

Safe Use of Oxygen Cylinders

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Background

The current pressures on the NHS, exacerbated by the surge in respiratory-related conditions, has increased the demand on supplies of oxygen gas cylinders, in particular small cylinders. To ensure continuity of supply of small cylinders especially for use in ambulances, larger cylinders are being used more routinely in hospitals.

The guidance below reiterates current best practice in the use of oxygen gas cylinders and asks organisations to undertake an urgent risk assessment of all acute clinical areas where patients are treated without immediate access to medical gas pipeline systems (MGPS), and oxygen cylinders are required.

Purpose

The purpose of this document is to support organisations to protect patients and staff by outlining the immediate actions that organisations should take to mitigate the identified clinical safety, patient safety, fire safety and physical safety risks with the current use of oxygen cylinders.

Actions

Medical Gas Committee: the organisation's Medical Gas Committee should be convened as soon as possible with appropriate representation, as outlined in [national guidance](#), and with additional representation from the Exec Director lead for patient safety (or another Exec Director as deputy) and with Ambulance trust input. As oxygen is legally classified as a medicine, the organisation's Chief Pharmacist should be an active member of the committee, and ensure all the normal medicines regulations apply, including those pertaining to supply and mutual aid.

The committee should take responsibility for ensuring a risk assessment is undertaken in all acute clinical areas without access to MGPS actions, to ensure safe and appropriate use of medical gas cylinders and using the information below as a guide. Risks and actions

identified should be recorded on the organisation's risk register and escalated, following trust escalation plans, as appropriate.

1. **Clinical Guidance:** to ensure the appropriate use of oxygen, and to avoid unnecessary use and excessive flow rates, oxygen treatment should be optimised to target saturation ranges as recommended in [BTS Guideline for oxygen use in adults in healthcare and emergency settings](#).

Fixed performance (or "Venturi") masks should be used preferentially to ensure that oxygen saturations remain within the target range.

Organisations should ensure that these are available in sufficient quantities.

NHS England support patients requiring CPAP or non-invasive ventilation, especially if in an ambulance, to be prioritised for transfer to a clinical area where oxygen via the MGPS is available.

If this is not possible, use the lowest flow device available within the Trust. Consult local respiratory team for further support.

Note: the UCL Ventura device no longer has regulatory approval and should not be used.

Ongoing clinical checks:

- **Oxygen saturation checks** using appropriate oximeter positioning and probes
 - [NHSE PSA: Risk of harm from inappropriate placement of pulse oximeter probes](#).
- **Initial and regular flow checks** to ensure oxygen is flowing to the patient.

2. **Patient Safety:** to reduce the risk of patient safety incidents from occurring organisations should ensure the previously issued advice is being adhered to:
 - **When using an integral valve oxygen cylinder**, ensure appropriate activation and flow as per:
 - NatPSA [NHS England » Risk of death and severe harm from failure to obtain and continue flow from oxygen cylinders](#).
 - [HSIB: Design and Safe Use of Portable Oxygen Systems](#)
 - Medical gas cylinder supplier instructions for use.
 - Useful video on [use of integral valve cylinders](#).
 - If using devices to deliver oxygen therapy such as nasal high flow or other forms of non-invasive ventilation in transient parts of the emergency department, escalation areas or ambulances waiting to offload, please note that some devices are reliant on mains power and have no battery backup mode when the patient is then transported to another setting - [NatPSA: Interruption of HFNO during transfer](#) .
 - **Large size 'F' and 'G' oxygen cylinders** will have the same thread as other similar sized medical gas cylinders including medical air cylinders when attaching a bullnose valve regulator. Care must be taken to ensure the right regulator has been connected to the right medical gas when this valve is in use
 - [BOC: Bullnose Cylinders - Guide to using with a regulator](#).

To avoid confusion between cylinders, there should be effective separation of oxygen and other medical gas cylinders, and of the related regulators, in all storage areas.

- **Check cylinder contents:** to ease the current supply issue, it is important the cylinders are used until the cylinder content display is nearing empty, to ensure maximal use. It is therefore essential when using any oxygen cylinder to always check the cylinder contents display and estimate the approximate residual volume according to the prescribed flow rate. A generic guide covering commonly used cylinders can be downloaded and displayed in clinical areas or laminated and tagged to standalone cylinders – available from [NAMDET](#). Care should be taken that cylinders do not fully empty, and patients no longer receive oxygen.

NOTE: Cylinder suppliers may provide a Remaining Time Estimator App which may be beneficial – speak to cylinder supplier.

- **On transfer:** ensure patients requiring oxygen are transferred with an oxygen cylinder and that there is sufficient oxygen left to facilitate the transfer and/or the time to undertake diagnostic tests.

On arrival to ward, ensure patient is attached to oxygen via MGPS (see [NHS England » NatPSA – Eliminating the risk of inadvertent connection to medical air via a flowmeter](#)) and oxygen cylinders are returned as soon as possible.

3. **Fire Safety:** organisations should be aware of the fire safety risks associated with the increased use of oxygen – previously outlined in [NHS England » Reminder of fire safety considerations when increasing the estate capacity of existing areas](#).

Specifically:

- Spaces that have been converted or adopted for patient use may have inadequate ventilation, leading to rising oxygen concentration – this should be monitored ensuring that there is adequate ventilation. See expert advice via Estates colleagues.
- Cylinders that are ready to be deployed should only be stored in designated and signed medical gas cylinder stores with appropriate warning signs.
- The Fire Risk Assessment should be revisited with consideration of:
 - Spaces that have been converted or adopted for patient use may have inappropriate surface finishes and fixtures for the spread of flame
 - Spaces that have been converted or adopted may impede access or egress in the event of an emergency – safe evacuation routes should be maintained.
 - Oxygen use may lead to oxygen saturation of materials increasing likelihood of ignition and fire intensity
 - Portable Oxygen equipment and associated apparatus are at risk of leakage, increasing the risk of fire.
- Patients and public should not smoke, vape or use a lighter in areas where oxygen concentration may be high – this includes close to hospital entrances and ambulances.

4. **Physical Safety:** the increased use of medical gas cylinders increases the risk of physical safety concerns for patients and staff. Organisations should ensure that:

- Medical gas cylinders are only transported using dedicated holders – they should never be placed on the patients’ bed or carried by the patient.
- Only staff trained in the use of manual handling aids move large medical gas cylinders to avoid manual handling injuries.

- Staff connecting cylinders to regulators are trained in their use – training resources are available on-line from your medical gas cylinder supplier.
- Cylinders in use are effectively secured to prevent falling (risk of damage and risk of crushing)
- Cylinders that are ready to be deployed are only stored in designated and signed medical gas cylinder stores with appropriate warning signs.
- Empty cylinders are returned as soon as possible to the empty medical gas cylinder store to prevent trip hazards and make them available for refilling.

See: 2010 E&F Alert - [Unsecured medical gas cylinders, including cylinders on trolleys.](#)

5. **Ambulance specific safety issues:** Prolonged use of supplemental oxygen in an enclosed ambulance saloon may increase the risk of fire due to raised ambient oxygen concentrations. To minimise this risk the following should be considered:
 - Any patient receiving supplemental oxygen should have their oxygen saturations monitored continuously, and oxygen administration titrated to oxygen saturations in accordance with JRCALC guidelines on the administration of oxygen.
 - Consider permanently or intermittently opening the roof vent on the ambulance saloon to facilitate equilibration of internal and external ambient oxygen concentrations.

With extended use of supplemental oxygen in the ambulance saloon it may be necessary to change onboard cylinders during deployment. Care should be taken to ensure that all valves, regulators and fitments are clean, dry and free from grease or any other contaminant before re-attachment to a cylinder. Following reattachment, valves should be opened slowly into an open supply, i.e. with the flowmeter open, to reduce the risk of fire or explosion from [adiabatic compression](#) – following instructions for use available for medical gas cylinder supplier.