RSV is a paramyxovirus that produces a characteristic fusion of human cells in tissue culture - the syncytial effect. Two subtypes, A and B, have been identified. Subtype B are characterized as the asymptomatic strains of the virus that the majority of the population experiences. The more severe clinical illnesses involve Subtype A strains, which tend to be predominant in most outbreaks. RSV affects the upper and lower respiratory tracts, but is most prevalent in lower respiratory illnesses, including pneumonia and bronchiolitis, inflammation of the bronchioles (the small airways in the lungs) of infants and young children.

**Behavioral Objectives**

After reading this newsletter the learner will be able to:

1. Discuss RSV, including risk factors for contracting it and transmission modes.
2. Describe diagnosis, assessment findings, treatment, recurring respiratory problems, and prevention of RSV, as well as implications for the healthcare provider.

Respiratory syncytial virus (RSV) infection is a respiratory virus, which was first discovered in 1956. While it often just causes symptoms similar to the common cold in older children and adults, in infants and younger children, it can cause bronchiolitis. RSV is the most common cause of pneumonia and bronchiolitis, a serious infection, associated with inflammation in the lungs, wheezing, and difficulty breathing. Approximately two-thirds of infants are infected with RSV during the first year of life and almost all children are infected by the age of two.

Most of these are mild infections, but RSV can lead to serious infections causing approximately 100,000 hospitalizations each year and death in 1-2% of infants.

This newsletter will discuss RSV, including risk factors for contracting it and transmission modes. Diagnosis, assessment findings, treatment, recurring respiratory problems and prevention will also be discussed, as well as implications for the healthcare provider.

**Risk Factors:**

- **Age:** The age of the child contributes significantly to the severity of respiratory infection associated with RSV. Full-term infants, under the age of 3 months, have a lower infection rate, presumably because of the protective function of maternal antibodies. Breastfeeding may help decrease this risk. Preterm infants are at highest risk for RSV infections. Besides having decreased immunity, premature birth interrupts the final stages of normal lung development and true alveoli are not universally present until 36 weeks gestation. Also, with prematurity there is a lack of maternal antibodies which are transferred during the last trimester of pregnancy. The infection rate in full-term infants soars from 3 to 6 months, the time between the disappearance of maternal antibodies and the infant’s own antibody production. The infection rate continues to be high during the toddler and preschool periods, but drops steadily. By age 5 years, viral respiratory infection is less frequent.

- **Preexisting Conditions:** Children, of any age, with underlying cardiac or pulmonary disease, such as congenital heart disease or cystic fibrosis, are at high-risk for serious complications of RSV. Additionally, children who are immunocompromised are also at risk for serious complications from RSV infection, including those who are undergoing chemotherapy or being treated with long-term corticosteroid therapy. Likewise, children with HIV, AIDS, cancer or those who have received a recent transplant are also at increased risk for development of serious RSV.

- **Season:** Outbreaks of disease, caused by RSV, occur on a yearly basis, most commonly during the winter months, with the epidemics lasting approximately five to six months. Outbreaks usually begin in November, peak in January or February, and end in April or May.

- **Environment:** Serious RSV infection is common in children who live in crowded living conditions. Family members often pass it on to one another. A school-age child may have RSV infection, resulting in the common cold. However, if the older child transmits RSV to a premature sibling, the infant is likely to develop serious RSV complications. Additionally, exposure to passive cigarette smoke and attendance in day care setting increases risk. The Centers for Disease Control and Prevention (CDC) defines day care as a supervised group of 2 or more unrelated children for greater than 4 hours per week.
TRANSMISSION: RSV is spread from respiratory secretions through close contact with infected persons or contact with contaminated surfaces or objects, such as toys, clothing and bathroom fixtures. Infection can occur when infectious material contacts mucous membranes of the eyes, mouth, or nose, and possibly through the inhalation of droplets generated by a sneeze or cough.

Another factor making the spread of RSV almost unavoidable is viral shedding. Viral shedding may occur one to two days before and two weeks after symptoms of RSV become apparent, the communicability period. Since disease can be spread before symptoms even appear and after they disappear, it is important to know the timing of the peak RSV infection season in your area, as well as the risk factors and prevention of RSV. The National Center for Infectious Diseases and the CDC recommend that during the RSV season, healthcare providers should consider RSV when an infant or young child presents with a respiratory illness.

DIAGNOSIS: For confirmation of RSV, proper testing of the patient's respiratory secretions will positively identify RSV and rule out bacterial infection. Nasopharyngeal secretions, containing epithelial cells, are necessary for a positive diagnosis of RSV. Although cultures have long been considered the gold standard for diagnosing RSV, this process takes several days. Rapid diagnostic tests are the preferred diagnostic method since results are available within hours. Such tests are considered 90% accurate. Four such diagnostic tests using enzyme-linked immunosorbent assays or immunofluorescence are useful to rapidly diagnosis active RSV infection. Although chest radiographs are rarely necessary in diagnosing RSV infection, they may be used to determine the severity of the illness.

ASSESSMENT FINDINGS: Most RSV-infected children experience upper respiratory tract infections, including nasal congestion, rhinorrhea (runny nose), coughing, sneezing, sore throat and a low-grade fever. During their first RSV infection, between 25% and 40% of infants and young children develop bronchiolitis, the most serious complication of RSV. Bronchiolitis can easily lead to airway obstruction, which can be extremely dangerous, especially in infants who have smaller peripheral airways than older children and adults.

Typically, RSV bronchiolitis presents with a two to three day "prodromal" phase, which resembles a common viral upper respiratory tract infection. With progression of RSV infection, children may experience poor feeding, sleep disturbances and slight lethargy. Increased coughing and wheezing become apparent, which may persist for months in severe bronchiolitis infections. Wheezing indicates air is trapped in the lungs, the bronchioles, and is noted on auscultation, as well as may be audible when the child inspires and/or expires. Irritability and signs of air hunger, such as head bobbing, restlessness, tachypnea, nasal flaring and retractions - intercostal, subcostal, and sternal) indicate airway obstruction. Apneic spells are also common, occurring in approximately 20% to 25% of young infants. Circumoral and nailbed cyanosis may be noted in severely affected infants.

TREATMENT: Like most viral infections, treatment of RSV infection is usually symptomatic. However, antibiotics may be prescribed if a secondary bacterial infection, such as otitis media, is present.

Healthy infants and children with mild RSV infections generally receive symptomatic treatment at home, such as a cool mist humidifier and acetaminophen for fever. However, parents should be instructed to seek medical attention immediately if wheezing, or other signs of respiratory distress, such as retractions, become apparent. Children with severe disease, those who have difficulty breathing, often require hospitalization. In children with wheezing and difficulty breathing, nebulized treatments with albuterol may be helpful. In general, though, breathing treatments only help about 25% of children with bronchiolitis. Other treatments may include supplemental oxygen and, if the child is not able to eat and drink well, intravenous fluids may be necessary. Treatment of bronchiolitis with steroids is controversial, and is generally not thought to be helpful. An antiviral drug, Ribavirin, is available, but is typically only used for serious, life-threatening RSV infections, and even then, its use is controversial.

RECURRING RESPIRATORY PROBLEMS: Asthma has been identified in children 10 years after suffering a RSV lower respiratory tract infection in infancy. Such pulmonary function problems are common in those who have suffered from severe RSV, even in children whose initial illness did not require hospitalization. This susceptibility to asthma may be caused by the early infection damaging the growing lung.

PREVENTION: RSV replicates in the nasopharynx, and readily spreads from hands to the eyes and nose of others. A simple and effective means of preventing disease spread, both at home, in childcare settings, and in the hospital, is strict hand washing. Hospital staff are frequent vectors in viral transmission. Children should be taught to prevent airborne droplet transmission by coughing or sneezing into the bend of their arm, rather than their hands, as well as not sharing cups and eating utensils with others. RSV survives a few hours on environmental surfaces and is readily inactivated with soap and water and disinfectants. Cleaning toys, doorknobs, and countertops often is effective prevention. Reinfection with RSV is common. However, signs and symptoms are commonly less severe with each subsequent infection. There is currently no vaccine to prevent RSV infection, although researchers continue their work. There are antibodies available to lessen the serious effects of RSV in infants and children at highest risk.

Respiratory illness from RSV infection is a leading cause of illness, as well as hospitalization, for infants and young children. Identifying those children most at risk, implementing measures to prevent transmission and performing ongoing assessments of respiratory status is priority.
Andy, 4 months old, has a 1 day history of nasal congestion and low-grade fever. Andy’s mother, who is 41 years old, reports he was born prematurely, at 34 weeks gestation. Andy is kept by a neighbor, who cares for three other children, while his parents work full-time.

1. Which of the following DOES NOT place Andy at high-risk for RSV? His:
   a. age.
   b. history of prematurity.
   c. mother’s age.
   d. exposure to other children.

2. Which of the following children are NOT at increased risk for developing serious RSV?
   a. Full-term infants who are 0-3 months of age.
   b. Young children who live in crowded living conditions.
   c. A toddler with cystic fibrosis.
   d. Infants who are exposed to passive smoke.

3. Premature infants are at high risk for developing serious complications of RSV because preemies usually lack maternal antibodies and their lungs are underdeveloped.
   a. True
   b. False

4. Which finding in your assessment of Andy’s respiratory status points to Andy having a severe RSV infection?
   a. Congestion
   b. Wheezes
   c. Rhinorrhea
   d. A low-grade fever
5. Virtually all children in this country become infected with RSV by age 2.
   a. True
   b. False

6. Which of the following does NOT indicate Andy’s airway is being obstructed?
   a. Head bobbing.
   b. Restlessness.
   c. Retractions.
   d. Slight lethargy.

7. The leading serious complication from RSV is:
   a. bronchitis.
   b. otitis media.
   c. bronchiolitis.
   d. croup.

8. RSV may be spread by all of the following EXCEPT:
   a. through fecal material.
   b. inhalation of droplets from a sneeze.
   c. contact with contaminated surfaces or objects.
   d. infected healthcare providers.

9. The simplest method to prevent RSV is:
   a. administration of the RSV vaccine.
   b. covering the infant’s mouth when coughing.
   c. good handwashing.
   d. administration of an antibody against RSV, such as Synagis.

10. Infants with severe RSV are at risk for eventually developing asthma.
    a. True
    b. False