Minimal Monitoring Standards in the Perioperative Period

SECTION and BOARD OF ANAESTHESIOLOGY
EUROPEAN UNION OF MEDICAL SPECIALISTS

Overview
Clearly identified standards of monitoring must be employed whenever a patient undergoes Monitored Anaesthetic Care, Local, or General Anaesthesia for an operative procedure. These are minimum standards, irrespective of the duration or location of anaesthesia.

1. Provision, maintenance, calibration and renewal of equipment is an institutional responsibility.
2. Qualified anaesthetic personnel must be present during the perioperative period.
3. The anaesthetist must ensure that all equipment has been checked before use. Alarm limits for all equipment must be set appropriately before use. Audible alarms must be enabled during anaesthesia
4. Core monitoring devices must be attached before induction of anaesthesia, and their use continued until the patient has recovered from the effects of anaesthesia. Additional monitoring may be necessary as deemed appropriate by the anaesthetist.
5. A brief interruption of monitoring is only acceptable if the recovery area is immediately adjacent to the operating theatre. Monitoring should be continued during transfer to the same degree as any other intra- or inter-hospital transfer.
6. A summary of information, either manual or electronic, provided by monitoring devices must be recorded on the anaesthetic record.

STANDARD I:
Provision, maintenance, calibration and renewal of equipment is an institutional responsibility
The institution is responsible for the provision and maintenance of the anaesthetising location and for the provision, maintenance and renewal of anaesthetic and monitoring equipment that meets current published equipment standards.
The department of anesthesia is responsible for advising the institution on the procurement of monitoring equipment and for establishing policies for monitoring to help ensure patient safety.
The institution must also ensure that all anaesthetic and monitoring equipment undergoes regular inspection and maintenance by qualified personnel.

STANDARD II:
Qualified anaesthetic personnel must be present during the perioperative period
Rapid changes in patient status occur during the perioperative period, both due to the operative procedure, and as a consequence of anaesthetic agents. Due care must be taken to ensure that each patient is adequately observed by a suitably trained person following an established protocol.
Qualified anaesthesia personnel, of appropriate experience, should be continuously present during the perioperative period.
In the event there is a direct known hazard, e. g., radiation, to the anesthesia personnel that might require intermittent remote observation of the patient, provision for remote monitoring of the patient must be made available.
Local circumstances may dictate that handing over of responsibility for patient care under anaesthetic may be necessary. If so, hand-over time must be sufficient to appraise the incoming anaesthetist of all information concerning the patient's condition. The time and details of the hand-over must be noted in the anaesthetic record.
In the event that an emergency requires the temporary absence of the person primarily responsible for the anesthetic, the best judgment of the anaesthetist must be exercised in comparing the emergency with the anesthetized patient's condition, and in the selection of the person left responsible for the anaesthetic during the temporary absence. If the anaesthetist leaves the operating room temporarily, he must delegate care of the patient to another member of the Anaesthetic Department, of appropriate experience. Before delegating care, the primary anesthetist must ensure that the anesthesia assistant is familiar with the operative procedure, the operating room environment and equipment, and that the patient's condition is stable.

STANDARD III:
The anaesthetist must ensure that all equipment has been checked before use. Alarm limits for all equipment must be set appropriately before use. Audible alarms must be enabled during anaesthesia
It is the responsibility of the anaesthetist to check all equipment before use. Anaesthetists must ensure that they are familiar with all equipment that they intend to use and that they have followed any specific checking procedure recommended by individual manufacturers. More complex equipment will require more formal induction and training in its use.
Anaesthetists must ensure that all alarms are set at appropriate values. The default alarm settings incorporated by the manufacturer are often inappropriate and during the checking procedure the anaesthetist must review and reset the upper and lower limits as necessary. Audible alarms must be enabled when anaesthesia commences.
Alarms for oximetry and capnography should not be disabled during the conduct of an anaesthetic except during unusual circumstances. The low-threshold alarm of the pulse oximeter and the capnograph apnoea alarm must give an audible signal. Audible alarms for oximetry and capnography should not be indefinitely disabled during the conduct of an anaesthetic.
When intermittent positive pressure ventilation is used during anaesthesia, airway pressure alarms must also be used to detect excessive pressure within the airway and also to give warning of disconnection or leaks. The upper and lower alarm limits must be reviewed, and set appropriately before anaesthesia commences.
When administering solutions using an infusion pump, alarm

settings and infusion limits must be verified and set to appropriate levels before commencing anaesthesia

STANDARD IV:
Core monitoring devices must be attached before induction of anaesthesia and their use continued until the patient has recovered from the effects of anaesthesia. Additional monitoring may be necessary as deemed appropriate by the anaesthetist.
The only indispensable monitor is the presence, at all times, of an anaesthetist or an anaesthesia assistant, under immediate supervision. Mechanical and electronic monitors are, at best, aids to vigilance. Such devices assist the anaesthetist to ensure the integrity of the vital organs and, in particular, the adequacy of tissue perfusion and oxygenation. Appropriate clinical observations may include mucosal colour, pupil size, response to surgical stimuli and movements of the chest wall and/or the reservoir bag. The anaesthetist should undertake palpation of the pulse, auscultation of breath sounds and, where appropriate, measurement of urine output and blood loss. A stethoscope must always be available.

Oxygen Supply
The use of an oxygen analyser with an audible alarm is essential during anaesthesia. It must be placed in such a position that the composition of the gas mixture delivered to the patient is monitored continuously. The positioning of the sampling port will depend on the breathing system in use.

Pulse Oximetry
Pulse oximetry is the non-invasive measurement of the ratio of oxyhaemoglobin to deoxyhaemoglobin, measured by optical plethysmography and spectroscopy. It is obtained by transilluminating pulsatile capillary beds. The pulse oximeter should be the first monitor placed on the patient, and the last one removed.

Non-invasive Blood Pressure Monitoring
Blood pressure monitoring is fundamental to determine the effects of anaesthetic agents on the patient's cardiovascular system. Blood pressure is monitored non-invasively either manually (auscultatory method) or with an automated device (oscillometric method).

Electrocardiogram
An ECG is a surface recording of the electrical activity of the myocardium, and is created by connecting various electrodes through which electrical potentials are measured. Although the three-lead system is adequate, a five lead system is preferable. By monitoring lead II and lead V5 simultaneously, optimum information can be obtained.

Capnography
Continual end-tidal carbon dioxide analysis using capnography should be used from the time of endotracheal tube/laryngeal mask placement, until extubation/removal or transfer to a postoperative care location.

Vapour Analyser
The use of an agent-specific vapour analyser is essential during whenever a volatile anaesthetic agent is in use.

Airway Pressure Monitor
An airway pressure monitor should alarm if the measured pressure in the anaesthetic circuit fails to reach a predetermined level. The alarm limits should be set appropriately for each patient.

Infusion Devices
When any compound (hypnotic, analgesic, muscle relaxant) is administered by infusion, the infusion device unit must be checked before use. The infusion site should be secure and preferably visible, to verify that these drugs are delivered to the patient.

CORE MONITORING IN THE PERIOPERATIVE PERIOD

The following is the core monitoring essential to the safe provision of anaesthesia. If it is necessary to continue anaesthesia without a particular device, the anaesthetist must clearly record the reasons for this in the anaesthetic record.

Induction and Maintenance of General Anaesthesia
1. Pulse oximeter
2. Non-invasive blood pressure monitor
3. Electrocardiograph
4. Airway gases: oxygen, carbon dioxide and vapour
5. Airway pressure

The following must also be available:
• A nerve stimulator whenever a muscle relaxant is used.
• A means of measuring the patient's temperature.
During induction of anaesthesia in children and in uncooperative adults it may not be possible to attach all monitoring before induction. In these circumstances monitoring must be attached as soon as possible and the reasons for delay recorded in the patient's notes.

Regional Techniques & Sedation for Operative Procedures
Patients must have appropriate monitoring, including a minimum of the following devices.
1. Pulse oximeter
2. Non-invasive blood pressure monitor
3. Electrocardiograph

During regional anesthesia and monitored anesthesia care, the adequacy of ventilation must be evaluated by continual observation of qualitative clinical signs and/or monitoring for the presence of exhaled carbon dioxide.

Recovery from Anaesthesia
A high standard of monitoring should be maintained until the patient is fully recovered from anaesthesia.
A Postanesthesia Care Unit (PACU), or an area which provides equivalent care, should be available to receive patients after surgery and anesthesia. All patients who receive general anesthesia, sedation and/or major regional anaesthesia should be admitted to the PACU or equivalent area.
The following core monitoring devices must supplement clinical observations:
1. Pulse oximetry
2. Electrocardiograph
3. Non-invasive blood pressure monitoring

The following must also be immediately available:
• Electrocardiograph
• Nerve stimulator
• Means of measuring temperature
• Capnograph

Additional Monitoring

The decision to apply additional monitoring should be made by the anaesthetist on a case-by-case basis, depending on the individual patient, and the nature of the procedure. Some patients will require additional, mainly invasive, monitoring, e. g. vascular or intracranial pressures, cardiac output, or biochemical variables.

Intra-arterial blood pressure monitoring is indicated when there may be rapid changes in blood pressure, large fluid shifts, when arterial blood gas analysis will be required, or where the patient's condition warrants.

Central venous pressure monitoring is used as a guide for fluid management as a guide to right ventricular preload. A central venous catheter can also facilitate insertion of a pulmonary artery catheter. This will facilitate measurement of Pulmonary Arterial Pressure, as well as intermittent measurement of Pulmonary Capillary Wedge Pressure. Cardiac Output as well as other haemodynamic variables can be calculated.

Routine use of devices designed to reduce the frequency of intra-operative awareness or to monitor depth of anaesthesia using adaptations of either surface EEG monitoring or auditory evoked potentials, is not yet considered as part of our recommended core monitoring standards. The decision to use a brain function monitor should be made on a case-by--case basis by the individual practitioner for selected patients.

STANDARD V:

A brief interruption of monitoring is only acceptable if the recovery area is immediately adjacent to the operating theatre. Monitoring should be continued during transfer to the same degree as any other intra- or inter-hospital transfer

The anaesthetist is responsible for ensuring that this transfer is accomplished safely.

If the recovery area is not immediately adjacent to the operating theatre, or if the patient's general condition is poor, adequate mobile monitoring of the above parameters will be needed during transfer.

It is essential that the standard of care and monitoring during transfer is as high as that applied in the controlled operating theatre environment and that personnel with adequate knowledge and experience accompany the patient. The patient should be physiologically as stable as possible prior to departure.

Prior to transfer, appropriate monitoring must be commenced. Oxygen saturation and non-invasive blood pressure should be monitored in all patients and an ECG must be attached. Intravascular or intracranial pressure monitoring may be necessary in special cases. A monitored oxygen supply of known content sufficient to last the maximum duration of the transfer is essential for all patients. If the patient's lungs are mechanically ventilated, expired carbon dioxide should be monitored continuously. Airway pressure, tidal volume and respiratory rate must also be monitored when the lungs are mechanically ventilated.

STANDARD VI:

A summary of information, either manual or electronic, provided by monitoring devices must be recorded on the anaesthetic record.

A pre-anesthetic checklist should be completed prior to initiation of anesthesia.

Accurate records of the measurements provided by monitors must be kept. It has become accepted that *core data* (heart rate, BP and peripheral oxygen saturation) should be recorded at intervals no longer than every five minutes, and more frequently if the patient is clinically unstable. It is recognised that contemporaneous records may be difficult to keep in emergency circumstances. Electronic record keeping systems are now becoming more widely available.

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HORIZONTY PREVENTIVNÍ GERONTOLOGIE PRO LÉKAŘE V PRAXI

konaný v rámci 30. ročníku mezinárodního zdravotnického veletrhu Pragomedica 2008

ve spolupráci s

Českou gerontologickou a geriatrickou společností ČLS JEP
Společností všeobecného lékařství ČLS JEP
1. lékařskou fakultou Univerzity Karlovy v Praze
Slovenskou lekárskou spoločností

DATUM A MÍSTO KONÁNÍ
16. dubna 2008, Hotel Olympik, Sokolovská 138, Praha 8

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