



## Patient Safety Alert

*Reducing the risk of oxygen tubing being connected to air flowmeters*

4 October 2016

Alert reference number: NHS/PSA/D/2016/009

Alert stage: Three - Directive

Severe harm or death can occur if medical air is accidentally administered to patients instead of oxygen. A Rapid Response Report (RRR) issued by the National Patient Safety Agency (NPSA) in 2009<sup>1</sup> highlighted the risk and requested that trusts develop action plans to prevent these incidents. However, events continue to occur. Since January 2013 the National Reporting and Learning System (NRLS) has received two reports of fatalities, two of severe harm, and over 200 of incidents resulting in moderate, low or no harm. A recent report reads:

“...Patient arrested a further time secondary to hypoxia. It was then discovered that patient was inadvertently being ventilated with medical air from piped supply for up to ten minutes. The medical air and the oxygen outlets were side by side, both with flowmeters attached. It was very difficult to tell which flowmeter was which, particularly in an emergency situation.”

Air and oxygen flowmeters can be difficult to tell apart and as they both have universal outlets, oxygen tubing can be attached to both. International connector standards are being developed for breathing systems and driving gases applications.<sup>2</sup> However, it is unclear at present whether these new connectors will differentiate oxygen and medical air. Even if they do, it can take industry many years to adopt a new design. Other solutions are required in the meantime.

Three barriers to human error have already been recommended by the NPSA<sup>1</sup> and British Thoracic Society (BTS)<sup>3</sup> but continuing incidents suggest they have not been universally implemented:

- **Medical air terminal units (wall outlets) are covered with designated caps in areas where there is no need for medical air.** Medical air outlets were traditionally built into most clinical areas for the delivery of nebulised treatment but not all areas need them (eg they never have patients who need nebulisers, or they have access to electrically driven compressors or ultrasonic nebulisers).
- **Medical air flowmeters are removed from terminal units (wall outlets) and stored in an allocated place when not in active use** Removing unnecessary equipment is a more effective method of reducing human error than adding labels or warnings alone.
- **Air flowmeters are fitted with a labelled, movable flap** The lettering on the flap is larger and more visible than on the flowmeter itself and this flap has to be lifted to attach a tube. This acts as a further barrier to unintended connection if staff occasionally forget to remove medical air flowmeters after a period of active use.

Air flowmeters are never required in an emergency situation (eg a cardiac arrest) and the lack of immediate access to medical air does not introduce risks to patients. See supporting information [improvement.nhs.uk/news-alerts/reducing-risk-oxygen-tubing-being-connected-air-flowmeters](http://improvement.nhs.uk/news-alerts/reducing-risk-oxygen-tubing-being-connected-air-flowmeters) for further details, other potential barriers and local implementation examples.

## Actions

**Who:** All hospitals (or any other sites) providing NHS funded care that supply medical air using medical gas pipeline systems (MGPSs)\*

**When:** To begin as soon as possible and to be completed by 4 July 2017.

- 1 Identify a named individual who will take responsibility for co-ordinating the delivery of the actions required by this alert.
- 2 Implement systems to ensure that the three barriers to human error described in this alert are all in place in all relevant clinical areas.
- 3 Establish ongoing systems of audit or equipment checks to ensure the barriers are maintained.
- 4 Share what you learn from implementing this alert or locally developed good practice resources by emailing [patientsafety.enquiries@nhs.net](mailto:patientsafety.enquiries@nhs.net)

**See page 2 for technical notes, supporting information and references**

\*Although this alert is directed at sites that use piped medical air, there is still useful learning in the supporting information for those that use cylinders to provide air and oxygen.

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## Technical notes

### Patient safety incident reporting

The NRLS was searched on 15 June 2016 for incidents reported between 1 January 2013 and 15 June 2016 that contained the keywords 'air' and 'oxygen' in the free text descriptions: 5,943 reports were identified. A sample of 593 incidents were reviewed. All remaining incidents were searched for the keywords 'instead' or 'flowmeter' (using the 'Excel find function'). In total 208 incidents were identified where oxygen tubing had been connected inadvertently to a medical air flowmeter.

For further details please see supporting information via the link below.

### Supporting information

Reducing the risk of oxygen tubing being connected to air flowmeters - supporting information [improvement.nhs.uk/news-alerts/reducing-risk-oxygen-tubing-being-connected-air-flowmeters](http://improvement.nhs.uk/news-alerts/reducing-risk-oxygen-tubing-being-connected-air-flowmeters)

### References

1. NPSA (2009) Oxygen safety in hospitals | Rapid Response Report [www.nrls.npsa.nhs.uk/alerts/?entryid45=62811](http://www.nrls.npsa.nhs.uk/alerts/?entryid45=62811)
2. ISO 80369 Small-bore connectors for liquids and gases in healthcare applications:  
Part 1: General requirements [www.iso.org/iso/catalogue\\_detail.htm?csnumber=45976](http://www.iso.org/iso/catalogue_detail.htm?csnumber=45976)  
Part 2: Connectors for breathing systems and driving gases applications [www.iso.org/iso/catalogue\\_detail.htm?csnumber=50730](http://www.iso.org/iso/catalogue_detail.htm?csnumber=50730)
3. BTS (2008) Guideline for emergency oxygen use in adult patients [www.brit-thoracic.org.uk/guidelines-and-quality-standards/emergency-oxygen-use-in-adult-patients-guideline/](http://www.brit-thoracic.org.uk/guidelines-and-quality-standards/emergency-oxygen-use-in-adult-patients-guideline/)

### Stakeholder engagement

- British Thoracic Society
- DH/NHS Estates and Facilities
- UK National Medical Gas Sub Group
- MHRA
- Medical Device Safety Officers (MDSO) network
- Medical Specialities Patient Safety Expert Group
- National Patient Safety Response Advisory Panel