5.7: Cautions with Oxygen Therapy

Oxygen therapy supports life and supports combustion. While there are many benefits to inhaled oxygen, there are also hazards and side effects. Anyone involved in the administration of oxygen should be aware of potential hazards and side effects of this medication. Oxygen should be administered cautiously and according to the safety guidelines listed in Table 5.4.

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Additional Information</th>
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<tr>
<td>Oxygen is a medication.</td>
<td>Remind patient that oxygen is a medication and should not be adjusted without consultation with a physician or respiratory therapist.</td>
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<tr>
<td>Storage of oxygen cylinders</td>
<td>When using oxygen cylinders, store them upright, chained, or in appropriate holders so that they will not fall over.</td>
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**Precautions and Complications of Oxygen Therapy**

Oxygen is essential to life, but as a drug it has both a maximum positive benefit and an accompanying toxicity effect. The toxic effects from oxygen therapy can occur based on the condition of the patient and the duration and intensity of the oxygen therapy. For example, with normal lung function, a stimulation to take another breath occurs when a patient has a slight rise in PaCO$_2$. The slight rise in PaCO$_2$ stimulates the respiratory centre in the brain, creating the impulse to take another breath. In some patients with a chronically high level of PaCO$_2$, such as those with chronic obstructive pulmonary disease (COPD), the stimulus and drive to breathe is caused by a decrease in PaO$_2$. This is called a hypoxic drive. When administering oxygen to patients with known CO$_2$ retention, watch for signs of hypoventilation, a decreased level of consciousness, and apnea.
Oxygen therapy can have harmful effects, which are dependent on the duration and intensity of the oxygen therapy. See Table 5.5 for precautions and complications of oxygen therapy.

### Table 5.5 Precautions and Complications of Oxygen Therapy

<table>
<thead>
<tr>
<th>Complications</th>
<th>Precautions</th>
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| Oxygen-induced hypoventilation/ hypoxic drive | If patients with a hypoxic drive are given a high concentration of oxygen, their primary urge to breathe is removed and hypoventilation or apnea may occur. It is important to note that not all COPD patients have chronic retention of CO\(_2\), and not all patients with CO\(_2\) retention have a hypoxic drive. It is not commonly seen in clinical practice.  

Never deprive any patient of oxygen if it is clinically indicated. It is usually acceptable to administer whatever concentration of oxygen is needed to maintain the SpO\(_2\) between 88% and 92% in patients with known chronic CO\(_2\) retention verified by an ABG. |
| Absorption actelectasis               | About 80% of the gas in the alveoli is nitrogen. If high concentrations of oxygen are provided, the nitrogen is displaced. When the oxygen diffuses across the alveolar-capillary membrane into the bloodstream, the nitrogen is no longer present to distend the alveoli (called a nitrogen washout).  

This reduction in alveolar volume results in a form of collapse called absorption atelectasis. This situation also causes an increase in the physiologic shunt and resulting hypoxemia. |
Oxygen toxicity, caused by excessive or inappropriate supplemental oxygen, can cause severe damage to the lungs and other organ systems. High concentrations of oxygen, over a long period of time, can increase free radical formation, leading to damaged membranes, proteins, and cell structures in the lungs. It can cause a spectrum of lung injuries ranging from mild tracheobronchitis to diffuse alveolar damage.

For this reason, oxygen should be administered so that appropriate target saturation levels are maintained.

Supplemental oxygen should be administered cautiously to patients with herbicide poisoning and to patients receiving bleomycin. These agents have the ability to increase the rate of development of oxygen toxicity.

Data source: British Thoracic Society, 2008; Perry et al., 2014.

Critical Thinking Exercises

1. A patient is being discharged with low oxygen levels and will receive home oxygen. Name four vital safety components to review with the patient prior to discharge.

2. COPD patients are at risk for developing a complication called oxygen-induced hypoventilation. What is the cause of this complication and how can it be prevented?