

REVIEW ARTICLE

The Role of Nurses in the Management of Respiratory Disorders in Children

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ABSTRACT

As babies and young children are more vulnerable to respiratory illnesses, pediatric respiratory disorders are a leading cause of death and morbidity. Chronic respiratory illnesses in children include tuberculosis, asthma, bronchopulmonary dysplasia and bronchiectasis. Furthermore, hereditary pulmonary diseases such as primary ciliary dyskinesia and cystic fibrosis are seen in children at a lower rate. Most children are examined by non-professional physicians (eg, senior nursing staff) who are specialized in pediatrics, as nursing practice in outpatient settings grows. Some people have a poor understanding of how to care for ill children. As a result, these professionals must be informed of any risk factors and can identify “red flags” in a sick child quickly so that further care may be escalated properly. Some children will

require hospitalization for breathing assistance and additional therapy including antibiotics and hydration.

With the growth of “non-medical practitioners” in nursing practice, it is essential to be aware of whether or not to administer antibiotic medication, especially given the risks of antibiotic misuse. Nurses are responsible for administering medications and assisting with various therapies, as well as for caring for children and their families during an illness. In specific circumstances, children and parents must be informed about protective and preventative steps that can help reduce the risk for eventual pulmonary disorders, such as vaccinations and smoking cessation. (*Altern Ther Health Med.* 2022;28(1):65-71).

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INTRODUCTION

Pediatric respiratory disease is the leading cause of sickness and hospitalization in children. These diseases vary from minor non-acute illnesses (like a sore throat and the common cold) to acute illnesses (like bronchiolitis), severe problems (like asthma) and catastrophic life-threatening illnesses (like acute supraglottitis). Chronic diseases, such as

hay fever, can have an impact on health, but often acute or recurring infections can also have a major impact on certain children's health and well-being.¹

Most acute illnesses in children are caused by respiratory infections. The etiology of respiratory diseases, and even the duration of sickness, can be influenced by the child's age and living situations and also the time of year. Little children and babies, for example, are more prone to decline quickly. Children in poor socioeconomic situations are more likely to have diseases that are severe or occur more frequently. In the winter, some viruses are more common, but allergen-related respiratory illnesses are more common in the spring and fall.^{2,3} Children with chronic illnesses, including hyperglycemia, inherited cardiac illness, cystic fibrosis and sickle cell disease, as well as children with neurologic abnormalities like cerebral palsy, are more susceptible to developing pulmonary problems. Parents may have trouble evaluating the severity of their child's condition and may either seek treatment earlier in the course of the disease (while the sickness is still mild) or wait until the child is severely unwell and go to a healthcare facility.⁴

To give advice and assistance to families, nursing staff must be knowledgeable about lung illnesses that have an impact in

children. Families frequently encounter nursing staff in outpatient clinics when their children become unwell. Nursing staff must be able to have conversations that will assist them in evaluating the degree of the child's sickness and whether or not they need to go to the hospital. Because respiratory disease is the leading cause of pediatric admissions to health centers, pediatric nurses must have advanced evaluation and management abilities in this area. Earlier diagnosis of deteriorating pulmonary conditions enables prompt intervention and increases the chances of avoiding a minor issue from becoming a serious sickness.^{5,6} Breathing problems may be distressing for both the child and their parents. All through the duration of a pulmonary infection the child and family require the nurse's assistance. The nursing staff is also in the rare role of being able to have a substantial influence on the burden of pulmonary diseases in children by correctly identifying, educating about and encouraging pulmonary illness avoidance.⁷

SELECTION OF LITERATURE FOR REVIEW

A total of 21 electronic databases searched for English language studies published between January 2000 and January 2020. The findings came from Mendeley/Medline/Google Scholar/Science Direct/ Springer /PubMed, and several keywords were utilized in the literature review, both individually and collectively. The keywords for assessment of the literature were "asthma," "nurse," "clinical presentation," "acute lymphocytic leukemia," "upper respiratory disease," "lower respiratory disease" and "bronchiolitis." Included studies described inpatient, outpatient and community-based interventions for respiratory disease management in children that were led, coordinated or delivered by nurses. Hospitalization at home and early discharge schemes for acute exacerbations of respiratory disease were excluded from the search. Reference lists were also checked for relevant journals that were not found during the first search.

ASTHMA

Asthma is an inflammatory illness in which hyperactivity and blockage of the airways occurs. More than 7 million children in the United States have asthma, making it one of the most frequent chronic childhood diseases. The prevalence is believed to be 9%, with school-aged children having the greatest rates. Despite nearly doubling in the 1980s, frequency has subsequently levelled off. In younger children, boys have higher rates than girls; girls, on the other hand, have higher rates following puberty. Furthermore, Puerto Rican children and non-Hispanic blacks have a higher incidence of asthma than non-Hispanic white children.^{8,9}

Asthma is among the leading reasons for missed school days, so it's linked to enhanced healthcare expenditures. In the United States, asthma-related healthcare costs total more than \$30 billion each year. Patients with asthma pay twice as much for healthcare as individuals who do not have asthma. Epidemiologic research has aided in the knowledge of asthma's natural history, as well as the effects of inheritance, gender, smoking and exposure to the environment on asthma

progression. According to the findings, maternal cigarette smoking is linked to reduced airway function, which may contribute to airway hyperactivity.¹⁰⁻¹²

Pathophysiology

Asthma is characterized by inflammation, which leads to airway blockage and hyperactivity. Excessive mucus secretion, bronchoconstriction and edema all contribute to airway blockage. Inflammation is caused by the interplay and aggregation of several cell types. Inflammatory substances setting off a series of signaling events by triggering cell-specific surface receptors.¹³

Inflammatory cells

Inhaled irritants cause T helper 2 (TH2) and mast cells to produce inflammatory markers including cysteinyl leukotrienes and histamine, as well as cytokines like interleukin (IL)-5 and IL-4. Endothelial cells are activated, matrix proteins and collagen are released and airway remodeling occurs as a result of cytokine secretion.¹⁴

Lymphocytes

Lymphocytes have a role in regulating airway inflammation via the TH2 and TH1 receptors. Because it produces interferon- γ (IFN- γ) and IL-4, which are recognized cellular defense processes, the TH1 phenotype has been regarded as preventive. However, cytokines (IL-13, 9, 6, 5, and 4) are released by TH2 cells, which promote allergic inflammation. A persistent inflammatory cascade is exacerbated by an imbalance between TH1 and TH2 cells. A TH2-driven, eosinophilic reaction that is immunoglobulin E (IgE)-predominant, is common in asthma.^{15,16}

Eosinophils

The amount of eosinophils in the airways of several populations of children with asthma is increased, and proinflammatory cytokines and inflammatory enzymes are found in these cells. Chronic asthma has been linked to a greater eosinophilic load.¹⁷

Dendritic Cells and Neutrophils

Neutrophils are present in people with chronic and acute asthma. Their function is yet not fully known. They may have a role in the inability to respond to steroid hormones. Dendritic cells, which come into contact with irritants on the airway surface and assist in the development of TH2 cells, are essential antigen-presenting cells.^{18,19}

Mast Cells

Mast cell mediator release is crucial in the pathophysiology of asthma. The allergen-induced route, as well as thermal or mechanical stimuli, can trigger the degranulation of mast cells. Airway inflammation, workout-induced bronchospasm and smooth muscle airways are due to the presence of mast cells. Mast cell numbers are decreased by the use of inhaled corticosteroids (ICSs).²⁰

Macrophages

Patients with asthma have a higher number of undeveloped macrophages. This might lead to the release of proinflammatory mediators and tissue injury.²¹

Inflammatory Mediators

The generation of mediators has been linked to asthma pathophysiology and may have a role in bronchial hyperresponsiveness. The activation of asthma is aided by cytokine and chemokine cellular infiltration.^{22,23}

Cytokines

Cytokines are generated by a variety of cells, including mast cells, eosinophils and lymphocytes, as mentioned previously. They affect the inflammatory response in asthma and, as a result, the intensity of tumor necrosis factor (TNF)- α and IL-1B, which increase the inflammatory process, as well as granulocyte-macrophage-colony-stimulating-factor (GM-CSF), which are essential cytokines. Eosinophil survivability is aided by the presence of GM-CSF. Proinflammatory and anti-inflammatory cytokine expression is influenced by ICSs.^{24,25}

Chemokines

Chemokines attract proinflammatory cells to the lungs. RANTES, a strong chemotactic substance for mast cells, macrophages, basophils, eosinophils and T cells, is one of the most researched. It causes the infiltration of eosinophils into the airways of patients with asthma.²⁶

Immunoglobulin E (IgE)

IgE is a key player in the genesis of allergic illness; it is the antibody that triggers the allergic reaction and produces acute bronchoconstriction and mucous inflammatory response. Prostaglandins, leukotrienes, tryptase, histamines and other eicosanoids are known to be released by mast cells, which have numerous IgE receptors.²⁷

Clinical Aspects

Coughing, breathlessness and wheezing are the most common asthma signs. If the patient is old enough, chest discomfort may be a complaint. Occasional or chronic symptoms are possible. It is critical to obtain a thorough history from the parents; it is also crucial to include older children in the conversation since their perceptions may help with the evaluation.

Asthma coughs are hacking and ineffective, and typically severe at nighttime.²⁸ The cough may sound moist or productive due to mucus hypersecretion. Difficulty breathing may occur as a result of exercise. If just exercise-induced symptoms occur, it's crucial to figure out when the cough occurs and how it relates to the child's activities and physical condition. There may or may not be wheezing.²⁹

The Nurse's Role in the Treatment of Childhood Asthma

The nurse's primary responsibility is to educate the child and their family so that they can manage their asthma on

their own. The Expert Panel Report 3 (EPR3) Guidelines on Asthma include information for patients with asthma and their parents.

Since 2002, the National-Asthma-Certification-Council has been providing national credentials for asthma instructors. Asthma self-management strategies are beneficial. Providing pediatric asthma training reduces the average number of visits to the hospital and the chance of visits to the emergency department. When parents and patients with asthma take part in self-management training, knowledge of asthma, self-efficacy, compliance and standard of living, as well as emergency department visits, hospitalizations and expenses are reduced.^{30,31}

After early detection of asthma, the child and their family should be provided with information that assures they both have fundamental knowledge of asthma and its treatment. The learning practice should be thorough and continuous. It must involve all medical team members and take place in a variety of venues. In particular, the nursing staff should establish a rapport with the child and parents. This collaboration involves setting mutually acceptable treatment goals; establishing treatment strategies should engage the child as much as is feasible. The nursing staff must foster an atmosphere that promotes open conversation. Nursing staff will be able to evaluate care problems and treatment compliance more efficiently as a result of this connection.³²⁻³⁴

Basic asthma education should be provided to all patients in a culturally appropriate way. Basic information, how asthma is cured (including knowledge about medicines and allergen prevention), how to analyze the level of control, how to utilize recommended devices, how to react to symptoms and signs of deteriorating asthma and where and when to obtain medical help are all crucial parts of an education program. An asthma action plan should be included in the plan, which must be suited to the requirements of the parents and the child. The nursing staff should assess what previous knowledge the parents and child have regarding asthma before providing the education. This assessment allows the nursing staff to reinforce proper instructions while also correcting those that are not. To avoid overwhelming the parents and the child, the nursing staff should decide how much knowledge to provide on each occasion.³⁵⁻³⁷

LOWER AIRWAY DISEASE

Children are prone to acute respiratory infections. The airways just below the thoracic intake, which is approximately one-third of the way down the trachea, are referred to as the "lower airways" in this study. Bronchitis, bacterial tracheitis, bronchiolitis and pneumonia are among the lower airway illnesses included in this study.³⁸

The lower respiratory tract can be infected by a variety of pathogens; the type and severity of the illnesses they cause varies. Both bacterial and viral pathogens can cause infectious lower airway disorders, although viral infections are more common. The most prevalent virus that causes lower

respiratory disease is the respiratory syncytial virus (RSV). Lower airway illness can be caused by adenovirus, metapneumovirus, parainfluenza and influenza in children. All of these viruses, in addition to the numerous rhinoviruses, have the ability to cause asthma. Infections of the lower pulmonary track can cause a variety of problems, and they are especially problematic in individuals who have underlying chronic disease or weakened immune function.^{39,40}

Mycoplasma pneumoniae, *Chlamydia pneumoniae*, *Haemophilus influenzae*, *Staphylococcus* and *Streptococcus pneumoniae* are the bacteria that most frequently cause infection. Furthermore, *S. pneumoniae* and *Staphylococcus* can cause complications of a preexisting viral infection.

LOWER RESPIRATORY ILLNESS IN CHILDREN

Bronchiolitis

Bronchiolitis is an acute sickness caused by a virus that leads to inflammation and blockage of the bronchioles that is most commonly associated with an upper respiratory infection. It usually happens in a single episode, although recurring infections, especially in the first year of life, have been observed. The first reports of bronchiolitis were of virus-induced wheezing in babies younger than 2 years of age. The symptoms and signs of respiratory syncytial virus (RSV) bronchiolitis coincide significantly with those of asthma, as does the fact that RSV bronchiolitis-affected children have a greater prevalence of future asthma than the overall population.⁴¹

Bronchiolitis is prevalent in babies and toddlers, although it is most severe and bothersome in children younger than the age of 12 months. Infants younger than 3 months; preterm newborns (born before 35 weeks of pregnancy); and babies with severe respiratory illness, hereditary cardiac problems, or immune-deficiency disorders who have bronchiolitis are more likely to be hospitalized and die. Factors like maternal tobacco smoking can exacerbate the disease's severity and, in certain cases, make it more common. The primary goal in the treatment of bronchiolitis should be careful clinical surveillance and early hospitalization to treat any possible complications.⁴²⁻⁴⁴

The Nurse's Role in Bronchiolitis Management

Assessment of pulmonary function, appropriate hydration, and supportive interventions are the major goals of nursing care. Nursing efforts and therapies must be grouped together to provide as much rest as possible for the baby and reduce the infant's stress. Required nasal aspiration is one of the supportive methods. It is crucial to remember that coughing is the most efficient way to clean the lungs. Suction catheters, which can produce airway edema and laryngospasm, are less efficient.⁴⁵

Because RSV bronchiolitis is highly infectious, measures such as contact isolation and regular hand washing can help limit its transmission. Since the virus thrives on surfaces, it can be transmitted to the hands of the caregiver by touching the infant and/or crib or nightstand, which can help the virus

spread to other people. To limit the transmission of RSV, it is particularly critical that nursing staff and other caregivers taking care of bronchiolitis-affected children do not simultaneously care for children with basic illnesses that place them at high risk for serious RSV infection.⁴⁶

In addition, nurses must do a psychosocial evaluation of the family to look for indications of anxiety and worry, which may be apparent and exacerbated by pulmonary difficulty. By offering detailed explanations and updates, nurses can help minimize worry. Enabling parents to be involved in as much of the infant's care as feasible can help build emotional stability. Nurses should also provide hospital discharge instructions in advance, as symptoms may last for weeks after release. Children younger than age 24 months with bronchiolitis have a 12-day median illness duration; roughly 18% will stay unwell after 21 days, and 9% will stay unwell after 28 days. Discharge instructions should include correct nasal aspiration and breathing methods and observation of the child's health status so that healthcare providers can be informed if complications arise. Parents should be made aware of the following warning signs: increasing respiratory rate and/or work of breathing as evidenced by accessory muscle use, inability to maintain adequate hydration (specific guidelines should be given based on the age and weight of the patient as to how much liquids should be consumed and how many wet diapers are adequate per day), recurring fever, and a worsening general appearance.^{47,48}

PNEUMONIA

In the United States, pneumonia is the sixth greatest risk factor for mortality, the second most frequent nosocomial illness and the major cause of death from nosocomial infections. Every year, pneumonia affects 10% to 20% of all children younger than age 5 years in underdeveloped nations. Infants younger than 1 year of age account for approximately 75% of pneumonia fatalities. Starvation, malaria and weakened immunity all raise the chance of mortality. According to the World Health Organization, pneumonia is the leading cause of death in children globally. Pneumonia kills approximately 1.8 million children younger than age 5 years annually, and is responsible for 20% of all mortality in that age group.^{49,50}

Every year, more than 155 million cases of pediatric pneumonia are reported around the globe. Pneumonia is widely transmitted and often fatal in underdeveloped nations due to a lack of medicines, hunger, overcrowding and inadequate cleanliness. Although most pneumonia is treatable with antibiotics, many children in developing countries do not have access to these drugs, leading to a high death rate. The high prevalence of pneumonia qualifies it as a serious public health problem that requires immediate attention and intervention.^{51,52}

The Nurses' Role in Pneumonia Management

Pneumonia may be a scary diagnosis for both a child and their parents or caregivers. To achieve the greatest

Table. Common Medical Treatments of Respiratory Diseases

Treatment	Explanation	Indication	Nursing Implications
Oxygen	Supplemented via mask, nasal cannula, hood, or tent or via endotracheal or nasotracheal tube	Hypoxemia, respiratory distress	Monitor response via breathing and pulse oximetry
High humidity	Addition of moisture to inspired air	Common cold, croup, tonsillectomy	Infant may require extra blankets with cool mist, and frequent changes of bedclothes under oxygen hood or tent as they become damp.
Suctioning	Removal of secretions via bulb syringe or suction catheter	Excessive airway secretions common cold, flu, bronchiolitis, pertussis)	Should be done carefully and only as far as recommended for age or tracheostomy tube size, or until cough or gag occurs
Chest physiotherapy (CPT) and postural drainage	Promotes mucus clearance by mobilizing secretions with the assistance of percussion or vibration accompanied by postural drainage (see Chapter 14 for more information about CPT and postural drainage)	Bronchiolitis, pneumonia, cystic fibrosis, or other conditions resulting in increased mucus production. Not effective in inflammatory conditions without increased mucus	May be performed by respiratory therapist in some institutions, by nurses in others. In either case, nurses must be familiar with the technique and able to educate families on its use.
Saline gargles	Relieves throat pain via salt water gargle	Pharyngitis, tonsillitis	Recommended for children old enough to understand the concept of gargling (to avoid choking)
Saline lavage	Normal saline introduced into the airway, followed by suctioning	Common cold, flu, bronchiolitis, any condition resulting in increased mucus production in the upper airway	Very helpful for loosening thick mucus; child may need to be in semi-upright position to avoid aspiration
Bronchoscopy	Introduction of a bronchoscope into the bronchial tree for diagnostic purposes. Also allows for bronchiolar lavage	Removal of foreign body, cleansing of bronchial tree	Watch for post-procedure airway swelling, complaints of sore throat.

feasible results for the patient and the minimal level of stress for the family, encouragement and correct instruction are required. The parent or caretaker must be instructed on the indications to look for that signal an unsatisfactory therapy response or deteriorating health. Increased breathing rate is one of the risk factors that have to be addressed right away (it is best to teach parents how to measure breath frequency while their child is sleeping and provide guidance on abnormal frequencies that will change with age), cyanosis, increased heart rate, puzzlement, signs of water loss (reduced urine output, absence of tears and dry mucus membranes), dyspnea, labored breathing, breathlessness, pulmonary distress after 72 hours or a fever that resolves and then returns.^{53,54} It is critical to describe these indicators in ways that parents can comprehend when delivering this information. The family should be informed of how to contact the physician if necessary. Before the child is released from the hospital, make preparations for adequate follow-up.

To help prevent future infections, the family should be made aware of warning signs. Parents should motivate their children to get an annual flu vaccine, as well as a pneumococcal vaccine. They must also be urged to wash their hands often and quit smoking and other adverse lifestyle practices.⁵⁵

UPPER AIRWAY DISORDERS

To fully appreciate upper airway disorders, it is necessary to have a fundamental knowledge of upper aerodigestive tract developmental anatomy. The embryologic growth of these tissues is critical throughout weeks 3 to 8 of pregnancy.

Laryngomalacia

Laryngomalacia is a frequent childhood disease in which the supraglottic larynx's fragile, undeveloped cartilage folds inwardly upon inhalation, obstructing the airway. The most frequent laryngeal abnormality is laryngomalacia, which is also the most prevalent cause of stridor in newborns. Boys are twice as likely as girls to develop laryngomalacia. The actual cause of the condition is unknown. Lack of maturity or aberrant growth or immaturity of neuromuscular control, extraesophageal reflux and cartilaginous structures are the 3 main hypotheses.^{56,57}

Disorders of the Vocal Cords

There are a variety of vocal cord issues that children may have. This section will outline the most likely types of problems seen: vocal fold immobility (VFI), vocal cord paralysis (VCP), vocal cord dysfunction (VCD), and vocal cord lesions.

Tracheomalacia

Tracheomalacia is a condition in which the tracheal walls collapse abnormally due to tracheal weakening or floppiness.

The Nurses' Role in the Treatment of Upper Airway Problems

Children with chronic obstructive pulmonary disease may be vulnerable to life-threatening circumstances. The counseling and assistance of the child's family are crucial in the treatment of the child's airway illness. Caretakers must have the necessary information, training, assistance and

resources to properly care for their children. Of course, the extent of the family's education and need for assistance is determined by the intensity and duration of the child's illness. All families should be given full details about their child's illness, such as treatments, medicines and surgery, as well as aggravating circumstances and when to obtain medical assistance.⁵⁸⁻⁶⁰

Many youngsters with tracheal and laryngeal problems need to stay in the hospital for a long time. This may cause a lot of stress for the family, including concern and dread about their child's diagnosis and future, time off from work, marital tension, isolation from family life/other children, financial difficulties and regret, to name a few. It is critical to ensure adequate family assistance by offering consistent nursing and provider care and exposure to social workers, religious assistance and therapy for upper airway problems.⁶¹ Families must also feel in charge of their child's care throughout extended hospitalizations. Many families, however, feel frustrated in the hospital environment and are unsure of their position with their child. Nursing staff should urge parents to be included in the decision-making process and care plan so that they may continue to love and care for their children.

The ability of a family to provide vital care for their child, as well as a secure and healthy home atmosphere, is frequently critical to a healthy transfer from the hospital to the home. In the home, most children may need ongoing complicated care and evaluation. Nurses play a critical role in educating parents and caretakers on the skills they need to care for their children once they return home. Because some patients will seek nursing care in the home environment, whether through expert home visits or private nurses, expert nursing practice frequently accompanies the child into the home atmosphere (see Table). Nurses are critical in providing information, support, awareness, motivation, understanding and good nursing evaluation and care for children with laryngeal and tracheal abnormalities, as well as their families, from diagnosis through discharge.^{62,63}

CONCLUSION

In the United States and around the world, pediatric respiratory diseases cause a variety of chronic and acute health problems. In both the school and primary care environment, nursing practitioners and staff are frequently the first to come into contact with and detect pulmonary issues in patients. As a result, the entire nursing profession must be competent in this area of practice.

This review provides both nurses and nurse practitioners with the information required to safely and confidently care for children with common respiratory disorders and their families.

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