Guideline on checking anaesthesia delivery systems Background Paper

1. Purpose of review

Anaesthesia delivery systems continue to advance as a result of technology accompanied by increasing complexity of systems and their componentry. Delivery systems were originally confined to the administration of gases and volatile anaesthetic agents. Now, however systems are also available for the administration of intravenous anaesthetic and analgesic agents. The inherent risks of anaesthesia delivery systems demand that measures are implemented to detect and prevent faults prior to equipment use.

The document seeks to assist all personnel, whose roles involve interaction with anaesthesia delivery systems, to achieve the highest standards of safety for these systems.

2. Background

This document is intended to apply to all anaesthesia delivery systems, including their individual functional components. It deals with the principles of checking delivery systems and protocols. This document is not intended to provide checklists for the array of specific equipment available from all manufacturers. It is the responsibility of each facility to ensure that specific checklists are available in accordance with manufacturers' guidelines, for each item of equipment relevant to anaesthesia delivery systems.

The principal problems of equipment malfunction are either delivery of inadequate quantities of medications, excessive quantities of medication, incorrect medication or inappropriate airway pressures.

In general terms, equipment failure may result in one or more of the following:

1. Failure of power supply, including battery power in battery operated devices.
2. Failure to supply selected anaesthetic or analgesic medications.
3. Failure of monitoring and alarm devices.
4. Failure to maintain circuit pressures within acceptable limits.

It is essential that each facility designates a suitable individual whose responsibilities include anaesthesia delivery system maintenance, and that this individual be highly accountable for fulfilling this role to the highest level.

Anaesthesia delivery systems may be complex and prone to disconnections, malconnections, leaks, pressurisation or depressurisation, and these may arise at any time before or even during use. Consequently frequent checks are required.

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The level 1 check must be implemented to ensure that equipment performs according to standards as well as manufacturers' specifications. This is a detailed check requiring the expertise of a suitably qualified person to certify that all new equipment, or all equipment following service and repair, achieve the standards and specified levels of performance.

Equally important are the level 2 and level 3 checks. For each level of check, protocols are provided and documentation of these is essential.

The manual "two bag" test in the level 2 check is to be applied to all machines as it exceeds the capabilities of any equipment featuring automated checks. In particular, it is designed to detect obstruction of the expiratory limb of the circle breathing system, a condition not reliably identified by other commonly used tests which focus on eliminating leaks. This is important, as expiratory limb obstruction typically manifests as hypotension and air trapping shortly after induction of anaesthesia, a condition easily mistaken for anaphalaxis.

A protocol for checking electric driven powered devices used for infusion of anaesthetic or analgesic medications has been included, in recognition of the increasing use of infusion pumps.

3. Summary

Anaesthesia delivery systems supply anaesthesia either by the inhalational route or by the intravenous route, and their increasing complexity is attended by potential for malfunction. The goal of this revision is to assist all personnel involved in the care and maintenance of these systems to minimise the likelihood of malfunctions thereby contributing to patient safety and best possible outcomes.

Process of document review

The document development group comprised:

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The following were also consulted:

ANZCA regional/national committees

Faculty of Pain Medicine Board

Faculty of Pain Medicine regional/national committees

ANZCA Trainee Committee

Airway Management Special Interest Group (SIG)

Anaesthesia and Critical Care in Unusual and Transport Environments SIG

Anaesthetists in Management SIG

Cardiothoracic, Vascular and Perfusion SIG

Day Care Anaesthesia SIG

Neuroanaesthesia SIG

Obstetric Anaesthesia SIG

Regional Anaesthesia SIG

Rural SIG

Simulation and Skills Training SIG

Trauma SIG

A revised version of PS31 was promulgated in 2012 for a pilot phase, during which further feedback was sought with a view to producing a definitive version. In 2014, at the close of the pilot phase, guidance regarding the manual "two bag" test was reinstated. As noted above, this test is considered vital as it exceeds the capabilities of any automated checks.

Professional documents of the Australian and New Zealand College of Anaesthetists (ANZCA) are intended to apply wherever anaesthesia is administered and perioperative medicine practised within Australia and New Zealand. It is the responsibility of each practitioner to have express regard to the particular circumstances of each case, and the application of these ANZCA documents in each case. It is recognised that there may be exceptional situations (for example, some emergencies) in which the interests of patients override the requirement for compliance with some or all of these ANZCA documents. Each document is prepared in the context of the entire body of the college's professional documents, and should be interpreted in this way.

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ANZCA website: www.anzca.edu.au