

Anaesthetic machine emergency equipment: an audit and completing the loop

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Introduction

Anaesthetists have a responsibility to check anaesthetic machines to ensure that all necessary and emergency equipment is available and functioning. The Association of Anaesthetists provide guidance on checking the anaesthetic machine prior to each operating list and before each case.

Methods

An initial audit of anaesthetic machines in anaesthetic rooms (AR) and operating theatres (OT) was completed in February 2022. The availability of equipment was recorded: oxygen and nitrous oxide cylinders; a spanner to open the oxygen cylinder; a self-inflating bag; equipment for front of neck access; a stethoscope; and a peripheral nerve stimulator (PNS). Following this, the interventions included ordering new equipment, as well as redistributing and labelling existing equipment. A repeat audit was performed in January 2023.

Results

The initial audit demonstrated that 100% of oxygen cylinders were within expiration date; however, only 75% of nitrous oxide cylinders were in date. Furthermore, merely 67% of anaesthetic machines included a spanner to open the oxygen cylinder in an emergency. 83% of theatres contained a self-inflating bag, stethoscope and PNS in either the OT or AR. Following the interventions described, the re-audit demonstrated 100% availability of in date oxygen and nitrous oxide cylinders, spanners, self-inflating bags and stethoscopes.

Conclusions

The initial audit demonstrated that all anaesthetic machines did not have the essential equipment for emergencies and suggested that anaesthetic machine checks were not being adequately performed or actioned. A number of interventions lead to an improvement in results, however, to maintain standards, anaesthetists must continue to monitor availability of equipment.

Introduction

Anaesthetists have a responsibility to check anaesthetic machines to ensure that all necessary and emergency equipment is available and functioning. The Association of Anaesthetists provide guidance on checking the anaesthetic machine prior to each operating list and before each case. The 2012 'Checking Anaesthetic Equipment' guidance includes checking for the presence of a self-inflating bag; ensuring adequate supply of oxygen and other gas cylinders; checking monitoring equipment; and checking the equipment for an unanticipated difficult airway is available.⁽¹⁾ In order to access the oxygen cylinder supply in an emergency, a spanner is required to open the cylinder.

The aim of this audit was to ensure that anaesthetic machines in Huddersfield Royal Infirmary have the appropriate equipment in case of emergency. The secondary aim was to gauge whether anaesthetic machine checks were being performed in line with the Association of Anaesthetists' guidance.

Methods

An initial audit was undertaken in the main theatre complex in Huddersfield Royal Infirmary, including the anaesthetic machines in the anaesthetic rooms (AR) and operating theatres (OT) of the six theatres. This initial data collection in February 2022 involved checking for the presence of a self-inflating bag; in date oxygen and nitrous oxide cylinders on the back of the anaesthetic machine; a spanner to open the oxygen cylinder; emergency front of neck access equipment; a stethoscope; and a peripheral nerve stimulator (PNS).

Following the initial audit, an action plan was launched to rectify the areas where equipment was missing. The interventions included ordering new equipment, as well as redistributing and labelling existing equipment. Spanners and stethoscopes were labelled as 'Th1' or 'Th2' and so on to avoid equipment being misplaced. The presence of expired nitrous oxide cylinders was highlighted. New front of neck access kits were assembled and distributed throughout the theatres.

A repeat audit was performed in January 2023, measuring the same outcomes, to analyse any maintained improvement.



Figure 1.

Figure 1: A spanner required to open the oxygen cylinder on the back of the anaesthetic machine

in an emergency. This has been labelled as 'Th1' to reduce the risk of being misplaced.

Results

The initial audit in February 2022 demonstrated that 100% of oxygen cylinders were within expiration date (12/12 cylinders). However, only 75% of nitrous oxide cylinders were within expiration date (9/12 cylinders). Furthermore, merely 67% (8/12) of anaesthetic machines included a spanner to open the oxygen cylinder in an emergency. The presence of a self-inflating bag, stethoscope and peripheral nerve stimulator was recorded in each theatre, either on the anaesthetic machine in the anaesthetic room or operating theatre; these items were present in 83% (5/6) of theatres. Emergency front of neck access equipment was present in 50% (3/6) theatres in either the anaesthetic room or operating theatre.

Following the interventions described above, the results of the re-audit in January 2023 demonstrated 100% availability of in-date oxygen and nitrous oxide cylinders, spanners, self-inflating bags, peripheral nerve stimulators and stethoscopes. The presence of front of neck access kits increased from 50% (3/6) to 83% (5/6) theatres.

		Initial results	Re-audit
All anaesthetic machines	Oxygen cylinder in date	100%	100%
	Nitrous oxide cylinder in date	75%	100%
	Spanner on oxygen cylinder	67%	100%
Available in anaesthetic room or operating theatre	Self-inflating bag	83%	100%
	Front of neck access kit	50%	83%
	Stethoscope	83%	100%
	Peripheral nerve stimulator	83%	100%

Table 1. *Table 1: Results of the initial audit of equipment availability compared to the re-audit results.*

Discussion

There were a number of limitations in this audit project: the initial audit was carried out in the main theatre complex at Huddersfield Royal Infirmary and improvements were demonstrated in a small-scale project. This could be extended to all theatre complexes in the Calderdale and Huddersfield NHS Foundation Trust. The improvement in results also coincided with a change in peripheral nerve stimulator equipment in theatres and therefore the improvement in number of PNS is unrelated to the initial audit results.

A discussion was prompted regarding the presence of both adult and paediatric self-inflating bags in all theatres. Given that paediatric cases in Huddersfield Royal Infirmary are currently only performed in the acute and trauma theatres, it seemed appropriate that, as a minimum, these specific theatres should have a paediatric self-inflating bag available. The presence of emergency front of neck access kits has since been improved by the issue of new kits which attach more securely to the wall and are clearly labelled.

Conclusions

The initial audit demonstrated that the anaesthetic machines did not have the essential and emergency equipment detailed in the Association of Anaesthetists guidelines. Anaesthetic machine checks should be completed by all anaesthetists, but the results suggest that machine checks were not being adequately performed or actioned. It is possible that anaesthetists rely on the operating department practitioner to check the anaesthetic machine or do not perform all the recommended

checks in the guidance. Emergency front of neck access equipment, self-inflating bags and a cylinder supply of oxygen are, thankfully, rarely needed, but failure to ensure their presence and functionality could have fatal consequences.

A number of simple interventions lead to improvement to near 100% presence of the necessary equipment. However, ongoing regular anaesthetic machine checks are essential to highlight any changes and allow timely correction. Regular departmental re-audit is one method to ensure standards are maintained and remind us of the importance of anaesthetic machine checks.

References

1. Checklist for anaesthetic equipment 2012. *Anaesthesia*. 2012; 66: pages 662-663. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2044.2012.07163.x/abstract> [Accessed: 11/09/2023]