



Patient Safety Alert

Stage One: Warning

Risk of using different airway humidification devices simultaneously

15 December 2015

Alert reference number: NHS/PSA/W/2015/012

Alert stage: One - Warning

In normal breathing, air is filtered, warmed and moistened by the nose and the upper airway. If the upper airway is bypassed (e.g. in intubated and ventilated patients), it is essential that this natural humidification system is replaced to help prevent lung damage, airway obstruction and lung infection. There are two types of humidification devices in common use:

- heated [water] humidifiers (HHs), usually located between the ventilator and the breathing system (a wet circuit); and
- heat and moisture exchangers (HMEs), placed at the patient's end of the breathing system.

A recent paper [1] highlighted the risk of inadvertently using a HME and a HH simultaneously on a single patient. Without correction, this may lead to airway occlusion as the HME will absorb water and may suddenly become obstructed.

A search of the National Reporting and Learning System (NRLS) identified 76 incidents where a HME had accidentally been left attached to a wet circuit. In many cases the error was not recognised for several hours and caused respiratory distress. One incident seems to have resulted in severe cardiovascular instability and another for the patient to lose consciousness. In some cases nursing staff noticed that patients were deteriorating but they could not always identify the cause of the problem. A typical incident report reads:

"I took handover of my patient from a senior band 5, she informed me that his ventilation had been problematic overnight.... Whilst doing my initial patient safety checks, I immediately noticed that there was an HME filter on the vent circuit, unfortunately this was a wet circuit and therefore it is contraindicated to use an HME.... I was on a day shift and have no idea how long the HME had been in situ but it was extremely sodden which would indicate that it had been there for some time."

Most incidents were related to patients mechanically ventilated via an endotracheal tube. There were also two reports relating to patients on non-invasive ventilation and one relating to a patient with a tracheostomy. Reports suggested that incidents occurred after a patient had been transferred (e.g. from a scan or theatre back to the ward); in these cases it seems that the HME used for the transfer had not been removed when the patient was reconnected to the humidified circuit. There were also reports suggesting that incidents occurred after the ventilator had been set up or the breathing system had been changed.

If using wet humidification, the HME must be removed as it can get saturated with water and block the airway. Safety information about specific products is available in the manufacturer's instructions and it is important that these are available and understood by staff.

Local action taken to prevent incidents included performing routine safety checks, with a particular focus on patients recently transferred on ventilators; and adding the risk to the transport checklist.

Actions

Who:

All organisations providing NHS-funded care where airway humidification devices are being used

When:

As soon as possible and by no later than 2 February 2016

- 1 Identify if incidents involving airway humidification devices have occurred, or could occur, in your organisation.
- 2 Consider if any immediate action needs to be taken locally, and ensure that an action plan is underway, if required, to reduce the risk of such incidents occurring.
- 3 Distribute this Alert to all relevant staff who use airway humidification devices.
- 4 Share any learning from local investigations or locally developed good practice resources by emailing patientsafety.enquiries@nhs.net

See page 2 for technical notes and references.

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Technical notes

NRLS search dates and terms

A NRLS search was undertaken on 23 November 2015 for the key words HME* and heat_moisture_exchange*. In total, 518 incidents were identified and all were reviewed.

It was found that 76 incidents had been reported in which a HME had accidentally been left attached to a 'wet circuit' and these reports were further analysed.

There were 442 incidents that did not describe the simultaneous use of HMEs and HHs but some of which described other risks, for example:

- HMEs becoming obstructed for other reasons (e.g. occluded with sputum or through regular administration of nebulised drugs);
- no artificial humidification device attached to the ventilation system and therefore dry and cold air given to the patient; and
- incorrect set up of breathing system.

Stakeholder engagement

- Safe Anaesthesia Liaison Group (SALG)
- Intensive Care Society
- Faculty of Intensive Care Medicine
- British Society of Critical Care Nurses
- NHS England Surgical Patient Safety Expert Group

For details of the membership of the NHS England Patient Safety Expert Groups see <http://www.england.nhs.uk/ourwork/patientsafety/patient-safety-groups/>

References

1. Doyle A, Mariyaselvam M, Wijewardena G, English N, Gent E, Young P. The simultaneous use of a heat and moisture exchanger and a heated humidifier causes critical airway occlusion in less than 24 hours. Journal of Critical Care; 2015 Aug;30(4):863.e1-3.