

**Abstract:**

The emergency care provider has a crucial role in the evaluation and management of respiratory distress in the newborn and can see infants presenting at time of birth to many months old. Respiratory distress in the newborn is important to recognize as it can present anywhere along a spectrum of severity from tachypnea to respiratory failure. In addition, it may represent a primary respiratory disease or be the harbinger of a systemic illness or problem in another organ system. Timely assessment, recognition of signs of newborn respiratory distress, and proper newborn airway management and assisted ventilation are the key initial steps in treatment. Once the infant is stabilized, being familiar with the normal newborn physical examination and vital sign parameters as well as the pertinent historical questions to ask can help rule in or out different causes of respiratory distress and help guide definitive treatment.

**Keywords:**

newborn; respiratory distress; emergency department

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# Respiratory Distress in the Newborn: An Approach for the Emergency Care Provider

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**T**iming is critical in the assessment of the newborn infant with respiratory distress. It is important to act quickly because of the potential for rapid deterioration. However, knowledge about the newborn's historical timing including the gestational age (GA) at the time of birth, the actual age of the infant at the time of presentation, and length of time symptoms have been present is also vital. These crucial pieces of information along with the maternal, birth and recent history, and a thorough physical examination will be key in narrowing down the broad differential diagnosis of neonatal respiratory distress.

## ADAPTATIONS FROM FETAL LIFE TO NEWBORN

Full-term infants are born within the GA range of 39 weeks 0 days to 41 weeks 6 days; preterm infants, prior to 37 weeks; early term, 37 weeks 0 days to 38 weeks 6 days; late term infants, 41 weeks 0 days to 41 weeks 6 days; and postterm infants, after 42 weeks GA.<sup>1</sup> As the neonate transitions from intrauterine to extrauterine life, several physiologic changes have to occur which depend on the GA and actual age. For the newborn to appropriately ventilate and oxygenate independently after birth, the lungs must have sufficient development and have started to

produce pulmonary surfactant, a lubricant-like layer that lowers the surface tension and reduces atelectasis. Both the degree of lung development and amount of surfactant production are dependent on the GA.<sup>2,3</sup>

At birth, newborns transition from fetal circulation to neonatal circulation in which the placenta is replaced by the lungs for oxygenation. Fetal shunts such as the ductus arteriosus that allowed blood to mostly bypass the lungs in utero close in the first hours to weeks of life.<sup>4</sup> In addition, the elevated pulmonary vascular resistance (PVR) necessary in utero must decrease after birth to allow for pulmonary blood flow and adequate gas exchange to take place.<sup>5</sup> Clamping of the umbilical cord removes the low resistance system of the placenta and increases systemic vascular resistance.<sup>5,6</sup> With the newborn's first breath, lung volume increases and PVR decreases.<sup>5</sup> The ductus arteriosus starts to close in response to the changes in pulmonary and arterial vascular resistance, removal of placentally derived prostaglandins, and increased arterial oxygen content. Initial closure occurs at 10 to 15 hours of life, with final closure at 2 to 3 weeks of life in term infants.<sup>4-8</sup> Respiratory distress can be caused by maladaptation to neonatal physiology but can also develop after normal transitioning in those infants who are reliant on the persistence of fetal circulation, like some congenital heart diseases.

## NORMAL NEWBORN PARAMETERS

Important vital signs to assess in newborns include heart rate (HR), respiratory rate (RR), preductal and postductal oxygen saturations, 4 extremity blood pressures, and unclothed weight. The range for normal HR at term is 110 to 160 beats/min, but this can decrease to 85 beats/min during sleep.<sup>9</sup> Normal RR is 40 to 60 breaths/min with tachypnea defined as sustained RR > 60 breaths/min.<sup>9</sup> The mean blood pressure in neonates 1 to 3 days old is 64/41 (mean arterial pressure [MAP] 50 mm Hg), which increases to 95/58 (MAP 72 mm Hg) for children 1 month to 2 years of age.<sup>10</sup> Normal oxygen saturations immediately after birth are close to 65% but by 10 minutes of life and thereafter, they should remain greater than 90%.<sup>11</sup> Weight gain is an excellent indicator of newborn health, and lack of expected growth can be an indication of an underlying problem. Newborns typically lose up to 10% of birth weight over the first several days of life and then regain birth weight by roughly 2 weeks of life. Weight should be obtained and plotted on an infant sex and GA-specific growth chart.

## PERTINENT HISTORY AND EXAMINATION FINDINGS

A thorough maternal and birth history can be invaluable in directing the initial work up and narrowing the differential diagnosis. A template that can be used to obtain and communicate this information follows:

*The infant is an \_  
(AGA/SGALGA)\_  
(number of days)\_ old \_  
(gender)\_ born at \_(gestational  
age in weeks)\_ via \_(mode of  
delivery)\_ under \_(type of  
anesthesia)\_ to a \_(age of  
mother)\_ \_(gravidity/parity  
status)\_ complicated by \_(any  
fetal, labor, or maternal history  
prior to delivery including  
medications/drugs)\_ with \_  
(appropriate/inappropriate)\_  
weight gain.*



With any newborn in respiratory distress, a full examination may be deferred until the infant is stabilized. Once stable, the newborn requires a head-to-toe examination to help rule in or out diagnoses on your differential. The general examination should note vitals, degree of distress, dysmorphic features, or cyanosis. Head and neck examination should assess the palate, nose, and oropharynx for patency or masses as well as masses along the neck.<sup>9</sup> Observe the chest for asymmetry or barrel shape. The respiratory examination should note symmetry and quality of breath sounds, abnormal sounds (eg, stridor and wheezing - including which phase[s] of respiration these sounds are heard), retractions, grunting, nasal flaring, and head bobbing.<sup>12</sup> The cardiac examination should include heart sounds, murmurs, central and peripheral perfusion, and brachial and femoral pulses.<sup>9</sup> The abdomen should be assessed for scaphoid

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