Preventing Respiratory Syncytial Virus in Homebound Premature Infants

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This article explores the home health nurse’s role in preventing respiratory syncytial virus (RSV) among premature infants. Thousands of children infected with RSV require hospitalization each year. Consistent contact with the infant alerts the nurse to subtle signs and symptoms of RSV infection, which may include nasal congestion, cough, low-grade fever, and malaise. By developing patient and caregiver trust, the home health nurse can implement an RSV prevention plan, leading to a decrease in hospitalization episodes of premature infants with RSV. Identification of patient risk factors contributing to RSV together with caregiver education is addressed in this article.

Each year, up to 4 million children younger than 4 years of age become infected with respiratory syncytial virus (RSV) worldwide. Approximately 125,000 of these children require hospitalization, and 1% to 2% die, costing billions annually (Lauts, 2005). Among premature infants worldwide, RSV is the most common cause of viral respiratory infection, illness, and rehospitalization (Groothuis & Nishida, 2002). A better understanding of the population-based incidence of RSV and its risk factors is warranted for the development of adequate prevention strategies. The global epidemic of RSV forces the healthcare industry to provide cost-effective management of RSV among premature infants. The home health nurse is in an excellent position to provide the most current and effective measures for the prevention of RSV.

Background
Respiratory Syncytial Virus
Respiratory syncytial virus is a single-stranded RNA virus with 2 main strains: A and B. The glycoproteins of RSV, G and F, mediate its attachment and penetration into the respiratory epithelial cells, causing an antibody response (Groothuis & Nishida, 2002). The virus subsequently spreads to adjacent cells through fusion of cell membranes, resulting in the formation of syncytia, which are giant collections of coalesced cells (Banning, 2006). The body responds by increasing its production of white blood cells (the initial sign of an infection) to help fight the infection (Groothuis & Nishida, 2002).

Transmission of RSV and Symptoms
Respiratory syncytial virus enters the body through the eyes, nose, or mouth. The virus infects the respiratory mucosa, spreading easily and rapidly via airborne and contact respiratory secretions (Lauts, 2005). It infects the respiratory mucosa. The virus can survive for 30 minutes or longer on hands and clothing and for several hours on toys, countertops, and other surfaces (Banning, 2006).

Usually, RSV produces mild respiratory illness symptoms that equate with those of the common cold. Symptoms include nasal congestion and discharge, dry cough, low-grade fever, sore throat, headache, and malaise. As RSV progresses, the symptoms of respiratory impairment worsen. Substantial symptoms include severe cough, high fever, wheezing, nasal flaring, and difficulty breathing and eating. The most serious and life-threatening signs include listlessness, tachypnea, chest retractions, apnea, and cyanosis (Lauts, 2005). The diagnosis of RSV usually is established by evidence of bronchiolitis or pneumonia accompanied by a positive nasal aspirate for RSV viral proteins (Banning, 2006).

The RSV contagion usually lasts for 3 to 4 days, but may last as long as 3-4 weeks. Prevalent in both temperate and tropical climates, RSV infections generally begin to appear in November and last for about 4 months (Banning, 2006). Non-
seasonal outbreaks have been noted in the southeastern United States, mainly due to climatic conditions (Lauts, 2005). Cases of RSV as early as August and as late as May have been reported in Louisiana (Centers for Disease Control and Prevention, 2006, October 10).

Risk Factors
Several risk factors have been linked to the development of RSV in children. Prematurity (less than 36 weeks’ gestation) appears to be the greatest identified risk factor. Premature infants requiring oxygen and mechanical ventilation therapy in early days of life have been the RSV patients most likely to be hospitalized for the virus (Lauts, 2005). Other risk factors associated with the infection of RSV include lower socioeconomic class, crowded living conditions, exposure to cigarette smoke, the presence of older siblings in the home, and day care attendance. Immunocompromised infants, such as those with congenital heart malfunctions, also have been identified as being at greater risk for contracting RSV (Leidy et al., 2005).

Prophylaxis
Palivizumab (Synagis TM), a monoclonal antibody, is recommended as prophylactic treatment in the prevention of RSV among high-risk infants. Palivizumab is a neutralizing agent that prevents RSV replication at the respiratory endothelial cell membrane (Groothuis & Nishida, 2002). Palivizumab is administered as an intramuscular injection (15 mg/kg of body weight) monthly, every 25 to 35 days, throughout the RSV season. Optimal protection usually is achieved after the second dose of palivizumab is administered. It has been shown to decrease the rate of hospitalization and rates of RSV in severely premature infants by 55% (Zarbock, 2000). The American Academy of Pediatrics (2003) lists specific guidelines for determining eligibility for palivizumab therapy (Table 1).

How the Home Health Nurse Can Prevent RSV
The home health nurse is in a unique position to provide care to preterm infants. In many instances, the premature infant is discharged home from the hospital requiring oxygen and apnea monitor therapy, warranting the care of a home health nurse. In other situations, the complex needs of the infant require home health services for follow-up evaluation and continuity of care.

Newly discharged premature infants are at a high risk for contracting RSV (Zarbock, 2000). A multitude of risk factors for RSV may be present. The home health nurse has a responsibility to assess for risk factors in the home related to the infant’s disease process to determine whether prophylactic palivizumab therapy is warranted. The home health nurse should consult with the infant’s physician for orders to administer prophylactic palivizumab therapy.

Palivizumab therapy is only one aspect of prevention strategies for RSV. It is vital that the home health nurse begin to educate caregivers on the prevention of RSV infection. Hand washing is the best practice for

Table 1. Indications for Use of Palivizumab Therapy for the Prevention of Respiratory Syncytial Virus

- Infants and children younger than 2 years of age who have required medical treatment for chronic lung disease within 6 months before the start of RSV season.
- Infants and children younger than 2 years of age who have hemodynamically significant cyanotic and acyanotic congenital heart disease.
- Infants born at 28 weeks’ gestation or earlier, up to 12 months of age.
- Infants born 29 to 32 weeks’ gestation, up to six months of age.
- Infants born 32 to 35 weeks’ gestation and have additional risk factors (daycare attendance, school-aged siblings, exposure to environmental air pollutants, congenital abnormalities of the airways, severe neuromuscular disease) up to 6 months of age.

preventing the spread of infection, including RSV infection (Pruitt, 2005). The home health nurse must emphasize that proper hand washing is beneficial in maintaining the health of the premature infant. The home health nurse should directly observe the infant’s caregivers and siblings washing their hands so that adequate feedback is generated. Proper hand washing is key to the prevention of RSV infection (Groothuis & Nishida, 2002).

Caregivers should be taught that limiting the number of visitors with whom the infant has contact can dramatically reduce the potential for RSV infection (Lauts, 2005). Many people deny their sickness as just the “sniffles,” when in some instances, the “sniffles” could be an RSV infection.

While limiting the number of visitors in contact with the infant, it also is important for the home health nurse to stress with caregivers the importance of keeping the infant out of a day care center (Bracht et al., 2005). Even the cleanest day care may have RSV outbreaks, and the premature infant is poorly equipped to fight the infection. If possible, one childcare provider at the infant’s home is best.

Cigarette smoke has been linked to the development of RSV (Bracht et al., 2005). Home health nurses must assess for the presence of smoking through question and observance. The nurse entering the home should advise caregivers against smoking, especially in the presence of the infant. Even if the caregiver does not smoke inside, the residue remains on clothing, exposing the infant to the cigarette smoke. Precautions should be taken to minimize this exposure.

Caregivers must be educated on the signs and symptoms of RSV. The earliest symptoms include nasal congestion, dry cough, and fever. Symptoms such as severe cough, high fever, wheezing, nasal flaring, and difficulty eating or breathing develop. Medical attention should be sought as soon as possible for evaluation (Pruitt, 2005). The home health nurse is in a unique position to evaluate symptoms and refer to or consult with the infant’s physician as needed. Furthermore, if the infant’s condition warrants more vigilant assessment and intervention, the home health nurse is in a key position to do so.

The home health nurse also can provide vital information about the infant’s status to the physician. If detected early enough, RSV infection may be managed in the home by the home health nurse under the direction of the physician, thereby decreasing the incidence of rehospitalization of premature infants.

The home health nurse can administer monthly palivizumab therapy during RSV season and promote a strict caregiver education program to prevent RSV. Palivizumab liquid solution (Synagis TM) is available in ready-to-use 50- or 100-mg vials. No reconstitution is required. The medication is stable for up to 6 hours at room temperature and should be stored at 2°C to 8°C (35.6 to 46.4°F). An ice chest with an ice pack is equally sufficient for the storage of palivizumab by the home health nurse. The solution is preservative and thimerosal free (mercury salts). The vial should not be shaken or agitated, and palivizumab can be administered cold, although, gentle hand warming may minimize injection-site pain for the patient.

The medication is withdrawn from the vial immediately before the injection. Palivizumab is administered intramuscularly into the anterior thigh. Doses exceeding 100 mg are divided into equal doses and administered at different injection sites (MedImmune Inc., 2004).

**Conclusion**

Comprehensive caregiver education programs regarding prevention of RSV infection, avoidance of risk factors, and recognition of early RSV infection symptoms remain important components of RSV prevention strategies. Caregiver noncompliance with prophylactic immunization ther-
apy and educational programs is detrimental and best evaluated by the home health nurse. In addition, early detection of RSV either by the home health nurse or through the educated caregiver could result in better outcomes for the premature infant.

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REFERENCES

CONFERENCE
Home Healthcare Technology: Promoting the Safe Migration of Medical Devices into the Home
Monday and Tuesday, September 17-18, 2007
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Medical devices are regulated by the Food and Drug Administration. Whether prescription or over the counter, they are still subject to a level of review before being allowed on to the market.

Many devices are specifically cleared or approved for use in a clinical environment by a healthcare professional. With the use of the Diagnostic Related Groups system (DRGs), patients are leaving the hospital environment quicker and continuing their treatment/recovery at home using medical devices. DRGs consist of a classification system that was developed for the Center for Medicare and Medicaid Services that groups a patient’s conditions into approximately 500 groups based on the International Classification of Diseases diagnoses. DRGs have been used since 1983 to determine reimbursement and therefore have a direct impact on patient care and hospital stays.

Participants at this conference will learn how the government and home care industry can work better together to provide a safer environment for medical devices in the home. Participants will also have the opportunity to hear presentations given by home healthcare technology experts in multiple plenary and general sessions in addition to gaining more in-depth knowledge via smaller breakout sessions.

Sessions will follow a technology, government, or clinical tract for specific device groups. Sessions will also highlight how the devices are getting into the home, what barriers there are in the environment for safe operation, and what barriers there are with the caregiver or patient while using the device.

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