Section 3: Postoperative care

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3.1 Recovery room staffing and monitoring provision
3.2 Oxygen therapy
3.3 Airway problems
3.4 Hypertension/hypotension
3.5 Postoperative nausea and vomiting (PONV)
3.6 Record keeping
3.7 Discharge protocols
3.8 Unplanned admission of elective surgical patients to HDU/ICU
3.9 Postoperative visiting
Recovery room staffing and monitoring provision

Dr C J Peden

Why do this audit? The immediate postoperative period is critical in ensuring a safe outcome for patients. Many problems associated with anaesthesia and surgery may occur in the immediate postoperative period, and it is essential that supervision by adequately trained and experienced personnel is continued in an appropriately equipped location during this time. The same standards should be applied to all recovery areas where anaesthesia is administered including obstetric, cardiology, X-ray, dental, psychiatric and community hospitals.

Best practice: research evidence or authoritative opinion Emergence from anaesthesia is potentially hazardous and patients require close observation until recovery is complete. The Association of Anaesthetists of Great Britain and Ireland recommends that fully staffed recovery facilities must be available at all times in hospitals with an emergency surgical service. If the anaesthetist is unable to remain with the patient, care must be transferred to staff specially trained in recovery procedures. All recovery rooms should be staffed to a level which allows this to be routine practice, even at times of peak activity. A minimum of two staff should be present at all times of day and night when there is a patient in recovery who does not fulfill discharge criteria.

A high standard of monitoring should be maintained until the patient is fully awake. Clinical observation must be supplemented by pulse oximetry and non-invasive blood pressure monitoring in all patients. An ECG, nerve stimulator, means of measuring temperature and capnograph should also be immediately available.

Suggested indicators

- % of staff present in recovery room trained to a nationally recognised standard. This should be audited at different times of day and night.
- % unconscious patients who are being cared for on a one-to-one basis.
- % conscious patients requiring critical care or critical monitoring cared for in a ratio of one nurse to two patients. This might include patients who are vomiting, patients who have uncontrolled pain and patients who are potentially unstable including those recently admitted following regional anaesthesia.
- % conscious stable patients who are being cared for by nurses not involved with the patients above, at a nurse to patient ratio that is acceptable in the opinion of the audit team and the nurse in charge of recovery. This might include patients who are ready to leave and are waiting for transfer to the ward.
- % patients who are admitted to recovery out-of-hours where there are two members of staff present in recovery throughout their stay in recovery.
- % of patients monitored with pulse oximetry and non-invasive blood pressure (NIBP) monitoring.
- % of patients, in the opinion of the auditor, where observations were recorded with appropriate frequency.
- Ease of availability of other monitoring equipment such as capnography and ECG.

All areas of the hospital where patients are recovered from anaesthesia should be audited on a regular basis, not just the main theatre recovery area.
Postoperative care

3.1 Raising the Standard: a compendium of audit recipes

Proposed standard or target for best practice

All patients recovering from general, epidural or spinal anaesthesia should be cared for in a specially designated recovery area staffed with sufficient numbers of appropriately trained staff.

100% of patients recovering from general anaesthesia should be nursed on a one to one basis until fully awake.

100% of patients who are admitted to recovery out of hours should have two members of staff present at all times.

100% of patients should have pulse oximetry and NIBP monitoring as well as close clinical observation.

All areas of the hospital where patients are recovered should meet these criteria.

Suggested data to be collected

The proposed audit should be discussed with recovery room staff. A member of the audit team should visit recovery at random times during the day, focusing particularly on likely busy periods. Patient dependency and staffing ratios for each patient should be recorded. Particular problems at the time of the visit may be noted (e.g. delay in arrival of ward staff to collect patient, patient awaiting ICU bed after unexpected deterioration). Periods when the senior nurse has to close the recovery to new admissions because of inadequate numbers of appropriate staff should be recorded.

For all patients in recovery when the audit team visits:

- type of anaesthesia/surgery
- ASA grade
- special considerations as indicated by the anaesthetist
- monitoring assessment completed
- monitoring in use compared to that indicated by the assessment
- frequency of observations and whether appropriate
- reasons for lack of monitoring including availability of monitoring equipment.

Common reasons for failure to reach standards

Inadequate staff for the number of patients in recovery either due to time of day, patient numbers or dependency, or staffing levels.

Lack of understanding by staff of patient’s monitoring requirements and failure by anaesthetist to make this clear.

Monitoring equipment unavailable.

Peripheral recovery areas inadequately staffed or equipped.

References


Oxygen therapy

Dr M Spivey, Dr J Phillips

Why do this audit?
Oxygen therapy is recognised as an important element of postoperative care both in the recovery room and after discharge to the ward. Difficulties in providing adequate oxygen therapy include poor patient compliance, nursing mistakes, equipment failure and inadequate communication by the prescribing anaesthetist. It is important to establish the efficacy of this simple therapeutic procedure that may reduce postoperative morbidity and mortality.

Best practice: research evidence or authoritative opinion
Hypoxaemia occurs in the postoperative period both in the recovery room and after discharge of the patient to the ward. Treatment by face mask oxygen is effective in treating hypoxaemia in many cases in the early postoperative period. Prescription of oxygen can decrease the incidence of hypoxaemia after recovery room discharge. This is important in high risk patient groups. The effectiveness of this depends on patient compliance, nursing care, equipment availability and the prescribing anaesthetist.

Suggested indicators
% patients receiving oxygen in the recovery room as described in local guidelines.
% patients who, in the opinion of the auditors, might benefit from oxygen therapy on the postoperative ward, who are prescribed it.
Of patients who have been prescribed oxygen to be used on the ward postoperatively, % who are using it correctly when visited by the audit team.

Proposed standard or target for best practice
100% patients in recovery should receive oxygen therapy as above.
100% patients who the auditors feel would have benefited from the use of oxygen on the postoperative ward should have been prescribed it.
100% of patients prescribed oxygen should be using it correctly when visited by the audit team.

Suggested data to be collected
A policy for the use of oxygen in the recovery room should exist before this audit can be performed. This will require discussion with fellow anaesthetists. Data to collect includes operation, anaesthetic technique, oxygen used before and after waking, criteria for discontinuing oxygen in recovery.

Looking for patients who might have benefited from oxygen therapy on the ward may be difficult. A list of indications should be drawn up. The notes of all patients who pass through recovery in a day may be examined. Alternatively a group where pathology is more likely to be found may be chosen. For example: all ASA 3, 4 or 5 patients; all patients on urology lists; all patients having major joint replacements or all vascular surgery patients.

If oxygen is prescribed post recovery room data to be collected will include prescription details, indication, compliance with prescription when ward is visited, reasons for non-compliance.
Common reasons for failure to reach standards

- Poor patient compliance and failure by anaesthetist to explain importance.
- Failure of nurses to understand the value of oxygen.
- Equipment failure.
- Poor communication by prescribing anaesthetist.

References

## Airway problems

**Dr M Spivey, Dr J Phillips**

### Why do this audit?

Airway problems such as obstruction occur in the immediate postoperative period and are an immediate threat to patient safety.\(^1\) This may be due to laryngospasm, persisting relaxation of airway muscles, soft tissue oedema, haematoma, vocal cord dysfunction or foreign body. Vigilant patient monitoring during the post-anaesthesia period is important firstly to identify airway problems and secondly to initiate effective management.\(^2\)

### Best practice: research evidence or authoritative opinion

Airway problems are the second most frequent complications after nausea and vomiting. In a large prospective study of 18,473 post-anaesthesia patients, 6.9% required airway support.\(^2\) Most interventions were simple and involved manual support of the jaw or insertion of an oral or nasal airway. Only 0.02% of patients needed re-intubation. Other studies show an incidence of airway problems of 2–7%\(^3-6\) with a higher incidence following endotracheal intubation compared to the laryngeal mask airway or face mask.\(^6\)

### Suggested indicators

- % of patients in the recovery room needing airway support from the recovery nurse to prevent airway obstruction.
- % of patients re-intubated in the recovery room.

### Proposed standard or target for best practice

- < 5% postoperative patients in the recovery room should require airway support by the recovery nurse.
- < 1% of patients should require re-intubation.

### Suggested data to be collected

- Anaesthetist, ASA status, type of operation and anaesthesia.
- Conscious state on admission to recovery.
- Airway problem.
- Intervention and time of intervention needed.
- Outcome.

### Common reasons for failure to reach standards

- Patients admitted to recovery ward too early.
- Surgical or anaesthetic complications.
### References

Hypertension/hypotension

Dr A Osborne

**Why do this audit?**

Postoperative hyper- or hypotension is common and may indicate acutely disordered physiology, in urgent need of correction.\(^1\) Stable blood pressure (BP) is a criterion for discharge from the recovery area,\(^2\) but what constitutes a stable BP is probably best defined in terms of a percentage change from baseline rather than an absolute level. Little relevant data exists on what quantifiable harm may be related to the extent or duration of extreme blood pressure changes in the postoperative period. Good practice should seek to discover, diagnose and treat such changes as soon as possible. This audit suggests that the postoperative BP be maintained at ± 20% of the preoperative value.

**Best practice: research evidence or authoritative opinion**

**Hypertension**

Preoperative hypertension (> 160/110) is common, especially in elderly patients, and is known to be associated with larger changes in blood pressure on induction and during the course of anaesthesia compared to normotensive patients. It is a predictor of myocardial ischaemia\(^3\) and hypertensive patients are known to suffer more episodes of hypotension associated with ECG evidence of ischaemia than normotensive patients.\(^4\) Myocardial ischaemia is associated with cardiac morbidity and mortality,\(^5\) which may be reduced (at least in those who have had a myocardial infarction within 6 months) by early detection and aggressive treatment to maintain mean arterial pressure (MAP) to within 20% of baseline.\(^6\)

**Hypotension**

Deliberate hypotensive anaesthesia has a reported morbidity of 3.3% and mortality of 0.2–0.6%.\(^7\) Expert opinion suggests the risk for hypotensive anaesthesia is acceptable where MAP is 50–65 mmHg for periods less than 1.5 h.\(^8\) Known cardiovascular, cerebrovascular or renovascular diseases are strong relative contraindications. No limit for arterial pressure has been proven safe, but a deviation of more than 20% from average preoperative values should probably not be maintained for prolonged periods.\(^9\) These observations relate to BP during anaesthesia, where it may be that blood flow is maintained despite hypotension because of vasodilation. It is unsafe to assume the same during the recovery period, especially where the possibility of a fixed vascular obstruction exists.

**Suggested indicators**

% all patients with blood pressure recorded preoperatively.

% elective and emergency cases where the BP is outside ± 20% of baseline BP at 1.5 h after waking.

% of all cases where the BP is outside ± 20% of baseline BP who had instructions for appropriate management given within 20 min of the reading.

**Proposed standard or target for best practice**

100% patients should have a baseline BP recorded in the notes prior to anaesthesia.

100% elective and emergency cases should have a BP of ± 20% of baseline at 1.5 h after waking.

100% all patients with a BP outside ± 20% baseline should have instructions for appropriate management given within 20 min of the reading.
### Suggested data to be collected

- Preoperative BP.
- Elective or emergency classification.
- Operation.
- Age.
- Presence of preoperative hypertension (either treated, incompletely treated or untreated).
- Evidence of cardiovascular or cerebrovascular disease.
- Time at which BP outside ± 20% of baseline.
- Time after this decision made as to appropriate management.
- Time at which BP returns to within ± 20% of baseline.

### Common reasons for failure to reach standards

- No preoperative BP taken.
- Failure to calculate ± 20% from baseline.
- Absence of competent person to manage hyper- or hypotension, e.g. unavailability of anaesthetist in recovery room, staff occupied with other patients.
- Frail patient, major or prolonged surgery.

### References

Postoperative nausea and vomiting (PONV)

Dr W J Brampton

Why do this audit?

PONV has an underlying incidence of 30–40% and is the symptom patients would most like to avoid. Management of PONV is a criterion in national guidelines and standards.

Management of PONV is complex so unlikely to follow best practice if left to individuals. PONV is multifactorial requiring an integrated approach for optimum reduction in incidence and an effective regimen to manage established cases. Best practice requires recognition of high risk patients, selection of appropriate anaesthetic techniques, knowledge of non-pharmacological options, drug efficacy, side effects and the number needed to treat versus the number needed to harm (NNT vs NNH).

Best practice: research evidence or authoritative opinion

**Prophylaxis**

Simplified scoring systems, which rank patients by risk, are available and have been tested. A large randomised controlled trial has investigated various combinations of prophylactic interventions. Each intervention worked independently so combinations have a cumulative effect. TIVA (propofol infusion without nitrous oxide) is approximately equivalent to one anti-emetic drug. The inexpensive anti-emetics (cyclizine and dexamethasone) are as effective as ondansetron, which costs at least eight times more.

Acupuncture, acupressure and associated treatments applied at the P6 acupuncture point, prior to anaesthetic induction, are also effective and approximately equivalent to a single anti-emetic or TIVA.

**Treating established PONV**

Remove precipitating causes where possible and prescribe a ‘ladder’ of therapeutic agents of different classes to any previous treatment or prophylaxis. Ondansetron 1 mg is as effective as 4 or 8 mg (NNT = 4). Agents likely to cause sedation or other CNS side effects should be avoided in day cases.

Suggested indicators

% patients who receive care that follows local guidelines aimed at reducing PONV postoperatively. Specific indicators will have to be prepared after discussion with colleagues and might include:

- % patients who receive correct prophylactic treatment.
- % patients who receive a postoperative pain relief regimen that minimises the need for opioids (regional or local anaesthetic, use of non-steroidal anti-inflammatory drugs and simple analgesia where possible).
- % patients with established PONV who are treated promptly and effectively (e.g. receive a first line anti-emetic within 1 h of the start of repeated vomiting or persisting nausea and a second line anti-emetic if symptoms persist within a further hour).
- % patients receiving 5HT3 receptor antagonists who fit locally agreed criteria for use.

Proposed standard or target for best practice

100% patients should receive care that follows locally agreed guidelines. For example:

- 100% high and medium risk patients and 0% low risk patients should receive the agreed prophylactic treatment.
- 100% patients should receive a pain relief regime as above.
- 100% patients should be assessed for PONV.
- 100% patients with established PONV should receive prompt and effective treatment as above.
- 100% patients who receive 5HT3 receptor antagonists should fit the criteria for use.
Postoperative care

Suggested data to be collected

As required to check above standards. Anaesthetic, recovery and ward performances will all require auditing. Suggested data includes: anaesthetists knowledge of local guidelines, components of PONV risk score, prophylactic strategies used, documentation of PONV, treatment prescribed and administered, incidence and severity of PONV (including telephone follow up of day cases), incidence and review of unplanned day-case admissions.

Common reasons for failure to reach standards

No individual or team with an interest locally.
Guidelines not drawn up or no associated dissemination or education.
Ignorance of comparative efficacy, relative cost and potential to harm of available interventions.
Overuse of 5HT3 antagonists because of easy availability, pharmaceutical industry influence, over-estimated efficacy, ignorance of NNH and ignorance or carelessness regarding cost.
Failure to use opioid-sparing analgesic regimens.
Poor documentation and delays in ward treatment due to staff levels.
Patients not asked or not knowing to report nausea and request treatment.

References

Record keeping

Dr C Green

Why do this audit?

The immediate postoperative period is a critical time in the patient’s overall recovery. Careful monitoring at this time is essential and should be reinforced with good record keeping which may be useful in subsequent diagnoses of complicating problems or in any medico-legal case.1-4

Best practice: research evidence or authoritative opinion

There is very little research on the quality of immediate postoperative care and outcome. However many medico-legal cases have made its importance clear as a risk management issue. Furthermore the increasing use of high dependency units for postoperative care implies that close monitoring of the patient is essential.

Also refer to audit 3.1 on recovery room staffing and monitoring provision.

Suggested indicators

% postoperative patients who have a postoperative record filed in the notes.
% postoperative records that are clear and legible.
% postoperative records signed legibly by the person responsible for the care provided in recovery.
% postoperative records in which all parameters agreed in local guidelines or requested by the anaesthetist are included.

Proposed standard or target for best practice

All the indicators given should be true for 100% patients or records.

Suggested data to be collected

Retrospective study analysing intraoperative and postoperative records. Special attention may be paid to cases which returned to theatre from the recovery room or from the ward in the first few hours after surgery.

Common reasons for failure to reach standards

Postoperative record could not be found.
Illegibility of record and signature.
Lack of equipment in recovery (e.g. for invasive monitoring).
Lack of adequate instructions from the anaesthetist or surgeon.
3 Postoperative care

Related audits
2.4 – Anaesthetic records
3.1 – Recovery room staffing and monitoring provision

References
### Discharge protocols

**Dr J L Brown, Dr R E Murphy**

| Why do this audit? | In order to ensure that patients are not put at risk by discharge from the recovery room which is premature or to an inappropriate destination every recovery room should have well-defined criteria for discharge of patients to the general ward or other clinical areas.\(^1\)\(^2\) |
| Best practice: research evidence or authoritative opinion | Discharge criteria based on the Aldrete's scoring system\(^3\) have been shown to be associated with a significantly reduced post-anaesthesia care unit (PACU) length of stay in comparison with time-based criteria.\(^4\) Regular revision and audit of standards of care, guidelines and protocols are essential in the development and improvement of post-anaesthetic patient care.\(^1\)\(^4\) Following an agreed discharge protocol helps to ensure patient safety, comfort (freedom from pain and emesis), adequacy of documentation, and can improve efficiency of the unit with appropriate and timely discharges.  

The importance of post-anaesthesia recovery facilities in ensuring patient safety has been stressed by the Association of Anaesthetists,\(^1\) the Royal College of Anaesthetists,\(^2\) and in reports from the National Confidential Enquiry into Perioperative Deaths.\(^5\)  
An anaesthetist must be available at all times when a patient in recovery has not fulfilled the discharge criteria.\(^1\) |
| Suggested indicators | % patients discharged from recovery to a general ward satisfying post-anaesthesia discharge criteria.  
% patients not meeting criteria who are reviewed by an anaesthetist prior to discharge and reasons if anaesthetist unavailable.  
% patients who do not satisfy the criteria who are discharged to a safe destination in the opinion of the auditor. This would usually be an HDU or ITU, but might in some circumstances be a general ward (e.g. a patient with poorly controlled nausea or mild pain despite best efforts).  
Adequate documentation of fitness for discharge and ongoing care requirements. |
| Proposed standard or target for best practice | 100% of patients returning to a general ward should fulfil the agreed discharge criteria. This should be documented.  
If discharge criteria are not achieved, the patient should remain in the recovery room until assessed by an anaesthetist.\(^1\)  
Following medical assessment, 100% of patients who do not meet criteria for discharge should be transferred to a safe and appropriate destination, e.g. ITU, HDU or CCU.\(^1\) |
Postoperative care

Suggested data to be collected

- Patient's age and ASA status.
- Procedure.
- Anaesthetist and grade.
- Type of anaesthetic including regional blocks.
- Pain and nausea scores in recovery.
- Recovery nurse or person taking responsibility for discharge.
- Communication with anaesthetist in recovery.
- Recovery room length of stay.
- Discharge destination and ongoing plan for ward.
- Discharge criteria fulfilled or not, and compliance with discharge protocol.

Common reasons for failure to reach standards

- Persistent pain despite treatment.
- Persistent PONV despite treatment.
- No available HDU/ITU bed.

References

Unplanned admissions of elective surgical patients to HDU/ICU
Dr J Silsby, Dr A McCrirrick

Why do this audit?
Anticipation of the requirement for postoperative admission to a critical care area well in advance of surgery helps with resource allocation and with the planning of staffing levels. Unplanned admissions can have a significant impact on the efficient running of a critical care area and may even prompt premature discharge or non-clinical transfer of other patients. Elective surgery should be postponed if the appropriate level of postoperative care is unlikely to be available.

Best practice: research evidence or authoritative opinion
With adequate preoperative assessment, most postoperative admissions should be anticipated well in advance. An accurate and structured preoperative consultation should identify the vast majority of patients who will require intensive care.1,2 There is little in the literature on the % of elective surgical procedures which result in unplanned HDU/ICU admission. However we do know from the ICNARC database (December 1995 to July 2005)3 that unplanned surgical admissions after elective surgery comprise 30.8% of HDU/ICU surgical admissions. These admissions will follow all complications during the hospital stay not just in the immediate postoperative period.

Suggested indicators
% admissions to ICU or HDU following elective surgery which are unplanned.

Proposed standard or target for best practice
The number of unplanned admissions should be low. Less than 5% could be taken as a gold standard. Units should audit their own current data before setting a realistic goal.

Suggested data to be collected
Primary reason for unplanned admission (surgical complications/complexity or anaesthetic complications/complexity).
Grade of senior surgeon/anaesthetist involved.
Time spent in post-anaesthetic care unit (if any) before HDU admission.
Adequacy of preoperative assessment. Percentage of patients who were reviewed in (preferably) anaesthetist-led preoperative assessment clinics.
Sequelae of unplanned admission; cancellation of other elective cases, premature discharge of HDU patients, non-clinical transfers.4
3 Postoperative care

Common reasons for failure to reach standards

Inadequate preoperative assessment by inexperienced and/or junior staff.
Surgical failure to communicate or anticipate the extent of the required surgery.
Anaesthetist failing to alert ICU/HDU after preoperative assessment.
Surgical or anaesthetic problems resulting from inexperience or avoidable mishap.
Unavoidable issues relating to complexity of case (anaesthetic or surgical).

References

Postoperative visiting
Dr R Hindocha, Dr D Carapiet, Professor D Hatch

Why do this audit?
Provision of postoperative care is a recognised aspect of an anaesthetist’s role, although it is not clearly defined beyond the immediate postoperative period. As a result, postoperative visiting of patients on the ward is largely based on the individual anaesthetist’s learned culture, although in some countries it is a legal requirement. Most early postoperative complications are due to alterations in physiology which anaesthetists are well trained to manage. Adequate pain management may reduce morbidity and early transfer of high risk patients to intensive care may reduce mortality. Anaesthetists have major responsibilities in the management of the patient recovering from anaesthesia, which some Colleges define more clearly than others. Postoperative visiting may improve both patient satisfaction and the public image of anaesthetists.

Best practice: research evidence or authoritative opinion
A study has shown that the incidence of emergencies within 48 h of surgery was 1:500, with a higher incidence in ASA 4 patients and those operated on out-of-hours, and that high risk patients may benefit from a visit by a postoperative care team. An in-hospital post-anaesthetic follow up of 21,116 patients identified minor anaesthetic-related complications in 8.15%, and major complications in 0.37%. The content, rather than the frequency of postoperative visiting, may do more to improve patient awareness of the role of the anaesthetist.

Suggested indicators
% in-patients listed below who are visited postoperatively by an anaesthetist.
% in-patients listed below who are visited postoperatively by their own anaesthetist:
- postoperative patients who are ASA 3, 4 or 5.
- postoperative patients who have an epidural or patient controlled analgesia device running on the ward.
- patients discharged from recovery with a central venous line in place (as a marker of patients in whom fluid balance may be a problem).
- complicated intraoperative course.

Proposed standard or target for best practice
0% of in-patients listed above should be visited by an anaesthetist, within 24 h of discharge from recovery. Ideally this should be their own anaesthetist, but if not available a deputy should be arranged.

Suggested data to be collected
Anaesthetist, procedure, day and time of surgery, category of patient from list above.
Time in hours between end of surgery and visit.
Postoperative interventions initiated.
Patient’s opinion of value of visit.
Anaesthetist’s opinion of value of visit.
Reason for failure to visit.
Common reasons for failure to reach standards

- Patient already discharged.
- Excessive workload.
- Multiple site working.
- Friday operating lists.
- On-call duties.
- Annual/study leave.
- Attitude of anaesthetist.

References

8. Klock PA, Roizen MF. More or better – educating the patient about the anesthesiologist’s role as the perioperative physician. Anesth Analg 1996;83:671–672.