



## Guideline on monitoring during anaesthesia

### 1. Purpose

Clinical observation and assessment by a vigilant anaesthetist is essential for safe patient care during anaesthesia. The purpose of this guideline is to guide practitioners on monitoring standards that should be applied to clinical management in order to optimise patient safety and quality care.

### 2. Scope

The terms “anaesthetist”, “medical practitioner” and “practitioner” are used interchangeably in this document. Although this document is primarily aimed at anaesthetists, any practitioner responsible for patient monitoring during “anaesthesia” should follow these guidelines. The following applies to the management of patients undergoing general anaesthesia, major regional anaesthesia/analgesia or sedation (to be collectively described by the term “anaesthesia”) for diagnostic or therapeutic procedures and should be interpreted in conjunction with other professional documents published by the Australian and New Zealand College of Anaesthetists.

### 3. Background

Monitoring can be defined as “observing and checking progress and quality over a period of time”. It includes clinical observation as well as measurement of applicable and relevant variables, and recording them over a period of time, which for the purposes of these guidelines includes the duration of clinical responsibility. Recording may be either by automated computerised methods or manually.

In principle, monitoring of physiological variables provides information and feedback on the body’s response to therapeutic interventions or changing clinical conditions. This allows fine-tuning of management to achieve optimal outcomes and minimisation of complications.

### 4. Principles

- 4.1 Monitoring of fundamental physiological variables during anaesthesia is essential. Clinical judgment will determine how long this monitoring should be continued following completion of anaesthesia.
- 4.2 The healthcare facility in which the procedure is being performed is responsible for provision of equipment for anaesthesia and monitoring on the advice of one or more designated specialist anaesthetists, and for effective maintenance of this equipment (see *PS55(A) Position statement on minimum facilities for safe administration of anaesthesia in operating suites and other anaesthetising locations*).
- 4.3 Some or all of the recommendations in this document may need to be exceeded depending on the results of the patient assessment at the pre-anaesthesia consultation (see *PG07(A) Guideline on pre-anaesthesia consultation and patient preparation*).

- 4.4 Monitoring equipment must always be used in conjunction with careful clinical observation by the anaesthetist as there are circumstances in which equipment may not detect unfavourable clinical developments.
- 4.5 Visual and audible alarms on anaesthesia equipment must be enabled at the commencement of anaesthesia. Alarms should only be disabled under exceptional circumstances (for example, cardiopulmonary bypass surgery where the patient is rendered apnoeic and pulseless) but those alarms should be made operational as soon as practicable.

## **5. Clinical observation and monitoring by an anaesthetist**

- 5.1 Clinical observation and assessment by a vigilant anaesthetist is essential for safe patient care during anaesthesia. This person cannot be the practitioner performing the procedure (see *PG09(G) Guideline on sedation and/or analgesia for diagnostic and interventional medical, dental or surgical procedures*). Clinical monitoring should be supplemented with monitoring devices as necessary, to assist the practitioner responsible for the anaesthesia.
- 5.2 A medical practitioner whose sole responsibility is the provision of anaesthesia care for that patient must be constantly present from induction of anaesthesia until safe transfer to recovery room staff or intensive care unit has been accomplished (see *PS02(A) Position statement on credentialling and defining the scope of clinical practice in anaesthesia* and the relevant ANZCA training and accreditation handbook).
- 5.3 In exceptional circumstances brief absences of the anaesthetist primarily responsible for managing anaesthesia may be unavoidable. In such circumstances observation, including recording of observations of the patient and a plan for responding to significant perturbations in monitored physiological variables, must be temporarily delegated to a suitably trained and skilled practitioner who is judged to be competent for the task.
- 5.4 Permanent handover of responsibility, when required, must be to an anaesthetist who is able to accept continued responsibility for the care of the patient (see *PS53(A) Position statement on the handover responsibilities of the anaesthetist*).
- 5.5 The anaesthetist responsible for monitoring the patient should ensure that all monitoring equipment that may be required is available. Some procedures necessitate special monitoring (for example, magnetic resonance imaging) or remote monitoring to reduce the hazard to staff (for example, radiological procedures) (see *PS55(A) Position statement on minimum facilities for safe administration of anaesthesia in operating suites and other anaesthetising locations*).
- 5.6 The monitoring of a patient undergoing any type of anaesthesia should include regular assessment and recording of the following:
  - 5.6.1 Circulation - by detection of the arterial pulse and supplemented by measurement of arterial blood pressure. Where blood pressure monitoring is omitted this decision must be clinically justifiable. The intervals between recordings of this data will depend on clinical circumstances and the stability of the patient but should be no less frequent than every 10 minutes.
  - 5.6.2 Ventilation - must be monitored continually.
  - 5.6.3 Oxygenation - in conjunction with clinical observation of the patient. Adequate lighting must be available to aid with assessment of patient colour.

## 6. Monitoring equipment

In general, monitoring equipment aids the clinical assessment of a patient and the following equipment should be available for use during anaesthesia. However, depending on the type of anaesthesia, some of these monitors are mandatory (please refer to those specific monitors). When the monitors are in use, the alarms (visual and audible) must be enabled (see item 4.5). The audible component of the alarm system must be able to be easily heard by the practitioner responsible for the anaesthesia. When any of the monitors of physiological function are in use during anaesthesia, regular recordings should be documented in the anaesthesia record either manually or using an automated electronic record keeping system (See also *PG06(A) Guideline on the anaesthesia record*).

### 6.1 Oxygen

- 6.1.1 Oxygen analyser - A device incorporating an audible signal to warn of low oxygen concentrations, correctly fitted in the breathing system, must be in continuous operation for every patient when an anaesthesia breathing system is in use.
- 6.1.2 Pulse oximeter - Pulse oximetry provides evidence of the level of oxygen saturation of the haemoglobin of arterial blood at the site of application and identifies arterial pulsation. A pulse oximeter must be in use for every patient undergoing general anaesthesia or sedation. When this particular monitor is in use, the variable pulse tone as well as the low threshold alarm shall be appropriately set and audible to the practitioner responsible for the anaesthesia.

### 6.2 Ventilation

- 6.2.1 Breathing system disconnection or ventilator failure alarm - When an automatic ventilator is in use, a monitor capable of warning promptly of a breathing system disconnection or ventilator failure must be in continuous operation. This must be automatically activated.
- 6.2.2 Carbon dioxide monitor - A monitor of the carbon dioxide level in inhaled and exhaled gases must be in use for every patient undergoing general anaesthesia and should be immediately available for any patient undergoing sedation.

### 6.3 Cardiovascular

- 6.3.1 Electrocardiograph (ECG) - Equipment to monitor and continually display the electrocardiograph must be available for every anaesthetised patient. The ECG should be used for patients undergoing general and major regional anaesthesia as clinically indicated.
- 6.3.2 Intermittent non-invasive blood pressure monitor - Equipment to provide intermittent non-invasive blood pressure monitoring must be available for every patient undergoing anaesthesia; whenever such monitors are applied blood pressure must be measured and recorded during anaesthesia at intervals as indicated in 5.6.1 above. A variety of cuff sizes must be available.
- 6.3.3 Continuous invasive blood pressure monitor - Equipment to provide continuous invasive blood pressure monitoring should be available. This generally refers to a monitor connected via a transducer to an intra-arterial line.

- 6.4 Monitoring of anaesthetic effect on the brain - When clinically indicated, equipment to monitor the anaesthetic effect on the brain should be available for use on patients, especially those at high risk of awareness, during general anaesthesia.

- 6.5 Inhalational anaesthetic agent monitor - to identify and monitor the inspired and end-tidal concentration of inhalational anaesthetics must be in use for every patient undergoing general anaesthesia from an anaesthesia delivery system where inhalational anaesthetic agents are delivered.
- 6.6 Temperature monitor - to monitor “core” temperature continuously must be available for every patient undergoing general anaesthesia. Temperature monitoring should be used whenever warming devices are being used.
- 6.7 Neuromuscular function monitor – Quantitative neuromuscular function monitoring must be available for every patient in whom neuromuscular blockade has been induced and should be used whenever the anaesthetist is considering extubation following the use of non-depolarising neuromuscular blockade.
- 6.8 Other equipment - When clinically indicated, equipment to monitor other physiological variables (for example the electroencephalogram, central venous pressure, cerebral oximetry, transoesophageal echocardiogram, cardiac output or respiratory mechanics) should be available.

**This document is accompanied by a background paper (PG18(A)BP) which provides more detailed information regarding the rationale and interpretation of the Guideline.**

#### **Related ANZCA documents**

PS02(A) Position statement on credentialling and defining the scope of clinical practice in anaesthesia

PG03(A) Guideline for the management of major regional analgesia

PG06(A) Guideline on the anaesthesia record

PG07(A) Guideline on pre-anaesthesia consultation and patient preparation

PG09(G) Guideline on sedation and/or analgesia for diagnostic and interventional medical, dental or surgical procedures

PS53(A) Position statement on the handover responsibilities of the anaesthetist

PS55(A) Position statement on minimum facilities for safe administration of anaesthesia in operating suites and other anaesthetising locations

ANZCA handbook for training

ANZCA handbook for accreditation

ANZCA Handbook for Training and Accreditation in the Affiliated Training Regions

#### **Further reading**

Canadian Anesthesiologists’ Society. Patient monitoring. In: Guidelines to the practice of anaesthesia. Toronto: Canadian Anesthesiologists’ Society, latest edition. From: <http://www.cas.ca/English/Guidelines>. Accessed 15 April 2015.

Committee on Standards and Practice Parameters, American Society of Anesthesiologists. Standards for basic anaesthetic monitoring. Park Ridge: American Society of Anesthesiologists, latest edition. From: <http://www.asahq.org>. Accessed 12 October 2015.

Short TG, O'Regan A, Lew J, Oh TE. Critical incident reporting in an anaesthetic department quality assurance programme. *Anaesthesia* 1992(47)3-7.

Association of Anaesthetists of Great Britain & Ireland. Recommendations for standards of monitoring during anaesthesia and recovery. London (2015). From:  
[http://www.aagbi.org/sites/default/files/Standards\\_of\\_monitoring\\_20150812.pdf](http://www.aagbi.org/sites/default/files/Standards_of_monitoring_20150812.pdf) Accessed 13 September 2015.

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