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## Understanding the Importance of Oxygen Therapy: Nursing Responsibilities

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### Abstract:

Oxygen therapy is a critical component in the management of patients with respiratory illnesses, hypoxemia, or conditions that compromise the lungs' ability to oxygenate blood effectively. For nurses, understanding the principles behind oxygen therapy is essential to deliver safe and effective care. Nurses are responsible for assessing patients' oxygen saturation levels using pulse oximetry, monitoring vital signs, and recognizing signs of respiratory distress. They must comprehend the different types of oxygen delivery systems—such as nasal cannulas, face masks, and ventilators—to select the most appropriate method for individual patients. Additionally, nurses are tasked with educating patients and their families about the importance of oxygen therapy, its purpose, and the proper usage of devices, fostering adherence to treatment plans. Moreover, the nursing role in oxygen therapy extends to ongoing evaluation and adjustment of therapy based on patients' evolving needs. Continuous assessment of respiratory status, including auscultation of lung sounds, visualization of chest movements, and tracking of response to therapy, allows nurses to identify complications such as oxygen toxicity or carbon dioxide retention. Nurses must also advocate for patients, communicating any changes in a patient's condition to the healthcare team promptly. Understanding the ethical implications, including patient autonomy and the necessity for informed consent, ensures that nurses provide compassionate care while prioritizing patient safety and comfort. Overall, a thorough grasp of oxygen therapy enhances patient outcomes and supports the vital work of healthcare teams.

### Keywords:

Oxygen therapy, respiratory illnesses, hypoxemia, nursing responsibilities, patient assessment, oxygen delivery systems, patient education, therapy adjustment, respiratory status monitoring, patient advocacy, ethical implications.

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### Introduction:

Oxygen therapy is a fundamental component of contemporary healthcare, serving as a vital intervention for patients suffering from a myriad of respiratory conditions. This therapeutic approach is primarily administered to increase oxygen saturation in the bloodstream, alleviate hypoxemia, and improve the overall clinical outcomes of patients with compromised respiratory function. Healthcare professionals, particularly nurses, play a pivotal role in the execution and management of oxygen therapy,

necessitating a comprehensive understanding of its significance, methodologies, and associated responsibilities [1].

The importance of oxygen therapy cannot be overstated, especially in acute care settings. Conditions such as chronic obstructive pulmonary disease (COPD), pneumonia, pulmonary embolism, and various forms of acute respiratory distress syndrome (ARDS) often necessitate supplemental oxygen to meet the metabolic demands of the body. Inadequate oxygenation can lead to serious

complications, including organ dysfunction, cognitive impairment, and, in extreme cases, can be life-threatening. Thus, timely and effective oxygen therapy serves to not only enhance patient comfort but also to substantially reduce mortality rates associated with profound hypoxemia [2].

Nurses are on the front lines of patient care and are therefore crucial to the implementation and monitoring of oxygen therapy. Their responsibilities encompass a wide range of activities, including the assessment of respiratory function, the administration of oxygen therapy via various devices, and the ongoing evaluation of patient responses to treatment. Each of these tasks requires a nuanced understanding of both the technology employed and the physiological implications involved in oxygen delivery [2].

One of the fundamental responsibilities of nurses is to conduct a thorough assessment of the patient's respiratory status. This encompasses the evaluation of oxygen saturation levels, often measured through pulse oximetry, as well as inspection of respiratory rate, depth, and pattern. Nurses must also take into account the patient's history, including pre-existing conditions, current medications, and overall physical fitness. This initial assessment establishes a critical baseline, guiding the nurse's decisions about the initiation and titration of oxygen therapy [3].

Following assessment, the nursing role transitions to the implementation of oxygen therapy. This can be administered through a variety of devices, such as nasal cannulas, simple masks, or more advanced ventilatory support systems. The choice of delivery method is contingent upon the patient's clinical status and the degree of hypoxemia present. Nurses must possess familiarity with the different options available and the specific benefits and limitations of each [3].

Moreover, the management of oxygen therapy is not a static process; instead, it requires ongoing monitoring and adjustment. Nurses are responsible for continuously assessing the patient's response to treatment, which includes regular checks of oxygen saturation, the observation of patient comfort, and vigilance for any adverse effects related to oxygen delivery, such as oxygen toxicity or carbon dioxide retention. This ongoing assessment allows for timely modifications to the therapy regimen, ensuring optimal oxygenation levels are maintained [4].

Education also forms a critical aspect of nursing responsibilities in oxygen therapy. Patients and their

families may have limited knowledge regarding the rationale behind oxygen therapy, its benefits, or its potential risks. Thus, nurses must educate patients about the importance of therapy and instruct them on how to properly use oxygen delivery devices at home, promoting adherence and self-management. This educational component is paramount for chronic patients who may require long-term oxygen therapy, such as those with COPD, as it empowers them to take an active role in their healthcare [5].

In addition to the direct clinical implications, nurses must also be aware of the ethical and regulatory aspects of oxygen therapy. This includes navigating challenges such as competing demands on resource allocation, informed consent, and the potential for patient autonomy versus clinical necessity. Nurses are uniquely positioned to advocate for their patients' needs and preferences, ensuring that decisions regarding oxygen therapy are participative and patient-centered [6].

#### **Indications for Oxygen Therapy: Identifying Patient Needs:**

Oxygen therapy has become an indispensable component of modern medical practice, playing a crucial role in the management of various clinical conditions that lead to hypoxia—insufficient oxygen levels in the tissues. The decision to initiate oxygen therapy is guided by numerous factors that include the patient's clinical presentation, underlying pathophysiology, and response to existing treatments. Understanding the indications for oxygen therapy not only enables healthcare professionals to provide optimal care but also to improve patient outcomes significantly [7].

Hypoxia, defined as a deficiency of oxygen in the body's tissues, can arise from a variety of conditions. Generally, hypoxia can be classified into four main types: hypoxemic, ischemic, anemic, and histotoxic. Hypoxemic hypoxia stems from insufficient oxygen in the arterial blood, typically due to pulmonary problems such as pneumonia, chronic obstructive pulmonary disease (COPD), or pulmonary embolism. Ischemic hypoxia occurs when there is inadequate blood flow to a region of the body, often seen in cases of cardiovascular diseases. Anemic hypoxia results from decreased hemoglobin levels or impaired hemoglobin function, leading to diminished oxygen-carrying capacity. Histotoxic hypoxia, though less common, occurs when cells cannot utilize oxygen effectively,

often due to toxins such as cyanide. Recognizing the type and cause of hypoxia is essential for determining the necessity and strategy for oxygen therapy [8].

### Clinical Indicators for Oxygen Therapy

The indications for oxygen therapy can be broadly classified into clinical signs, symptoms, laboratory findings, and specific medical conditions. Each of these factors can help healthcare providers identify when patients may benefit from supplemental oxygen [9].

1. **Clinical Signs and Symptoms:** The most immediate indicators for oxygen therapy often manifest through the patient's clinical presentation. Common signs of hypoxia include:

- Restlessness or confusion
- Cyanosis (bluish discoloration of lips, face, or extremities)
- Tachypnea (rapid breathing) or bradypnea (slow breathing)
- Use of accessory muscles for breathing
- Decreased level of consciousness

Patients may also exhibit an increased heart rate, elevated blood pressure, and metabolic acidosis due to the body's attempt to compensate for low oxygen levels. These clinical signs warrant immediate assessment of oxygen saturation levels [10].

2. **Pulse Oximetry:** Pulse oximetry is a non-invasive tool used to monitor arterial oxygen saturation (SpO<sub>2</sub>). Normal SpO<sub>2</sub> levels typically range between 95% and 100%. Values below 90% are concerning, while levels below 85% generally indicate severe hypoxia and a compelling need for therapeutic intervention. Continuous pulse oximetry is particularly important in environments such as emergency departments, critical care units, and during procedures where hypoxia may arise [10].
3. **Arterial Blood Gas Analysis:** For a more comprehensive evaluation of a patient's respiratory status, arterial blood gas (ABG) analysis may be performed. This test provides essential information, including arterial oxygen partial pressure (PaO<sub>2</sub>) and carbon dioxide partial pressure (PaCO<sub>2</sub>). A PaO<sub>2</sub> of less than 60 mmHg or a significant drop in oxygen saturation levels can indicate the need for oxygen therapy. In patients diagnosed with respiratory failure, characterized by hypoxemia and/or hypercapnia

(elevated CO<sub>2</sub> levels), supplemental oxygen may be necessary to help maintain adequate oxygenation and prevent respiratory distress [11].

4. **Specific Medical Conditions:** Various conditions signify potential indications for oxygen therapy. These include:

- **Chronic Obstructive Pulmonary Disease (COPD):** Patients with COPD often experience significant airway obstruction leading to reduced oxygen levels. Oxygen therapy can help alleviate symptoms and improve quality of life, especially during exacerbations.
- **Pneumonia:** This infection causes inflammation in the lungs, resulting in impaired gas exchange. Administering supplemental oxygen can support the respiratory system during the recovery phase [12].
- **Congestive Heart Failure (CHF):** Hypoxia can occur due to impaired cardiac output and pulmonary congestion. In CHF patients, oxygen therapy is often warranted to relieve dyspnea and minimize hypoxic stress on the body.
- **Acute Respiratory Distress Syndrome (ARDS):** This critically ill population typically requires aggressive oxygen therapy to counteract severe hypoxemia and support mechanical ventilation strategies.
- **COVID-19:** This pandemic-associated condition prominently illustrated the need for oxygen therapy in acute cases of respiratory distress and hypoxemia, particularly in those requiring intensive care [12].

### Individualized Treatment Approaches

In determining the appropriate level of oxygen therapy, it is critical to take an individualized approach. Factors such as patient age, underlying medical conditions, and the severity of hypoxemia should be measured against existing comorbidities. For example, while a patient with mild COPD may be appropriately managed with low-flow oxygen, a patient with severe ARDS might require high-flow nasal cannula or mechanical ventilation.

Furthermore, continuous monitoring of a patient's response to oxygen therapy is essential. Adjustments may need to be made based on SpO<sub>2</sub> readings, arterial blood gas values, and the patient's overall clinical status. A hyperoxic state—excess oxygen in the blood—can pose risks and has been associated with oxygen toxicity, particularly in certain populations,

necessitating careful titration and monitoring strategies [13].

### **Oxygen Delivery Systems: Types and Applications:**

Oxygen is a vital component for human survival, playing a critical role in cellular metabolism and energy production. In many clinical scenarios, ensuring an adequate supply of oxygen is essential for the health and recovery of patients, especially those suffering from respiratory illnesses, trauma, or cardiac conditions. Oxygen delivery systems vary in design and function, catering to different medical needs and circumstances [14].

#### **Types of Oxygen Delivery Systems**

Oxygen delivery systems can be classified based on their design, method of delivery, and patient needs. The primary types include:

1. **Nasal Cannula:** One of the most commonly used oxygen delivery devices, the nasal cannula consists of two prongs that are inserted into the patient's nostrils. It usually delivers oxygen at flow rates ranging from 1 to 6 liters per minute, providing a concentration of 24% to 44% oxygen. This low-flow system is suitable for patients who require supplemental oxygen but can breathe comfortably on their own [15].
2. **Simple Face Mask:** A simple face mask covers the nose and mouth and is attached to a reservoir of oxygen. It can deliver oxygen concentrations between 40% to 60% at flow rates of 5 to 10 liters per minute. This system is used when higher concentrations than a nasal cannula are needed and is useful for patients who are unable to tolerate nasal delivery [15].
3. **Venturi Mask:** The Venturi mask is a specialized device that provides a precise concentration of oxygen. It uses different sized entrainment ports to deliver variable oxygen concentrations ranging from 24% to 50% at flow rates beginning at 4 liters per minute. This mask is particularly useful for patients with chronic obstructive pulmonary disease (COPD) as it allows for controlled oxygen delivery, important for preventing hypoxemia and hypercapnia [15].
4. **Non-Rebreather Mask:** This high-flow system comprises a face mask with a reservoir bag that allows for the administration of a large volume of oxygen (60% to 100% concentration) quickly. The mask has one-way valves that prevent the patient from rebreathing exhaled carbon dioxide. It is crucial in

emergency situations when patients are in respiratory distress or need rapid oxygenation [15].

5. **High-Flow Nasal Cannula (HFNC):** This system uses a specialized cannula that can deliver heated and humidified oxygen at high flow rates (up to 60 liters per minute) and is capable of providing more than 90% oxygen concentration. HFNC is popular in various clinical settings, particularly in patients with severe respiratory distress [16].
6. **Mechanical Ventilation:** For patients who cannot breathe independently, mechanical ventilators support or fully control the patient's ventilation. These advanced systems can deliver precise oxygen concentrations, pressures, and volumes, enabling optimal care for critically ill patients [16].
7. **CPAP (Continuous Positive Airway Pressure) and BiPAP (Bilevel Positive Airway Pressure):** These devices provide non-invasive ventilation by keeping the airway open and improving oxygenation in patients with conditions such as sleep apnea, COPD, or acute pulmonary edema. CPAP provides a continuous level of pressure, while BiPAP offers two levels of pressure: higher during inhalation and lower during exhalation [16].

#### **Applications of Oxygen Delivery Systems**

Oxygen delivery systems are utilized in various clinical settings, including emergency medicine, critical care, and outpatient settings. Their applications include:

1. **Emergency Situations:** In cases of respiratory failure, trauma, or cardiac arrest, prompt oxygen delivery is crucial to stabilize the patient and maintain adequate tissue oxygenation. Devices like non-rebreather masks and bag-valve masks are often employed in these high-pressure situations [17].
2. **Chronic Respiratory Conditions:** Patients with COPD, asthma, and other chronic lung diseases may require supplemental oxygen for maintaining saturation levels and enhancing their quality of life. Long-term oxygen therapy can reduce the risk of complications and improve survival rates.
3. **Postoperative Care:** Following major surgeries, patients may experience transient hypoxemia due to anesthesia and pain medication. Appropriate oxygen delivery ensures that they remain adequately oxygenated during recovery [17].

4. **Palliative Care:** Familiarly seen in patients with terminal illnesses, oxygen delivery systems help manage symptoms like dyspnea (shortness of breath) and ensure patient comfort.
5. **Transport and Transfer:** During the transfer of patients, particularly in emergency situations or inter-hospital transportation, maintaining oxygenation is critical. Portable oxygen tanks or high-flow nasal cannulae are essential for assuring continuity of care [18].

### Nursing Responsibilities in Oxygen Delivery

Nurses play a crucial role in the administration of oxygen therapy, requiring a blend of technical knowledge, clinical skills, and critical thinking. Key responsibilities include:

1. **Assessment:** Conducting thorough assessments is vital to identify the patient's oxygen needs. This includes general observations (e.g., color, respiratory effort), pulse oximetry readings to measure oxygen saturation, and auscultation of lung sounds [19].
2. **Care Plan Implementation:** Based on the assessment, nurses develop and implement an individualized care plan that aligns with the prescribed oxygen therapy. This includes the selection of the appropriate delivery system depending on the patient's condition and preferences.
3. **Monitoring:** Continuous monitoring of the patient's response to oxygen therapy is essential. Nurses must observe vital signs, oxygen saturation levels, and any signs of respiratory distress or adverse reactions to the treatment [19].
4. **Education:** Educating patients and their families about the importance of oxygen therapy, how to use devices correctly, and the significance of compliance is a key nursing responsibility. This knowledge empowers patients and fosters self-management.
5. **Equipment Management:** Nurses are responsible for ensuring that all oxygen delivery equipment is functioning correctly. This includes checking tanks for adequate levels, confirming connections, and assessing for malfunctions that could compromise safety and efficacy [20].
6. **Documentation:** Accurate and timely documentation related to oxygen therapy is vital. This includes noting the type of delivery system used, flow rates, patient responses, and any changes in condition, ensuring continuity of care among healthcare providers.

7. **Collaboration:** Nurses often work alongside respiratory therapists, physicians, and other medical staff to ensure holistic patient care. Effective communication and collaboration are essential for optimal outcomes [20].
8. **Emergency Preparedness:** Knowledge of emergency procedures and protocols related to oxygen therapy is critical. Nurses must be prepared to respond to acute changes in a patient's condition, including managing potential complications such as oxygen toxicity or fires related to the use of oxygen [21].

### Nursing Assessment: Monitoring and Evaluating Patient Oxygenation:

Oxygenation is a fundamental physiological process that is crucial for maintaining human life. It involves the delivery of oxygen to tissues and the removal of carbon dioxide, facilitating cellular metabolism and ensuring that vital organs function effectively. In the healthcare setting, nursing professionals play a central role in monitoring and evaluating patient oxygenation, which is vital for early detection of respiratory issues, guiding treatment decisions, and improving outcomes for patients across various clinical scenarios [22].

### Importance of Monitoring Oxygenation

Monitoring a patient's oxygenation status is essential because it directly influences their overall health and clinical outcomes. Numerous conditions – including chronic obstructive pulmonary disease (COPD), pneumonia, asthma, pulmonary embolism, and heart failure – can compromise a patient's ability to adequately oxygenate. In such cases, timely intervention can prevent complications, promote recovery, and improve quality of life.

Nurses have the responsibility to assess not only the clinical presentation of patients but also their physiological parameters related to oxygenation. Evaluating oxygenation involves the integration of subjective data, such as patient-reported symptoms and medical history, and objective data obtained through clinical observations and diagnostic tools. This holistic approach enables nurses to identify any critical changes in a patient's respiratory status and implement appropriate interventions [22].

### Techniques for Assessing Oxygenation

#### 1. Vital Signs Monitoring

Vital signs serve as the first indicator of oxygenation status. Nurses routinely assess respiratory rate, heart

rate, temperature, and blood pressure. An elevated respiratory rate (tachypnea) may indicate distress, while bradycardia or hypotension can be associated with hypoxia. A detailed understanding of normal ranges is essential for recognizing subtle deviations that could signify underlying pathology [23].

## 2. Pulse Oximetry

Pulse oximetry is a non-invasive and efficient method for measuring blood oxygen saturation (SpO<sub>2</sub>). This device employs light absorption through the skin to quantify oxygen levels bound to hemoglobin in red blood cells. Normal SpO<sub>2</sub> levels typically range between 95% to 100% in healthy individuals. Values below this threshold can indicate hypoxemia, a condition requiring immediate investigation and intervention.

Nurses must familiarize themselves with factors that may affect pulse oximeter readings, such as poor peripheral perfusion, skin pigmentation, and nail polish, which can lead to inaccurate assessments. Recognizing when to supplement pulse oximetry with arterial blood gas (ABG) analysis can also provide a more comprehensive understanding of the patient's oxygenation status, including the levels of carbon dioxide and bicarbonate in the blood [24].

## 3. Arterial Blood Gas Analysis

ABG analysis provides critical insights into a patient's respiratory function and acid-base balance. By obtaining a sample of arterial blood, nurses and healthcare providers can measure key parameters, including partial pressure of oxygen (PaO<sub>2</sub>), partial pressure of carbon dioxide (PaCO<sub>2</sub>), blood pH, and bicarbonate (HCO<sub>3</sub><sup>-</sup>) level. This comprehensive view enables clinicians to discern whether hypoxemia is occurring and, if so, assess its severity and underlying cause.

Nurses may be involved in collecting and interpreting ABG results, which are critical for diagnosing and managing conditions like respiratory acidosis, respiratory alkalosis, and metabolic disorders. Understanding and applying this knowledge guides nursing interventions and ensures patient safety in critical situations [25].

## 4. Clinical Assessment

Visual and physical assessments are also integral components of evaluating a patient's oxygenation status. Observations such as cyanosis (bluish

discoloration of the skin), use of accessory muscles during breathing, nasal flaring, and the presence of wheezing or stridor can provide significant clues about respiratory distress. Furthermore, auscultation of lung sounds enables nurses to differentiate between normal respiratory function and abnormalities, such as crackles or rhonchi, which may suggest fluid accumulation or obstruction in the airways.

Subjective assessments – including the patient's ability to speak in complete sentences, level of fatigue, and presence of anxiety – provide additional context to the objective data gathered and enhance the overall assessment of oxygenation [26].

## Evaluating Oxygenation: The Nursing Process

Evaluation of patient oxygenation is often framed within the nursing process, which consists of assessment, diagnosis, planning, implementation, and evaluation. Each of these steps plays a critical role in ensuring effective oxygenation management.

1. **Assessment:** Gathering data about the patient's state of oxygenation through the techniques described above [27].
2. **Diagnosis:** Formulating nursing diagnoses based on the assessment findings. Common diagnoses related to oxygenation might include "Ineffective Airway Clearance," "Impaired Gas Exchange," or "Activity Intolerance."
3. **Planning:** Developing individualized care plans that outline interventions aiming to optimize oxygenation. This could include patient education on breathing exercises, positioning to facilitate lung expansion, or prescribing supplemental oxygen therapy as needed [27].
4. **Implementation:** Executing the planned interventions, which may involve monitoring the patient's response to treatment, providing education, or coordinating with the interdisciplinary team for more advanced interventions as necessary.
5. **Evaluation:** Continuously evaluating the effectiveness of interventions through ongoing assessment and adjusting care plans as necessary based on the patient's response [27].

## Implications of Effective Oxygenation Management

Effective monitoring and evaluation of patient oxygenation have significant implications for patient

safety and outcomes. Proactive management can lead to early identification of respiratory compromise, reducing the risk of severe complications such as respiratory failure or cardiac arrest. Furthermore, improved oxygenation has been associated with shorter hospital stays, reduced healthcare costs, and enhanced patient satisfaction.

In addition to fostering a safe clinical environment, nurses serve as advocates for patient education regarding oxygenation management. Teaching patients about recognizing the signs and symptoms of hypoxia, as well as encouraging adherence to prescribed therapies, empowers individuals to take an active role in their health care. This is especially vital for patients with chronic conditions requiring ongoing management and monitoring of oxygen levels [28].

#### **Patient Education: Enhancing Understanding and Compliance:**

Oxygen therapy is a critical component of medical treatment for patients with respiratory and cardiovascular conditions such as chronic obstructive pulmonary disease (COPD), pneumonia, heart failure, and many other diseases. While the clinical application of oxygen therapy is relatively straightforward, creating an effective framework for patient education surrounding its use remains an essential responsibility of nursing professionals. Engaging patients in their own care not only enhances understanding of oxygen therapy but also promotes adherence to prescribed treatment regimens. As nurses navigate the complexities of patient education, they must employ evidence-based strategies that cultivate a meaningful understanding of oxygen therapy and empower patients to take an active role in their healthcare [29].

To adequately educate patients about oxygen therapy, it is essential first to delineate the purpose and process involved. Oxygen therapy involves administering supplemental oxygen to patients to maintain adequate tissue oxygenation and improve overall oxygen utilization in the body. Therapies can take several forms, including compressed gas tanks, liquid oxygen systems, or oxygen concentrators, with varying flow rates tailored to each patient's precise medical needs. Patients commonly rely on supplemental oxygen during daily activities, making it crucial for them to understand its importance and functionality [29].

Nurses have the responsibility to communicate the basic principles of oxygen therapy to patients in language that is both clear and approachable. This

includes discussing how oxygen therapy works, the expected benefits, potential side effects, and the significance of compliance with prescribed dosages and administration methods. It is vital to connect the educational content to each patient's unique condition and treatment plan to build relevance and facilitate retention [30].

Patient education is the cornerstone of successful healthcare delivery and patient empowerment. When patients are well-informed about their conditions, they are more likely to engage in self-management, comply with treatment regimens, and communicate effectively with their healthcare providers. Thus, the aim of patient education in the context of oxygen therapy is not only to inform but also to promote active participation in care [30].

By promoting understanding of the rationale behind oxygen therapy, nurses can help patients move beyond passive reception of medical care to become active partners in their treatment. Through methodical educational strategies, nurses can assess patient knowledge, tailor information to meet individual needs, and enhance health literacy. Techniques may include verbal explanations, written materials, visual aids, and simulated demonstrations to effectively reinforce key concepts [30].

#### **Nursing Responsibilities in Patient Education**

Nurses play a pivotal role in ensuring that patient education around oxygen therapy is thorough and comprehensive. This involves conducting initial assessments to ascertain individual information needs and learning preferences, which guide the educational approach.

1. **Assessment of Knowledge and Understanding:** Nurses should initiate conversations that assess the patient's prior knowledge regarding oxygen therapy. Open-ended questions allow for dialogue that provides insight into misconceptions or gaps in understanding. For instance, a nurse may ask, "What do you already know about using oxygen at home?" Responses guide nurses in tailoring education. Patients often have fears or misconceptions about being reliant on oxygen therapy that need to be addressed sensitively to destigmatize the experience [31].
2. **Developing an Educational Plan:** Once nurses assess the patient's knowledge and understand their learning preferences, they can devise an individualized education plan. This plan should emphasize clarity and

simplicity, particularly for patients with low health literacy. Educational materials should be written in plain language with an appropriate level of detail, illustrated with visual aids if necessary, to enhance retention of important concepts [31].

3. **Providing Practical Demonstrations:** Demonstrating how to properly use oxygen delivery systems serves to empower patients and reduce anxiety. Whether it involves showing how to operate an oxygen concentrator or adjusting flow rates on a nasal cannula, hands-on training can help reinforce understanding. Patients should be encouraged to practice these techniques under the guidance of the nurse to ensure competence and confidence when they transition to independent use at home [32].
4. **Promoting Compliance:** Nurses must highlight the importance of consistent oxygen therapy usage and adherence to prescribed protocols. Discussions should encompass the potential consequences of non-compliance, such as escalating respiratory distress or emergency hospitalization. By framing compliance in the context of the patient's ability to engage in daily activities and enhance quality of life, nurses can assist patients in viewing oxygen therapy as a therapeutic partner rather than a burden [32].
5. **Encouraging Self-Monitoring:** To further enhance patient independence, education should include strategies for self-monitoring oxygen saturation levels, recognizing signs of worsening respiratory status, and knowing when to seek additional medical help. Teaching patients to use pulse oximeters provides them with tangible tools to assess their oxygen levels effectively [33].
6. **Follow-Up and Reinforcement:** Education regarding oxygen therapy should not cease upon discharge or patient encounters. Nurses have the responsibility to facilitate follow-up contacts to reinforce learning, check compliance, and provide ongoing support. Scheduling regular consultations allows nurses to assess patient progress and revisit any areas of confusion or concern [33].

#### **Complications and Risks: Recognizing and Managing Adverse Effects:**

Oxygen therapy has revolutionized the management of various medical conditions, particularly those involving respiratory distress. By increasing the availability of oxygen in the body, this therapeutic modality aids patients with chronic obstructive

pulmonary disease (COPD), pneumonia, acute respiratory distress syndrome (ARDS), and various other conditions that compromise oxygenation. However, despite its critical benefits, oxygen therapy is not devoid of complications and risks. Understanding and managing these adverse effects is essential for healthcare providers to optimize patient outcomes while minimizing potential harm [34].

#### **The Mechanism of Oxygen Therapy**

Before delving into its associated risks, it is crucial to understand the mechanism of oxygen therapy. This therapy involves the administration of supplemental oxygen to maintain adequate tissue oxygenation, particularly in scenarios where endogenous systems may be insufficient. Supplemental oxygen can be delivered through various devices, including nasal cannulas, face masks, and mechanical ventilators, depending on the severity of the patient's condition and the required oxygen concentration. Oxygen is classified into various categories based on the delivery method and concentration, such as low-flow systems that provide supplemental oxygen in a controlled blend with room air and high-flow systems that deliver a specific concentration of oxygen [34].

#### **Common Complications Associated with Oxygen Therapy**

1. **Oxygen Toxicity:** One of the most significant risks associated with prolonged oxygen therapy is oxygen toxicity. This condition primarily affects the lungs and central nervous system when high concentrations of oxygen are administered, typically exceeding 50% for an extended period. It can lead to symptoms from mild to severe, such as cough, chest pain, and even pulmonary edema. Central nervous system manifestations may include seizures and altered mental status in extreme cases [35].
2. **Respiratory Depression:** In certain patients, particularly those with chronic respiratory failure, excessive oxygen administration can lead to respiratory depression. For individuals with conditions such as COPD, the body relies on hypoxic drive for respiratory stimulation. An excessive supply of oxygen may reduce the stimulus to breathe, resulting in low respiratory rates and, subsequently, respiratory failure [35].
3. **Fire Hazard:** Oxygen is a combustible substance. Thus, the risk of fire increases significantly in an oxygen-rich environment. Patients receiving oxygen



therapy must be educated about the importance of avoiding flammable materials, maintaining a safe distance from open flames, and refraining from smoking [36].

4. **Barotrauma:** Patients using mechanical ventilation or positive pressure ventilation are at risk for barotrauma, a condition resulting from excessive pressure within the lungs. This can lead to pneumothorax, a potentially life-threatening accumulation of air in the pleural space, causing respiratory distress and requiring urgent intervention [36].
5. **Mucosal Drying and Irritation:** Prolonged oxygen therapy can lead to drying and irritation of the mucous membranes, particularly in patients receiving supplemental oxygen through nasal cannulas or face masks. This condition can result in discomfort, nasal congestion, or even epistaxis (nosebleeds) [36].
6. **Hypercapnia:** While oxygen helps improve hypoxemia, in some cases—especially in patients with COPD—too much oxygen can lead to hypercapnia, an increased level of carbon dioxide in the blood. This occurs due to inadequate carbon dioxide elimination because of reduced respiratory drive [37].

#### Managing and Mitigating Risks

To effectively manage the complications of oxygen therapy, healthcare providers need a structured approach that combines assessment, monitoring, and patient education.

1. **Continuous Monitoring:** Routine monitoring of oxygen saturation levels using pulse oximetry is vital during oxygen therapy. Target oxygen saturation levels should be individualized based on the patient's clinical presentation, underlying condition, and prevailing guidelines, generally aiming for saturation between 90% and 92% in COPD patients [37].
2. **Careful Dosing:** To mitigate the risks of oxygen toxicity and hypercapnia, it is essential to titrate oxygen therapy to the lowest effective dose. The "just enough" approach minimizes risks while still ensuring adequate oxygenation. For patients with COPD and other conditions where the hypoxic drive is important, careful consideration of the appropriate oxygen concentration is crucial [37].
3. **Educating Patients and Families:** Patient education is paramount to ensure safety during oxygen therapy. Patients should comprehend the importance of keeping the oxygen delivery system intact, understanding the

risks of fire associated with oxygen use, and recognizing the signs of adverse effects that require immediate medical intervention [37].

4. **Regular Assessments:** Clinicians should routinely assess not only the oxygen saturation but also the overall respiratory status of patients undergoing therapy. This includes monitoring for signs of respiratory distress, changes in consciousness, and any development of new symptoms that may suggest a complication of therapy [38].
5. **Interdisciplinary Approach:** Drawing from various healthcare professionals—physiotherapists, respiratory therapists, and nurses—can enhance the management of patients receiving oxygen therapy. A multidisciplinary approach ensures comprehensive patient care and helps identify complications early in their course [38].

#### Ethical Considerations: Informed Consent and Patient Autonomy:

In the realm of healthcare, ethical considerations play a pivotal role in ensuring patients receive not only appropriate medical treatment but also respect for their rights and autonomy. One of the most critical components of ethical healthcare practice is the principle of informed consent, particularly in the administration of treatments such as oxygen therapy [39].

Oxygen therapy is a medical treatment that involves the administration of supplemental oxygen to patients suffering from conditions that impair their ability to breathe adequately, such as chronic obstructive pulmonary disease (COPD), pneumonia, or pulmonary fibrosis. While oxygen therapy can be life-saving and significantly enhance quality of life, it is not without risks and complications, particularly when mismanaged or overused. Therefore, a nuanced understanding of the treatment, its benefits, and potential adverse effects is essential for informed patient decision-making [39].

Informed consent is a fundamental ethical and legal requirement in healthcare. It signifies that patients have the right to be informed about and to understand medical treatments proposed to them. This process includes providing comprehensive information about the treatment, including its purpose, risks, benefits, and alternatives, allowing patients to make an educated decision about whether to proceed. Informed consent is not merely a formality; it embodies the respect for

patient autonomy—the recognition that individuals have the right to make choices concerning their own bodies and health [40].

For oxygen therapy, obtaining informed consent entails ensuring that patients understand why the therapy is being recommended, the expected outcomes, and potential complications. It is crucial for healthcare providers to communicate effectively, using layman's terms to facilitate understanding, particularly for patients who may have limited medical knowledge or who may be experiencing anxiety due to their medical condition [40].

Patient autonomy is the principle that underscores an individual's right to self-determination. In healthcare, it means individuals should have the freedom to make their own medical choices based on their values, preferences, and beliefs. This principle is particularly important in the context of oxygen therapy, where patients may have varying perspectives on treatment based on their personal experiences, cultural backgrounds, and understanding of their health conditions [41].

Respecting patient autonomy is essential for fostering a trusting relationship between healthcare providers and patients. When patients feel that their preferences are acknowledged and respected, they are often more engaged and compliant with their treatment plans. Conversely, failing to respect a patient's autonomy can lead to feelings of coercion, distrust, and dissatisfaction with the healthcare system. This is particularly pertinent in cases where patients refuse oxygen therapy or prefer alternative approaches to managing their respiratory conditions [41].

Despite its ethical imperatives, obtaining informed consent for oxygen therapy can present unique challenges. One primary issue is related to the urgency often encountered in healthcare settings, especially in emergency situations where quick decisions are paramount. In cases where patients are in acute respiratory distress, the need for immediate intervention may undermine the opportunity for thorough informed consent discussions. Healthcare professionals are faced with the dilemma of prioritizing patient safety while adhering to ethical principles [42].

Another challenge arises from the variations in patients' understanding and cognition. Patients may have differing levels of health literacy, which can impact their ability to comprehend complex medical

information. Additionally, cognitive impairments, language barriers, and emotional distress related to their health situation can further complicate the informed consent process. It becomes the duty of healthcare providers to assess the patient's understanding continuously and to adapt their communication strategies accordingly [43].

### **Best Practices for Ensuring Informed Consent and Autonomy**

To ensure ethical compliance in the context of oxygen therapy, healthcare providers can adopt several best practices:

1. **Effective Communication:** Healthcare professionals should aim to communicate clearly and compassionately, using language patients can easily understand. Visual aids, pamphlets, and teach-back methods can enhance patient comprehension [43].
2. **Tailored Information:** Providers should customize information based on individual patient needs, accounting for factors such as age, cognitive abilities, and cultural beliefs. Engaging with family members, when appropriate, can also facilitate a comprehensive understanding of the treatment [44].
3. **Assessing Understanding:** By asking patients to explain the treatment in their own words, clinicians can better ascertain the patient's understanding and address any uncertainties [45].
4. **Empowering Patients:** Encouraging patients to express their preferences and asking for their input in the decision-making process can strengthen their sense of autonomy. Providing options and discussing potential outcomes fosters a collaborative environment [46].
5. **Continuous Re-Evaluation:** Informed consent is an ongoing process that may need to be revisited as treatment progresses or as the patient's condition changes. Regular assessments ensure that patients remain informed and engaged [47].
6. **End-of-Life Considerations:** In cases where oxygen therapy is part of end-of-life care, discussions about the goals of treatment should include considerations about comfort, quality of life, and patient and family preferences [48].

### **Collaborative Care: Interdisciplinary Approaches to Oxygen Therapy:**

In recent years, the healthcare landscape has increasingly embraced collaborative care models, particularly in complex and multifaceted therapeutic areas such as oxygen therapy. Oxygen therapy is a critical intervention for patients experiencing respiratory distress, chronic obstructive pulmonary disease (COPD), asthma, and various acute and chronic conditions that compromise oxygenation and perfusion. The successful management of oxygen therapy relies not only on clinical guidelines and technological advancements but also on an interdisciplinary approach that integrates various healthcare professionals [49].

At the core of an interdisciplinary approach to oxygen therapy is the understanding that effective patient management requires the expertise of multiple healthcare professionals. Traditionally, oxygen therapy may have been implemented primarily by physicians or respiratory therapists. However, the complexities involved in assessing, prescribing, and monitoring oxygen therapy call for a diverse team that may include nurses, pharmacists, case managers, social workers, and even nutritionists. Each of these roles contributes a unique perspective and skill set, which collectively enhances patient care [50].

Physicians, the primary overseers of oxygen therapy, are responsible for diagnosing respiratory conditions and determining the need for supplemental oxygen. They evaluate clinical indicators, such as arterial blood gases (ABGs), pulse oximetry readings, and clinical signs of hypoxemia. With an emphasis on evidence-based practice, physicians utilize clinical guidelines to prescribe the appropriate type and flow rate of oxygen therapy tailored to the individual patient. Additionally, ongoing communication with other interdisciplinary team members is critical to ensuring optimal management and monitoring of the patient's condition [51].

Nurses, often the frontline providers of patient care, play a pivotal role in administering oxygen therapy and ensuring patient safety. They monitor patients' vital signs, evaluate their response to therapy, and educate patients and families about the importance of maintaining appropriate oxygen levels. Nurses are also instrumental in identifying any complications or adverse reactions related to oxygen administration, such as oxygen toxicity or carbon dioxide retention in patients with chronic lung diseases. Their constant presence and patient interaction facilitate timely communication with physicians and respiratory

therapists to make necessary adjustments to the therapy [52].

Respiratory therapists (RTs) bring specialized expertise in the treatment and management of patients with respiratory issues. They are trained to provide advanced airway management and administer various forms of oxygen therapy, including continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP), and high-flow nasal cannula therapy. RTs also educate patients on the use of home oxygen equipment and ensure that these devices function properly. Their technical know-how, combined with their ability to assess and monitor patients comprehensively, makes them indispensable members of the collaborative care team [53].

Pharmacists are also vital in optimizing oxygen therapy. Although pharmacists traditionally focus on medication management, they play a crucial role in ensuring that patients on oxygen therapy receive appropriate adjunctive treatments, such as bronchodilators, corticosteroids, or antibiotics. Improved pharmacological interventions can complement oxygen therapy, leading to better clinical outcomes. Furthermore, pharmacists assist in monitoring drug interactions and adjusting medications as needed, enhancing both safety and efficacy for patients receiving oxygen therapy [54].

Equally important are case managers and social workers, who address the broader context of patient care. Given that oxygen therapy is often prescribed for chronic conditions requiring long-term management, these professionals help navigate the complexities of healthcare systems, including insurance coverage and access to necessary resources. They communicate with various stakeholders to develop a comprehensive care plan that addresses social determinants of health, ensuring that patients can maintain therapy at home in a safe and effective manner. This holistic approach recognizes that medical interventions often extend beyond clinical decisions, embracing the social and economic factors that influence patient health [55].

Moreover, the inclusion of nutritionists or dietitians in the collaborative care model can significantly enhance patient outcomes. For example, patients with respiratory diseases often experience increased caloric needs due to the energy expended on labored breathing. Nutritional support can play a vital role in enhancing overall health and combating the effects of malnutrition, which can adversely affect respiratory

function. By providing tailored dietary advice, nutritionists equip patients with the tools to optimize their health and maximize the benefits of oxygen therapy [56].

The advantages of a collaborative care approach in the context of oxygen therapy are manifold. First and foremost, interdisciplinary cooperation facilitates comprehensive patient assessments, allowing for a more individualized treatment plan. As team members communicate effectively and share insights, disparate pieces of clinical information converge to paint a clearer picture of the patient's overall health status [57].

Furthermore, collaborative care enhances educational efforts, as each team member can contribute to patient and family education in their areas of expertise. Patients receiving oxygen therapy must understand not only how to use their devices but also how to manage their overall health to minimize complications and promote recovery. A cohesive team approach ensures that patients receive consistent messages about their condition, self-management, and adherence to therapy [58].

Additionally, optimizing oxygen therapy through collaboration often leads to reduced lengths of hospital stays and decreased readmission rates. By addressing the multifaceted needs of patients, interdisciplinary teams can help patients transition more effectively to home-based care, reducing the overall burden on healthcare facilities. Furthermore, positive patient outcomes associated with collaborative care may lead to enhanced patient satisfaction, fostering better patient-provider relationships and promoting adherence to treatment plans [59].

#### **Conclusion:**

Oxygen therapy is an indispensable intervention in the management of patients with respiratory disorders, and the nursing role in this process is critical to ensuring effective and safe delivery. A comprehensive understanding of the principles of oxygen therapy, various delivery systems, and appropriate patient assessment techniques empowers nurses to make informed decisions that enhance patient outcomes. By monitoring patients' oxygenation levels and educating both patients and their families about the importance and correct usage of oxygen therapy, nurses foster adherence to treatment and improve overall health experiences.

As healthcare continues to evolve, the need for nurses to stay informed about best practices, potential complications, and ethical considerations surrounding oxygen therapy remains paramount. Collaborative efforts within the healthcare team further enhance the quality of care provided to patients receiving oxygen therapy. By embracing their responsibilities in this area, nurses not only safeguard patient safety but also contribute significantly to the overall effectiveness of treatment protocols, ultimately leading to improved patient satisfaction and quality of life.

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