The High Risk Infant
Respiratory Dysfunction

A Training Curriculum

Developed by:

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For the
Pennsylvania Child Welfare
Training Program

University of Pittsburgh
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316 & 936: The High Risk Infant: Respiratory Dysfunction

316 & 936: The High Risk Infant: Respiratory Dysfunction

An Overview of the Curriculum

Rationale

As Foster Parents, Adoptive Parents, and Child Welfare Professionals continue to care for medically complex children, a better understanding of various disease entities becomes increasingly significant. Caregivers need to be educated on conditions related to a disturbed respiratory system in order to better care for their medically complex child. Caregivers must also keep abreast on the current management and home care techniques which are available for their medically complex child.

Learning Objectives

- Define conditions leading to a disturbance in the respiratory system.
- Identify those infants who are at greatest risk for developing respiratory problems.
- Understand the physiology of various respiratory conditions.
- List appropriate interventions for the care of infants with a disturbance in the respiratory system.
- Understand the home care involved with infants who have a disturbance in the respiratory system.
- List current management for the care of infants who are experiencing respiratory system dysfunction.

Competency to be Addressed in Curriculum

316-1. The Child Welfare Professional knows health and medical conditions which can affect the well being of children and families or which can contribute to or result from child abuse/neglect.

Workshop Training Time

3 hours

Target Audiences

Child Welfare Professionals, Family Preservation Workers, Foster Caregivers, and Adoptive Parents.

Expectations of Trainer

This curriculum has been developed to be delivered by a trainer knowledgeable in the medical, developmental, and psychosocial needs of the high risk infant have an awareness of community resources available to meet the needs of this diagnostic group, and have experience with disease management in the home setting. The trainer should have a strong medical background and have a minimum of a Bachelor's Degree. The trainer should have some knowledge in child welfare practice, specifically in direct services to children and families. The trainer should have considerable experience in training workshops and should possess excellent group facilitation skills. The trainer must have knowledge and experience in diversity awareness so that special attention can be afforded to the provision of culturally congruent healthcare.

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An Overview of the Curriculum (continued)

Equipment Needed

Specific materials needed to conduct the training are listed for each section of the curriculum. All sections require overhead projector and flip chart.

316 & 936: The High Risk Infant: Respiratory Dysfunction

Agenda for a Half-Day Curriculum on The High Risk Infant: Respiratory Dysfunction

0.25 Hours	INTRODUCTION AND OPENING ACTIVITIES
Section I 0.5 Hours	APNEA OF PREMATURITY Pathophysiology Clinical manifestations Therapeutic management Family teaching Home care
Section II 1 Hour	RESPIRATORY DISTRESS SYNDROME Pathophysiology Clinical manifestations Therapeutic management Family teaching Home care
Section III 0.25Hours	BRONCHOPULMONARY DYSPLASIA (BPD) Pathophysiology Clinical manifestations Therapeutic management Family teaching Home care
Section IV 0.5 Hours	RESPIRATORY SYNCYTIAL VIRUS (RSV) / BRONCHIOLITIS Etiology Pathophysiology Transmission Clinical Manifestations Diagnostic Evaluation Considerations
0.5 Hours	EVALUATION & CLOSURE Transfer of Learning Activity

316 & 936: The High Risk Infant: Respiratory Dysfunction

Dear Trainer –

This curriculum is an extension of "The Infant at Risk" segment of "Meeting the Needs of Medically Complex Children". You may want to review that curriculum, as well as applicable sections of the "Accessing Services Directory", prior to teaching this segment on Respiratory Dysfunction.

Caring for a child experiencing Respiratory Dysfunction can be a sometimes frightening and overwhelming experience for those involved. It is our hope that the educational information provided in this curriculum will offer some assistance to those caregivers.

316 & 936: The High Risk Infant: Respiratory Dysfunction

Preface

This curriculum was designed as an introductory segment on Respiratory Dysfunction and provision of care to infants with this diagnosis. It must be understood that as research and medicine evolves, so do treatments, and education materials change with the advancement of technology. Workers, parents, and trainers should continue to remain updated on new information to assist in managing respiratory dysfunction.

The trainer should explain to the audience that he/she will be purposely using both medical and non-medical terminology in order to familiarize participants with verbiage they may see on the child's medical record of hear during healthcare provider appointments.

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Incorporating Transfer Of Learning Into This Curriculum

In order for this training to be deemed effective, there must be a mechanism present to promote transfer of learning from the training session atmosphere to the care environment surrounding the child with Respiratory Dysfunction.

You will find a "What Have I Learned?" activity at the conclusion of this curriculum to promote this transfer of learning. Take the time to review learning objectives before training begins to facilitate mutual expectations of outcomes.

316 & 936: The High Risk Infant: Respiratory Dysfunction

INTRODUCTION AND OPENING ACTIVITIES

Rationale: Participant interaction and group trust promote a positive environment for learning. Because each training audience may contain a blend of caseworkers, family preservation workers, adoptive parents, and foster parents, it is important for the trainer to provide an opening activity that will reduce stress caused by this diversity in participants and to encourage active involvement in the training experience.

Learning Objectives: Participants will be able to:

Introduce themselves to other participants.
Identify their training needs.
Describe the course and details of the competencies.

Time: 0.25 Hours

Methods: Presentation by trainer. Group discussion.

Materials: Name tents (large index cards or heavy stock paper), markers, 3x5 cards
Overhead #1 – Agenda & Learning Objectives

Activities: Activity #1 – Name Tents

Trainer Notes

INTRODUCTION AND OPENING ACTIVITIES

Trainer Note: Name tent materials and 3x5 cards may be given to participants when they arrive or placed on the participants' tables prior to the start of training.

- Introduction of the trainer and welcome participants to the training.

- Review specifics of Competency-Based Training:
  15-minute rule
  Sign-in sheet
  Evaluation form completion and submission
  Availability of continuing education units
  Review "Housekeeping Rules" pertaining to specific training site.

- Review Agenda & Learning Objectives
  Overhead #1

Activity #1 – Name Tents and Question Cards

Step 1 – Instruct participants to write their name in the center of their paper name tent with a marker. They should also note if they are caseworker, foster parent, or adoptive parent.

Step 2 – Trainer should go around the room and have each participant give their name and why they are attending the training session (i.e. foster parent for child with respiratory dysfunction, caseworker for child with respiratory dysfunction, etc.)

Step 3 – Trainer should explain that 3x5 index cards are for writing questions participants may have. These questions will be addressed throughout the training as time permits.

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APNEA OF PREMATURITY (AOP)

Rationale: Child welfare professionals, family preservation staff, foster care providers, and adoptive parents must have better understanding of Apnea of Prematurity if they are to be participants in the care of an infant with this disorder.

Learning Objectives: Participants will be able to:
Identify Apnea of Prematurity and care interventions appropriate for treatment.

Time: 0.5 Hours

Methods: The trainer presents the content in lecturette form using flip charts and overhead transparencies as reinforcement.

Materials:
Apnea/Cardiac Monitor (optional)
Watch with seconds hand (optional)
CPR flipchart (optional)
Overhead #2 – Factors that Promote Apnea in the Premature Infant
Overhead #3 –Signs of Toxicity

Activities:
Activity #2 (optional) – Participants may hold breath for 20 seconds
Activity #3 (optional) – Demonstrate apnea/cardiac monitor
Activity #4 (optional) – Review basics of infant CPR through use of flipchart

Trainer Notes

APNEA OF PREMATURITY (AOP)

Trainer Note: Optional supplements to the lecturette include a demonstration of an apnea/bradycardia monitor and use of CPR flipchart for reviewing the basics of infant CPR. (Refer to flipchart availability in Reference Section.) Apnea/Cardiac monitor may be borrowed from a local medical equipment supplier or hospital.

Lecturette Content:

Apnea of Prematurity (AOP) is a common occurance in the premature population. Apnea in the purest definition means a cessation of breathing generally lasting longer than 20 seconds.

Trainer Note: Optional Activity – Give participants the opportunity to hold breath for 20 seconds. Participants should be cautioned that those with medical problems should not participate.

Characteristically, premature infants, or those infants born before the completion of the 37th week of gestation, are periodic breathers. Premature infants have periods of rapid breathing separated by periods of very slow breathing and often short periods during which there is no visible breathing or audible respirations, hence apnea.

Apnea is primarily an extension of this periodic breathing pattern which can also be accompanied by bradycardia, or a slowing of the heart rate to below 100 beats per minute.

*Pathophysiology

Although the cause of AOP is unknown, it probably reflects the immature and poorly refined neurologic and chemical respiratory control seen in the premature infant that is intact in the term infant. Premature infants are not as responsive to the chemical changes seen in the blood that term infants are. These chemical changes include fluctuating levels of carbon dioxide and oxygen. The poorer response of these chemicals coupled by immature respiratory reflexes all contribute to AOP.

Trainer Notes

*Clinical Manifestations

Trainer Note: Use Overhead #2 here. "Factors that Promote Apnea in the Premature Infant"

There are a number of factors that appear to promote the incidence of apnea in the premature infant. These include:

- Airway obstruction such as with mucus or poor positioning.
- Anemia.
- Dehydration.
- Cooling or overheating of the infant.
- Hypoglycemia or low blood sugar.
- Hypocalcemia or low calcium levels.
- Infection.
- Seizures.
- Increased vagal (stimulation) tone which comes about from too much tracheal suctioning.
- Depression of the respiratory center from drugs (infant or maternal).
- Hemorrhages within the brain.
- Heart problems including patent ductus arteriosus or congestive heart failure.
- Congenital defects of the upper airway.

*Therapeutic Management

It has been found that the administration of certain drugs such as methylxanthines (aminophylline, theophylline, or caffeine) is often effective in reducing the frequency of the apnea. Theophylline and caffeine act as stimulants to breathing by working directly on the central nervous system.

While on these drugs, it is important to have blood levels of the infant periodically monitored in order to avoid toxic levels of the drugs.

Trainer Note: Use Overhead #3 here. "Signs of Toxicity"

Trainer Notes

Signs of toxicity include:
- Tachycardia (heart rate greater than 180 to 190 beats
- per minute at rest).
- Vomiting.
- Irritability.
- Restlessness
- Excessive urination.
- Jitteriness.
- Bloody emesis or vomit.

*Family Teaching/Home Care

If the infant is sent home from the hospital on an apnea/ cardiac monitor, the family needs to be trained in CPR (cardio-pulmonary resuscitation) prior to hospital discharge. Instruction must be provided by a certified CPR instructor, i.e. American Red Cross, American Heart Association.

Should the alarm sound at home, the infant first needs to be assessed for color and the presence of respirations. If the infant is displaying the normal color and respirations are evident, the primary caregiver needs to search for other causes such as a detached lead, disconnected cable, or mechanical failure.

If the primary caregiver finds that the infant is indeed apneic, then gentle tactile stimulation such as gently rubbing the back or chest of the infant or turning the infant over will most often stop the apneic spell.

If tactile stimulation fails, the upper airway of the infant may need to be cleared of mucus through suctioning. If the infant has been sent home with supplemental oxygen, then a flow-by administration of the oxygen may be necessary at this time.

The infant is never shaken. After breathing has been restored, the infant should be assessed for possible precipitating factors such as temperature, humidity, or abdominal distension. It is important for the parent or primary caregiver to record the time, circumstances, and frequency of the apnea episodes.

Trainer Note: Use this optional activity time to demonstrate the use of the apnea/cardiac monitor. Encourage hands-on use of the monitor.

Trainer Notes

Trainer Note: If the trainer is a certified CPR instructor, he/she may want to review the basics of infant CPR through use of the flipchart. Otherwise, the trainer should direct participants to local community sites for CPR training such as hospitals, Red Cross, American Heart Association, or local ambulance/paramedic services.

316 & 936: The High Risk Infant: Respiratory Dysfunction

RESPIRATORY DISTRESS SYNDROME (RDS)

Rationale: Child welfare professionals, family preservation staff, foster care providers, and adoptive parents need to have a better understanding of Respiratory Distress Syndrome (RDS) so that they can better participate in the care of an infant with this problem.

Learning Objectives: Participants will be able to:

Identify signs and symptoms of RDS and be knowledgeable in appropriate treatment interventions.

Time: 1 Hour

Methods: The trainer presents the content in lecturette form using flipcharts and/or overhead transparencies to supplement.

Materials:
Overhead #4 – Pathophysiology of Respiratory Distress Syndrome
Overhead #5 – Fluid-filled Air Sac
Overhead #6 – Clinical Manifestations
Overhead #7 – Therapeutic Management
Handout #1 – Tracheostomy Suctioning
Handout #2 – Tracheostomy Tube in Trachea and Securely Tied
Handout #3 – Talking Tracheostomies for Children
Handout #4 – Bronchial Drainage Positions for Major Segments of All Lobes in Infant
Handout #5 – Bronchial Drainage Positions for All Major Lung Segments of Child.

Activities:
Activity #5 – Skin Color Assessment in Different Racial Groups
Activity #6 – Sharing of Experience with Surfactant Administration

Trainer Notes

RESPIRATORY DISTRESS SYNDROME (RDS)

*Introductory Lecturette

Respiratory Distress Syndrome (RDS) is a name applied to respiratory dysfunction in neonates and is primarily a disease related to developmental delay in lung maturation. RDS is a term applied to the severe lung disorder that is responsible for more infant deaths than any other disease. RDS also carries the highest risk in terms of long-term respiratory and neurological disorders.

RDS is almost exclusively seen in the preterm infant.

RDS is rare in infants born to narcotic addicted mothers or in infants who have been subjected to stress while in the uterus. RDS of a NON-PULMONARY origin can be seen in neonates who have sepsis or a multi-system infection who have an airway obstruction, been exposed to cold, have suffered a brain bleed, have hypoglycemia (low blood sugar), have suffered an acute blood loss, or who have been exposed to certain drugs.

Pneumonia in the neonatal period can also cause respiratory-like symptoms, but the cause here is either bacterial or viral in nature.

*Pathophysiology

Pre-term infants who are born before their lungs are fully developed are at most risk for developing RDS. Although the exact cause is still undetermined, there are several features which need to be present for the development of the disorder. These include:

Trainer Note: Use Overhead #4 here.
"Pathophysiology of Respiratory Distress Syndrome"

- Underdeveloped alveoli (air sacs)
- Uninflatable alveoli (air sacs)
- Limited lung blood flow
- Immature capillary blood network

Trainer Notes

At the time of birth, infants must initiate breathing and keep the previously fluid-filled lungs inflated with air. At the same time, the lung blood flow must be increased tenfold to provide for adequate lung perfusion. Certain cardiac structures must close in order to force more blood flow through the lungs. While most infants are able to accommodate these necessary requirements with minimal effort, the preterm infant has the most problem due to their overall immaturity. Although all these factors are involved, most authorities agree that the central factor responsible for adaptation from intra-uterine (inside the uterus) to extra-uterine (outside the uterus) is a normal production of surfactant.

*What is Surfactant?

Trainer Note: Use Overhead #5 here. "Fluid-filled Air Sac"

Surfactant is a surface-active phospholipid which is secreted by the alveolar or air sacs. Acting much like a detergent, this substance reduces the surface tension of the fluids that surround the air sacs. By reducing the surface tension, these air sacs can more easily open or expand. Deficiency of this surfactant substance causes unequal inflation of the air sacs on inspiration (when the infant breathes in) and collapse of the air sacs at the end of expiration (when the infant breathes out).

*Clinical Manifestations

Trainer Note: Use Overhead #6 here. "Clinical Manifestations"

Infants with RDS develop the distress either acutely (suddenly) or over a period of hours after birth. Usually the observable signs produced by the pulmonary changes begin to appear in infants who apparently achieved a normal breathing pattern and color after birth. In a matter of a few hours, however, breathing gradually becomes more rapid (greater than 60 breaths per minute).

Trainer Notes

Infants will display retractions (a pulling in of the chest wall at various positions) – suprasternal or substernal, subcostal or intercostal – which results from a very compliant or soft chest wall.

During the early stage, the infant's color may be normal. Within a few hours, the infant's respiratory rate increases to 80-120 breaths per minute and breathing becomes more labored or difficult. The infant is trying to compensate by increasing its rate of respiration, however, the depth is limited and, therefore, ineffective.

Rales may be heard over the lungs. Rales are abnormal sounds heard over the lungs generally caused by fluid in the lungs.

Grunting is also heard. Grunting is an attempt on the infant's part to overcome this tension and to hold oxygen in the lungs for a longer period of time.

> **Trainer Note:** At this time, audibly demonstrate what grunting may sound like.

The nostrils may flare and the overall color of the infant will change to a bluish hue.

At this point, the RDS will either decrease over the next several hours with eventual recovery, or it may increase in severity.

Activity #7 – Assess Color in Different Racial Groups

> **Trainer Note:** At this time, have participants describe to presenter how color would be assessed in different racial groups.

Cyanosis
Light skin – Bluish tinge, especially in lower eyelid, nail beds, earlobes, lips, oral membranes, soles, and palms.
Dark skin – Ashen-gray lips and tongue.

Trainer Notes

Pallor
Light Skin – Loss of rosy glow in skin, especially face.
Dark Skin – Ashen gray appearance in black skin. More yellowish-brown color in brown skin.

Erythema
Light Skin – Redness easily seen anywhere on body.
Dark Skin – Much more difficult to assess; rely on palpation for warmth or edema.

Ecchymosis
Light Skin – Purplish to yellow-green areas; may be seen anywhere on skin.
Dark Skin – Very difficult to see unless in mouth or conjunctiva.

Petechiae
Light Skin – Purplish pinpoints most easily seen on buttocks, abdomen, and inner surfaces of arms or legs.
Dark Skin – Usually invisible except in oral mucosa, conjunctiva of eyelids, and conjunctiva covering eyeball.

Jaundice
Light Skin – Yellow staining seen in sclera of eyes, skin, fingernails, soles, palms, and oral mucosa.
Dark Skin – Most reliably assessed in sclera, hard palate, palms, and soles.

*Therapeutic Management

The treatment of RDS is largely supportive and includes all the general measures required for any premature infant. The supportive measures which are most crucial to a favorable outcome include:

Trainer Note: Use Overhead #7 here. "Therapeutic Management"

- Maintain adequate ventilation or breathing. This can be done either through artificial means such as ventilator or by the use of oxygen only.
- Maintain a neutral environment in terms of temperature. This is done by keeping the infant warm, yet not overheated.

Trainer Notes

- Correct any underlying imbalances in the blood (chemical).
- Maintain adequate hydration and nutrition. This is usually done by IV therapy or nipple or gavage (tube) feedings.
- Correct any infections through the use of antibiotics.
- Correct the underlying deficit, which is the lack of surfactant. One of the newest and accepted methods of doing this includes the administration of an exogenous (outside) source of surfactant.

Exogenous sources of surfactant available to date are derived from a natural source such as human, porcine, bovine, or from an artificial source. Commercially available surfactant products include Exosurf Neonatal and Survanta, a natural bovine surfactant.

Studies to date have shown no advantage of one over the other; however, clinical trials show a high correlation of infant survival in those infants who did receive the surfactant therapy.

Activity #8 – Share Experiences with Surfactant Administration

Trainer Note: At this time, briefly discuss the complications seen with surfactant administration. Ask participants who have cared for children who received surfactant therapy about some complications they experienced. Write response from participants on a flipchart.

*Family Teaching/Home Care

Care of the infant with RDS in the home setting requires all the observations and interventions previously taught in the course "Caring for the Medically Complex Child".

Involvement of a respiratory therapist is an important component to the long-term care of the infant with RDS. Use of home oxygen therapy and training in home suctioning is a critical component as well.

Trainer Notes

Trainer Note: Distributed handouts # 1, 2, 3, 4, and 5 here.

Review suctioning techniques with the participants using the handouts.

BRONCHOPULMONARY DYSPLASIA (BPD)

Rationale: Child welfare professionals, family preservation workers, foster care providers, and adoptive parents must have a basic knowledge of Bronchopulmonary Dysplasia (BPD) in order to provide appropriate care to infants with this disorder.

Learning Objectives: Participants will be able to:

Identify physical manifestations of Bronchopulmonary Dysplasia (BPD) and care interventions suggested for management.

Time: 0.25 Hours

Methods: The trainer presents the content in lecturette form using flipcharts and/or overhead transparencies to assist.

Materials: Overhead #7 – (optional) Therapeutic Management

Activities: Activity #9 – (optional) Home Oxygen Safety

Trainer Notes

BRONCHOPULMONARY DYSPLASIA (BPD)

Trainer Note: This session should follow the lecturette on Respiratory Distress Snydrome since it is conisdered an extension of that disease.

Lecturette

Bronchopulmonary Dysplasia, also known as BPD, is actually a chronic lung disease. It is primarily seen in infants who were of very low birth weight (VLBW) or in infants who suffered RDS as a neonate.

BPD can also come about as a result of the therapies used to treat lung disease. Examples of this would include high oxygen concentration administration, use of a ventilator to support breathing, or from fluid overload. While this is rare, this incidence of BPD occurring from such causes is still seen.

Infants who survive the initial phase of RDS and then BPD have a survival rate of approximately 30%. Infants who do survive are at risk for frequent hospitalizations because of their borderline respiratory reserve, hyperactive airway, and increased susceptibility to respiratory infections.

*Pathophysiology

The pulmonary or lung changes that accompany BPD include a thickening of the alveolar or air sacs and an over growth or proliferation of a certain kind of cell (squamous) in the lung tissue, all leading to decreased functioning of the lungs.

*Clinical Manifestations

As previously mentioned, infants who do develop BPD tend to be at greater risk for respiratory infections. Their growth and development are often delayed, which is in part related to inadequate nutrition because of prolonged hospitalizations.

Many times the metabolic or nutritional needs of these infants are not fully recognized since these infants often have gastroesophageal reflux (GER) which frequently complicates

Trainer Notes

the disease.

*Therapeutic Management

The first approach is to prevent the disorder. Despite previous thoughts that the administration of surfactant would eliminate or at least reduce the incidence of BPD, this has failed to be the finding.

Research to date indicates that there are too many variables in the treatment of pre-term infants experiencing respiratory problems to say for sure that surfactant is effective. What appears to be more significant in the overall outcome for BPD is the early supportive treatment and management of those infants who have RDS.

> **Trainer Note:** Trainer may wish to review the therapeutic management section of RDS at this time. Overhead #7.

*Family Teaching/Home Care

Since the availability of home apnea/cardiac monitors, as well as home oxygen therapy, has increased, many of these infants can be discharged when they are gaining weight, oxygen need is low, and they pass the "room air challenge" (are able to keep oxygen saturation levels above 85% for 20-30 minutes in room air).

Home care is desirable to promote parent/infant bonding, minimize health care costs, and prevent any possible "acquired" infections from occurring.

Parents, or the primary caregivers, need to be taught and feel comfortable with the apnea/cardiac monitors, as well as the oxygen equipment. Most families have been taught these principles prior to discharge.

They need to know the risk of infection is greater in these children and should be cautioned about contact with persons who have respiratory infections. These children are threatened even with minor illnesses, since they have such limited pulmonary or lung tissue reserve.

Trainer Notes

Because of the high mortality rate which occurs during the first year of life, parents, or the primary caregivers, should be taught CPR. They should also be linked with parents or families who have a child with a similar need for support.

Activity #9 – Home Oxygen Safety (optional)

> **Trainer Note:** If time permits, lead a participatory group discussion related to safety considerations with home oxygen use.

1. Post "no smoking" signs.
2. Avoid smoking, fire, or sparks in the patient's room.
3. Keep oxygen tank and patient's bed at least 5 feet from radiator or heater.
4. Ensure that oxygen tank is secured upright at all times.
5. Avoid use of alcohol, petroleum jelly (Vasoline), or other petroleum-based products, and aerosols.
6. Keep oxygen in a well-ventilated area at all times.
7. If using an oxygen concentrator, do not use an extension cord, and do not plug into outlets being used for other appliances.

RESPIRATORY SYNCYTIAL VIRUS (RSV) BRONCHIOLITIS

Rationale: Child welfare professionals, family preservation workers, foster care providers, and adoptive parents are better able to care for a child with Respiratory Syncytial Virus (RSV) if they have a basic understanding of this disease.

Learning Objectives: Participants will be able to:
Identify cause, symptoms, and management of Respiratory Syncytial Virus (RSV).

Time: 0.5 Hours

Methods: The trainer presents the content in lecturette form using flipcharts and/or overhead transparencies to assist.

Materials: Overhead #8 – Lower Respiratory Tract Infection.

Activities: Activity #10 – (optional) If any training participants have cared for a child with RSV, encourage him/her to share experience with group.

Trainer Notes

RESPIRATORY SYNCYTIAL VIRUS (RSV) / BRONCHIOLITIS

Respiratory Syncytial Virus (RSV) is actually an acute viral infection with maximum effect at the bronchial level. This infection occurs primarily in winter and early spring and is actually rare in children over the age of two. Although very few children with these Bronchiolitis or RSV require hospitalization, it can be a serious disease. Although Adenoviruses and Parainfluenza viruses can cause acute Bronchitis, RSV is responsible for at least 50% of children admitted for Bronchiolitis.

*Etiology

RSV is considered to be a paramyxovirus, which basically means it contains just a single strand of RNA. It is considered to be related to the Parainfluenza virus.

There are two major subgroups of RSV. Strain A, which is the more virulent or stronger strain, and Strain B. More children develop Bronchiolitis and pneumonia from RSV subgroup A infections than from subgroup B infections during the years of major outbreaks.

The disease usually begins in the Fall, reaches a peak during the Winter, and then decreases during the Spring.

*Pathophysiology

RSV effects the epithelial cells of the respiratory tract. These epithelial cells (cells that line the inner layer of the respiratory tract) loose their cilia, or their ability to propel organisms or bacteria to the outside.

The major disease process of RSV causes the bronchial mucous or inner layers of the bronchials to swell and the lumina subsequently to fill with mucous and exudate. As the inner tube of the bronchials begin to swell and become filled with exudate or sputum, the child has more and more difficulty breathing. Dilation of the bronchial passages on inspiration allows for sufficient space for intake of air but narrowing of these passages on expiration prevents air from leaving the lungs. The air is trapped distal to the obstruction and causes progressive over inflation; ultimately like an emphysema-like state in the adult.

Trainer Notes

Trainer Note: Describe ball-valve like effect seen in the emphysema patients. Use diagram for better understanding.

The transmission of RSV is predominately through direct contact with respiratory secretions, mainly as a result of either hand-to-eye, hand-to-nose, or other mucous membrane. Also by inhaling direct large pore aerosols. RSV secretions have been found to survive for hours on countertops, gloves, paper tissues and cloths, and for hours on the skin. It remains infectious when transferred from hands to objects. Distance spread of RSV by small particle aerosols air borne transmission has not been well documented.

*Clinical Manifestations

The younger the infant the greater the likelihood that severe lower respiratory tract disease requiring hospitalization will occur. The peak incidence for RSV is 2-5 months of age, but reinfection with RSV is extraordinarily common at all ages with the highest rates being reported from day care centers. The severity of RSV tends to diminish with age and repeated infections.

Generally the illness begins with an upper respiratory infection because its main entry includes the mouth or nose. There is an incubation period of about 5-8 days with symptoms such as runny nose and fever appearing first. An inner ear infection and eye infection may also be present. Eventually a cough may develop. If the disease progresses, it becomes more of a lower respiratory tract infection and will manifest typical symptoms.

Trainer Note: Use Overhead #8 here. “Symptoms of Lower Respiratory Tract Infection”

These include increased coughing and wheezing and air hunger indicating that the child will breath at a much faster rate. The child may also display what is known as retractions and will have some color changes. As the disease progresses, there may be a respiratory rate of greater than 70 breaths per minute. The child will display listlessness and poor air exchange when the lungs are auscultated.

Trainer Notes

Once the lower airways are involved, classic manifestations include signs of altered air exchange such as wheezing, retractions, crackles, shortness of breath, and diminished breath sounds.

*Diagnostic Evaluation

Because RSV infection may be manifested as an upper respiratory infection, it is often difficult to identify the specific etiological or causative agent by clinical criteria alone. The most difficult distinction to make in infants is between RSV and what is known as reactive airway disease or asthma, because these conditions also involve the lower airway and have very similar symptoms.

When RSV is identified as being the problem, there are various tests that can be done both on nasal and nasopharyngeal secretions. These are known as a rapid immunofluorescent antibodies (IFA). Another test can be done known as the enzymed-linked immunosorbent assay. This is also known as ELISA. Both of these rapid tests have sensitivities of about 90% accuracy. The other more traditional tests still being done is the viral culture. This is pretty much considered obsolete, however, it may still be done in some hospitals. The reason why it is considered more obsolete is that it does take several days to get a result.

*Therapeutic Management

Treatment of RSV is based on the severity of the symptoms and includes high humidity, adequate fluid intake, rest, and medications. Most children with RSV can be managed at home, however, hospitalization is usually recommended in children with complicating conditions such as an underlying lung or heart disease associated with debilitated states or if the adequacy of the caregiver is in question. If the child is very short of breath, has marked retractions, seems listless, or has a history of poor fluid intake, the child should also be admitted.

Mist therapy is generally combined with hood or tent in concentrations sufficient to alleviate the shortness of breath. Fluids by mouth may be contraindicated because of the shortness of breath, weakness, and fatigue, therefore, IV fluids are preferred until the crisis of the disease has passed.

Trainer Notes

Medical therapy for RSV is controversial. Bronchodilators, corticosteroids, cough suppressants, and antibiotics have not proved to be effective in uncomplicated diseases and, therefore, are not recommended for routine use. Corticosteroids, theophylline, and lasix have all been used for intubated and ventilated infants and children. Ribavirin, an anti-viral agent, is the only specific therapy available for RSV infection. It also has therapeutic activity against the influenza and parainfluenza types or strains. Improvement has been demonstrated in children with lower respiratory tract involvement.

Currently, there is a lot of controversy as far as unclear evidence from the use of Ribavirin as to whether or not it is effective, how much should be given, and some of the toxic effects. There have been several studies citing examples of the use of a high dose, short duration therapy in which Ribavirin is administred for two hours three times per day for three days. To date, the results have proven to be very effective as the traditional time frames.

Attempts to produce a safe and effective vaccine have been going on since RSV was first discovered. At present, the greatest success has been with newly developed genetic engineering techniques of a vaccine production. In an attempt to combat the infection, especially in the high risk situation, research is also being done to the use of what is known as prophylactic administration of RSV immune globulin. The initial conclusion is that monthly administration of the high dose of RSV immune globulin was safe and effective and significantly decreased both the incidence and severity of RSV infection in high risk children.

*Considerations

Children who are admitted to the hospital with RSV infection should be assigned to separate rooms or grouped with other RSV infected children. A variety of infection control procedures have been employed over the years. The most important, of course, is consistent hand washing and not touching the nasal mucosa or the eyes. The routine use of gowns and masks have not been shown to be of additional benefit, although gowns may help to diminish the potential for spreading of the organism during close contact.

Other isolation procedures of potential benefit are those aimed at diminishing the number of hospital personnel, visitors, and

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uninfected people coming in contact with the child. Therefore, visitors should be limited.

Once the child has been discharged back to the home setting, monitoring temperature, good hand washing technique, increasing fluid intake, as well as allowing for smaller more frequent meals would be helpful in getting the infant over the final stages of the disease.

Activity #10 – (optional) Group Sharing

Trainer Note: Encourage any participants who have care for a child with RSV to share his/her experiences with the group.

EVALUATION AND CLOSURE

Rationale: This section is designed to assist participants in transferring information learned in training to their everyday practice, as well as evaluate the trainer on his/her presentation.

Learning Objectives: Participants will to:
Participate in the "What Have I Learned?" activity.
Complete and submit the program evaluation form.

Time: 0.5 Hours

Methods: Group Activity.

Materials: Evaluation form.
Handout #6 – What Have I Learned

Activities: Completion of evaluation form.
Group discussion and completion of "What Have I Learned?" handout.

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EVALUATION & CLOSURE

Trainer Note: Distribute Handout #6

Have participants take about 10 minutes to complete the handout and then review it with the group at large.

*Transfer of Learning

1. What is apnea?

2. How would I know if an infant I was caring for was having breathing problems?

3. What would I do if an infant I was caring for stopped breathing?

4. I can help care for a child with Respiratory Dysfunction by _____.

*Evaluation

Before closing the training sessions, all participants must complete the evaluation forms and return to assist in future curriculum planning.

Trainer Note: Allow approximately 5-10 minutes for completion and collection of the evaluation.

*Closure

Thank participants for their attention and involvement during this very medically complex training session. Encourage their continued support and care of the medically complex child.

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References

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