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>
</tr>
</thead>
<tbody>
<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>
</tr>
<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>
</tr>
</tbody>
</table>
No smoking

Oxygen supports combustion. No smoking is permitted around any oxygen delivery devices in the hospital or home environment.

Keep oxygen cylinders away from heat sources.

Keep oxygen delivery systems at least 1.5 metres from any heat source.

Check for electrical hazards in the home or hospital prior to use.

Determine that electrical equipment in the room or home is in safe working condition. A small electrical spark in the presence of oxygen will result in a serious fire. The use of a gas stove, kerosene space heater, or smoker is unsafe in the presence of oxygen. Avoid items that may create a spark (e.g., electrical razor, hair dryer, synthetic fabrics that cause static electricity, or mechanical toys) with nasal cannula in use.

Check levels of oxygen in portable tanks.

Check oxygen levels of portable tanks before transporting a patient to ensure that there is enough oxygen in the tank.

ABGs should be ordered for all critically ill patients on oxygen therapy.

High concentrations of oxygen therapy should be closely monitored with formal assessments (pulse oximetry and ABGs).

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

### 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 PaCO₂. The slight rise in PaCO₂ stimulates the respiratory centre in the brain, creating the impulse to take another breath. In some patients with a chronically high level of PaCO₂, such as those with chronic obstructive pulmonary disease (COPD), the stimulus and drive to breathe is caused by a decrease in PaO₂. This is called a hypoxic drive. When administering oxygen to patients with known CO₂ 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>
<thead>
<tr>
<th>Complications</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen-induced hypoventilation/ hypoxic drive</td>
<td>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 CO₂, and not all patients with CO₂ retention have a hypoxic drive. It is not commonly seen in clinical practice.</td>
</tr>
<tr>
<td></td>
<td>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 SpO₂ between 88% and 92% in patients with known chronic CO₂ retention verified by an ABG.</td>
</tr>
<tr>
<td>Absorption actelectasis</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td>This reduction in alveolar volume results in a form of collapse called <strong>absorption atelectasis.</strong> This situation also causes an increase in the physiologic shunt and resulting hypoxemia.</td>
</tr>
</tbody>
</table>
**Oxygen toxicity**

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?