National Patient Safety Alert

NHS

Eliminating the risk of inadvertent connection to medical air via a flowmeter

Date of issue:	16 June 2021	Reference no:	NatPSA/2021/003/NHSPS

This alert is for action by: Acute, specialist, and any other hospitals with piped medical air.

This is a safety critical and complex National Patient Safety Alert. Implementation should be co-ordinated by an executive lead (or equivalent role in organisations without executive boards) and supported by leaders in critical care, emergency, and respiratory medicine and medical device management.

Explanation of identified safety issue:

Air flowmeters attached to piped medical air outlets are primarily used to drive the administration of nebulised medication; typically for short periods to manage respiratory conditions. Most other uses of piped medical air do not require an air flowmeter.[Note A]

Due to the proximity of the piped medical air and oxygen outlets at the bedside, and the similarity in design of flowmeters, there is a significant risk when using air flowmeters that patients may be inadvertently connected to medical air instead of oxygen.

A previous alert[1] and additional communications[2] have sought to minimise the use of air flowmeters by encouraging their replacement with compressor or ultrasonic nebulisers, alongside additional risk reduction methods if air flowmeters remained in use. A recent survey of Medical Device Safety Officers indicated that many hospitals no longer use air flowmeters and others are part way through eliminating their use. Where air flowmeters are still in use, the risk of inadvertent connection remains.

Despite the measures outlined above, 108 Never Events describing unintentional connection were reported in a recent three-year period[3]; over a third of incidents occurred in emergency departments. Consequences included respiratory arrest, cardiac arrest, collapse (requiring ITU admission and ventilation), and nine incidents of incorrect connection when responding to cardiac arrest, which will have impacted on the chance of successful resuscitation; six patients subsequently died.

The size and portability of current models of powered nebuliser devices means they can be used in all wards and departments and thus eliminate the need for medical air flowmeters for nebulisation.[Note B] Any other procedures that have historically used medical air via a flowmeter can utilise devices specifically designed to use ambient air.

Reversible capping of the medical air outlet is a further barrier to possible misconnection of air flowmeters.[1] Please note however this Alert does not advocate the permanent capping off or diversion of piped medical air; as direct access to the air outlet may be still be required for non-nebuliser uses. [Note A]

Actions required

Actions to be completed by 16 November 2021

1. Purchase sufficient powered nebuliser devices for use across the organisation; to remove the need for medical air to drive nebulisers via a flowmeter.[Note B]

2. Remove the need for air flowmeter use in the delivery of humidified air, by purchasing sufficient devices that use ambient air.

3. Review any niche uses of air flowmeters and replace with suitable alternatives. If in exceptional circumstances, an air flowmeter cannot be replaced by an alternative device, ensure the flowmeter is tethered to the equipment.

4. On completion of actions 1,2 and 3, remove and discard **all** medical air flowmeters except those tethered to equipment for niche use.

5. Reversibly cap off all medical air outlets that are no longer routinely required; secured caps are most appropriate for this.

6. Ensure policies and procedures relating to the prescribing and administration of nebulised medication are updated to reflect this change in practice and that they align with British Thoracic Society (BTS) guidance.[4, Note C]

For further detail, resources and supporting materials see: https://www.england.nhs.uk/2021/06/eliminating-the-risk-of-inadvertent-connection-to-medical-air-via-a-flowmeter

For any enquiries about this alert contact: patientsafety.enquiries@nhs.net

Additional information:

Notes

A: The main uses for medical air not requiring a medical air flowmeter are; to drive ventilators and resuscitaires, as a power source for driving surgical tools and as a carrier gas for volatile anaesthetic agents.

B: When purchasing powered nebuliser devices, consider what the most convenient surfaces are to place them on during use, lead length to power supply, and length of consumable tubing for each location/ bed/trolley space. Shelving or portable trolleys may need to be considered. These considerations should not be a barrier to complying with the actions outlined in this Alert. Nebulisers can be swapped between patients, following manufacturer guidance for decontamination, but purchasing sufficient devices in areas of high demand reduces nursing workload and delays to treatment. Before purchasing, check nebuliser specifications to ensure the device is appropriate for multiple use and/or to deliver certain medications eg pentamidine. NHS Supply Chain will develop a product matrix of suitable nebuliser devices to aid purchasing.

C: The clinical considerations for when oxygen or air should be used for nebulisation (particularly for patients who retain CO_2) should be prescribed and documented. BTS guidance[4] on when nebulisers should be driven by air or by oxygen, is referenced in this Alert to ensure there is no confusion between this requirement and the method used to deliver air-driven nebulised medication.

Patient safety incident data

Review of the 108 incidents[3] reported as occurring between 01 April 2018 and 31 March 2021, indicates that misconnection is often an 'unconscious error' (the person does not realise that they have made a wrong connection) and so incidents often go undetected even when other staff respond to deterioration or take over care. Whilst six patients died following reports of misconnection, when attempts were being made to resuscitate them after cardiac arrest, it is unclear if they could have been successfully resuscitated even if oxygen had been connected throughout. Other consequences may occur later and be less obvious, as oxygen is prescribed to provide respiratory support, and these may be much more significant for patients with COVID-19 due to the rapid onset of hypoxia.

References

1. NHS Improvement Patient Safety Alert *Reducing the risk of oxygen tubing being connected to air flowmeters* October 2016: https://www.england.nhs.uk/publication/patient-safety-alert-reducing-risk-oxygen-tubing-being-connected-air-flowmeters/
2. Letter from NHS Improvement Medical Director/Director of Nursing June 2018 – see Healthcare Safety Investigation Branch *Piped supply of medical air and oxygen* February 2019 Section 1.11 https://www.hsib.org.uk/investigations-cases/piped-supply-medical-air-and-oxygen/final-report/
3. NHS England Never Events data publication https://www.england.nhs.uk/patient-safety/never-events-data/
4. British Thoracic Society Guideline for oxygen use in adults in healthcare and emergency settings. BMJ Open Respiratory Research 2017. Section 10.4 Driving gas for nebulised treatments https://bmjopenrespres.bmj.com/content/4/1/e000170

Stakeholder engagement

- Association of Respiratory Nurse Specialists (ARNS)
- British Thoracic Society (BTS)
- National Patient Safety Response Advisory Panel (for a list of members and organisations represented on the panel see https://www.england.nhs.uk/patient-safety/patient-safety-alerts)

Advice for Central Alerting System (CAS) officers and risk managers

This is a safety critical and complex National Patient Safety Alert. In response to CHT/2019/001 your organisation should have developed new processes to ensure appropriate oversight and co-ordination of all National Patient Safety Alerts. CAS officers should send this Alert to the executive lead nominated in their new process to coordinate implementation of safety critical and complex National Patient Safety Alerts, copying in the leads identified on page 1.