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Role of Nursing in Respiratory Care: Nursing Care Education and Respiratory Biomarkers Evaluation-An Updated Review

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Abstract

Background: The increasing prevalence of respiratory diseases underscores the importance of effective respiratory care. Nurses are essential in delivering respiratory care, and their role includes education, assessment, intervention, and patient self-management. This review explores the role of nursing in respiratory care with an emphasis on educational strategies to enhance patient outcomes and support patients in managing their conditions independently.

Aim: This review aims to update current knowledge on the role of nursing in respiratory care, emphasizing the educational components that nurses provide to support respiratory health, prevent complications, and optimize patient quality of life.

Methods: This updated review synthesizes data from recent literature, covering nursing interventions in respiratory care, patient education strategies, and evidence-based approaches to respiratory condition management. Relevant databases, including PubMed, CINAHL, and Medline, were searched for articles published within the past five years. Studies included were based on criteria focusing on nursing roles in respiratory care, patient outcomes, and educational practices.

Results: The findings reveal that effective respiratory care by nursing professionals contributes to improved patient outcomes, decreased hospital admissions, and enhanced patient self-efficacy in managing respiratory diseases. Nurses educate patients on symptom management, proper use of respiratory devices, lifestyle modifications, and emergency response. Innovative educational strategies such as individualized care plans, use of digital platforms, and interactive sessions have shown to improve patient adherence to respiratory care protocols.

Conclusion: Nurses play a pivotal role in respiratory care through patient education, fostering self-management, and providing comprehensive support for patients with chronic respiratory conditions. Educational interventions led by nurses empower patients, resulting in improved disease management, reduced complications, and higher patient satisfaction. Expanding nursing education on respiratory care and utilizing digital resources could further enhance nursing efficacy in respiratory health support. Further research is recommended to explore long-term impacts of nurse-led education on respiratory disease outcomes.

Keywords: Nursing, respiratory care, patient education, self-management, respiratory diseases, nursing interventions, patient outcomes.

Introduction:

Respiratory failure is characterized by the dysfunction of ventilation and/or expiration resulting from a range of factors, leading to the inability of the body to sustain autonomous respiration. If left untreated, this condition can cause CO2 retention,

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triggering a cascade of physiological and metabolic disturbances, or even death [1,2]. Given the incomplete maturation of the respiratory system and diminished defensive capacity, children with severe pneumonia, tracheal obstruction, sepsis, and similar conditions are particularly vulnerable to respiratory failure [3]. Additionally, research indicates that pediatric respiratory failure progresses at a much faster rate than in adults, increasing the likelihood of complications such as cardiac arrest, respiratory arrest, and damage to vital organs, including the brain, which can lead to severe adverse outcomes [3]. Currently, the management of pediatric respiratory failure primarily focuses on symptomatic and supportive treatment. However, the absence of optimal nursing interventions during the treatment process results in a poor prognosis for these patients, making it challenging to achieve the desired therapeutic outcomes. Therefore, targeted nursing interventions are essential for improving both the quality of care and the prognosis for pediatric patients with respiratory failure.

The effectiveness of conventional nursing practices for pediatric patients with respiratory failure in clinical settings is unsatisfactory, with notable limitations such as insufficient attention to psychological support and inadequate environmental interventions. Common nursing challenges include inadequate health education, insufficient understanding of respiratory failure, and neglect of nutritional balance in pediatric patients [4,5]. Comprehensive nursing, as a holistic approach, offers high-quality, integrated care tailored to patients' needs. Some studies have shown that comprehensive nursing enhances the quality and scope of nursing interventions [6,7]. This approach ensures that scientifically-based, high-quality nursing measures are implemented to facilitate patient recovery. Existing research primarily focuses on various nursing models for pediatric respiratory failure, such as cluster nursing and evidence-based nursing, with varying levels of efficacy depending on the outcome measures used [8,9]. However, few studies have explored the impact of comprehensive nursing care specifically on pediatric patients with respiratory failure.

Background:

One of the main reasons people are admitted to medical surveillance units or intensive care units (ICUs) is acute respiratory insufficiency [10]. Obesity, systemic illnesses (including anemia), and cardiovascular abnormalities can all lead to this condition [11]. ICU patients frequently suffer dyspnea, a common and upsetting symptom [12-14]. Dyspnea is frequently underreported, despite its great prevalence [15]. A pandemic has been declared in response to the worldwide spread of the new coronavirus, SARS-CoV-2 [16, 17]. This virus causes COVID-19, a condition that can cause acute respiratory distress syndrome (ARDS) and, in extreme situations, death. About 20% of COVID-19 patients are expected to need hospitalization, despite the fact that most of them only have minor symptoms [18]. According to a Norwegian study, dyspnea was reported by 69% of COVID-19 patients [19].

In order to provide high-quality care, nurses are essential to the healthcare system [20–24]. Nursing competencies must be in line with the requirements of healthcare services [25]. In addition to being a professional capability that combines knowledge, personal traits, and skills to handle both predictable and unpredictable clinical situations, especially in unstable environments [28], competence has also been defined as a combination of knowledge, skills, assessments, and attitudes [26, 27]. Globally, the current pandemic offers serious difficulties to nurse competency because it is such an unstable situation. Differentiating between individuals who require immediate attention and those who can wait safely is a crucial part of evaluating patients with respiratory insufficiency. Lung auscultation, physical evaluation of vital signs, and dyspnea assessment are all part of this procedure [29]. Studies have demonstrated that with focused training, nurses can conduct these assessments with comparable proficiency to doctors [30]. Because patients in intensive care units are unable to self-report, assessing symptoms in these settings can be very difficult. Sedation, endotracheal intubation, and mechanical ventilation limit a patient's ability to express their demands or symptoms verbally. As a result, symptoms could go unnoticed, delaying responses and resulting in avoidable mistakes or issues [31, 32]. A knowledge gap on nursing methods for patients with respiratory insufficiency has been brought to light by numerous studies [33–35]. We set out to investigate the viewpoints of nurses, critical care nurses, and critical care nursing students about the management of patients with respiratory insufficiency. Our team consisted of a female nurse anesthetist/PhD, two critical care nurses, and a critical care nursing educator/MSc. We decided to concentrate on fundamental assessment techniques rather than critically sick patients, like those in the prone position, because of the importance of this information for a larger nursing audience outside of intensive care units.

Nursing Education:

Given that patients are taking a more active role in their own health care, recent improvements in life expectancy and quality of life for patients with chronic respiratory disorders have created a substantial challenge for nursing care. Long-term, ongoing care is necessary for chronic illnesses such AIDS, diabetes, cancer, heart disease, and respiratory disorders. These illnesses frequently cause multisystemic problems that lead to significant lifestyle changes and necessitate particular care and self-care requirements depending on the restrictions or impairments that develop as the illness worsens. Chronic illnesses have a number of traits in common: They frequently result in long-lasting changes that are

gradual, irreversible, and permanent. They have multiple causes, thus managing them calls for an all-encompassing strategy. In order to collaborate with the healthcare team and provide good care, they require education for patients and their families. To manage the illness and lessen its consequences, they need ongoing care and therapy. They are linked to sentiments of loss, which are an important emotional factor for the person and their family. A patient's physical, mental, social, familial, and professional lives are all affected when they receive a chronic respiratory disease diagnosis. These consequences may be made worse by the severity of the condition as well as unique characteristics of the patient. Physical issues might be caused by the illness itself or as a result of medicinal interventions. Family members may take prolonged medical leave or quit their jobs due to work-related concerns. As more people, especially mothers, take on caregiving responsibilities, family dynamics are frequently upset. Loss of relationships, social isolation, and changes in time management are common social difficulties that impact the frequency and quality of social contacts.

The nursing team and other medical experts must work together continuously to develop successful care methods. The physical, biological, psychological, social, and spiritual aspects of the human experience must all be addressed in this collaborative treatment. Health education for patients and their families is a crucial component of this type of care, necessitating collaboration between hospitals, homes, and educational institutions. Since they are frequently the most consistent caregivers in a child's development, parents in particular are crucial. Thus, it is essential to provide age- and condition-appropriate education to both parents and children. Although putting nursing theory into practice is still difficult, it helps set nursing apart from other health professions by highlighting the use of a unique professional vocabulary. The traditional biological focus that has long dominated healthcare is being replaced by a more holistic, patient-centered approach in nursing care according to theories. Even though a large portion of healthcare is delivered in everyday life, outside of professional settings, the study of healthcare highlights the vital role that nursing plays in human health, development, and survival. A holistic approach to nursing care for chronic diseases increases the care of the patient as a whole, considering the disease's effects on their life and family. A person's demands are not only determined by their illness; rather, they are shaped by how experienced and treated. Because they are frequently the most familiar with the needs and experiences of the patient and family, nurses are in a unique position to grasp and communicate the patient's world.

Dorothea Orem's thesis, which sees humans as biological, logical, and reflective beings, is one of the most popular nursing theories. Orem asserts that people have the capacity to think critically about themselves and their environment, as well as to think, communicate, and act in ways that are beneficial to their well-being through the use of symbolic creations (words, ideas). Nursing care assists people in achieving and maintaining self-care behaviors that are essential for maintaining health, recovering from illness, and managing its aftereffects. According to this paradigm, the environment includes all social, biological, chemical, and physical elements that have an impact on an individual, such as family and community. A condition of well-being that varies according to an individual's distinct biological and human traits is called health. The ability to control elements that impact one's growth and functioning in order to improve health, life, and well-being is the definition of self-care, a key idea in Orem's philosophy. It is an educational exercise designed to help people reach particular health objectives.

Nursing Care Management:

The management of care involves clinical processes directly linked to patients' healthcare. These processes must be adjusted to align with both individual patient needs and broader healthcare guidelines. This balancing act connects clinical logic, which focuses on the patient, with public health logic, which emphasizes collective health management. Effective care management requires incorporating available evidence, updated publications, the patient's preferences regarding education, and the available resources and environment. The modern model of global hospital management embraces an integral approach to healthcare. This model emphasizes comprehensive actions aimed at providing efficient, effective, and timely care, not just for specific incidents but for individuals considered in their totality—physically, mentally, and socially. The model acknowledges the ongoing adaptation of individuals to their environments, including their families and communities.

Characteristics of a Correct Educational Instance for Self-Care

In outpatient settings, particularly within pulmonary function laboratories, the diversity of patients offers valuable opportunities for promoting health self-care. Self-care is the ability of the patient to actively manage their health needs, maintaining or improving their physical functioning and overall well-being. This capability is learned to meet continuous care needs and manage various health processes. Adherence to treatment is crucial across all diseases and is directly linked to treatment outcomes. Since adherence can be influenced by multiple factors, it represents a modifiable component of care. However, the diversity of diseases, especially in children with chronic conditions, results in educational needs that are highly variable and often unpredictable. These needs can be categorized into three types:

1. **Medical Needs**: These relate to the diagnosis, treatment, disease management, and adherence to prescribed therapies. They also involve the family and school environment's role in supporting the child's care.
2. **Emotional and Social Needs**: These address the psychological and emotional support required for both the child and the family to adapt to the illness and its consequences.
3. **Educational Needs**: These focus on providing an appropriate cognitive, motor, emotional, and social development for the child. It involves early intervention services, hospital-based educational support, home-based education, and school-based reference centers.

Objectives of Educational Attention in Early Childhood

Educational attention for children with chronic diseases during early childhood serves several key objectives:

- **Adaptation**: The hospital, family, and school environments must be adapted to the child's needs to eliminate any associated risk factors.
- **Parent Education**: Teaching parents how to manage the disease and ensure treatment adherence is a priority at this stage.
- **Child's Disease Management**: Empowering the child to take an active role in managing their disease, including learning how to use medical devices, preparing for tests, and understanding treatments. This is achieved through educational opportunities tailored to the child's development.

Health Self-Care Education Program

Since 2009, our institution has implemented the "Education for Health Self-Care" program, which addresses specific topics tailored to the patient's condition. This program aims to improve the patient's health by providing relevant educational content and clarifying any questions from both patients and their families regarding basic care and disease management.

Objectives of Educational Programs

The primary objectives of educational programs include:

- **Emphasizing Disease Knowledge**: Educating patients about their conditions to improve understanding and management.
- **Promoting Prevention**: Providing information on preventive measures to manage or reduce the risk associated with the disease.
- **Targeting Specific Groups**: Tailoring the content and delivery of the educational program to the specific age group and condition of the patient.

These educational programs have demonstrated their effectiveness in improving the quality of life for patients and enhancing adherence to prescribed treatment regimens.

Characteristics of Efficient Education:

Education is a continuous and dynamic process that must be adapted to the individual needs of the patient. It aims to bring about changes in the attitudes and lifestyles of both the patient and their family, leading to improved quality of life. This process fosters self-control and enables autonomous decision-making.

Key considerations for an efficient educational instance include:

1. **Importance for Children with Chronic Diseases**: Education is crucial for children suffering from chronic diseases, helping them manage their conditions effectively.
2. **Involvement of Family and School**: Education must involve not only the patient but also the family and school environment, as these play significant roles in the child's overall care and support.
3. **Early Start**: Education should begin as soon as the diagnosis is made to provide timely information and support.
4. **Ongoing Process**: Education is a continuous process, evolving as the patient progresses in their care, ultimately leading to self-management.
5. **Goal of Enhancing Quality of Life**: The primary objective is to enhance the patient's quality of life without limitations.

An effective educational plan must first identify the educational needs of the child and family and address the core aspects of the disease they are dealing with.

Learning Areas

In the educational process, three key learning areas should be addressed:

- **Affective**: The main caregiver must understand the importance of their participation in the care process.
- **Cognitive**: The caregiver must be able to describe the signs and symptoms of the chronic disease affecting the patient.
- **Psychomotor**: The caregiver must demonstrate the ability to perform care techniques through repeated practice under supervision.

Evaluation of Educational Instances

Evaluating educational instances involves assessing learning outcomes, the effectiveness of disease management, and how well the patient, family, or caregiver adapts to everyday life. Evaluation criteria include:

- Achievement of the objectives set during the educational sessions.
- The quality and effectiveness of the educational techniques employed.
- The competency of the educators delivering the program, underscoring the importance of

continuous training for the entire healthcare team.

Educational programs may need adjustments based on the learner's capacity to absorb information and their individual characteristics.

Minimum Contents of an Effective Educational Instance

In respiratory disease centers, professionals deal with a variety of conditions like asthma, cystic fibrosis, sleep disorders, and food allergies. For each condition, specific educational content is tailored to the patient and family.

Self-Care in Asthma

In asthma management, education goes beyond mere information; it aims to equip patients and families with the skills to control asthma. Education should progress from basic understanding to self-control, being both continuous and adapted to the patient's needs. Evidence has shown that educational programs can reduce unscheduled medical visits, emergency room visits, hospitalizations, and school absenteeism.

Basic Knowledge about Asthma

The educational program should begin with a simple, age-appropriate explanation of asthma, including:

- What asthma is and how it affects the body.
- Factors that trigger asthma symptoms.
- Rules for avoiding asthma triggers, such as allergens.

Treatment Description

Patients and their families need to understand the types of medications used to treat asthma. These include:

- **Rescue Medications**: These are used during asthma attacks to provide relief.
- **Preventive Medications**: These are used regularly to manage symptoms and prevent asthma flare-ups.

Common concerns include the side effects of medications, such as tachycardia from bronchodilators or stunted growth from steroids.

Prescription and Sequence of Utilization

The treatment aims to control symptoms and prevent long-term damage to the lungs, reducing the risk of exacerbations and mortality. Asthma treatments typically include:

- **Anti-inflammatory Medications**: Primarily steroids, and in some cases, cromones or leukotriene antagonists, to reduce airway inflammation.
- **Bronchodilators**: Used as rescue medications to relieve acute symptoms.

It is well-documented that many patients do not use inhalers correctly, with up to 80% of patients making errors in inhalation technique. Therefore, the following steps are essential:

1. **Choosing the Appropriate Device**: The healthcare team should determine the most suitable inhaler device for the patient during their first consultation.
2. **Verifying Technique**: The healthcare provider should demonstrate the correct inhaler technique and ask the patient or caregiver to repeat the process to ensure they understand.

By focusing on these elements, asthma education programs can be more effective in helping patients manage their condition and reduce the need for emergency care.

Techniques for Medication Use:

Education on medication use is crucial, especially during medical exams where the patient spends significant time with the healthcare team, allowing for hands-on demonstration and reinforcement. The correct use of inhalation devices is critical, as improper technique can render medication ineffective. With various inhalation systems available (e.g., metered-dose inhalers (MDI), dry powder inhalers (DPI), holding chambers), choosing the appropriate device for the patient's age and capacity is essential. For toddlers, small-volume chambers with masks are preferred, while older children can use DPIs or MDI with mouthpieces. Assessment of the inhalation technique should be part of every patient visit, with education on device cleaning, verifying the functionality of the inhalers, and maintaining proper oral hygiene post-use.

Educational Factors for Asthma Self-Care:

Effective self-care in asthma involves:

- Recognizing and avoiding triggers
- Monitoring symptoms
- Mastering inhalation techniques
- Recognizing worsening asthma and taking preemptive action

For infants and younger children, caregivers handle asthma management. As the child grows, they should be gradually involved in disease control, making age-appropriate decisions, and expressing their views on treatment. Adolescents may benefit from individual discussions, as they may be more receptive to information without parental presence. A key aspect of self-care is having a clear self-treatment plan based on symptom tracking or peak expiratory flow (PEF) measurement. This plan includes when to use rescue medication, adjust doses, or seek medical help. In younger children, symptom registration, along with PEF monitoring, helps track the disease progression.

Self-Care in Cystic Fibrosis:

Cystic fibrosis (CF) is a progressive, multisystem disease that primarily affects the lungs and digestive system. Due to advances in medical treatment, the survival rate has increased significantly. Effective disease management requires both patient and family involvement, as they must adhere to various daily treatments related to nutrition and respiratory care. The role of education in CF management has evolved. Initially, programs focused on medication adherence; now, they emphasize the collaboration between healthcare providers and families to actively manage the disease. This includes:

- Respiratory physiotherapy and muscular training
- Psychosocial and nutritional support
- Oxygen therapy and non-invasive ventilation as needed

Over time, parents become experts in managing CF, collaborating with healthcare teams to adjust treatments as necessary. Specialist nursing staff play a vital role in patient education, facilitating coordination between hospital and home care. They guide patients and families on the correct use of medications, ensuring adherence to complex regimens and proper drug administration techniques. In CF, education helps patients understand the disease's progression and the importance of following treatment protocols, which leads to better outcomes and greater patient engagement. By empowering patients and families with the knowledge and skills to manage the disease, healthcare providers improve the quality of life and health outcomes in chronic conditions like asthma and cystic fibrosis.

Nurse Specialized in Cystic Fibrosis: Key Responsibilities and Educational Role

A nurse specialized in cystic fibrosis (CF) has a crucial role in managing patients, supporting families, and coordinating with the healthcare team. This involves several key responsibilities that ensure effective care and support for individuals with CF. These responsibilities include:

1. **Patient Advocacy**: Staying updated on current treatments and advocating for the needs of each patient.
2. **Clinical Experience and Practice**: Applying specialized knowledge in clinical settings, ensuring best practices are followed.
3. **Support and Advice**: Offering emotional and practical support to patients and families to help manage the disease.
4. **Education and Research**: Educating both patients and healthcare professionals about CF management, treatments, and ongoing research.
5. **Patient and Family Relationship**: Building trust with patients and families, ensuring they feel supported and informed throughout the care process.

Objectives in Managing Cystic Fibrosis

The overarching goals when treating CF patients include:

- **Reducing respiratory symptoms and flare-ups**
- **Improving motivation and mental health**
- **Enhancing muscular function and exercise tolerance**
- **Reducing hospital admissions and length of stay**
- **Prolonging survival**

Key Areas of Education for CF Patients and Families

1. **Basic Knowledge of Cystic Fibrosis**: CF is a chronic, inherited disease that primarily affects the lungs, digestive system, and pancreas. It causes the production of thick mucus that leads to pulmonary infections and digestive issues. Understanding this disease helps patients and families manage symptoms effectively.
2. **Respiratory Symptoms and Exacerbations**: Education should include recognizing early signs of respiratory worsening, understanding the role of pulmonary function tests, and knowing when to seek medical attention.
3. **Microbiology and Pulmonary Complications**: Patients are educated on how CF leads to bacterial colonization in the lungs and the potential complications like atelectasis, bronchiectasis, and hemoptysis. Regular monitoring and early intervention are key to managing these issues.
4. **Pancreatic and Other Systemic Complications**: Patients should understand the signs of pancreatic, hepatic, and urogenital complications to detect them early and manage them more effectively.
5. **Essential Disease Management Pillars**:
    - **Nutrition**: Ensuring proper nutritional intake to maintain health and growth.
    - **Medication for Respiratory Infections**: Adhering to prescribed inhalers and antibiotics.
    - **Physical Therapy**: Respiratory physiotherapy and exercises to strengthen chest muscles and clear airway secretions.

Specialized Care for Cystic Fibrosis Patients

- **Inhalation Therapy**: Nurses play a vital role in ensuring that the correct inhalation device is used properly by both patients and families, educating them on the importance of device maintenance, cleaning, and optimal use.
- **Physical Activity**: Exercise helps clear secretions from the lungs and prevents osteoporosis, which is common in CF patients. A tailored exercise plan, often following a stress test, is essential for promoting overall health.
- **Psychosocial Support**: Nurses also provide essential emotional support for families dealing with the chronic nature of CF, acting as a bridge between patients, caregivers, and the broader medical team.

Sleep Disorder Management in Pediatric CF Patients

Sleep disorders are common in children with CF due to respiratory issues and the impact of chronic illness. Addressing these sleep issues early is crucial

for the child's development and overall health. Nurses educate families on:

- **Wake-up and Bedtime Schedules**: Establishing regular sleep routines.
- **Pre-Sleep Activities**: Teaching relaxation techniques to improve sleep quality.
- **Meal and Comfort Guidelines**: Ensuring appropriate meals before bedtime and optimizing the sleeping environment for comfort.

Educational programs that focus on sleep hygiene, relaxation techniques, and the importance of sleep for children with CF are essential for improving long-term health outcomes. These programs should be delivered in a calm environment, ideally with the child and both parents present, to foster understanding and support.

First Months of Life (0-2 months)

- **Teach the child to fall asleep independently**: Encourage the child to self-soothe instead of relying on external sleep aids (e.g., cradling, strolling).
- **Recognize active sleep**: Active sleep is normal and should not be interrupted unless necessary. It typically lasts for 30–40 minutes and transitions into quiet sleep.
- **Establish a sleep routine**: Parents should place the baby in the cradle while still awake, to help them associate the cradle with sleep.
- **Feeding during the night**: Keep feedings brief and without excessive stimulation. Avoid turning on lights or making noise during night feedings.

6 Months of Age

- **Physiological nighttime awakenings**: At this stage, it's important to understand that night awakenings are normal and part of the child's sleep cycle.
- **Avoid feeding at night**: The child should not be fed if they wake up. The last feeding should be at midnight.
- **Comfort with minimal interaction**: Use comforting words and a cuddly toy, but avoid picking the child up or turning on lights.

12 Months of Age

- **Limit daytime naps**: Naps should not exceed 45 minutes. This helps ensure that the child is tired enough to sleep independently at night.
- **Encourage independent sleeping**: If the child has tantrums or wakes up at night, the caregiver should not engage in excessive interaction but calmly put the child back in bed.

18 Months of Age

- **Reinforce independence**: The child should not rely on breastfeeding, baby bottles, or pacifiers to fall asleep. Encourage them to sleep independently and calmly handle nighttime awakenings.
- **Create a consistent routine**: Following a consistent bedtime routine helps the child understand when it is time to sleep and reduces anxiety.
- **Avoid co-sleeping**: Co-sleeping can alter sleep physiology and increase the risk of suffocation. Children should sleep in their own beds.

Key Takeaways:

1. **Consistency is crucial**: Maintaining a regular routine helps the child understand the expectations around sleep.
2. **Self-soothing is encouraged**: Children should learn to fall asleep without external aids, which will promote healthier sleep patterns.
3. **Comfort but don't engage**: Provide comfort during night awakenings but avoid actions that could turn into sleep associations (like feeding or picking up).
4. **Parental involvement**: Caregivers should be patient and calm when handling sleep disruptions and should model confidence and consistency.

This structured approach to sleep hygiene helps both children and parents create a restful sleep environment, encouraging independence while also meeting the child's emotional needs during the transition to self-regulated sleep.

Sleep Hygiene Between 2 and 5 Years of Age

Accomplishments in this phase:

- Parents should understand that if the child is struggling to fall asleep, it can be a good opportunity to talk briefly about the events of the day.
- Encourage a healthy balance of daytime sleep, with naps no longer than **45 minutes** to complement nighttime rest.

Reinforce in this instance:

- **Avoid setting rigid bedtime cut-offs**: Establishing a strict sleep time may increase stress and anxiety for both the child and parents, as it can be difficult to meet.
- **Encourage independence in sleep**: The key message to convey to the child is that they are **capable of sleeping on their own**.
- **Limit electronic devices**: Do not allow the child to use electronic games to fall asleep, and keep **television** out of the room to promote healthier sleep habits.

Sleep Hygiene from 11 Years of Age

Accomplishments in this phase:

- By this age, a child's sleep patterns are typically established, but **sleep disorders may emerge** due to increased social and academic pressures, and the growing influence of technology.

Reinforce in this instance:

- **Understand the changes in adolescence**: Educate caregivers about physiological

changes that affect sleep patterns, such as the natural delay in sleep onset during adolescence. Teens also require more sleep, but their sleep may be disrupted by the use of electronic devices like **cell phones** and the **internet**.

- **Recognize signs of sleep deprivation**: Look for symptoms like irritability, difficulty waking up, and catching up on sleep during weekends.
- **Establish family dialogue**: Open communication within the family about the importance of sleep helps raise awareness about healthy sleep habits.
- **Create a positive sleep environment**: Encourage a calming atmosphere in the late afternoon and evening to prepare for rest.
- **Parental role modeling**: Parents should lead by example, as their behaviors influence the child's attitudes toward sleep.

Sleep Hygiene in Adolescence (13+ Years)
Accomplishments in this phase:

- **Sleep disorders** are common again in adolescence. This is due to increased academic demands, social activities, and screen time.
- **Regular sleep schedules** become even more critical, and morning exposure to light helps regulate the child's sleep-wake cycle.

Reinforce in this instance:

- **Maintain consistent sleep schedules**: Try to keep bedtime and wake-up times consistent throughout the week, even on weekends.
- **Keep television and screens out of the room**: Excessive exposure to screens, particularly before bed, can negatively impact the quality of sleep.
- **Avoid stimulants**: Teenagers should avoid **caffeine** (including sodas and energy drinks) after midday, as it can disrupt sleep.
- **Regular meals and exercise**: Maintain consistent **meal schedules** and encourage regular **physical activity**, which promotes better sleep.
- **No studying before bed**: Studying or working late into the night can hinder the ability to fall asleep easily.

Key Points Across All Phases:

1. **Establishing Healthy Sleep Habits Early**: From infancy to adolescence, the focus is on encouraging children to develop healthy, independent sleep routines.
2. **Role of Parents**: Parents and caregivers must lead by example, provide emotional support, and create a conducive environment for healthy sleep patterns.
3. **Impact of Technology**: Limiting exposure to screens before bed is a crucial factor in improving sleep hygiene, particularly for older children and teenagers.
4. **Physical Activity and Sleep Environment**: Encouraging physical exercise and maintaining a quiet, relaxing sleep environment are important strategies for better sleep quality.
5. **Long-Term Benefits**: Correcting sleep issues early, especially in children with chronic diseases, improves **psychological**, **academic**, and **physiological** outcomes, benefiting the child and their family as a whole.

This approach not only improves the quality of sleep but also reduces the risk of sleep disorders later in life, positively impacting the overall well-being of children and adolescents.

Self-Care in Allergies

Food allergies involve the immune system's abnormal response to certain foods, which can cause a range of symptoms, including gastrointestinal, respiratory, and skin reactions. In infants and young children, gastrointestinal symptoms are most common. Symptoms range from mild reactions like itching and hives to severe conditions such as anaphylaxis, which can be life-threatening. Over the last three decades, there has been growing concern about food allergies, particularly in developed countries. Common allergens include cow's milk, peanuts, nuts, fish, and shellfish. While allergies can improve with age, peanut, tree nut, fish, and shellfish allergies tend to persist longer.

Basic Knowledge About the Physiology of Food Allergies

- **What Is a Food Allergy?** A food allergy occurs when the immune system mistakenly identifies a food as harmful, triggering the release of specific antibodies called immunoglobulin E (IgE). These antibodies then cause the body to react with symptoms such as swelling, hives, and, in severe cases, anaphylaxis.
- **What Factors Influence the Onset of Symptoms?** Both genetic predisposition and early exposure to allergens can influence the development of food allergies. Monitoring food intake and identifying potential allergens is essential for diagnosing food allergies. Immediate symptoms typically occur within 2 hours of exposure, often triggered by IgE-mediated reactions. Reactions after 24 hours are more likely to involve cellular responses or delayed immune mechanisms, such as eczema or gastrointestinal issues.

Managing Food Allergies:

- **Avoiding Triggers**: The primary treatment for food allergies is strict avoidance of the

identified allergens. Parents of young children should work with a nutritionist to ensure proper dietary development while avoiding allergens.

- **Creating a Safe Environment**: Schools play a key role in managing food allergies. Parents should inform schools about the child's condition, provide necessary medication, and ensure staff are trained in recognizing symptoms and administering emergency medications. Children should also carry identification indicating their allergies and be educated about their condition.
- **Emergency Treatment**: The most crucial intervention in anaphylaxis is the administration of adrenaline via an epinephrine auto-injector. Patients must always carry this device, especially when engaging in activities where food intake cannot be monitored.

Educational Factors and Awareness:

- **Communication**: Special events like birthday parties or eating outside the home can pose risks, so communication about food allergies is vital. Schools, restaurants, and social gatherings should be aware of potential cross-contamination and have procedures in place to ensure the child's safety.
- **Precaution in Food Preparation**: Cross-reactivity can occur between different food groups (e.g., cow's milk and goat's milk, eggs from different birds, certain fish species, etc.). Understanding these cross-reactions is essential to prevent accidental exposure. Reading food labels and avoiding prepared foods or those with complex ingredients can help reduce risks.

Rules for Disease Management:

Anaphylaxis, which can be triggered by food, insect bites, or medications, requires prompt emergency intervention. Early symptoms may include tingling in the mouth, nasal congestion, and difficulty breathing, which can escalate to shock or death if untreated. The administration of epinephrine is the immediate response. Overall, consistent education about managing food allergies, especially for school-age children, can significantly reduce risks and improve quality of life. Nurses, caregivers, and school staff play a critical role in supporting patients and ensuring their safety. Through clear communication and proper planning, food allergies can be managed effectively, minimizing their impact on daily life [36-42].

Biomarkers in Respiratory Disorders:

Respiratory disorders, including asthma, chronic obstructive pulmonary disease (COPD), pneumonia, and pulmonary fibrosis, represent a significant burden on global health. These conditions not only impact quality of life but also contribute to high morbidity and mortality rates worldwide. Biomarkers, defined as measurable biological indicators, have emerged as invaluable tools in diagnosing, monitoring, and managing respiratory disorders. Biomarkers provide critical insights into disease pathogenesis, progression, and response to treatment, thereby enabling personalized medical approaches that improve patient outcomes.

Inflammatory Biomarkers

1. **Exhaled Nitric Oxide (FeNO):** Fractional exhaled nitric oxide (FeNO) is an established biomarker used in respiratory disorders, particularly in asthma. FeNO is elevated in individuals with eosinophilic airway inflammation, which is commonly seen in asthma. Measuring FeNO is non-invasive and can help assess airway inflammation levels, monitor response to corticosteroid treatment, and aid in asthma diagnosis. Studies have shown that high FeNO levels correlate with poor asthma control and increased risk of exacerbations. FeNO measurement is now widely recommended in clinical guidelines for asthma management, making it a valuable tool in monitoring inflammatory response in respiratory disease.
2. **C-Reactive Protein (CRP):** C-reactive protein (CRP) is a general inflammatory marker that rises in response to acute inflammation and tissue injury. In respiratory conditions like pneumonia, COPD, and pulmonary infections, elevated CRP levels can indicate the presence of infection or exacerbation. For instance, in COPD patients, a high CRP level often correlates with acute exacerbations and can signal an increased risk of hospitalization. Measuring CRP is beneficial for assessing disease severity and for differentiating between bacterial and viral infections, helping to guide appropriate treatment strategies.
3. **Interleukin-6 (IL-6):** IL-6 is a pro-inflammatory cytokine that plays a significant role in immune response and inflammation. Elevated IL-6 levels are often observed in patients with severe respiratory infections, including COVID-19, where high levels are linked to severe disease and complications such as acute respiratory distress syndrome (ARDS). IL-6 has also been associated with COPD exacerbations and is useful in assessing inflammation levels and disease progression in various respiratory disorders. Monitoring IL-6 levels in respiratory patients provides insight into the inflammatory burden and helps predict disease severity.

Oxidative Stress Biomarkers

1. **Malondialdehyde (MDA):** Oxidative stress plays a critical role in the pathogenesis of several respiratory diseases, especially

COPD, due to its impact on lung tissue. Malondialdehyde (MDA) is a product of lipid peroxidation and serves as an oxidative stress biomarker. Elevated MDA levels have been observed in COPD and asthma patients, reflecting the degree of oxidative damage within the lungs. Tracking MDA levels can assist in assessing the oxidative burden and evaluating the effectiveness of antioxidant therapies in respiratory conditions.

2. **8-Isoprostane:** Another marker of oxidative stress, 8-isoprostane, is a product of arachidonic acid oxidation and has been associated with airway inflammation and oxidative damage in respiratory diseases. Elevated 8-isoprostane levels are frequently detected in the exhaled breath condensate of patients with asthma and COPD. This biomarker helps assess oxidative stress in the lungs and is beneficial for understanding the role of environmental pollutants and smoking in respiratory conditions.

Genetic and Molecular Biomarkers

1. **Surfactant Protein D (SP-D):** Surfactant proteins are involved in lung function and immune defense in the alveoli. Surfactant Protein D (SP-D) is particularly relevant in lung injury and respiratory disease. Elevated levels of SP-D have been observed in patients with interstitial lung diseases, COPD, and ARDS, where it reflects alveolar and epithelial damage. Monitoring SP-D levels can assist in diagnosing and evaluating the extent of lung injury and disease progression.
2. **MicroRNAs (miRNAs):** MicroRNAs are small, non-coding RNAs that regulate gene expression and have shown potential as biomarkers in various respiratory diseases. Specific miRNAs, such as miR-21 and miR-146a, are associated with inflammatory pathways and immune responses in asthma, COPD, and lung cancer. Changes in miRNA expression profiles have been linked to disease severity and prognosis, and they may serve as diagnostic or prognostic markers in respiratory disorders. Measuring miRNA levels in blood, sputum, or lung tissue is a promising avenue for non-invasive diagnosis and monitoring of respiratory diseases.

Biomarkers have revolutionized the understanding and management of respiratory disorders by providing precise, individualized insights into disease processes. From inflammatory markers like FeNO and CRP to oxidative stress indicators such as MDA and 8-isoprostane, these biomarkers enable clinicians to assess the inflammatory and oxidative state of the lungs. Genetic and molecular markers like SP-D and miRNAs further enrich diagnostic and prognostic capabilities, paving the way for personalized treatment approaches. The ongoing research and application of biomarkers in respiratory diseases hold the potential to enhance early diagnosis, monitor treatment efficacy, and improve the quality of life for patients with chronic respiratory conditions.

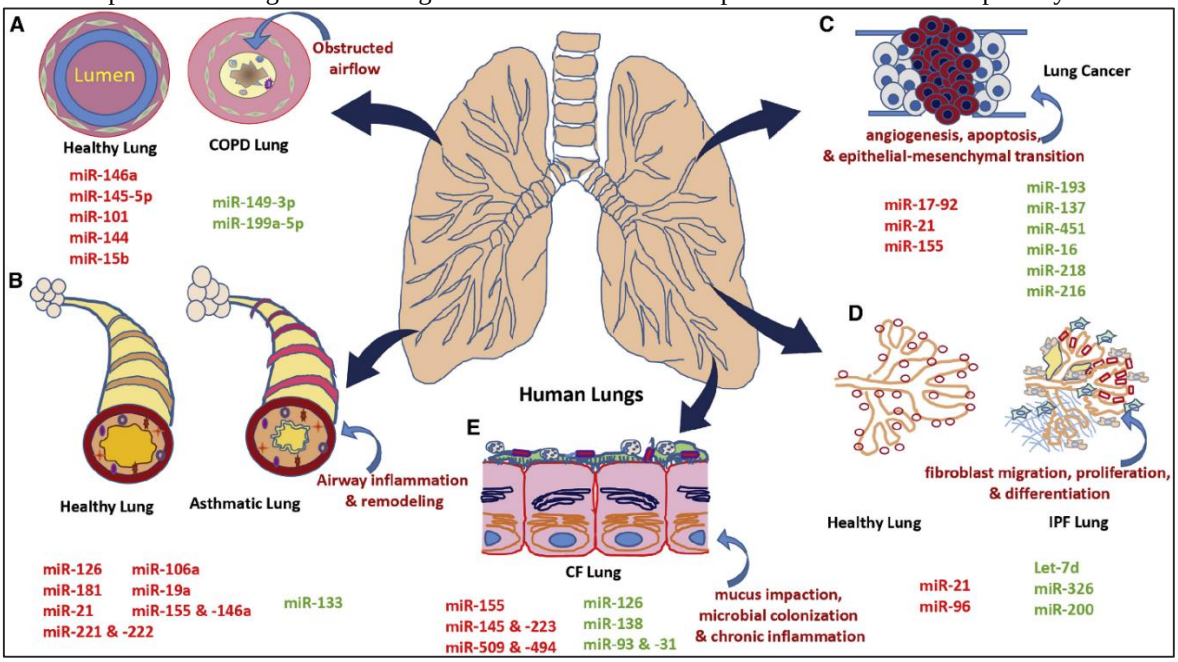

Figure 1: Biomarkers in Respiratory Disorders.

Conclusion:

This review emphasizes the critical role that nurses play in respiratory care, highlighting how comprehensive patient education contributes significantly to managing respiratory conditions. Nurses are uniquely positioned to provide patients with the tools and knowledge necessary for effective self-care, which can lead to better adherence to treatment plans, fewer complications, and reduced need for hospital readmissions. Patient education is

integral to respiratory care, as it addresses both disease-specific knowledge and general self-management techniques. Through consistent education, nurses enable patients to understand their condition, recognize symptoms, and use respiratory aids effectively, fostering independence and improved quality of life. Innovative educational approaches, such as digital platforms, personalized learning modules, and simulation-based training, have shown promising results in enhancing patients' engagement and compliance with respiratory care. Such approaches not only improve patient understanding but also support behavior change, leading to long-term health benefits. Moreover, by involving family members and caregivers in the education process, nurses can create a support system that further strengthens patient adherence to respiratory health protocols. Despite the significant progress in nursing-led respiratory care, this review suggests that additional resources and structured training programs are necessary for nurses to keep up with advancements in respiratory care techniques. Regular training in emerging respiratory interventions and patient education methodologies would enable nurses to deliver the highest quality of care. Future research should focus on assessing the effectiveness of different nursing educational interventions on long-term patient outcomes, exploring ways to integrate technology in patient education, and developing best practice guidelines for respiratory care education. In conclusion, nursing-led education is essential to effective respiratory care, offering patients the knowledge and skills to manage their conditions. By fostering self-efficacy and improving patient outcomes, nursing professionals play a vital role in enhancing the quality of life for individuals with respiratory illnesses.

References:

1. Nunez CA, Hassinger AB. Predictors of negative pressure ventilation response in pediatric acute respiratory failure. Respir Care. 2020;65:91–98. doi: 10.4187/respcare.07020.
2. Dallefeld SH, Spears TG, Zimmerman KO. The challenges of identifying an oxygenation index threshold for increased mortality in pediatric acute respiratory failure. Respir Care. 2017;62:1375–1376. doi: 10.4187/respcare.05863.
3. Franklin D, Shellshear D, Babl FE, Schlapbach LJ, Oakley E, Borland ML, Hoeppner T, George S, Craig S, Neutze J, Williams A, Acworth J, McCay H, Wallace A, Mattes J, Gangathimn V, Wildman M, Fraser JF, Moloney S, Gavranich J, Waugh J, Hobbins S, Fahy R, Grew S, Gannon B, Gibbons K, Dalziel S, Schibler A PARIS and PREDICT. Multicentre, randomised trial to investigate early nasal high-flow therapy in paediatric acute hypoxaemic respiratory failure: a protocol for a randomised controlled trial-a Paediatric Acute respiratory Intervention Study (PARIS 2) BMJ Open. 2019;9:e030516. doi: 10.1136/bmjopen-2019-030516.
4. Liu Q, Li W. The way of severe nursing of respiratory system failure. J Healthc Eng. 2021;2021:1667458. doi: 10.1155/2021/1667458.
5. Zou H, Wang X, Liu L, Zhang C, Ren D. The effects of specialized emergency and intensive nursing team on arterial blood gas and pulmonary function in pulmonary infection with respiratory failure. Am J Transl Res. 2021;13:10785–10792.
6. Liu J, Xun Z. Evaluation of the effect of comprehensive nursing in psychotherapy of patients with depression. Comput Math Methods Med. 2021;2021:2112523. doi: 10.1155/2021/2112523.
7. Rodgers ML, Fox E, Abdelhak T, Franker LM, Johnson BJ, Kirchner-Sullivan C, Livesay SL, Marden FA American Heart Association Council on Cardiovascular and Stroke Nursing and the Stroke Council. Care of the patient with acute ischemic stroke (endovascular/intensive care unit-postinterventional therapy): update to 2009 comprehensive nursing care scientific statement: a scientific statement from the American Heart Association. Stroke. 2021;52:e198–e210. doi: 10.1161/STR.0000000000000358.
8. Zhou Y, Sun L, Liang Y, Mao G, Xu P. Comprehensive quality of elderly rehabilitation nursing staff in medical and health care institutions in Liaoning Province, China: a cross-sectional study. BMC Geriatr. 2022;22:410. doi: 10.1186/s12877-022-03092-6.
9. Wu X, Zhang H, Chen J. Comprehensive expectoration nursing in elderly patients with pulmonary infection and its influence on respiratory function. Am J Transl Res. 2021;13:12965–12972.
10. Latronico N, Shehu I, Seghelini E. Neuromuscular sequelae of critical illness. *Curr Opin Crit Care*. 2005; **11**: 381-390. **https://doi.org/10.1097/01.ccx.0000168530.30702.3e**.
11. Hassett R, Meade K, Partrige M. Enhancing the accuracy of respiratory diagnoses in primary care: a report on the establishement of a community respiratory assessment unit. *Primary Care Resp J*. 2006; **15**: 354-361. **https://doi.org/10.1016/j.pcrj.2006.10.003**.
12. Haugdahl H, Storli S, Meland B, Dybwik K, Romild U, Klepstad P. Underestimation of patient breathlessness by nurses and physicians during a spontaneous breathing trial. *Am J Resp Crit Care Med*. 2015; **192**(12): 1440-1448. **https://doi.org/10.1164/rccm.201503-0419OC**.
13. Puntillo K, Nelson J, Weissman D. Palliative care in the ICU: relief of pain, dyspnoea, and thirst—a report from the IPAL-ICU advisory board. *Intensiv Care Med*. 2014; **40**(2): 235-

248. https://doi.org/10.1007/s00134-013-3153-z.
14. Schmidt M, Banzett R, Raux M, et al. Unrecognized suffering in the ICU: addressing dyspnea in mechanically ventilated patients. *Intensive Care Med*. 2014; **40**: 1-10. https://doi.org/10.1007/s00134-013-3117-3.
15. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China. *N Eng J Med*. 2020; **382**(8): 727-733. https://doi.org/10.1056/NEJMoa2001017.
16. World Health Organization. 2020. Coronavirus disease (COVID-19) pandemic 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019.
17. Wu Z, McGoogan J. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020; **323**: 1239. https://doi.org/10.1001/jama.2020.2648.
18. Ihle-Hansen H, Berge T, Tveita A, et al. COVID-19: symptoms, course of illness and use of clinical scoring systems for the first 42 patients admitted to a Norwegian local hospital. *Tidsskr Nor Legeforen*. 2020. https://doi.org/10.4045/tidsskr.20.0301.
19. Finnbakk E, Wangensteen S, Skovdahl K, Fagerström L. The professional nurse self-assessment scale: psychometric testing in Norwegian long term and home care contexts. *BMC Nursing*. 2015; **14**(59): 1-13. https://doi.org/10.1186/s12912-015-0109-3.
20. Kirwan M, Matthews A, Scott P. The impact of the work environment of nurses on patient safety outcomes: a mulit-level modelign approach. *In J Nurs Stud*. 2013; **50**: 253-263. https://doi.org/10.1016/j.ijnurstu.2012.08.020.
21. Needleman J, Hassmiller S. The role of nurses in improving hospital quality and efficiency: real world results. *Health Aff*. 2009; **28**(4): 625-633. https://doi.org/10.1377/hlthaff.28.4.w625.
22. Kemppainen V, Tossavainen K, Turunen H. Nurses' roles in health promotion practice: an integrative review. *Health Promot Int*. 2013; **28**(4): 490-501. https://doi.org/10.1093/heapro/das034.
23. Naylor M, Volpe E, Lustig A, Kelley H, Melichar L, Pauly M. Linkages between nursing and the quality of patient care. A 2 year comparison. *Med Care*. 2013; **51**(4): 6-14. https://doi.org/10.1097/MLR.0b013e3182894848.
24. Fukada M. Nursing competency: definition, structure and development. *Yonage Acta Medica*. 2018; **61**: 1-7. https://doi.org/10.33160/yam.2018.03.001.
25. Cowan D, Norman I, Coopamah V. Competence in nursing practice: a controversial concept—a focused review of literature. *Nurse Educ Today*. 2005; **25**(5): 355-362. https://doi.org/10.1016/j.aaen.2006.11.002.
26. Cowan D, Wilson-Barnett J, Norman I, Murrells T. Measuring nursing competence: development of a self-assessment tool for general nurses across Europe. *Int J Nurs Stud*. 2008; **45**: 902-913. https://doi.org/10.1016/j.ijnurstu.2007.03.004.
27. Nagarajan R, Prabhu R. Competence and capability: a new look. *Int J Manag*. 2015; **6**(6): 7-11.
28. Ray P, Birolleau S, Lefort Y, Becquemin M, Beigelman C, Isnard R. Acute respiratory failure in the elderly: etiology, emergency diagnosis and prognosis. *Crit Care*. 2006; **10**: 82. https://doi.org/10.1186/cc4926.
29. Lim B, Liew X, Vasu A, Chan K. Do emergency nurses and doctors agree in their triage assessment of dypneic patients? *Int Emerg Nursing*. 2014; **22**: 208-213. https://doi.org/10.1016/j.ienj.2014.02.003.
30. Bartlett G, Blais R, Tamblyn R, Clermont R, MacGibbon B. Impact of patient communication problems on the risk of preventable adverse events in acute care settings. *Can Med Assoc J*. 2008; **178**(12): 1555-1562. https://doi.org/10.1503/cmaj.070690.
31. Clukey L, Weyant R, Roberts M, Henderson A. Discovery of unexpected pain in intubated and sedated patients. *Am J Crit Care*. 2014; **23**(3): 216-220. https://doi.org/10.4037/ajcc2014943.
32. Heidari M, Shahbazi S. Nurses' awareness about principles of airway suctioning. *J Clin Diagn Res*. 2017; **11**(8): 9-17. https://doi.org/10.7860/JCDR/2017/25550.10452.
33. Nafiu O, Bradin S, Tremper K. Knowledge, attitude and practice regarding cricoid pressure of ED personnel at a large U.S. teaching hospital. *J Emerg Nurs*. 2009; **35**(1): 11-15.
34. Happ M, Sereika S, Houze M, Seaman J, Tate J, Nilsen M. Quality of care and resource use among mechanically ventilated patients before and after an intervention to assist nurse-nonvocal patient communication. *Heart Lung*. 2015; **44**(5): 408-415. https://doi.org/10.1016/j.hrtlng.2015.07.001.
35. Ayala R, Torres MC, Calco MJ. Gestión del cuidado en enfermería. Santiago: Ed. Mediterráneo; 2009.
36. Guzmán MA. Alergia, guía clínica. 2ª ed. Santiago: Ed Mediterráneo; 2012.

37. Herrera AM, León A, Ubilla C, Pérez MA, Lozano J. Utilidad de la educación en asma bronquial infantil: experiencia piloto. Rev Chil Enf Respir. 2014;30:197–202.
38. Manrique JJ. Higiene del sueño. Acta de Otorrinolaringología & Cirugía de Cabeza y Cuello. 2011;39(3-Suplemento):49–51.
39. Saieh C, Pinto V. Manual de pediatría ambulatoria. Santiago: Ed. Mediterráneo; 2013.
40. Sánchez I, Prado F, editors. Enfoque clínico de las enfermedades respiratorias del niño. Santiago: Ediciones Universidad Católica de Chile; 2007.
41. Valenzuela P, Moore R, editors. Pediatría ambulatoria. Un enfoque integral. 3ª ed. Santiago: Ediciones Universidad Católica de Chile; 2011.
42. Alanazi, S. M. H., Alanazi, I. Z., Almazyad, L. T., Alanazi, M. A., Alanazi, S. A., Alenezi, H. M., ... & Alanazi, R. A. K. (2023). Overview of Respiratory Care of the Neonate, Review Article. *Archives of Pharmacy Practice*, *14*(2-2023), 153-162.

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