Continuity of Oxygen Therapy During Intrahospital Transport

PA-PSRS has received many reports of unintended interruptions in oxygen therapy. Oxygen therapy may be necessary for patients with respiratory diseases (such as emphysema) that decrease the lungs’ natural ability to extract oxygen from the air. Even a small amount of supplemental oxygen can make an enormous difference in a patient’s arterial oxygen saturation.

Cases in which supplemental oxygen cylinders were inadvertently turned off or became depleted during patient transport are frequently reported to PA-PSRS. These cases have occurred throughout the hospital environment and in all types of facilities. A heightened sensitivity to the critical nature of oxygen therapy (even at low flow rates) is warranted, as the following cases indicate:

After returning a patient from physical therapy, a transport aide reported to the floor nurse that oxygen and pulse oximetry had been provided during physical therapy but, during transport, the pulse oximeter alarmed. The oxygen saturation was 85%. It was discovered that the oxygen canister was turned off.

When a patient arrived in the operating room holding area for surgery, the oxygen cylinder was empty, and the patient’s oxygen saturation was 70%.

A patient receiving high-flow oxygen was taken to the radiology department for an ultrasound examination. No replacement oxygen cylinders were available in the radiology department, and a misunderstanding had occurred regarding the availability of in-line oxygen. The patient experienced a decrease in oxygen saturation until a replacement cylinder arrived.

A mechanically ventilated patient was transported from the intensive care unit to a cardiac catheterization lab for an emergent procedure. After being placed on a ventilator by a respiratory therapist, the patient appeared to be “bucking the vent” and went into respiratory distress. Though the ventilator was connected to the oxygen tubing, the oxygen was not turned on.

Failure Modes

Oxygen therapy requires multiple steps and multiple equipment connections. Each step holds the potential for failure.

A review of the reports submitted to PA-PSRS indicates that interruption of oxygen therapy can occur secondary to the following failure modes:

- Failure to treat with oxygen when ordered.
- Failure to initiate flow from the oxygen source (cylinder or wall outlet).
- Failure to connect the oxygen tubing to the oxygen source.
- Failure to place the oxygen delivery device on the patient.
- Failure to anticipate oxygen demand throughout patient transport and to provide an adequate supply.

How Can These Occurrences Be Prevented?

Risk reduction can be addressed by standardizing procedures, by reducing reliance on memory, and by clarifying responsibilities. The following two success stories are examples of these interventions to provide safe patient transport.

A formalized hand-off of patients with supplemental oxygen was implemented by a Pulmonary Clinical Nurse Specialist at Hines’ Veterans Hospital (Hines, Illinois). A standardized form was developed, “Oxygen Patient Transport Communication Tool,” which requires documentation of the oxygen delivery device, flow rate, PSI, and available minutes of oxygen in the cylinder at each patient hand-off. The use of this form provides both a consistent reminder and trail of accountability, preventing a potential error of...
omission: failing to check the cylinder for adequacy of oxygen.

This program has been widely successful according to Eileen Hagarty, the nurse responsible for the program. This tool has been disseminated across the VA system and the private sector. Tips from the VA implementation include:

- Providing education and maintaining competency of the transport staff and the treatment/procedure staff.
- Recognizing the transporters’/escorts’ contribution as team members responsible for maintaining supplemental oxygen during transport.
- Assessing availability of oxygen throughout the facility, addressing potential shortages (by banking cylinders strategically) and, routinely monitoring these storage areas.

A 1992 Harborview Medical Center (Seattle, Washington) study focused on oxygen therapy during transport and found that supplemental oxygen was interrupted in 55% of transports. Similar to the VA intervention, staff education, along with a structured approach to oxygen use during transport, was implemented. In a final audit, one hundred percent of the patient transports successfully delivered uninterrupted oxygen. The interventions consisted of:

- Educating staff of the risk of breakdowns in oxygen therapy during transport.
- Developing and posting guidelines for oxygen use during transport.
- Determining who is responsible for completing certain steps in the oxygen therapy process:
  - When can therapy be discontinued for transport?
  - What is done by whom, especially when oxygen care is complicated?
  - When is the respiratory therapy department involved?
- Posting a chart to assist staff in estimating oxygen cylinder duration. [The chart in Table 1, provided by Hines VA Hospital, is an excellent example of this.]

Efficient and timely transport drives the schedule of activities in hospital departments such as radiology, occupational therapy, and physical therapy. Therefore, the urgency of timely transport can overshadow the attention to detail necessary when a patient is being prepared for transport with oxygen. Consider using mnemonic triggers to help staff remember the steps needed to set up the patient and equipment for supplemental oxygen during transport. A mnemonic reduces reliance on memory and promotes standardization. For example:

START transport with supplemental oxygen using this mental checklist:

<table>
<thead>
<tr>
<th>Table 1. Guide for Estimating Minutes of Available Oxygen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liters per Minute</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

Note: Shaded area indicates “at-risk” minutes. When psi regulator readings are between the psi readings on the table, use the lower psi reading to determine the approximate minutes of oxygen available. Consult with respiratory staff to gauge calibration and approximate times. Source: Hines VA Hospital and VA National Center for Patient Safety. See Reference No. 1.
Continuity of Oxygen Therapy During Intrahospital Transport (Continued)

Supply adequate oxygen for the trip.

Turn on the oxygen cylinder.

Apply the cannula or mask to the patient.

Rate as ordered and verified.

Trace the connections from the patient to the oxygen source.

Implementing a standard approach to the hand-off of patients with supplemental oxygen, educating staff in their role and use of oxygen equipment, and providing tools such as charts and mnemonics may reduce the potential for mishaps when supplemental oxygen is needed during patient transport.

Notes


The Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error (“Mcare”) Act. Consistent with Act 13, ECRI, as contractor for the PA-PSRS program, is issuing this newsletter to advise medical facilities of immediate changes that can be instituted to reduce serious events and incidents. For more information about the PA-PSRS program or the Patient Safety Authority, see the Authority’s website at www.psa.state.pa.us.

ECRI is an independent, nonprofit health services research agency dedicated to improving the safety, efficacy and cost-effectiveness of healthcare. ECRI’s focus is healthcare technology, healthcare risk and quality management and healthcare environmental management. ECRI provides information services and technical assistance to more than 5,000 hospitals, healthcare organizations, ministries of health, government and planning agencies, and other organizations worldwide.

The Institute for Safe Medication Practices (ISMP) is an independent, nonprofit organization dedicated solely to medication error prevention and safe medication use. ISMP provides recommendations for the safe use of medications to the healthcare community including healthcare professionals, government agencies, accrediting organizations, and consumers. ISMP’s efforts are built on a non-punitive approach and systems-based solutions.