SAFE ANAESTHESIA LIAISON GROUP
PROMOTING FIRE SAFETY ON INTENSIVE CARE AND IN THEATRE

SALG RECOMMENDATIONS

1 Although oxygen is a safe product to administer and handle, at high concentrations and under pressure it is potentially dangerous and should be treated with respect.

2 Oxygen cylinders should be handled with care, and where possible, positioned in specially designed holders, rather than being laid on a patient’s bed.

3 All staff should undergo regular training in fire prevention and fire procedures, which should include training in situ in the clinical areas in which they work. Special attention should be given to the location of fire call points, fire extinguishers and medical gas shut off valves.

4 Every hospital should have a fire evacuation policy specifically for its Intensive Care Unit (ICU) and theatre suite.

5 Any problems with oxygen cylinders and associated equipment must be reported immediately to the medical gas supplier and the MHRA.

Authors
Dr F Kelly and Dr R Hardy, Consultants in Anaesthesia and Intensive Care Medicine, Royal United Hospital, Bath

RATIONALE

1 Oxygen
Oxygen supports combustion. If a fire occurs in a clinical area where high concentrations of oxygen are present, the consequences can be devastating for both patients and staff. Although many patients receive oxygen every day in hospital, all staff should treat oxygen with respect.

2 Handling of oxygen cylinders
New recommendations regarding the use of oxygen cylinders have recently been published by BOC (see table below) and have been endorsed by the Association of Anaesthetists of Great Britain and Ireland (AAGBI). It is now recommended that oxygen cylinders are, whenever possible, placed in specially designed brackets attached to the patient’s bed, rather than being laid on the bed itself.

3 Staff training
All staff should undergo regular training in fire prevention and fire procedures, which should include training in situ in each clinical area in which they work. Special attention should be given to ensuring staff know how to locate and operate fire call points, are shown where fire extinguishers are situated and are taught which type of fire extinguisher to use. Staff should be shown where medical gas pipeline shut off valves are located, how to operate them, and the implications of shutting off these valves. In addition, staff should be given basic training in the use and handling of medical oxygen cylinders, ensuring that they are aware of correct handling procedures.

4 Fire evacuation policy
Each theatre complex and ICU should have a fire evacuation policy in place, which should take account of the layout of the building and the resources available within each hospital. It should be remembered, when drawing up such policies, that staff may well be affected by the fire themselves. Such policies should be tested regularly, ideally as part of a simulation scenario.

5 Reporting faulty oxygen cylinders
Any fault with an oxygen cylinder or attached equipment should be reported to the medical gas supplier and the MHRA Adverse Incident Centre immediately www.mhra.gov.uk.

Safe Anaesthesia Liaison Group
Promoting Fire Safety on Intensive Care and in Theatre

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BACKGROUND AND EXAMPLES OF INCIDENTS

In November 2011, a fire occurred on the ICU at the Royal United Hospital, Bath. An oxygen cylinder (figure 1), laid on a patient’s bed to provide oxygen to her whilst she was being transferred to another hospital, was turned on and then caught fire. Her mattress and bedding immediately ignited, rapidly followed by the curtains around her bed, the flooring and ceiling tiles (figure 2). Within seconds the ICU filled with thick, black, acrid smoke; visibility was reduced to less than a metre and breathing became extremely difficult. The patient on the burning bed was pulled to safety by two nurses, and ten of the eleven ICU patients were evacuated within seven minutes. The eleventh patient, ventilated in a side room, was not immediately affected and was evacuated ten minutes later. The fire was put out by two doctors, using five fire extinguishers. The patient on the bed suffered burns to her lower legs but no other patient suffered ill effects. However, one member of staff was admitted overnight and another was kept in hospital for six hours with smoke inhalation injury. The Health and Safety Executive (HSE) investigation is ongoing and their final report is awaited at time of writing.

A previous incident occurred in 2010 in a fire station in Suffolk. A firefighter was carrying out routine tests, within the fire station, on an oxygen cylinder that was usually kept in their first aid bag. When the fireman turned the oxygen cylinder on and selected a flow rate, a bang was heard, sparks were seen and he dropped the oxygen cylinder onto the first aid bag on the floor. The bandages inside this bag, enriched with oxygen, then caught fire and produced a huge fireball. The fire was put out by the fireman using a fire extinguisher, and no one was injured.

A third incident occurred in January 2012 in a health centre in Oxfordshire. A patient with a suspected myocardial infarction was sitting in a chair in her GP’s consulting room whilst an emergency ambulance was called. She required facemask oxygen therapy, and an oxygen cylinder, placed upright in a cylinder trolley next to her, was used. When the valve was opened and the flow selected, a bang was heard and sparks were seen coming from the cylinder valve. In a short period of time, the valve guard caught light and a fireball was seen over the cylinder. The GP was able to usher the patient and her carer out of the room, shut the door, and wait for the fire and rescue services to arrive. No one was hurt. The consequences of this fire were undoubtedly less serious because the oxygen cylinder was in a cylinder trolley in an upright position.

REPORTED EVIDENCE

REFERENCES


ADDITIONAL RESOURCES

| 1 | Set up the cylinder for patient use before placing it close to the patient. | The most likely time for an ignition to occur is either when the valve is initially turned on or when a flow is selected. Hence the advice is to:  
   a. connect the tubing and oxygen delivery device to the cylinder  
   b. slowly open the cylinder valve  
   c. select the prescribed flow rate  
   d. if required, check the gas is flowing  
   e. fit the oxygen delivery device to the patient. |
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| 2 | Place the cylinder in an appropriately designed holder. | Where possible, cylinders should be placed in holders designed to be fitted, ideally, to the bottom of the bed (or to the back of wheelchairs). The position of the holder needs to take account of how close the cylinder is to the patient. The holder should ideally keep the cylinder upright so that if there is an ignition its impact would be minimised.  
   Although cylinder holders and brackets are available, a suitable design is dependent on the specific bed or wheelchair being used. As the NHS uses many different types of hospital beds and trolleys, there is no single design that can be used in all situations and this remains an issue to be resolved. BOC Ltd is currently working with bed, trolley and wheelchair manufacturers to develop suitable cylinder supports. |
| 3 | Avoid placing the cylinder on the bed next to the patient if at all possible; use extra care when there is no option but to place the cylinder on the bed. | There are times when there is no option but to place the cylinder on the bed or stretcher. If this is the only option, setting up and turning on the cylinder before putting the cylinder on to the bed will minimise the potential risk of injury to the patient. |