



Guidelines on Monitoring in Anaesthesia

Version	Effective Date
1	OCT 1992
2	FEB 2002
3	APR 2012
4	JUL 2013
5	MAY 2017

Document No.	HKCA – P1 – v5
Prepared by	College Guidelines Committee
Endorsed by	HKCA council
Next Review Date	2022



Table of Contents

	Page
1. Introduction	3
2. Personnel	3
3. Clinical Monitoring of the Patient	4
4. Monitoring Equipment	5
5. Emergency Circumstances	8
6. Postanaesthetic Recovery	8
7. References	8



1. INTRODUCTION

1.1 The Hong Kong College of Anaesthesiologists recommends the monitoring of certain fundamental physiological variables during anaesthesia. Clinical judgement will determine how long monitoring should be continued following completion of anaesthesia.

1.2 The following recommendations refer to patients undergoing general anaesthesia, major regional anaesthesia and monitored anaesthetic care (where relevant) for diagnostic or therapeutic procedures and should be interpreted in conjunction with other policy documents published by the Hong Kong College of Anaesthesiologists.

1.3 Some, or all, of these basic recommendations will need to be exceeded depending on the physical status of the patient, the type and complexity of the surgery to be performed, and the requirements of anaesthesia.

1.4 Monitoring must always be used in conjunction with careful clinical observation by the anaesthesiologist as there are circumstances in which equipment may not detect unfavourable clinical developments.

1.5 Visual and audible alarms must be appropriate and enabled at the commencement of anaesthesia by the anaesthesiologist. There may be exceptional circumstances where this may not be achievable (e.g. cardiopulmonary bypass surgery where the patient is rendered apnoeic and pulseless) but those alarms should be made operational as soon as practicable.

1.6 The health care 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 anaesthesiologists, and for effective maintenance of this equipment. Equipment need to have been checked as safe before use on patients.

2. PERSONNEL

2.1 Clinical monitoring by a vigilant and diligent anaesthesiologist is the basis of patient care during anaesthesia. This should be supplemented by appropriate



devices to assist the anaesthesiologist.

2.2 The person who monitors the patient must be a medical practitioner with appropriate training in anaesthesia whose sole responsibility is the provision of anaesthetic care for that patient. This person cannot be the practitioner performing the procedure. The person should be familiar with all the equipment he intends to use and has followed any specific checking procedures recommended by individual manufacturers.

2.3 The anaesthesiologist who monitors the patient must be constantly present from induction of anaesthesia until safe transfer to the post-anaesthetic care unit or intensive care unit has been accomplished. In exceptional circumstances, that person shall delegate, briefly, observation of the patient to an appropriately qualified person who is judged to be competent for the task. The primary anaesthesiologist should remain contactable by the relieving personnel and return instantly to patient if required.

2.4 The individual anaesthesiologist, being responsible for monitoring the patient, should ensure that appropriate monitoring equipment is available. Where there is an environmental risk to staff, e.g. radiation, adequate facilities must exist to enable remote patient monitoring.

3. CLINICAL MONITORING OF THE PATIENT

3.1 The clinical monitoring of a patient undergoing any type of anaesthesia should include regular assessment and recording of the following:

3.1.1 Circulation

3.1.1.1 The circulation must be monitored at frequent and clinically appropriate intervals by detection of the arterial pulse and measurement of the arterial blood pressure.

3.1.2 Ventilation

3.1.2.1 Ventilation must be monitored continuously by both direct and indirect means. A stethoscope should be available in every operating room and anaesthetizing location.

3.1.3 Oxygenation



3.1.3.1 The patient must be observed at frequent intervals for evidence of central cyanosis. The displayed values of an oximeter must be interpreted in conjunction with observation of the patient. Adequate lighting must be available to aid with assessment.

4. MONITORING EQUIPMENT

4.1 In general, monitoring equipment aids the clinical assessment of a patient. Depending on the type of anaesthesia, some of these monitors are mandatory.

4.2 Minimal monitoring devices must be attached before induction of anaesthesia and their use continued until the patient has recovered from the effects of anaesthesia. During induction of anaesthesia in children and in uncooperative adults, it may not be feasible to attach all monitoring before induction. In these circumstances, monitoring must be attached as soon as possible and the reasons for delay recorded.

4.3 When the monitors are in use on a patient, the alarms (visual and audible) must be enabled and appropriate (refer section 1.5). The audible component of the alarm system must be able to be heard by the practitioner responsible for the anaesthesia.

4.4 When any of the monitors of physiological function are in use during anaesthesia, regular recordings should be documented in the anaesthesia record. Minimum monitoring data, for example, heart rate, blood pressure, peripheral oxygen saturation, end-tidal carbon dioxide and anaesthetic vapour concentration (if volatile anaesthetic agents or nitrous oxide are used) must be recorded at least every five minutes, and more frequently if the patient is clinically unstable.

4.5 The following equipment must be available for every patient under any type of anaesthesia:

4.5.1 Pulse Oximeter

4.5.1.1 Pulse Oximeter must be in use for every patient under 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



4.5.2 Electrocardiograph.

4.5.2.1 A 5-lead option should be available

4.5.3 Intermittent Non-invasive Blood Pressure Monitor

4.5.3.1 A variety of cuff sizes must be available.

4.6 The following equipment are mandatory for general anaesthesia:

4.6.1 Oxygen Supply Failure Alarm

4.6.1.1 An automatically activated device to monitor oxygen supply pressure and to warn of low pressure must be fitted to the anaesthetic machine.

4.6.2 Oxygen Analyzer/Monitor

4.6.2.1 A device incorporating an audible and visual signal to warn of low oxygen concentrations, correctly fitted in the breathing system, must be in continuous operation for every patient when an anaesthetic breathing system is in use.

4.6.3 Volatile Anaesthetic Agent Concentration Monitor

4.6.3.1 Equipment to monitor the concentration of inhaled anaesthetics must be in use for every patient undergoing general anaesthesia from an anaesthetic delivery system where volatile anaesthetic agents are available. Automatic agent identification should be available on newly acquired monitors.

4.6.4 Monitor for Ventilation and Alarms for Ventilation Failure

4.6.4.1 When an automatic ventilator is in use, airway pressure, tidal volume and respiratory rate must be monitored. A device capable of warning promptly of presence of high or continuous airway pressure, breathing system disconnection or ventilator failure must be in continuous operation. It is desirable that this device be automatically activated.

4.6.5 Carbon Dioxide Monitor

4.6.5.1 A monitor of the carbon dioxide level in inhaled and exhaled gases must be in use for every patient undergoing general anaesthesia or deep sedation, except in certain circumstances capnography monitoring is



not feasible, for example during high frequency jet ventilation.

4.6.6 Monitor of Cuff Pressure of Airway Device

4.6.6.1 Cuff pressure of airway devices, for example, endotracheal tube and laryngeal mask, should be monitored regularly throughout the operation.

4.7 The following equipment could be useful in some circumstances:

4.7.1 Continuous Invasive Blood Pressure Monitor

4.7.1.1 Equipment to provide continuous invasive blood pressure monitoring should be available where appropriate. In most cases, this refers to a monitor connected via a transducer to an intra-arterial line.

4.7.2 Temperature Monitor

4.7.2.1 Equipment to monitor 'core' temperature continuously must be applied for all patients undergoing general anaesthesia, in which the procedure lasts longer than 30 minutes.

4.7.3 Neuromuscular Function Monitor

4.7.3.1 Monitoring of neuromuscular function must be available for those patients in whom neuromuscular blockade has been induced and should be used whenever the anaesthetist is considering extubation following the use of non-depolarizing neuromuscular blockade.

4.7.4 Monitoring of anaesthetic effect on the brain

4.7.4.1 When clinically indicated, equipment to monitor the anaesthetic effect on the brain should be applied, especially for patients at high risk of awareness, for example, those under total intravenous anaesthesia with muscle relaxant used.

4.7.5 Other Equipment

4.7.5.1 When clinically indicated, equipment to monitor other physiological variables (e.g. the electroencephalogram, central venous pressure, trans-esophageal echocardiogram, cardiac output or respiratory mechanics) should be available.



5. EMERGENCY CIRCUMSTANCES

5.1 Immediate life support measures are the first priority in emergency circumstances. Appropriate monitoring as described in these recommendations should be instituted as soon as practicable.

6. POSTANAESTHETIC CARE

6.1 The anaesthesiologist should issue clear instructions concerning monitoring of post-anaesthetic care when handing over the patient to post-anaesthetic care unit (PACU) staff. Appropriate monitoring facilities should be available in the PACU.

6.2 In the unusual circumstance that a patient is transferred to general ward with arterial line, e.g. waiting for ICU/HDU bed in general ward or pending CT scan for consideration of re-operation, it is essential to properly handover the plan and care of such line.

7. REFERENCE

- Guidelines on Monitoring During Anaesthesia. Australian and New Zealand College of Anaesthetists. PS18 (2015)
- Checketts MR, et al. Recommendations for Standards of Monitoring During Anaesthesia and Recovery 2015: Association of Anaesthetists of Great Britain and Ireland. *Anaesthesia* 2016; 71: 85-93.
- Standards for Basic Anesthetic Monitoring. The ASA House of Delegates. (2015)