved in preparing the 9th edition course materials, we hope they support your personal journey to master the skills of neonatal resuscitation and our shared mission to improve the health of newborn infants and their families.



Gary M. Weiner, MD, FAAP

Neonatal Resuscitation Program[®] Provider Course Overview

Neonatal Resuscitation Scientific Guidelines

The Neonatal Resuscitation Program[®] (NRP[®]) materials are based on the Part 5: Neonatal Resuscitation: 2025 American Heart Association (AHA) and American Academy of Pediatrics (AAP) Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (*Pediatrics*. 2025; doi: 10.1542/peds.2025-074352). A link to the Guidelines appears in the Appendix. Please refer to the Guidelines if you have any questions about the rationale for the current program recommendations. The Guidelines, originally published in October 2025, are based on the International Liaison Committee on Resuscitation (ILCOR) Consensus on Cardiopulmonary Resuscitation Science with Treatment Recommendations. The evidence-based reviews prepared by members of ILCOR, which serve as the basis for both documents, can be viewed at <https://ilcor.org/publications>.

Level of Responsibility

The NRP 9th edition curriculum offers 2 NRP provider categories:

- **NRP Essentials:** Anyone involved in the care of a newborn infant should take NRP Essentials, which consists of materials in Lessons 1 through 4.
- **NRP Advanced:** This provider option may be appropriate for those who attend births and are responsible for anticipated resuscitation of the infant with known risk factors and for those who participate in neonatal resuscitation beyond ventilation. The NRP Advanced participant is responsible for material in Lessons 1 through 11.

Any learner may study supplemental lessons 12 through 16 but will not be tested on that material.

Each facility determines its own policy for who should attain NRP Essentials or Advanced provider status. If most staff participate in births with risk factors and are called to assist with complex resuscitation, then only a small number of select staff with limited responsibilities may be suited to NRP Essentials.

Special Note: Neonatal resuscitation is most effective when performed by a designated and coordinated team. It is important for you to know the neonatal resuscitation responsibilities of team members who are working with you. Periodic practice among team members will facilitate coordinated and effective care of the newborn infant.

Course Completion

The NRP 9th edition curriculum offers 2 learning methodologies for attaining NRP provider status: instructor-led courses and RQI® for NRP®.

Instructor-Led Courses

In hospitals that use the instructor-led course format, learners must complete the Online Learning Assessment and, within 90 days, attend the in-person skills/simulation portion of the course. During the in-person course, learners demonstrate mastery of resuscitation skills (Lessons 2 through 4 for Essentials and Lessons 2 through 7 for Advanced) and participate in simulated resuscitation scenarios, as determined by the course instructor(s).

Upon successful completion of these requirements, participants are eligible to receive an NRP Course Completion eCard (Essentials or Advanced). Once the online course evaluation is completed, an electronic Course Completion Card will be available in the learner's profile of the NRP Learning Platform™. Learners who attain provider status through an instructor-led course must renew their provider status every 2 years.

RQI® for NRP®

As a result of findings showing that episodic learning can improve neonatal resuscitation outcomes, the AAP has formed a collaboration with RQI Partners (a partnership between the American Heart Association and Laerdal Medical) to develop RQI for NRP, an optional learning methodology for NRP Essentials provider training.

RQI for NRP is a quality improvement program offering an alternative educational and administrative method that verifies competence in ventilation skills on a neonatal simulator. This program offers self-directed learning that uses low-dose, quarterly cognitive review and skills sessions to cover the content of NRP Essentials (Lessons 1 through 4).

Initial entry into the RQI for NRP format requires that learners complete the Online Learning Assessment and complete the skills required at the simulator. At that point, the learner attains an Essentials eCredential. An RQI for NRP learner is required to engage in quarterly cognitive and skills activities at their hospital simulation station (Figure) to maintain a current Essentials eCredential. With each quarterly activity, learner skills are reinforced and the expiration of the learner's eCredential is extended by 3 months.

If an RQI learner changes their NRP training location to a hospital that uses instructor-led courses and 2-year provider renewal, the learner requests an eCard that is valid for 2 years from the last completed quarterly engagement activity.

The NRP Advanced provider in a hospital that uses RQI for NRP maintains their Essentials provider status by completing the quarterly cognitive and skills-based practice sessions at the simulation station and renews their Advanced provider status at an instructor-led course every 2 years.



Figure. An NRP learner practices ventilation skills at the RQI simulation station.

Completion Does Not Imply Competence

The NRP is an educational program that introduces the concepts and basic skills of neonatal resuscitation. Attaining and maintaining NRP provider status does not imply that an individual has the competence to perform neonatal resuscitation in the clinical setting. Each hospital is responsible for determining the level of competence and qualifications required for someone to assume clinical responsibility for neonatal resuscitation.

Standard Precautions

The United States Centers for Disease Control and Prevention has recommended that standard precautions be taken whenever the risk of exposure to blood or bodily fluids is high and the potential infection status of the patient is unknown, as is certainly the case in neonatal resuscitation.

All fluid products from patients (eg, blood, urine, stool, saliva, vomitus) should be treated as potentially infectious. Gloves should be worn when resuscitating a newborn infant, and the rescuer should not use their mouth to apply suction via a suction device. Mouth-to-mouth

Neonatal Resuscitation Program® Provider Course Overview

resuscitation should be avoided by having a resuscitation bag and mask or T-piece resuscitator always available for use during resuscitation.

Masks and protective eyewear or face shields should be worn during procedures that are likely to generate droplets of blood or other bodily fluids. Gowns or aprons should be worn during procedures that probably will generate splashes of blood or other bodily fluids. Birth settings must be equipped with resuscitation bags, masks, laryngoscopes, endotracheal tubes, mechanical suction devices, and the necessary protective shields.

Foundations of Neonatal Resuscitation

What you will learn

- Why neonatal resuscitation skills are important
- Physiologic changes that occur during and after birth
- The format of the Neonatal Resuscitation Program® Algorithm
- Communication and teamwork skills used by effective resuscitation teams
- How implementing quality improvement methods can improve outcomes

Lesson

1



Key Points

- 1 Most newborn infants make the transition to extrauterine life without intervention.
- 2 Before birth, pulmonary blood vessels in the fetal lungs are tightly constricted, and the alveoli are filled with fluid, not air.
- 3 Respiratory failure is the most common reason that neonatal resuscitation is needed.
- 4 The most important and effective step in neonatal resuscitation is to ventilate the newborn infant's lungs.
- 5 Very few newborn infants will require chest compressions or medication.
- 6 Teamwork, leadership, and communication are critical to successful resuscitation of the newborn infant.

Neonatal resuscitation skills are important

The Neonatal Resuscitation Program (NRP®) will help you learn the cognitive, technical, and teamwork skills needed to resuscitate and stabilize newborn infants. Most newborn infants make the transition to extrauterine life without intervention. Within 30 seconds after birth, approximately 85% of term newborn infants will begin breathing. An additional 10% will begin breathing in response to drying and stimulation. To successfully transition, approximately

- Five percent of term newborn infants will receive assisted ventilation.
- Less than 1% of term newborn infants will be intubated.
- One to 3 per 1,000 newborn infants will receive chest compressions or emergency medications.

The likelihood of requiring these lifesaving interventions is higher for infants with certain identified risk factors and those born before full term. Even though most newborn infants do not require intervention, the large number of births each year means that timely intervention can save many newborn infants' lives. Because the need for assistance cannot always be predicted, health care professionals need to be prepared to respond quickly and efficiently at every birth.

During your NRP course, you will learn how to evaluate a newborn infant, make decisions about what actions to take, and practice the steps involved in neonatal resuscitation. As you practice together in simulated cases, your team will gradually build proficiency and speed. The most gratifying aspect of providing skillful assistance to

a compromised newborn infant is that your efforts are likely to be successful. The time you devote to learning how to resuscitate newborn infants is time well spent.

Newborn infants require a different approach to resuscitation

Most often, adult cardiac arrest is a complication of coronary artery disease.

- It is caused by a **sudden arrhythmia** that prevents the heart from effectively circulating blood.
- Without effective circulation, the individual loses consciousness and stops breathing. At the time of cardiac arrest, the blood oxygen and carbon dioxide (CO₂) content is usually normal, and the lungs remain filled with air.
- During adult resuscitation, chest compressions maintain circulation until the heart's function is restored.

In contrast, most newborn infants requiring resuscitation have a healthy heart. When a newborn infant requires resuscitation, it is usually because **respiratory failure** interferes with oxygen and CO₂ exchange.

- Before birth, fetal respiratory function is performed by the placenta instead of the fetal lungs. When the placenta is functioning normally, it transfers oxygen from the pregnant person to the fetus and carries CO₂ away from the fetus to the pregnant person.
- When placental respiration fails, CO₂ accumulates and **acid increases in the fetal blood** as cells attempt to function without oxygen.
- Fetal monitoring may show a decrease in activity, loss of heart rate variability, and heart rate decelerations. If placental respiratory failure persists, the fetus will make a series of reflexive gasps followed by apnea and bradycardia.
- If the fetus is born in an early phase of respiratory failure, tactile stimulation may be sufficient to initiate spontaneous breathing and recovery. If the fetus is born in a later phase of respiratory failure, stimulation alone is not sufficient. The newborn infant will require assisted ventilation to recover. The most severely affected newborn infants may require chest compressions and epinephrine. **At the time of birth, you will not know if the newborn infant is in an early or a late phase of respiratory failure.**
- After birth, respiratory failure occurs if the newborn infant does not initiate or cannot maintain effective breathing effort.
- When respiratory failure occurs, the primary problem is a lack of gas exchange. Therefore, **the focus of neonatal resuscitation is effective ventilation of the newborn infant's lungs.**

Many concepts and skills are taught in this program. Establishing effective ventilation of the newborn infant's lungs during neonatal

resuscitation is the single most important concept emphasized throughout the program.

Ventilation of the newborn infant's lungs is the single most important and effective step in neonatal resuscitation.

Physiologic changes that occur after birth

Understanding the basic physiology of the cardiorespiratory transition from intrauterine to extrauterine life will help you understand the steps of neonatal resuscitation.

- **Before birth, the fetal lungs are filled with fluid**, not air, and they do not participate in gas exchange. All of the oxygen used by the fetus is supplied by the pregnant person's blood via diffusion across the placenta. The oxygenated fetal blood leaves the placenta through the umbilical vein and flows to the fetal heart (Figure 1.1A).
- Blood vessels in the fetal lungs (pulmonary vessels) are **tightly constricted** and very little blood flows through them. Instead, most of the oxygenated blood returning from the placenta via the umbilical vein bypasses the lungs and flows directly to the left side of the fetal

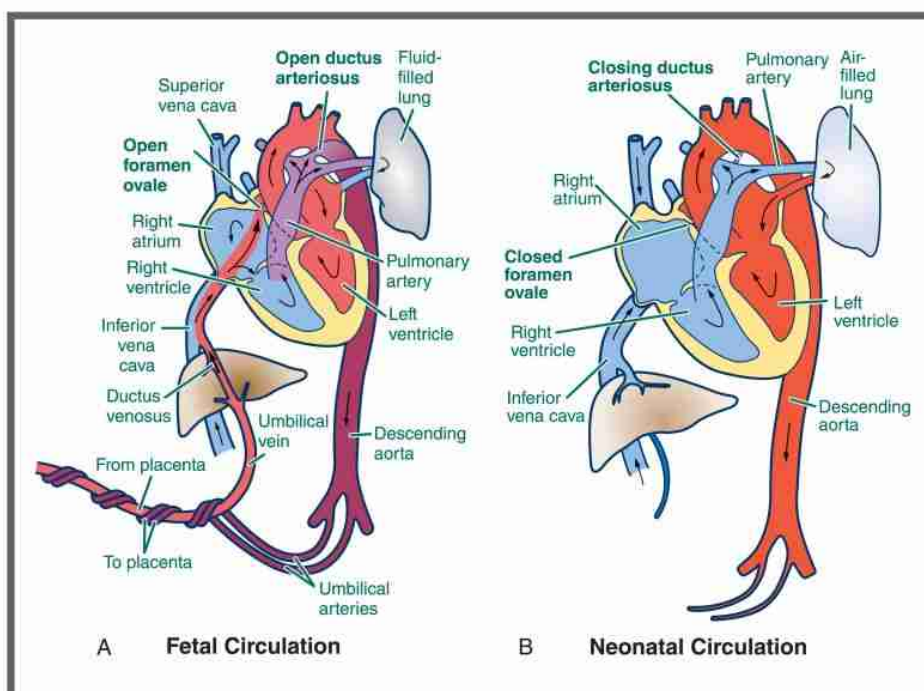


Figure 1.1. (A) Fetal Circulation Path: Oxygenated blood (red) enters the right atrium from the umbilical vein and crosses to the left side through the open foramen ovale and ductus arteriosus. Only a small amount of blood flows to the lungs. There is no gas exchange in the fluid-filled lungs. (B) Neonatal Circulation Path: The newborn infant breathes, pulmonary vessels relax, and blood flows to the air-filled lungs. Blood returning to the left side of the heart from the lungs has the highest oxygen saturation.

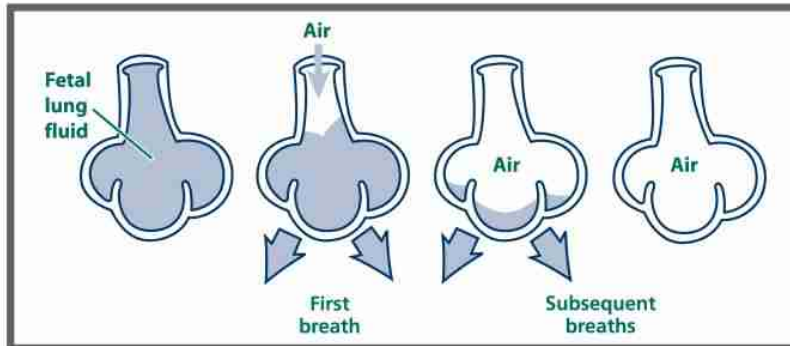


Figure 1.2. Air replaces fluid in the alveoli.

heart. This allows the most highly oxygenated blood to flow directly to the fetal brain and heart.

- After birth, a series of events culminates in a successful transition from fetal to neonatal circulation (Figure 1.1B).
 - As the infant takes deep breaths and cries, the **lungs fill with air** and fluid is pushed out of the air sacs (alveoli) (Figure 1.2).
 - **Air in the lungs causes the previously constricted pulmonary vessels to relax** so that blood can flow to the lungs and reach the alveoli where oxygen will be absorbed, and CO₂ will be removed.
 - **Oxygenated blood returning from the infant's lungs helps to fill the infant's heart** and ensure that the heart and brain will receive adequate blood flow once the umbilical cord is clamped.
 - Clamping the umbilical cord increases the infant's systemic blood pressure, decreasing the tendency for blood to bypass the infant's lungs.

Although these changes begin within a few minutes of birth, the entire process may not be completed for hours or days. For example, it may take up to 10 minutes for a healthy term newborn infant to achieve an oxygen saturation greater than 90%. It may take several hours for fluid in the lungs to be completely absorbed, and complete relaxation of the pulmonary blood vessels occurs gradually over several months.

When normal transition does not occur

If normal transition does not occur, the newborn infant's organs will not receive enough oxygen, acid will accumulate in tissues, and blood vessels in the infant's intestines, kidneys, muscles, and skin may constrict.

Temporarily, a survival reflex maintains blood flow to the newborn infant's heart and brain to preserve function of these vital organs. If inadequate gas exchange continues, the heart begins to fail and blood flow to all organs decreases. The lack of adequate blood flow and oxygen may lead to organ damage. Table 1-1 summarizes some of the clinical findings associated with an interruption in normal transition.

Table 1-1. Clinical Findings of Abnormal Transition

- Irregular breathing, absent breathing (apnea), or rapid breathing (tachypnea)
- Slow heart rate (bradycardia) or rapid heart rate (tachycardia)
- Decreased muscle tone or decreased activity
- Decreased alertness
- Persistent blue skin around mouth and face (central cyanosis)
- Persistent pale skin (pallor)
- Low oxygen saturation

The Neonatal Resuscitation Program Algorithm

The NRP Algorithm (Figure 1.3) describes the steps that you will follow to evaluate and resuscitate a newborn infant. It is divided into 6 blocks beginning with your team's preparation for the birth and continues through the series of interventions you may perform (**ABCD**). Throughout the Algorithm, hexagons indicate assessments and rectangles show actions that may be required. Although it is important to work quickly and efficiently, **you must ensure that you have adequately performed the steps of each block before moving on to the next block.** Assessments are repeated at the end of each block and will determine if you need to proceed. The details of each block are described in subsequent lessons.

- **Preparation:** Identify risk factors, discuss with obstetric care provider, counsel parents, assemble the team, perform a team briefing, and check supplies and equipment.
- **Initial Evaluation:** During the interval between birth and umbilical cord clamping, perform an initial evaluation to determine if the newborn infant can remain with the parent or should be moved to a radiant warmer for further assessment and intervention.
- **(A) Airway:** Perform the initial steps to establish an open **Airway** and support spontaneous respiration.
- **(B) Breathing:** Ventilation is provided to assist **Breathing** for infants with apnea or bradycardia. Other interventions (continuous positive airway pressure [CPAP] or supplemental oxygen) may be appropriate if the infant has labored breathing or low oxygen saturation.
- **(C) Circulation:** If severe bradycardia persists despite assisted ventilation, **Circulation** is supported by performing chest compressions coordinated with ventilation.
- **(D) Drug:** If severe bradycardia persists despite assisted ventilation and coordinated chest compressions, the **Drug** epinephrine is administered as coordinated ventilation and chest compressions continue.

Take a moment to familiarize yourself with the layout of the NRP Algorithm (Figure 1.3).

- Neonatal Resuscitation Program Essentials learners will focus on anticipating and preparing for resuscitation, the rapid evaluation, airway, and breathing steps of the Algorithm.

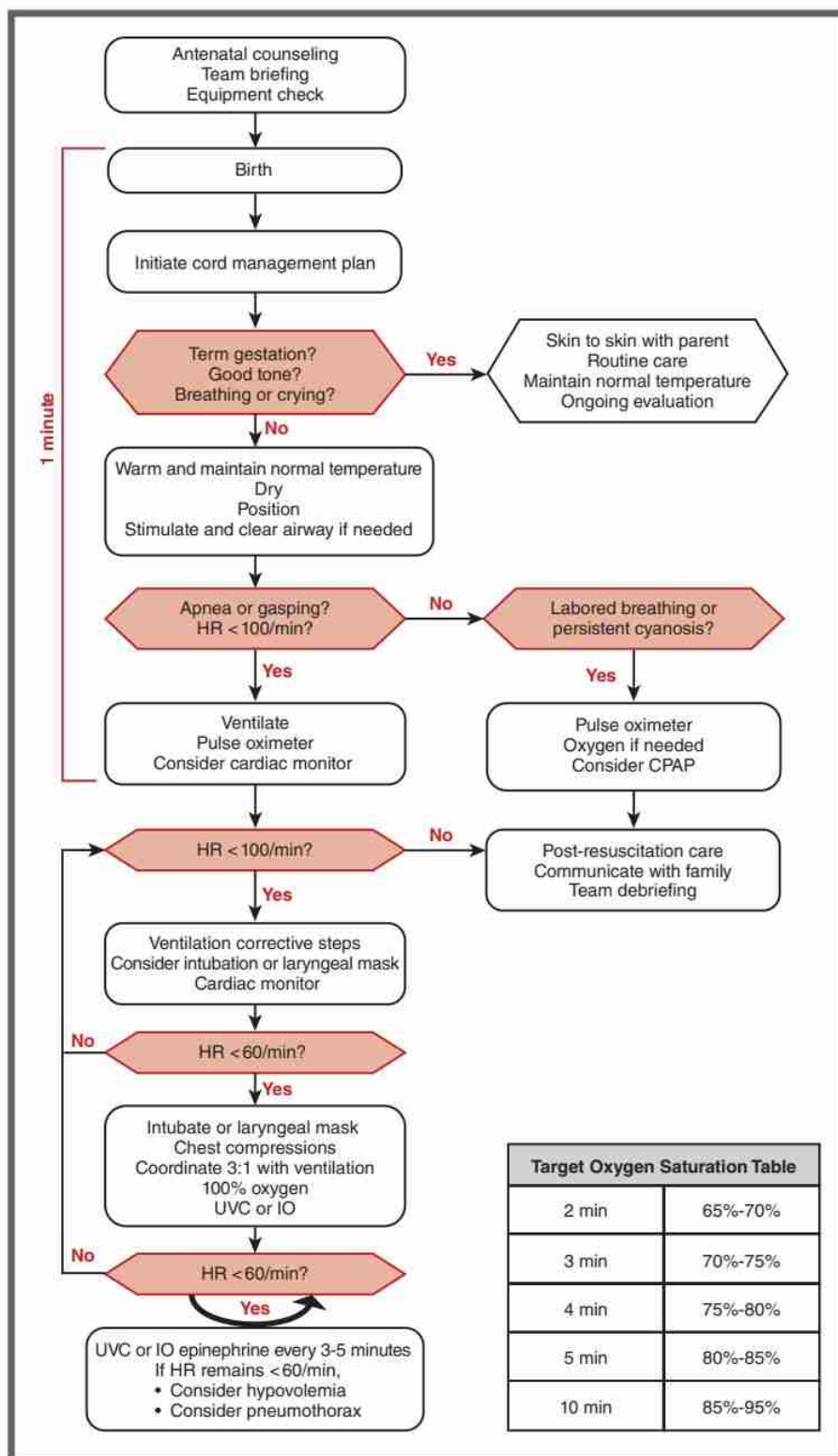


Figure 1.3. Neonatal Resuscitation Program Algorithm.

- Neonatal Resuscitation Program Advanced learners will study the entire Algorithm.

Teamwork

Effective teamwork is essential during neonatal resuscitation. Joint Commission investigations continue to find that **failures in teamwork, communication, and leadership are among the most common root causes of potentially preventable infant deaths in the delivery room.**

- During a complex resuscitation, providers need to perform multiple procedures without delay. Confusion and inefficiency may occur because several teams of caregivers are working in a confined space at the same time.
- Even though each individual may have the knowledge and skills needed to perform a successful resuscitation, each person's skills will not be used optimally without effective coordination.

Key Behavioral Skills

The 10 NRP Key Behavioral Skills, described in Table 1-2, are adapted from previously described models of effective teamwork (Center for Advanced Pediatric & Perinatal Education [CAPE], Lucile Packard Children's Hospital at Stanford University). In each of the lessons that follow, we will highlight how effective teams use these behavioral skills.

Improving your teamwork, communication, and leadership requires deliberate practice under conditions that are as realistic as possible. As you review each lesson and participate in simulation, think about how these behavioral skills can be used to improve your own team's performance. **Remember that every member of the team has a responsibility to tell the leader and other team members of observations or information that will improve the resuscitation in progress.**

Quality improvement methods improve outcomes

The NRP course helps you acquire the knowledge and skills that you need to save newborn infants' lives, but knowledge alone does not guarantee improved outcomes. Completing an NRP course is only the first step in improving the quality of care you provide.

- Making a difference in clinical outcomes requires a commitment to quality improvement (QI). Providers who are committed to quality improvement set goals, measure outcomes, identify areas for improvement, and make changes that improve care.
- Carefully look at the systems and processes used in your own setting to determine how best to put your knowledge and skills into practice.

Table 1-2. Neonatal Resuscitation Program Key Behavioral Skills

Behavior	Example
Know your environment.	<ul style="list-style-type: none"> • Know the location of resuscitation equipment and how to access it. • Know how to call for help and who is available.
Use available information.	<ul style="list-style-type: none"> • Know the prenatal and intrapartum history, including pregnancy complications, medications received, and other risk factors.
Anticipate and plan.	<ul style="list-style-type: none"> • Perform a pre-resuscitation team briefing to ensure all team members know the clinical situation. • Assign roles and responsibilities. • Discuss an action plan in the event of complications.
Clearly identify a team leader.	<ul style="list-style-type: none"> • Identify the team leader before the birth. • Effective leaders <ul style="list-style-type: none"> – Clearly articulate goals. – Delegate tasks as appropriate while monitoring the distribution of workload. – Include other team members in assessment and planning. – Think out loud. – Maintain situation awareness. – Hand over leadership to another team member if they must become involved in a procedure.
Communicate effectively.	<ul style="list-style-type: none"> • Call team members by name. • Share information actively. • Inform your team if you identify a problem, an error, or a patient safety concern. • Order medications by name, dose, and route. • Use concise, clear language. • Use closed-loop communication. • Verify information. • Ensure that changes in information or assessments are shared with all team members. • Include family members in communication as appropriate.
Delegate workload optimally.	<ul style="list-style-type: none"> • Do not duplicate work or use more resources than necessary. • Change task assignments depending on skill sets and what is required at the moment. • Do not allow one person to become overloaded with tasks. • Do not allow the team to become fixated on a single task.
Allocate attention wisely.	<ul style="list-style-type: none"> • Maintain situation awareness by scanning and reassessing the clinical situation frequently. • Monitor each other's skill performance to ensure patient safety.
Use available resources.	<ul style="list-style-type: none"> • Know what personnel are available. • Know what additional or special supplies are available and how to access them.
Call for additional help when needed.	<ul style="list-style-type: none"> • Anticipate the need for additional team members based on risk factors and the progress of the resuscitation. • Call for additional help in a timely manner. • Know how you will call for additional help and the process for getting the right kind of assistance.
Maintain professional behavior.	<ul style="list-style-type: none"> • Use respectful verbal and nonverbal communication. • Actively seek and offer assistance. • Support and promote teamwork. • Respect and value your team.

- As you read the lessons in the textbook, think about opportunities to improve care in your own setting. In the lessons that follow, note the measurable processes and outcomes that may identify opportunities for improvement. Additional QI resources are included in Supplemental Lesson 14.

LESSON 1 REVIEW

1. Before birth, the alveoli in the fetal lungs are filled with (fluid)/(air).
2. Before birth, oxygen is supplied to the fetus by (the placenta)/(the fetal lungs).
3. Before birth, most fetal blood (enters the fetal lungs)/(bypasses the fetal lungs).
4. After birth, air in the alveoli causes vessels in the newborn infant's lungs to (constrict)/(relax).
5. When resuscitating newborn infants, chest compressions and medication are (rarely)/(frequently) needed.
6. Members of an effective resuscitation team (share information)/(work quietly and independently).

Answers

1. Before birth, the alveoli in the fetal lungs are filled with fluid.
2. Before birth, oxygen is supplied to the fetus by the placenta.
3. Before birth, most fetal blood bypasses the fetal lungs.
4. After birth, air in the alveoli causes vessels in the newborn infant's lungs to relax.
5. When resuscitating newborn infants, chest compressions and medication are rarely needed.
6. Members of an effective resuscitation team share information.

Lesson 2

Anticipating and Preparing for Resuscitation

What you will learn

- Risk factors that can help predict which newborn infants will require resuscitation
- Four key questions to ask the obstetric provider before birth
- How to determine what personnel should attend a birth
- How to perform a pre-resuscitation team briefing
- How to assemble and check resuscitation supplies and equipment
- Why accurate documentation is important



Key Points

- 1 Identify risk factors and prepare for the birth by asking the obstetric provider these 4 questions: (1) What is the expected gestational age? (2) Is the amniotic fluid clear? (3) Are there any additional risk factors? (4) What is the umbilical cord management plan?
- 2 Some newborn infants without any apparent risk factors will require resuscitation.
- 3 Every birth should be attended by at least 1 qualified individual who can initiate resuscitation and whose only responsibility is managing the newborn infant.
- 4 If risk factors are present, at least 2 qualified individuals should be present solely to manage the newborn infant. The number and qualifications of these individuals will be determined by the risk factors.
- 5 A qualified team with full resuscitation skills should be identified and immediately available for every resuscitation. The fully qualified resuscitation team should be present at the time of birth if the need for advanced resuscitation measures is anticipated. All supplies and equipment necessary for a complete resuscitation must be readily available and functional for every birth.

Case: Preparing for a birth with perinatal risk factors

A pregnant person arrives in labor at 36 weeks' gestation. The pregnancy has been complicated by insulin-requiring gestational diabetes and hypertension. The obstetric provider reports ruptured membranes with clear amniotic fluid. Fetal heart rate monitoring shows a Category II pattern (indeterminate pattern requiring evaluation, surveillance, and possibly other tests to ensure fetal well-being). Labor progresses rapidly and a vaginal birth is imminent. The obstetric provider calls your resuscitation team to attend the birth.

You ask the obstetric provider 4 brief questions and determine that there are several perinatal risk factors. You assemble a team composed of enough people with qualified skills to manage the interventions that may be needed. The team identifies the team leader, performs a pre-resuscitation team briefing, discusses roles and responsibilities, and performs a complete equipment check. As your team enters the room,

you introduce yourselves to the parents and the obstetric team and take your positions near the preheated radiant warmer.

Anticipate the need for resuscitation

At every birth, you should be prepared to resuscitate the newborn infant. Table 2-1 describes risk factors that increase the likelihood that the newborn will require support. Thoughtful consideration of these risk factors will help you identify the correct personnel to attend the birth. Although attention to these risk factors is helpful and will identify most newborn infants who require resuscitation after birth, **some newborn infants without any apparent risk factors will require resuscitation.**

Table 2-1. Perinatal Risk Factors Increasing the Likelihood of Neonatal Resuscitation

Antepartum Risk Factors	Intrapartum Risk Factors
Gestational age less than 36 0/7 weeks	Emergency cesarean delivery
Gestational age greater than or equal to 41 0/7 weeks	Forceps or vacuum-assisted delivery
Preeclampsia or eclampsia	Breech or other abnormal presentation
Maternal [†] hypertension	Category II or III fetal heart rate pattern*
Multiple gestation	General anesthesia
Fetal anemia	Maternal [†] magnesium therapy
Polyhydramnios	Placental abruption
Oligohydramnios	Intrapartum bleeding
Fetal hydrops	Chorioamnionitis
Fetal macrosomia	Opioids administered within 4 hours of delivery
Fetal growth restriction	Shoulder dystocia
Significant fetal malformations or anomalies	Meconium-stained amniotic fluid
No prenatal care	Prolapsed umbilical cord

*See Appendix 3 in this lesson for a description of fetal heart rate categories.

[†]We use the term *maternal* to respectfully refer to persons of any gender who are pregnant and giving birth.

Ask 4 key questions

Obstetric and newborn health care providers can coordinate care by establishing effective communication. Before every birth, review the antepartum and intrapartum risk factors described in Table 2-1 and ask the following 4 pre-birth questions:

- 1 What is the expected gestational age?
- 2 Is the amniotic fluid clear?
- 3 Are there any additional risk factors?
- 4 What is the umbilical cord management plan?

Based on the responses to these questions, assemble the necessary personnel and equipment. You will learn more about the timing of umbilical cord clamping and establishing a plan for umbilical cord management in Lesson 3.

Assemble the correct team

The number and qualifications of personnel will depend on your risk assessment. Consider creating a written policy for how many people should attend a birth, what qualifications they should have based on assessment of perinatal risk, and how to call for additional help if needed.

- **Every birth should be attended by at least 1 qualified individual**, skilled in the initial steps of newborn care and ventilation, whose only responsibility is managing the newborn infant. When a birth is attended by only 1 qualified individual, the likelihood of resuscitation should be low. In the event of unanticipated resuscitation, this team member will initiate resuscitation and call for additional help.
- **If risk factors are present** (Table 2-1), **at least 2 qualified individuals should be present solely to manage the newborn infant**. The number and qualifications of personnel will vary depending on the anticipated risk, the number of infants, and the birth setting.
- **A qualified team with full resuscitation skills**, including endotracheal intubation, chest compressions, emergency vascular access, and medication administration, **should be identified and immediately available for every resuscitation**.
 - The fully qualified resuscitation team should be present at the time of birth if the need for advanced resuscitation measures is anticipated.
 - It is not sufficient for the team with these advanced skills to be on call at home or in a remote area of the hospital. When resuscitation is needed, it must begin without delay.

Each hospital must develop and practice a system for assembling its resuscitation team. Identify how the team will be alerted if risk factors are present, who will be called, and how additional help will be contacted if necessary. Practice various scenarios to ensure you have sufficient personnel immediately available to perform all necessary tasks.

Perform a pre-resuscitation team briefing

Once your team is assembled, perform a pre-resuscitation team briefing to review the clinical situation and any management plans developed during antenatal counseling. Identify a team leader, delegate tasks, identify who will document events as they occur, determine what supplies and equipment will be needed, and identify how to call for additional help. Use all of the available perinatal information to anticipate potential complications and plan your response (Table 2-2).

The pre-resuscitation team briefing (Figure 2.1) is important even for well-established teams. A common analogy is to compare the medical team's pre-resuscitation briefing to an airline pilot's preflight check. Even pilots who have flown the same route many times perform their preflight check to ensure their passengers' safety.