

Respiratory Distress Syndrome (RDS)

One of the most common problems facing premature infants is difficulty breathing. There are many causes of breathing problems in premature infants. The most common cause is called respiratory distress syndrome (RDS). In RDS, the infant's immature or stressed lungs do not produce enough of an important substance called surfactant. Surfactant enables the lungs to expand more easily. Without surfactant, the air sacs in the lungs, also called alveoli, collapse very easily. This collapse leads to decreased amounts of air in the lungs. The lack of surfactant combined with alveolar collapse makes it very difficult for the infant to breathe. The infant eventually becomes tired and breathes poorly, and may even stop breathing.

Symptoms

The symptoms of respiratory distress include:

- rapid breathing (tachypnea), or stopped breathing (apnea)
- grunting noises, nasal flaring, or pulling of the chest or neck muscles as the infant works to breathe
- pale color (pallor) or blue color (cyanosis)

Prevention and Treatment

The more premature an infant is, the greater the chance that he or she will have RDS. That is one reason why premature birth is avoided whenever possible. When premature delivery cannot be stopped, most pregnant women are given a steroid medication before delivery. These steroids help to prevent or decrease the severity of RDS. Then, after birth, a surfactant medication can be given to the infant. The surfactant is given directly into the lungs through a tube that is placed to help the infant breathe. Because lack of surfactant is the main problem in RDS, surfactant medication is the best way to treat RDS.

Once surfactant medication has been given, the care of an infant with RDS is centered on providing proper respiratory support. There are two main types of breathing support. The first is the traditional breathing machine, or ventilator. The ventilator gives the infant breaths through a breathing tube in the infant's airway. The second type is called "CPAP," or Continuous Positive Airway Pressure that is given through prongs in the nose or a mask on the infant's face. CPAP blows air into the infant's airway. The pressure from this air makes it easier for the infant to keep his airway open and lungs inflated. The clinicians decide which type of support to use based on how bad the RDS is and how the infant is doing clinically. As the infant improves, he may be changed to oxygen via a Nasal Canula (nasal prongs attached to a tube under the nose), and then off of oxygen completely.



Infant with a breathing tube in place, attached to a ventilator.



Infant on Nasal CPAP (Nasal Continuous Positive Airway Pressure)



Infant on Nasal Cannula

Management of RDS

To make decisions about the care of an infant with RDS, the amount of oxygen and carbon dioxide in the infant's blood are followed. These levels show how well the lungs are working. They can be measured in two ways. One way is through the skin using special sensors. The other way is by taking very small samples of the infant's blood from a thin tube, or catheter, placed in a blood vessel. Drawing blood from these catheters does not hurt the infant. X-Ray images are also used to help care for an infant with RDS. Typically, an x-ray of an infant who has RDS shows:

- low volumes of air in the lungs (atelectatic lungs)
- a "ground glass" or grainy appearance due to the collapsed air sacs (which look light on x-ray) next to the air in the lungs (which appears dark)
- a "white out" appearance, or more opaque looking lungs due to increased fluid in the lungs and the collapsed alveoli, or air sacs

Below is an X-Ray image of a premature infant's chest before surfactant medication (left). Then, the x-ray on the right shows dramatic improvement after the first dose of surfactant. Notice that the lungs on the left appear grainy and very white. The lungs on the right look much clearer and darker. The lungs appear darker on the right because air is darker on X-Ray, and because there is better inflation of the lungs with air after the surfactant dose, the lungs contain more air.

The blood gas measurements, x-rays, and the infant's clinical status all help the clinicians to decide how to treat the infant. These decisions include how many doses of surfactant medication the infant will receive, and how long the infant will stay on a breathing machine or on CPAP. Each infant is treated differently, and each infant responds differently. But, the use of surfactant medication has greatly reduced the complications and the amount of time spent on the ventilator machine for infants with RDS.

