

**CONCLUSIONS:** We found a low rate of HBO<sub>2</sub>-related complications in critically ill intubated patients treated with HBO<sub>2</sub>. Most complications were related to the ventilator/circuit. Blood gas measurements during HBO<sub>2</sub> indicate lower arterial oxygenation than in normals, due to concomitant lung injury.

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#### **HYPERBARIC CHAMBER FIRE IN PERU ON 2006 FEBRUARY 8: PROBABLE CAUSE AND SAFETY RECOMMENDATIONS**

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**BACKGROUND:** Use of hyperbaric oxygen therapy (HBO<sub>2</sub>) in South America is expanding dramatically. HBO<sub>2</sub> is used for approved, investigational, and “life-style” indications. On February 8 an extensive hyperbaric oxygen chamber fire occurred in a monoplace chamber in a free-standing facility in Lima, Peru, causing one fatality. Our company was requested by the UHMS Peru Chapter to help authorities determine the cause of the fire and to provide equipment and training recommendations to help prevent such accidents.

**MATERIALS AND METHODS:** One of us (GJB) inspected the chamber site and interviewed some of the people involved; a government investigation is underway.

**RESULTS:** We believe the chamber was compressed with air to 2.4 atm and the patient breathed oxygen by mask and exhaled into the chamber. The chamber was periodically ventilated with air, but oxygen level was not analyzed, and the intensity of the fire suggested that the content was close to 100% oxygen. The patient’s position and other evidence suggest that a speaker perhaps with a push-to-alert button may have been the source of ignition. This system was not approved for use in an oxygen-rich atmosphere; the Peruvian government has ordered the use of these and similar units discontinued. From our limited evidence we conclude at this time that high oxygen and electrical equipment not designed for oxygen service were the likely cause of the fire, but the investigation is continuing.

**DISCUSSION:** Many chambers in South America are manufactured there and are in free-standing, non-hospital clinics. High costs and limited reimbursement force operators to compromise safety. The most effective way to improve HBO<sub>2</sub> safety in Latin America is to teach the hazards and how to avoid them. We recommend teaching both manufacturers and operators the concepts of chamber safety, in particular the principles covered in PVHO-1 and NFPA-99.

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#### **SAFETY ANALYSIS OF TRANSDERMAL MEDICATION DELIVERY SYSTEMS IN THE HYPERBARIC ENVIRONMENT**

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**BACKGROUND:** Transdermal medication delivery systems (medication patches) are used to treat medical conditions, including hypertension and chronic pain, that are common in patients receiving hyperbaric oxygen therapy. The safety of these medications in the hyperbaric chamber has not been formally analyzed.

**MATERIALS AND METHODS:** A structured literature search was conducted to identify all published case reports and human and animal experiments relating to the question. Analysis of the potential for creating fire in the hyperbaric environment was performed using standard chemical and hazardous materials references and formulae at a range of appropriate pressure and FO<sub>2</sub> values. In addition, relevant data were obtained from product manufacturers.

**RESULTS:** Transdermal medication delivery systems appear to present a low risk of fire in both monoplace (FO<sub>2</sub> 1.0) and multiplace (FO<sub>2</sub> 0.21-0.23) hyperbaric chamber environments. However, the direct effect of pressure changes on the patch and alterations of skin perfusion due to hyperoxic vasoconstriction, adiabatic heating, and adiabatic cooling significantly alter medication absorption. With narrow therapeutic index medications, this effect may be harmful to the patient.

**CONCLUSION:** Transdermal medication delivery systems do not produce an excessive fire risk in the hyperbaric environment. However, because of erratic drug absorption, use of patch medications should be avoided in patients undergoing hyperbaric oxygen therapy when possible.

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#### **MEDICAL CONTRAINDICATIONS FOR HYPERBARIC OXYGEN TREATMENTS IN CRITICAL CARE PATIENTS**

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**BACKGROUND:** Hyperbaric oxygen therapy (HBOT) is frequently used for patients with conditions that necessitate management in the critical care unit. In these patients different factors may postpone and/or place on hold HBOT.

**MATERIALS AND METHODS:** Over a 32-year period almost 200,000 HBO treatments have been done in our hyperbaric medicine facility. About 5% of these patients were hospitalized in a critical care unit. Medical and/or logistic reasons for the interruptions of HBOT in critically ill patients were analyzed. They can