

Quality and safety guidelines of postanaesthesia care

Working Party on Post Anaesthesia Care (approved by the European Board and Section of Anaesthesiology, Union Européenne des Médecins Spécialistes)

Laszlo Vimlati^a, Fernando Gilsanz^b and Zeev Goldik^c

Postanaesthesia care units are standard parts of hospital care in most European Union countries. Their main purpose is to identify and immediately treat early complications of surgery or anaesthesia, before they develop into deleterious problems. This review, prepared by the Working Party on Post Anaesthesia Care of the European Board of Anaesthesiology.* European Union of Medical Specialists (Union Européenne des Médecins Spécialistes) and approved by the European Board and Section of Anaesthesiology, gives recommendations on relevant aspects of organization, responsibilities, methods, safety and quality control of postanaesthesia care. *Eur J Anaesthesiol* 26:715–721 © 2009 European Society of Anaesthesiology.

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^aDepartment of Anaesthesia and Intensive Care, University of Szeged, Szeged, Hungary, ^bHospital Universitario La Paz, Madrid, Spain and ^cCarmel Medical Center, Post Anaesthesia Care Unit, Haifa, Israel

Correspondence to Laszlo Vimlati, Department of Anaesthesia and Intensive Care Medicine, University of Szeged, Semmelweis str. 6, 6725 Szeged, Hungary
E-mail: vimlati@orto.szote.u-szeged.hu

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1. Purpose of guideline for postanaesthesia care:

To improve postanaesthesia care outcomes for patients who have just had anaesthesia or obstetric care or sedation or analgesia care. This is accomplished by evaluating available evidence and providing recommendations for patient assessment, monitoring and management with the goal of optimizing patient safety. It is expected that each recommendation will be individualized according to the needs of each patient.

2. Definition of postanaesthesia care:

Activities undertaken to safely manage the patient following completion of a surgical procedure and the concomitant primary anaesthetic care, including identification and immediate treatment of early complications of both anaesthesia and surgery before they develop into deleterious consequences.

3. Definition of postanaesthesia care unit:

A unit located as close to operating theatres as possible in order to avoid unnecessary time loss for transfer of unstable patients, staffed and equipped for serving for treatment and care of patients during their immediate postanaesthesia or post surgery period, regardless of the type of interventions, before they are scheduled to be admitted to general wards, other units of the hospital or discharged home. Postanaesthesia care units (PACUs) have to be standards in most hospitals of European countries [1,2].

4. Functions of PACU [1–4]

- immediate postoperative treatment in the PACU,
- preoperative optimization of severely ill patients' conditions in special situations,
- titration and optimization of acute pain therapy,
- buffer before intensive care unit (ICU), high dependency unit (HDU) or ward admission,
- evaluation and determination of further treatment on ICU, HDU or ward,
- improve or optimize patient's condition for further treatment at ICU, HDU or ward.
- **responsibilities:** separated by profession and by responsibilities although cooperative as well:
 - **the anaesthetist:** during the recovery period, the patient should still be under the supervision of the anaesthetist. His or her main tasks during recovery period:
 - monitoring and maintenance of vital functions,
 - professional and organizational responsibilities in the PACU,
 - to be present or urgently available immediately if it seems necessary.
 - **the surgeon:**
 - should be notified whenever any possible surgical complications may require his intervention,

- has to be available for urgent consultation if it seems necessary.
5. **Who runs the PACU?** The majority of PACUs in Europe are run by anaesthesiologists, and the responsibility for care is also devoted to the anaesthesiologist [4].
6. **Patients admitted to the PACU:** exclusively post-anaesthesia or post(perio)operative patients.
7. **Transfer from operating room to PACU:**
- By suitably trained staff,
 - Under the supervision of an anaesthetist,
 - Portable monitoring is recommended if alteration or deterioration of patient's condition may be anticipated or the distance of operating room and PACU makes it reasonable,
 - Steps should be taken to protect the patient during transfer mainly from:
 - traumatic injury,
 - hypoxia,
 - hypothermia,
 - soiling of the airway,
 - accidental disconnections or removal of drains, lines, and catheters.
 - Properly designed transfer trolleys or beds are needed [5], equipped with:
 - oxygen cylinders, masks, and tubing,
 - infusion poles,
 - equipment(s) to secure and support airway and assist ventilation;
 - provision of clamps for drainage tubes,
 - protective 'sides',
 - a means to produce head-down tilt.
 - Handover: on arrival to the receiving unit [6]
 - full and formal handover should take place from professional to professional,
 - with a completed anaesthetic record together with important details of surgery,
 - with specific verbal and written instructions for postoperative care,
 - drugs and fluid regimens must be written on appropriate charts,
 - the anaesthetist should ensure that recovery staff is taking over the responsibility before leaving the patient.
 - *Observation and record keeping:* each patient must be kept under continuous clinical observation during transport. Physiological parameters should be measured and recorded at regular intervals.
8. **Transfer from PACU to the ward:**
- A formal 'checklist' is highly recommended for the staff to satisfy themselves that the patient is fit to be discharged from recovery area [7].
 - Documentation accompanying the patient should include instructions for:
 - supplemental oxygen,
 - fluid therapy,
 - analgesic and antiemetic regimens,
 - monitoring, if it differs from normal practice of the receiving unit,
 - physiotherapy,
 - nursing care provisions.
9. **Minimal requirements and recommendations:**
- 9.1. **Area, location, capacity and working time** [1,4,5]:
- Generally, 12–15 m² per bed as a minimum is recommended in order to provide undisturbed access to beds for nursing, therapy and emergencies. Open areas provide better view and access to all patients, whereas bays provide more privacy. Equipments can also be used more economically in an open area.
 - Location: as close to the operating theatres as possible in order to avoid unnecessary time loss for transfer of unstable patients if interventions are necessary. If a hospital has more separated operating suites, each suite needs to have its own PACU, staffed and equipped properly.
 - Capacity: generally and on an average, 1.5–2 patients for each operating table but strongly and inversely dependent on typical duration of surgery: less if long-lasting procedures are dominant with slower patient turnover and more if short procedures or day case surgery is performed.
 - Length of stay: strongly dependent on dominating type of surgery and capacity of other wards of the hospital, usually less than 6–12 h but usually no more than 24 h, (but the last rule may sometimes be overwritten by special needs).
 - Working time: 24 h working time is recommended but not necessarily. It depends on the ratio of elective surgery and availability of ICU or HDU. PACU can be closed at a certain time, usually during night, if surgical schedule makes it possible and duties can be taken over temporarily by other units such as ICUs. In questionable situations, the responsibility of decision should concern the anaesthesiologist.
- 9.2. **Equipments and facilities** [5,8,9]:
- *Bedside monitoring devices at place:*
 - pulse oxymeter,
 - ECG,
 - noninvasive blood pressure (BP) monitor.
 - *Immediately available monitoring devices:*
 - ECG recording,
 - capnograph,
 - nerve stimulator,
 - means of measuring temperature.
 - *Specific additional monitoring* (e.g. vascular or intracranial pressures, cardiac output or some biochemical variables):
 - may be required and should be performed on a case-by-case basis for selected patients or selected procedures.

- *Mobile monitoring:*
 - If PACU is not immediately adjacent to the operating theatre, or if the patient's general condition is unstable, adequate 'mobile monitoring' of above parameters is needed during transfer.
 - It is the anaesthetist's responsibility to ensure that transfer is accomplished safely.
- *Central monitor station:*
 - It controls and records all warnings and alarms of bedside monitors and provides documentation in the form of hard copies, and is therefore recommended.
- *Facilities needed:*
 - defibrillator and resuscitation trolley appropriately supplied,
 - difficult airway devices,
 - immediate access to blood gas analysis and acute laboratory testing,
 - access to mobile radiograph and ultrasound imaging and endoscopies,
 - warming blankets,
 - forced air-warming devices for each bed,
 - sufficient air condition system providing a minimum of 15 air change rate per hour for sufficient scavenging of anaesthesia gases and other disinfectant vapours.

9.3. Staffing: dependent on the praxis of individual hospitals and on the circumstances in which patients are admitted to the PACU [9,10].

- No fewer than two nurses should be present when there is a patient in the recovery room.
- There should be an anaesthetist, supernumerary to requirements in the operating theatres, immediately available for the recovery room.
- If it is a local standard to extubate patients in PACU, practised often for increasing surgical turnover, one-to-one nursing is necessary until a well tolerated extubation can be performed or cardiovascular function stability achieved.
- *The extubation manoeuvre itself is the responsibility of the anaesthetist!*
- If patients are admitted to PACU in awake or arousable state, nurse–bed ratio may increase up to 1 : 4, depending on the type of surgery.
- The skill mix of the nursing staff usually varies, but it is advisable to have specially trained nurses, including anaesthesia or intensive care nurses.
- Satisfactory quality of care during recovery from anaesthesia and surgery relies heavily on investment in the education and training of recovery room staff. Maintenance of standards requires continuous update in resuscitation skills, application of new techniques, and advances in pain management.

9.4. Postoperative assessment and monitoring [5,11]

- *Patient should be observed continuously* by adequately trained (PACU) nurses and an anaesthesiologist.
- *Respiratory function:*
 - Oxygen saturation: it is recommended that monitoring of airway patency, respiratory rate and continuous oxygen saturation should be controlled in emergence and recovery. Particular attention should be given to monitoring oxygenation and ventilation.
 - *Capnography:* it is strongly recommended if patient is ventilated or drug-induced hypoventilation can be anticipated for any reasons.
- *Cardiovascular function:* it is agreed that pulse rate, BP and ECG monitoring detect cardiovascular complications, reduce adverse outcomes and should be done during emergence and recovery.
 - It is recommended that routine monitoring of pulse rate and BP should be done during emergence and recovery, and ECG monitors should be available.
- *Neuromuscular function:* assessment of neuromuscular function primarily includes physical examination. On occasions, it may include neuromuscular blockade monitor, as it is suggested to be effective in detecting neuromuscular dysfunction. It is agreed that assessment of neuromuscular function identifies potential complications, reduces adverse outcomes and should be done during emergence and recovery.
 - It is recommended that assessment of neuromuscular functions should be performed during emergence and recovery for patients who have received non-depolarizing neuromuscular blocking agents or who have medical conditions associated with neuromuscular dysfunction.
- *Mental status:* assessment of mental status can detect complications and reduces adverse outcomes.
 - It is recommended to assess mental status periodically during emergence and recovery.
- *Temperature:* routine assessment of patient temperature detects complications and reduces adverse outcomes.
 - It is recommended to assess patient temperature periodically during emergence and recovery.
- *Pain:* routine assessment and monitoring of pain detects complications and reduces adverse outcomes.

- It is recommended to assess pain periodically during emergence and recovery and manage it accordingly.
- *Nausea and vomiting*: routine assessment of nausea and vomiting detects complications and reduces adverse outcomes.
 - It is recommended to assess nausea and vomiting routinely during emergence and recovery.
- *Hydration status and fluid management*: routine perioperative assessment and monitoring of patient's hydration status and fluid management detects complications, reduces adverse outcomes and improves patient's comfort and satisfaction.
 - It is recommended to assess postoperative hydration status routinely and manage accordingly during emergence and recovery. Certain procedures involving significant loss of blood or fluids may require additional fluid management.
- *Urine output and voiding*: assessment and monitoring of urine output and urinary voiding detects complications and reduces adverse outcomes during emergence and recovery.
 - It is recommended that assessment of urine output and urinary voiding should be done on a case-by-case basis for selected patients or selected procedures during emergence and recovery.
- *Drainage and bleeding*: assessment and monitoring of drainage and bleeding detect complications and reduce adverse outcomes.
 - It is recommended that assessment of drainage and bleeding should be a routine component of emergence and recovery care.

9.5. Treatment methods during emergence and recovery [11]:

- *Prophylaxis and treatment of nausea and vomiting*: single or multiple antiemetic agents may be used for prevention and treatment of nausea and vomiting.
 - It is recommended, when indicated.
- *Administration of supplemental oxygen*: effective in preventing and treating hypoxemia, therefore,
 - it is recommended for all patients to administer during transportation or in the recovery room for patients at risk of hypoxemia.
- *Normalizing patient temperature* by active warming is suggested by the literature to be effective and the use of forced-air warming devices is supported. It is suggested that their use reduces recovery time and shivering and increases comfort and satisfaction of patients.

Consequently normothermia should be a goal during emergence and recovery.

- Forced-air warming systems should be used for treating hypothermia when available.
- *Pharmacologic agents for reduction of shivering*: it is cautioned that hypothermia, a common cause of shivering, should be treated by active rewarming. Advantages of pharmacologic agents as additive methods may be considered for select patients when shivering is known to be seriously harmful.
 - In these patients, meperidine is recommended as first-line drug for treatment of shivering during emergence and recovery for select patients. Other opioids may be considered if meperidine is contraindicated or not available.
- *Antagonism of benzodiazepines*: specific antagonists should be available whenever benzodiazepines are administered.
 - Flumazenil should not be used routinely, but may be administered to antagonize respiratory depression and sedation in select patients. After pharmacologic antagonism, patients should be observed long enough to ensure that cardiorespiratory depression does not recur.
- *Antagonization of opioids*: specific antagonists should be available whenever opioids are administered.
 - Opioid antagonists should not be used routinely but may be administered to antagonize respiratory depression in selected patients. After pharmacologic antagonism, patients should be observed long enough to ensure that cardiorespiratory depression does not recur. It is reminded that acute antagonism of the effects of opioids may result in pain, hypertension, tachycardia or pulmonary oedema.
- *Reversal of neuromuscular blockade*: T4:T1 ratio is the single and proven objective measure of safe neuromuscular function up to now.
 - It is recommended that assessment of restoration of neuromuscular function (e.g. by train-of-four monitor) should be checked during emergence and recovery on a case-by-case basis, and specific antagonists are recommended to administer for reversal of residual neuromuscular blockade whenever indicated.
- *Postoperative pain management*: anaesthetists are usually involved in the provision of pain relief in the days following surgery. If so, they have to ensure that:
 - If patient-controlled anaesthesia systems are to be used, all staff who are likely to

come into contact with them should have undergone training in their use and be able to recognize complications should they arise.

- The same principles apply to those required to look after patients receiving continuous epidural or other regional blockade.
- Drug prescription charts should be reviewed and annotated.
 - to highlight the administration of neur-axial opioid infusion
 - and help eliminate the risk of unintentional, simultaneous administration of opioids by other routes.

10. Special considerations [5]

10.1. Critically ill patients

- Critically ill patients, if being transiently managed in the recovery area, need special care:
 - The primary responsibility for the patient lies with the ICU staff.
 - All the standards of medical and nursing care as well as monitoring requirements should be equal to that within the ICU.
 - A special action plan should be worked out in order to facilitate the transport of this patient to the ICU as soon as possible.

10.2 Regional anaesthesia

- The principles of management for any patient undergoing regional anaesthesia, either alone or as part of a general anaesthetic technique, are the same as for any other patient.
- Information and instructions given on hand-over to recovery staff should include:
 - site and type of local block,
 - drug and dosage used,
 - anticipated duration of action,
 - instructions for further pain relief and positional restrictions for the patient.
- Information for the patient includes the anticipation of return of sensation, motor function, or both.
- Considerations after spinal and epidural anaesthesia include noting the level of analgesia achieved, cardiovascular status, sitting up (when and how much), bladder care, details of any continuous infusions, degree of motor block and time of likely recovery.
- Many of these considerations also apply to plexus block.

10.3 Children

- Children have special needs, best met by having a designated paediatric recovery area that is child friendly and staffed by nurses

trained in the recovery of paediatric patients.

- Equipment must include a full range of sizes of facemasks, breathing systems, airways, nasal prongs and tracheal tubes.
- Essential monitoring equipment includes a full range of paediatric noninvasive BP cuffs and small pulse oximeter probes.
- Children require one-to-one supervision throughout their recovery room stay.
- Postoperative vomiting, bradycardia and laryngeal spasm are more common. The latter can have devastating effects as small children become hypoxemic much faster than adults.
- Children should not be denied adequate pain relief because of fear of side effects. It can be difficult to assess pain; however, suitable techniques are available.
- In general, intramuscular injections should be avoided.

11. Documentation: each patient must be kept under continuous clinical observation [5,9].

- Data of clinical observations should be recorded regularly.
- Physiological parameters should be measured and recorded at regular intervals.
- Drug prescription or medication charts should be recorded 'on line' and annotated.
- Laboratory tests, radiographs or other diagnostics as well as consultation results should be recorded.

12. Transfer from recovery area to the wards

- A formal checklist should be established to document that patient is fit to be discharged from the recovery area safely [5,9,12,13]. It is advisable that the checklist should include:
 - Vital parameters as relevant, such as:
 - pulse rate,
 - BP,
 - arterial O₂ saturation,
 - train-of-four ratio,
 - end-tidal CO₂ (mandatory if patient is ventilated).
 - Instructions for the immediate post-PACU period as required, at least:
 - supplemental oxygen,
 - fluid replacement,
 - analgesic or antiemetic regimens,
 - monitoring if different from the normal practice of the receiving unit,
 - physiotherapy,
 - others if relevant.
- A formal handover should be performed to a qualified nurse and documented.

13. Discharge criteria

13.1 Each patient care facility should develop suitable recovery and discharge criteria based on well defined principles and should be designed to minimize the risk

of cardiorespiratory or central nervous depression after discharge [5,7,11,13].

– The requirement of a minimum mandatory stay in recovery area is a frequent dilemma. The literature is insufficient to evaluate the benefits of requiring a minimum mandatory stay in the recovery area.

- It is recommended that a mandatory minimum stay should not be required, but the length of stay should be determined strictly on a case-by-case basis [11].

13.2 Patients to be discharged to the wards should fulfil well defined discharge criteria [11], including:

- fully conscious, able to maintain a clear airway and exhibit effective protective reflexes;
- respiration and oxygenation are returned to preoperative base level;
- stable cardiovascular function on acceptable level with no unexplained irregularity or uncontrolled bleeding;
- pain and emesis should be properly controlled and analgesic or antiemetic regime prescribed;
- use of well defined scoring systems have proven value on patient safety and quality control in this respect [5,7,10,12,13];
- if discharge criteria are not achieved, the patient should remain in the PACU area and the anaesthetist informed, who anyway must be available at all times when a patient who has not reached the criteria for discharge is present in the recovery room. If there is any doubt as to whether a patient fulfils the criteria, or if there has been a problem during the recovery period, the anaesthetist with special duties in the recovery room must assess the patient. Patients who do not fulfil the discharge criteria may be transferred to an HDU or ICU but not to normal wards [5].

13.3 Patients to be discharged home

- Patients who are discharged home directly from the PACU area require special arrangements to ensure street safety and an adequate level of after-care [12,14–16].
- Routine use of special scoring systems [Aldrete, PADSS (postanaesthesia discharge scoring system), etc.] are proven helpful and therefore recommended.
- Pain and emesis should be properly controlled and analgesic or antiemetic regime prescribed [10].
- Further supply of analgesics and antiemetics as well as handling of other unexpected events should be advised with particular attention.
- A signed note outlining any advice given should be placed in the medical record.

– If discharge criteria are not achieved, the patient should remain in the recovery room and the anaesthetist informed.

– If there is any doubt as to whether a patient fulfils the criteria, or if there has been a problem during the recovery period, the patient should remain in the PACU area and the anaesthetist must be informed and he has to assess the patient.

14. Quality control

14.1 Audit and critical incident systems should be in place in all recovery rooms [5,7]. An effective emergency call system should be in place in all recovery rooms.

14.2 Monitoring the quality of immediate postoperative care and audit for compliance with local and national standards [17] include, for example:

- recovery room staffing,
- monitoring in recovery room,
- oxygen therapy,
- record keeping,
- discharge protocols,
- postoperative visiting by the anaesthetist,
- critical incidents (there should be a local system for the documentation of critical incidents as well as for the response to them),
- airway problems,
- hypertension and hypotension,
- postoperative nausea and vomiting,
- unplanned admissions to HDU and ICU,
- acute pain management (starts in the PACU and the quality of pain relief on arrival and on discharge to the ward should be recorded and audited),
- education and training of PACU staff.

14.3. Conduct audit for compliance with local protocols:

- quality of recovery [14,17,18],
- violation of discharge protocol,
- documentation of critical incidents.

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