

POLICY FOR THE SAFE HANDLING OF MEDICAL GASES

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3.0	January 2020	Charity Okoli, CHS Lead Pharmacist, Newham	Final	Updated in light of recent medical gas alerts in 2016 and 2018, ELFT Clinical alerts 2017 and 2018 added to policy. Updated the Purpose, Scope, Introduction and training sections. Some updates and additions also made to section 3, 5, 6, 8 and 9 of document. Section 7.5 updated to include the cylinders with integral valves. The other related policies added. The references also updated.

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PURPOSE

The Policy ensures the health, safety and well-being of Trust staff and patients by maintaining the safe use, handling, storage and maintenance of medical gas systems within Trust premises. The Medical Gas policy has been developed with an aim to guide and support all staff who directly or indirectly interface with medical gases within their role of employment to ensure safe and effective procurement, use and management of medical gases; and therefore safeguard public health.

The policy is intended to:

- Clearly establish what is expected of the staff who will be exposed to medical gases
- Help prevent incidents involving medical gases
- Ensure a safe use and secure facility for storing medical gases
- Reduce any risks associated with each gas.

SCOPE

This Policy covers the use, safe storage, and handling/porterage of medical gases in in-patient, community clinics and other departments where ELFT staff are providing care to patients.

It also gives advice to ELFT Staff, who are involved in the care of patients in their own homes, on the safe use of medical gases. It does not cover the supply of medical gases to the patient in their own homes.

This Policy also covers the administration equipment associated with use of medical gases in inpatients facilities and community clinics.

Managers

Managers are required to ensure that:

- This policy is available to all staff who handle medical gases
- Risks assessments are undertaken for using medical gases
- Appropriate standing operating procedures are written for using medical gases
- Appropriate equipment is available to promote the safe use of medical gases
- Staff receive training in the safe use of medical gases
- Incidences and accidents related to the use of medical gases are reported appropriately via the Trust DATIX system.

Staff Working with Medical Gases

All staff who handle or use medical gases must:

- Comply with this policy
- Follow all information, instruction and training provided
- Use equipment safely and appropriately
- Take an active role in promoting safety both to the recipients of gas therapy and other members of staff
- Report all incidents, accidents or “near misses” using DATIX

Relationship with Other Policies

This Policy should not be considered in isolation. The following Policies should also be taken into account:

- Health and Safety
- Medical Devices Policy
- Fire Safety Policy
- Maintenance Policy
- Confined Space Policy
- Infection Control
- Manual Handling
- Policy For Prescribing, Storage, Dispensing and Administration of Medicines to Patients.
- Prescription and Administration of Emergency Oxygen in Adults

1.0 Introduction

Medical gases are licensed medicinal products that are used for a variety of purposes in caring for patients.

There is a high risk of death or severe harm to patients if their oxygen supply is not maintained. Following several serious incidents involving oxygen stored in and administered from cylinders, the National Patient Safety Agency (NPSA) issued a Rapid Response Report in September 2009 focusing on oxygen safety in hospitals. In October 2016 a safety alert was issued around Oxygen tubing being connected to airflow meters. This can be accessed via the link below https://improvement.nhs.uk/documents/407/Supporting_information_for_air_flowmeter_PSA1.pdf. Then in January 2018 another safety alert was issued again around risk of death and severe harm from failure to obtain and continue flow from oxygen cylinders. It outlined areas for immediate action, incorporating prescribing, monitoring, administration and equipment. The principles outlined in the report are applicable to all medical gases stored in cylinders hence the scope of this policy covers all medical gas cylinders and also piped gases. See appendix D, for ELFT action on these alerts.

Key points:

- Minimise the use of cylinders, and increase the amount of piped gas used, where necessary .
- Minimise the use of airflow meters, different labels to be used on piped gases
- Reliable systems should be in place for stock taking and checking of medical gas cylinders, ensuring adequate supplies are always available
- Minimise risks of confusing oxygen and medical compressed air.
- Prescribe medical gases in all situations in accordance with British Thoracic Society (BTS) guidelines (acknowledging that the BTS guidelines do not cover critical care).
- Ensure pulse oximetry is available in all locations where oxygen is used.
- A multidisciplinary team should be responsible for review of medical gas related incidents, developing a policy and a training programme.

2.0 Training

Under the Health and Safety at Work Act 1974 it is the responsibility of employers to train their employees on the recommended safeguards relating to products and equipment used at work. NHS Improvement and the Medicines and Health Products Regulatory Agency (MHRA) are supporting the distribution of training materials and resources for different manufacturers' design of oxygen cylinders. All staff who are involved in prescribing, administering, handling and managing oxygen and oxygen equipment should be competent to do so and training is required. This includes nursing, medical, midwifery, allied health care professionals, portering, clinical engineering and estates staff. Training can also be accessed via BOC by many organisations including ELFT. With regards to medical gases, training should be provided in the following

areas:

- Explanation of medical gases their properties and their clinical uses
- Medical gas cylinders' identification and labelling
- Cylinder storage and handling
- Dealing with faulty cylinders and other equipment
- Fire and explosion risk associated with medical gases
- Practical use of cylinders including the types of valves used for each type and size of cylinder, leak tests as well as gas flowmeters used to regulate flow
- The risk from failure to obtain and continue flow from oxygen cylinders
- Medical gas pipeline systems
- Staff must be made aware and trained about what to do in the case of discovery of a breach of security, evidence of loss or theft of medical gas cylinders (See page section 10.0).

This information should be provided:

- Via induction
- Through training
- The use of awareness materials
- Use of Standard Operating procedures (SOPs)

2.1 Training should be provided on a regular basis that is, during staff induction, device specific by local clinical leads/educators and the personnel training records maintained

2.2 How Training is Delivered

Staff must attend the BOC yearly updates to retrain themselves for the safe handling of medical gases and handling of medical gas cylinders; as well as attend any other training provided by the trust.

3.0 Medical Gases In Cylinders

For many settings in ELFT, medical gases are still provided in cylinders that are stored and transported to the area of use when required, for example oxygen cylinders used in emergency situations and portable cylinders used for patients when leaving the pipeline systems in their rooms to activity rooms or other areas where they have no access to the pipeline system.

4.0 Ordering Medical Gases and Inventory Control

- 4.1** The service lead for each clinical setting that uses medical gases should delegate the ordering and maintaining of inventory control for medical gases to a suitably trained person.
- 4.2** Medical gas cylinders belong to the contracted supplier and are rented by ELFT. The frequency of ordering depends on the amount used but should be frequent enough to ensure adequate supplies are always available.
- 4.3** Written orders should be prepared so delivery notes and invoices can be matched.
- 4.4** A record must be maintained for each type of medical gas cylinder kept at each locality/community setting showing:
- What type of medical gas cylinders are kept in each setting
 - Maximum number of cylinders to be kept in cylinder store
 - Dates and quantities received from suppliers
 - Date and quantities issued to each location
 - Expiry date for each cylinder issued

This record should be used for inventory control purposes and for establishing maximum numbers of stock to be kept at the unit. It is very important that accurate inventory control is maintained to avoid wastage or loss. Some medical gas suppliers will supply tags to assist with this process.

5.0 Storage of Medical Gas Cylinders

It is important that medical gases in cylinders are stored safely and securely to mitigate the following health and safety and diversion risks:

- Cylinders are heavy and can cause severe injuries if mishandled
- Cylinders contain compressed gas at high pressure and can cause severe injury or death if damage leads to sudden escape of gas
- Oxygen supports combustion and increases the risk of fire
- Other gases may cause suffocation if used inappropriately or may be subject to theft, diversion and abuse.

- 5.1** The service lead for each clinical setting that uses medical gases should designate a staff member to ensure medical gases are stored correctly.
- 5.2** Medical gas cylinders must be stored separately from any non-medical gases and in a dedicated area which must be designed to the requirements of Health Technical Memorandum (HTM 02-01) <https://www.gov.uk/government/publications/medical-gas-pipeline-systems-part-a-design-installation-validation-and-verification> .
- 5.3** Cylinders must be stored under cover i.e. out of direct sunlight, preferably inside, in a dry, clean secure lockable area not subjected to extremes of heat or cold.

- 5.4 Cylinders must not be stored near stocks of combustible materials or near sources of heat.
- 5.5 Warning notices prohibiting smoking and naked lights must be posted at the cylinder store that is clearly visible to all.
- 5.6 The storage area must provide adequate space to allow segregation of cylinders of different gases as well as full and empty cylinders. It must also be large enough to allow easy access for stock examination and cylinder rotation. Cylinders must be checked daily and documented for obvious signs of leakage (also see section 9.1.4).
- 5.7 Full cylinders should be used in strict rotation according to expiry dates.
- 5.8 When new cylinders are placed into the storage area, inventory control measures must be employed (as per 4.4 above) the expiry dates on each cylinder should be recorded and checked regularly to avoid cylinders with short dates being distributed to areas of use. Cylinders with less than 3 months expiry should be returned to the supplier along with empty containers.
- 5.9 F size cylinders and larger sizes must be stored in an upright manner in a cage or secured to a fixed structure by a safety chain, at all times. E size cylinders should be stored horizontally on racks. Small size medical gas cylinders (e.g. size C, CD) are stored horizontally on shelves or in wall-mounted fittings
- 5.10 Gas cylinders must always be firmly secured and never left unsupported.
- 5.11 Cylinders in a clinical area (ward or unit) must be stored on a secure trolley or suitable rack in a well-ventilated “parking” area that will not block doorways or fire exits.
- 5.12 When transported in vehicles such as ambulances, cylinders are secured appropriately so they cannot move in transit
- 5.13 In the event of an emergency the Emergency services should be advised of the location of the cylinder store by the responsible person for fire safety at the site.

6.0 Handling Medical Gas Cylinders

- 6.1 All personnel handling medical gas cylinder must receive regular manual handling training in line with the statutory and mandatory training matrix.
- 6.2 Personnel moving cylinders should be aware of the hazards of moving cylinders and wear appropriate Personal Protective Equipment (PPE).
- 6.3 Cylinders must be handled with care, never knocked violently or allowed to fall over. Cylinders should never be lifted by the neck.
- 6.4 Cylinders must only be moved with the appropriate size and type of trolley. When cylinders are moved with apparatus attached, the cylinder valve should always be closed.
- 6.5 When in use cylinders must be firmly secured to a suitable cylinder support.
- 6.6 Never roll cylinders along the ground as this may cause the valve to open accidentally. It

may also damage the cylinder label and paintwork.

Cylinders must be turned off/fully closed when not in use

7.0 Use Of Cylinders

7.1 When using medical gas cylinders it is most important that no part of the cylinder valve or equipment is either lubricated or contaminated with oil or grease.

7.2 Special care is needed with the use of hand creams as these could provide sufficient contamination to the medical cylinder valve surface when handling the cylinder to cause an ignition when the valve is turned on.

7.3 Before use ensure that:

- the correct cylinder is selected for the application and where a regulator is required, check that the cylinder product and filling pressure are compatible with the selected regulator
- only correctly designed valve spindle keys are used to open the cylinder valve
- the cylinder contents are checked to ensure that sufficient gas is available for the required use (contents may be determined by reading the gas regulator pressure gauge)
- the cylinder is in date

7.4 The cylinder should be prepared for use as follows:

- Remove the disposable seal by pulling the tear tag and discard
- For cylinder fitted with bullnose outlet valves, remove the cap from the valve outlet by pulling forward and leaving to one side
- For cylinders with integral valves (like the one shown in diagram in Appendix D), the steps involve; removing a plastic cap, turning a valve and adjusting a dial. Please ensure oxygen is flowing.
- For cylinders fitted with pin-index valves, remove the disposable seal and outlet clip and discard
- Check for signs of oil or grease on the cylinder valve. If either is discovered do not use
- Check that the regulator or equipment to be attached to the cylinder is appropriate for the cylinder to be used
- Ensure that the regulator or equipment to be attached to the cylinder is also free of oil or grease
- Check that the 'o' ring or sealing washer is in good condition. Replace it if shows any signs of wear or damage
- Only reasonable force should be used to attach a regulator to the cylinder. Never use excessive force as this may damage the valve outlet threads
- Open the cylinder valve slowly with a standard valve key or hand wheel. Fully open the valve and then close a quarter turn to enable subsequent users to distinguish

between an open and closed valve

- Leave the spindle key in the valve so that it may be closed in an emergency
- Ensure that the equipment operating instructions are available. Cylinders should be checked regularly whilst in use to ensure that they have sufficient content and that leaks do not occur

7.5 Checks must be made to avoid leaks of gas while using gas cylinders. The procedure for checking is as follows:

- listen for hissing sound from cylinder connections
- close the cylinder valve and verify the leak by noting any fall in the regulator pressure gauge reading
- tighten connections and check for leaks again
- if a leak is still present, do not attempt to use sealing or jointing compounds to stop leak but notify the supplier as soon as possible to obtain advice. Do not use the cylinder

8.0 Piped Medical Gases

Recent guidance from NHS Improvement and National Reporting and Learning System (NRLS) has stated that the use of oxygen cylinders in a ward environment should be minimised and wherever possible piped oxygen should be provided. Guidance for planning piped oxygen must be in accordance with HTM 02-01 Part A and B. Key Personnel in ELFT responsible for Medical Gases Pipeline Systems (MGPS) are defined in Appendix A.

ELFT is working towards having piped oxygen available in all its community hospitals, where appropriate.

- 8.1** All personnel handling or responsible for medical gas manifold equipment must ensure they are familiar with the operating and safety procedures laid down in the manufacturer's user manual. They must have undertaken the training outlined in Section 2.
- 8.2** The procedures for handling and storage of medical gas cylinders used with manifold equipment for piped gases is the same as listed above for medical gas cylinders.
- 8.3** Only personnel trained in the use of cylinders in the manifold room are allowed to enter the room and replace the large cylinders used for supplying piped medical gases.
- 8.4** When supplying cylinders to the manifold room, ensure that:
 - The pipeline connections are leak tested when connecting to cylinders, using an approved leak test solution
 - Any separate emergency cylinders are full and available for use and that they are checked and stock rotated on a regular basis
 - The manifold room is not used as a general cylinder store

- All empty cylinders are removed immediately from the manifold room and returned to the empty cylinder storage area of the main cylinder store

8.5 Where cylinder manifolds are used it is important to ensure that:

- Adequate training is given to all personnel involved in pipeline operations
- Written procedures are readily available giving details of operating instructions and actions to be taken in the event of a gas supply failure or maintenance shutdown
- At maintenance shutdown, written warnings are given to all persons responsible for gas supplies in line with the "Permit to Work" system and this must be done with the Estates Department
- In the event of an emergency failure, all hospital departments are advised verbally as an immediate priority

8.6 For automatic changeover manifolds ensure that:

- All cylinder valves on both banks are open at all times (with the exception of the emergency standby cylinders)
- As soon as the running bank cylinders are empty and the manifold changeover has taken place, close the cylinder valves and replace with full cylinders
- Open the cylinder valves on the reserve bank and complete leak checks

8.7 For manual changeover manifolds ensure that:

- The cylinder valves on the running bank are open
- The cylinder valves on the reserved bank are closed
- As soon as the running bank cylinders are empty, open the valves on the reserve bank and manually changeover the manifold
- The empty cylinders on the now empty bank are replaced
- The connections are leak tested and the cylinder valves then left closed

8.8 Liquid Oxygen (Cryogenic liquid)

- Piped oxygen can be supplied from a stainless steel vessel containing liquid oxygen
- This source of oxygen is connected to the pipe line system and has its dedicated control panel for monitoring purposes
- Liquid oxygen vessels are refilled by the gas provider at frequent intervals to ensure a constant supply of oxygen
- Caution must be taken to avoid the following possible health hazards associated with liquid oxygen:
 - a) Effects of cold on lungs
Transient exposure to very cold gas can provoke an attack of asthma in susceptible subjects. Prolonged breathing of extremely cold gas may damage lung tissue
 - b) Cold burns and frostbite
Because of the low temperature of liquid gases, the liquid, cold vapour or gas can produce damage to the skin. Unprotected parts of the skin coming in

contact with uninsulated items of cold equipment may also stick fast to them and the flesh may be torn on removal

- If for any reason hospital personnel are involved in handling or connecting liquid oxygen to the pipe line system personal protective equipment must be available
- Should a spill or splash of liquid oxygen occur, prompt medical attention must be obtained. Guidance is given in Appendix B

8.9 If for any reason work needs to be undertaken that affects the piped medical gas system, a “Permit to Work” systems must be used and this must be done with the Estates Department.

8.10 If for any reason the piped medical gas system is not working:

- Contact the Designated Officer (Medical or Nursing) at the hospital or unit responsible for piped medical gases
- Use medical gas cylinders as described above until instructed to recommence using the piped medical gas system

9.0 Types Of Medical Gases Used In ELFT Settings

9.1 Medical Oxygen

Oxygen is one of the most common medicines used in hospital settings. It is administered to patients across a range of specialties to provide oxygen to the lungs and thereby increase the availability of oxygen to the body tissues. If used appropriately, oxygen is life-saving and part of first-line treatment in many critical conditions; however, if used incorrectly it may cause serious harm or even death.

9.1.1 Handling of Oxygen Cylinders and their Regulators

- All staff involved with medical oxygen should be fully trained in the use of cylinders and the attachment of regulators as well as the fire risks associated with oxygen
- Ensure hands are clean before handling oxygen cylinders due to the risk of combustion from oils and grease. In particular, make sure that hands are adequately dried after the use of alcohol gels
- Clean clothing, free from oil and easily combustible contaminants should be worn when handling oxygen cylinders
- Make sure that the oxygen cylinder outlet and oxygen regulator inlet are clean before attaching a regulator. Always open the cylinder slowly and check for leaks. Close cylinder valves when not in use
- When using medical oxygen cylinders ensure adequate ventilation. If clothing becomes impregnated with oxygen (due to leak) keep away from sources of ignition or open flames. Clothing impregnated with oxygen should be ventilated in fresh air for a minimum of 15 minutes
- Although the risks are small, there is a potential for burns to hands and face if hand creams or other petroleum based lotions are used on patients receiving oxygen therapy.

Also refer to document “Emollients and risk of fire” on trust intranet for more information; this can be accessed via this link

http://elftintranet/download/8472f8b8-9bab-43be-8ca9-3f3ee9718e6b/f/Emollients_and_Risk_of_Fire.pdf

9.1.2 Prescribing Oxygen

- Oxygen should be prescribed in accordance with current [British Thoracic Society Guideline](#). For the purposes of saving life, in an emergency, oxygen should always be given immediately and documented later
- Prescriptions for oxygen must be clearly written on the prescription chart indicating the dose to be administered, the method of delivery and the target saturation required
- When oxygen is no longer required by a patient, it must be crossed off the prescription chart by the prescriber along with the date of discontinuation

9.1.3 Administering Oxygen to Patients

- Only appropriately trained practitioners should administer oxygen to patients
- Before administering oxygen to a patient, the practitioner must confirm the identity of the gas, check the expiry date of the gas and ensure adequate supplies of oxygen are available to maintain the flow rate prescribed
- Care must be taken to avoid confusing oxygen with medical compressed air. Air flowmeters should be removed from wall outlets when not in regular use.
- Air flowmeters if not removable should be clearly labelled to distinguish from oxygen
- Appropriate monitoring and flow rate devices including pulse oximetry must be used to achieve the target saturation prescribed
- Practitioners must regularly monitor saturation levels and adjust flow rates to keep within the target saturation range
- Accurate documentation of flow rates and target saturations achieved must be recorded in the patient's notes

9.1.4 Emergency Oxygen Cylinders

- Even if piped oxygen is available at the patient's bedside, it is important that each hospital has emergency cylinders of oxygen available for transporting patients and/or for use in areas where piped oxygen is not provided
- Community Clinics should consider the type of intervention being carried out and following a risk assessment have emergency oxygen available if necessary. If emergency oxygen is required, the service should have written guidelines for its use in place
- The expiry date and quantity of gas in each cylinder must be checked daily and documented. Within community hospitals this is the responsibility of the modern matron who may delegate it to a suitably trained person. Within community clinics and other units this is the responsibility of the service lead who may delegate it to a

suitably trained person.

9.1.5 Oxygen in Patient's Own Home

- Oxygen may be supplied to patients for use in their own home
- This will be arranged by the patient's General Practitioner
- ELFT nurses who attend patients at home should provide advice on the safe use of oxygen if required
- There are more information about home oxygen therapy and safety advice for people via this link <https://www.nhs.uk/conditions/home-oxygen-treatment/>.

9.1.6 Piped Oxygen Supplies In Case of Fire

- In case of a fire, a trained and assigned personnel on the Duty of Senior Nurse rota must follow the Trust's Fire protocol regarding the isolation of fixed oxygen.

9.2 Medical Air

Like atmospheric air, Medical Air contains 21% oxygen. It is used:

- as a replacement for atmospheric air when the atmosphere is contaminated by noxious fumes, vapours or gases
- in anaesthesia as a carrier gas for volatile anaesthetic agents
- as a power source for pneumatic equipment
- in ventilators and incubators to provide uncontaminated and controlled air flows

9.2.1 Prescribing Medical Air

- Legally Medical Air is a medical product but unlike oxygen, it does not require a prescription by a medical practitioner before it can be used
- Only trained practitioners may use Medical Air and its use must be documented in the patient's notes

9.2.2 Care and Handling of Medical Air Cylinders

- The guidance in section 6.0 regarding the handling of medical gases should be followed when handling Medical Air cylinders

9.2.3 Dosage and Administration of Medical Air

- For breathing purposes, medical air is administered by various means, commonly by self-contained or compressed air line breathing apparatus
- In anaesthesia, medical air is administered from a cylinder and valve assembly or pipeline through a face mask or endotracheal tube
- Medical air is contra-indicated when oxygen or other gaseous combinations are required. Utmost care must be taken to avoid using medical air when oxygen has been prescribed

- To protect against medical air being used instead of oxygen, medical air flow meters should be removed from the wall outlet when not in regular use

10.0 Safety and Security of Medical Gas cylinders and Medical Gases Storage Areas

- Through work undertaken with the British Transport Police, NHS Protect identified that in particular parts of the country, gangs were targeting health bodies' medical gas storage facilities to steal medical gas cylinders for a number of reasons, including their use as a recreational drug, and for the financial value from the sale of cylinder contents and the scrap metal value of the cylinder. The size and portability of medical gas cylinders make them susceptible to being stolen.
- An annual risk assessment should be undertaken by trained staff to establish and re-establish the physical security requirements for the medical gas storage facilities with a view of ensuring that any breaches or failures in security are addressed as soon as possible.
- Gas cylinders must be tracked from point of receipt into the NHS organisation to their return when empty to the suppliers.
- Any concerns of theft and/or misuse of cylinders must be reported to the Lead Nurse immediately and reported using the Trust Datix reporting system in order for the matter to be recorded, assessed and investigated.
- All personnel involved in the managing of medical gases must be appropriately trained for the management and use of medical gas cylinders, medical gas pipeline systems and vacuum insulated evaporators (VIEs) in NHS organisations to equip them to recognise security risks.
- Any new builds or refurbishment of storage facilities should have due regard to incorporating security measures into the early stages of the design process, in discussions with the local police Designing Out Crime Officer/Crime Prevention Design Advisor, involvement of the Local Security Management Specialist and taking account of relevant guidance.
- Any concerns regarding the breach of security, evidence of intruders, evidence of loss or theft of medical gas cylinders must be escalated with the Buildings or Property Manager and Estates straight away. Datix incidents forms must be completed.
- Staff must be monitored to ensure that they comply with SOPs, policies and security measures for managing and accessing the medical gas cylinder storage/supply areas and reporting incidents when they occur.
- No untrained personnel should be permitted to handle the security and storage of medical gas cylinders without having received training beforehand.
- Security of medical gas cylinders on wards must be assigned to an appropriate

member of staff in that area.

- Only authorised and assigned members of staff may be given permission by way of carrying keys for areas where medical gas cylinders are being stored. When carrying keys or any other device that allows them access to such areas, the staff member will be responsible to ensure that all areas are left in a secure state to restrict any unauthorised access to medical gas cylinders, whether they are empty cylinders or not.
- Stock levels must be managed by setting an agreed minimum and maximum cylinder stock level.
- The requisitions of all medical gas cylinders must be recorded
- Keys to the medical gas cylinders storage area:
 - must be securely stored
 - restricted to authorised staff only
 - Must be on person to authorised staff only to restrict the key holding responsibility (where master keys are used to provide access to storage areas); appropriate measures must be in place to restrict the key holding responsibility to authorised personnel only.
 - Must be regulated by undertaking a regular inventory, especially if more than one set of keys are in circulation that provide access to medical gas storage facilities.
 - If lost or missing must be reported using the Datix reporting system and reported to the Duty Senior Nurse.
- Access to the main medical gas storage facility must be controlled. Ideally keys to the medical gas cylinders' storage areas must be auditable by signing keys between one staff members to another.
- If numeric key pads are used, the codes must be changed monthly.
- Only authorised staff members may order medical gas cylinders from suppliers in accordance with the Trust's SOP. The supplier may also have to be aware of the individuals from the Trust who are able to order medical gas cylinders from them.
- A record of all the staff who are authorised to order medical gas cylinders must be in operation at all times and reviewed whenever a member of staff leaves or joins and at quarterly intervals periodically.

- Receipt of medical gas cylinders following an order must be witnessed and supervised by appropriate personnel. All received gas cylinders must be checked against a delivery note and the original requisition form to verify that the correct (medical gas) type, cylinder size, and quantity have been received.
- A dedicated stock management system must be used to record the requisition of medical gas cylinders
- There must be a written process in place for the ordering of medical gas cylinder stock from suppliers
- If it is not possible for deliveries to be signed for and witnessed by an appropriate member of staff (e.g. out of hours deliveries), the cylinders must be left in an agreed secure location on Trust premises until the receipt of the cylinders can be validated against the order and the delivery note.
- Internal ordering of medical gas cylinders within the same building such as ward or other inpatient area be done so according to the Trust SOP. Stock levels remaining in the main storage area must be recorded to indicate the transfer of the cylinder(s) from the main storage area to the ward to where they have been transferred to and back.
- Daily stock checks must be carried out in the main storage area of each medical gas cylinder types and of each cylinder size that are being held in the main storage area. In case of any stock discrepancies, the buildings or property manager must be informed immediately and the issue must be reported using the Trust Datix incident reporting system so that an investigation may be carried out.
- Patients who arrive onto the trust with their own medical gas cylinders may continue to use their own cylinders until empty though the ward should keep a record of this and once empty must transfer this to the main storage site by informing the appropriate personnel so that the supplier can be contacted to have these returned to the appropriate supplier.
- Any attempted, real theft or robbery of medical gas cylinders must be reported to the police and Local Security Management Specialist (LSMS) as well as on the Trust's Datix incident reporting system and recorded on NHS Protect's Security Incident Reporting System (SIRS)
- All records of medical gas cylinder stock must be maintained for auditing and reconciliation purposes
- No unauthorised vehicle access to external medical gas storage and VIE areas at

any time.

11. **MONITORING ARRANGEMENTS**

The monitoring arrangements are given in Appendix C.

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12. BOC Liquid Nitrogen Safety Data Sheet
13. BOC Liquid Oxygen Safety Data Sheet
14. East London NHS Foundation Trust (ELFT) intranet: Clinical Alerts No 32 (2017) & No 30 (2018)
15. ELFT intranet: “Emollient and risk of fire/burns” protocol, updated January 2019
16. Provision and Use of Equipment Regulations 1992
17. Control of Substances Hazardous to Health 2002
18. The Royal Marsden Hospital Manual of Clinical Nursing procedures 2015 (9th ed) The Royal Marsden Hospital
19. NHS Protect Circular S/G/06/2014-15 ‘Guidance on the security and storage of medical gas cylinders’.
20. British Compressed Gases Association:
http://www.bcgga.co.uk/pages/index.cfm?page_id=29&title=medical_gases
[Accessed 20/10/19]
21. NHS/PSA/W/2018/001; Risk of death and severe harm from failure to obtain and

continue flow from oxygen cylinders

22. NHS Improvement/Patient Safety 2016 <https://improvement.nhs.uk/news-alerts/reducing-risk-oxygen-tubing-being-connected-air-flowmeters/>

APPENDIX A – Key Personnel with Specific Responsibilities within the Medical Gases Pipeline Systems (MGPS)

Executive Manager

This is the person with ultimate management responsibility, for the Medical Gas Pipeline System, including allocation of resources and the appointment of personnel, for the organisation in which the MGPS is installed. This may be the CEO, Laboratory Manager or other person of similar authority. The Executive Manager has responsibility for the overall implementation of the operational policy including monitoring of the effectiveness of the policy. The Executive Manager may delegate certain responsibilities and the scope of the delegation shall be clearly set out in the policy.

Estates Operational Manager

The Estates Operational Manager holds responsibility for the integrity of the MGPS. This duty shall include monitoring the implementation of the operational policy, ensuring that the MGPS is compliant with HTM02-01 and ensuring all work on the MGPS is carried out in accordance, where possible, with the permit-to-work procedures.

Authorising Engineer (MGPS)

The Authorising Engineer shall be suitably qualified in accordance with the training requirements identified in Chapter 7 of HTM02-01. The Authorising Engineer shall be responsible for the assessment and subsequent recommendation to the Executive Manager, of appointment of the Authorised Person(s).

The Authorising Engineer shall be independent to the organisation within which the MGPS is located.

Authorised Person

The Authorised Person is defined as that person, designated by the Executive Manager with responsibility for the day-to-day management of the MGPS at particular Trust sites. The Authorised Persons shall be appointed in writing by the Executive Manager on the recommendation of an Authorising Engineer and shall be responsible for issuing permits in accordance with the permit-to-work procedures.

The complete responsibilities and duties of the Authorised Person are outlined in Section 4.0 of HTM 02-01.

Competent Person

The Competent Person is the person who carries out the installation and/or maintenance work on the MGPS. This person must have received appropriate training and should be on a list of Competent Persons for work relating to MGPS. This person can be either in-house or external to the Trust, such as a specialist contractor.

Quality Controller

The Quality Controller is responsible for the quality control of medical gases at the terminal units and on the MGPS. The Quality Controller will accept the professional responsibility for the last independent check of an MGPS that, if faulty, could cause critical consequences to patients. The Quality Controller will be contacted by the Authorised Person and the Chief Pharmacist when testing of an MGPS is required. The Quality Controller shall be able to provide documentary evidence of continuing and recent experience in MGPS testing.

The Authorised Person will need to liaise with the Quality Controller before an MGPS can be taken into use, as quality tests may be required before gases are passed to patients.

Designated Officer (Medical or Nursing)

This is the person in each hospital department that the Authorised Person must liaise with on any matters affecting the MGPS and who can give permission for a planned interruption to the MGPS supply.

The Designated Officer will be required to sign the relevant parts of any permit-to-work set up by the Authorised Person.

Deputy designated Officers must also be identified who can cover for the Designated Officer due to absences.

The Designated Officer or their deputy would normally carry out any appropriate action in the event of an emergency (for example isolation of a ward supply).

All Designated Officers shall have received appropriate training on the MGPS relevant to the department in which they are working and also on the actions to be taken in the event of an emergency.

APPENDIX B - First Aid Measures for Treating Burns Associated with Liquid Gases (liquid Oxygen/Liquid Nitrogen)

INTRODUCTION

Cold burns and frostbite are a hazard related to spills and splashes of liquid gases onto unprotected parts of the skin. Medical attention should be provided as quickly as possible. However, such injuries are not an everyday occurrence and doctors, hospital staff or first aid personnel may not be aware of the basic methods of treatment. Therefore the following first aid measures must be followed.

1.0 The aim of first aid treatment is to raise the temperature of the affected areas of skin slowly back to normal.

1.2 Minor Injuries:

- Move victim to a comfortable room if possible
- Ensure that clothing is loose to provide unrestricted blood circulation. Do not remove clothing that is stuck to the body until area is completely thawed
- Place the affected area of skin in TEPID WATER or run TEPID WATER over the area for half an hour until the skin changes from pale yellow to pink or red. DO NOT use hot water or any other form of direct heat
- Cover the affected area of skin with a bulky dry sterile dressing
- Do not rub the area in attempt to improve blood circulation
- Transport injured person to the nearest Accident and Emergency Department for further medical attention

1.3 Major Injuries:

- Dial 999 for ambulance service and follow procedure for minor injuries

Appendix C: Monitoring table

What will be monitored	How/Method	Frequency	Lead	Reporting to	Where would Deficiencies/gaps recommendations and actions go?	Implementation of any Required Change
Appropriate inventory control records	On-going monitoring	3 monthly	Service Managers and Service Leads	AD of the Service	Patient Safety and Quality	Gaps in compliance will be rectified by Service Manager or Service Lead
Staff receive appropriate training for using medical gases	Individual Personal Development Plan	At appraisal	Line Manager	Service Manager	Training Department	Gaps in compliance will be rectified by Service Manager or Service Lead in conjunction with the training department
Errors and Incidents	Analysis of Error Reporting	Monthly	Clinical Governance	Patient Safety and Quality	Integrated Governance	Trend analysis may inform future policy

Appendix D: The Clinical Alerts

CLINICAL ALERT

Quality and
Safety

February 2018

Alert No: 30

Risk of death and severe harm from failure to obtain and continue flow from oxygen cylinders

The problem

Some of our patients need to be given additional oxygen as part of their treatment, or in emergencies. This is provided in oxygen cylinders, the design of which has changed over recent years. Cylinders with integral valves (like the one shown in the diagram on the following page) are now commonly-used within ELFT and require several steps to be taken before oxygen starts to flow. These steps involve; removing a plastic cap, turning a valve and adjusting a dial. An unintended consequence of these changes is that staff may believe oxygen is flowing when it is not, and/or may be unable to turn on the oxygen flow in an emergency.

There is a high risk of death and severe harm to patients if their oxygen supply is not maintained. A national [Patient Safety Alert](#) published by NHS Improvement in January 2018 highlighted that in a recent three-year period, over 400 incidents involving incorrect operation of oxygen cylinder controls were reported to the National Reporting and Learning System (NRLS). Six patients died, five patients had a respiratory and/or a cardiac arrest and four became unconscious.

Learning points

- All staff working in clinical and non-clinical areas where oxygen may be used should familiarise themselves with how to operate oxygen cylinders safely (see the guide on the following page).
- A laminated copy of the 'Oxygen Cylinder guide and uses' diagram from the following page should be placed close to the point of use.
- Staff CPR training will include theoretical sessions about operating the cylinder controls, and linking safe operation of cylinder controls with other key safety issues, including fire hazards and how long a full cylinder will last on various flow rates.
- Resuscitation simulation exercise will give regular opportunities to practice safe operation of oxygen cylinders in a controlled environment.

For more information about the clinical use of oxygen, please consult the British Thoracic Society [Guidelines for oxygen use in adults in healthcare and emergency settings](#).

Oxygen Cylinder guide and uses

ELFT has supplied portable oxygen cylinders for use in the emergency bags and emergency trolleys on the various sites of the trust. The size of cylinder in the bags is a CD cylinder which contains 460 litres of oxygen. There should be one cylinder with the emergency equipment and a spare on the ward. These should be stored away from heat sources in an area labelled as oxygen storage.

This aide-memoir will explain how to operate the cylinder and the duration of a full cylinder (depending on flow rates for different oxygen therapy masks).

Step 1:

Ensure you have the correct Medical gas by checking the label and expiry date on the batch label.



Step 2:

Make sure the contents gauge is in the green zone. This indicates that the cylinder is full.



Step 3:

Remove the tamper evident handwheel cover by pulling the tear-ring.



Step 4:

Turn the black valve to the 'Open' position. This allows Oxygen to the flow rate valve on the top of the cylinder.



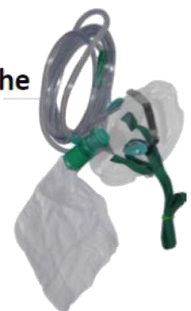
Step 5:

Connect the oxygen tubing for the appropriate mask for the patient to the



Mask type:

High concentration non-rebreathe
Flow rate: 15 ltrs/min
Full cylinder duration: 30 mins



Mask type:

Nebuliser mask
Flow rate: 6—10 ltrs/m
Full cylinder duration:
At 8 ltrs/min - 55 mins



Mask type:

Bag-valve-Mask
Flow rate: 15 ltrs/min
Full cylinder duration: 30 mins



CLINICAL ALERT

Quality and
Safety

Date: July 2017

Alert No: 32

Clinical Alert: Reducing the risk of oxygen tubing being connected to air flow meters

Incidents leading to death and severe harm have been reported to the National Reporting and Learning System (NRLS) that describe the inadvertent connection of tubing to medical air instead of the oxygen supply intended for the patient's treatment. A Rapid Response Report1 (RRR) issued by the National Patient Safety Agency (NPSA) in 2009 highlighted this risk and made recommendations to prevent such incidents. All hospitals providing NHS-funded care were asked to assess the risks of confusing oxygen and medical air and to develop action plans. In ELFT we do not use piped air or pressurised air.

The following solutions **are** suggested **for areas with medical air supply**:

- Removing air flowmeters from the outlets when these are not in active use; removing unnecessary equipment is a more effective method of reducing human error than displaying warnings on that equipment
- Placing warning labels on air and oxygen wall outlets
- Colour coding flowmeters (white – oxygen; black – air)
- Putting covers on air flowmeters that are used intermittently
- Ensuring that flowmeters are not obscured by curtains or other equipment
- Restricting the use of compressed air outlets on general wards (given the increased use of electrically driven compressors to provide an air supply for nebulisers)

Learning points

- Keeping air flowmeters away from a patient's bedside and only inserting them into the wall outlet when required
- Occlusion of air ports with non-removable discs in as many cases as possible
- Labelling flowmeters and putting clips over air outlets to increase awareness
- Including the removal of air flowmeters in checklists (eg. bed cleaning checklist)
- Reducing the need for medical air outlets by using compression or ultrasonic nebulisers
- Leaving oxygen flowmeters in place in all oxygen outlets ready for immediate

See supporting information: improvement.nhs.uk/newsalerts/reducing-risk-oxygen-tubing-being-connected-air-flowmeters for further details, other potential barriers and local implementation examples.