Neonatal Respiratory Distress

A Practical Approach to Its Diagnosis and Management

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KEYWORDS

- Respiratory distress syndrome • Transient tachypnea of newborn
- Meconium aspiration syndrome • Bronchopulmonary disease
- Interstitial lung disease • Congenital lung disorders

KEY POINTS

- Respiratory disorders are the most frequent cause of admission to the special care nursery both in term and preterm infants.
- In critically ill infants or when the diagnosis in unclear, a neonatologist, cardiologist, pulmonologist, or ear, nose, and throat (ENT) surgeon must be promptly consulted.
- The need for referral to a tertiary perinatal-neonatal center for fetal intervention or early neonatal intervention, such as congenital diaphragmatic hernia, other congenital malformations, or delivery of very low-birth-weight (BW) infants is of paramount importance.

Respiratory disorders are the most frequent cause of admission to the special care nursery both in term and preterm infants. Pediatricians and primary care providers may encounter newborn infants with respiratory distress in their office, emergency room, delivery room, or during physical assessment in the newborn nursery. Often these infants may be in distress because of the failure of transition from fetal to extrauterine environment due to retained lung fluid commonly seen in neonates born by cesarean delivery, being immature with relative surfactant deficiency, or having meconium aspiration syndrome (MAS).[1–4] In some instances, the cause of respiratory distress may pose a diagnostic challenge, especially in differentiating from cardiac diseases.[5] Significant advances have been made in fetal diagnosis, pathophysiology,

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and early management of these diseases.[6–8] Therefore, referral to a tertiary perinatal-neonatal center for fetal intervention or early neonatal intervention for congenital diaphragmatic hernia, other congenital malformations, or delivery of a very low-BW infant is of paramount importance.

In this article, the authors have proposed a practical approach to diagnose and manage such infants with suggestions for consulting a neonatologist at a regional center (**Box 1**). For an in-depth review, the reader is encouraged to preview a text on the subject.[9] The authors' objective is that practicing pediatricians should be able to asses and stabilize a newborn infant with respiratory distress, and transfer to or consult a neonatologist, cardiologist, or pulmonologist after reading this article.

PHYSIOLOGIC CHANGES AT BIRTH

Before birth, the lung is fluid filled, receiving less than 10% to 15% of the total cardiac output, and fetal oxygenation occurs by the placenta. The transition from intrauterine to extrauterine life requires establishment of effective pulmonary gas exchange.[2,10] This complex process entails rapid removal of fetal lung fluid controlled by ion transport across the airway and pulmonary epithelium with varying roles of catecholamines, glucocorticosteroids, and oxygen-regulating sodium uptake in alveolar fluid clearance.[10] During fetal life, the high pulmonary vascular resistance directs most of the blood from the right side of the heart through the ductus arteriosus into the aorta. At birth, clamping the umbilical vessels removes the low-resistance placental circuit with increase in systemic blood pressure and relaxation of the pulmonary vasculature.[2,10,11] Adequate expansion of the lungs and increase in Pa_{O_2} values results in an 8- to 10-fold increase in pulmonary blood flow and constriction of the ductus arteriosus. The cardiopulmonary transition takes approximately 6 hours, resulting in rise in Pa_{O_2} values and decrease in P_{CO_2} values as the intrapulmonary shunt decreases, and the functional residual capacity (FRC) after crying establishes adequate lung volume. Initially the respiratory pattern may be irregular but soon becomes rhythmic modulated by chemoreceptors and stretch receptors, with rates of 40 to 60 breaths per minute.[12] Respiratory distress is common in preterm infants because of poor respiratory drive, weak muscles, compliant chest wall, and surfactant deficiency.[3,9,12]

Clinical presentation involves tachypnea (rate>60 breaths per minute), cyanosis, expiratory grunting with chest retractions, and nasal flaring. The underlying disease may be due to pulmonary, cardiac, infectious, metabolic, or other systemic disorders. Peripheral cyanosis or acrocyanosis is often observed in normal newborn infants or in ill infants with poor cardiac output. Central cyanosis is assessed by examining the oral mucosa and suggests inadequate gas exchange signifying more than 3 to 5 g/dL of desaturated hemoglobin. Clinical determination of central cyanosis may be unreliable

Box 1
When to call a neonatologist for respiratory distress in an infant

- Inability to stabilize or ventilate infant, or requiring vasopressors
- Suspect cardiac disease
- Meconium aspiration with and without pulmonary hypertension
- Sepsis with pneumonia
- Pulmonary hemorrhage
- Pneumothorax or pneumomediastinum