

## MONITORING IN THE RECOVERY ROOM

Dr Keith Allman, Royal Devon and Exeter Hospital, Exeter, UK, previously Royal Perth Hospital, Australia.

The recovery room is the area where patients recover from the immediate effects of anaesthesia and surgery and provides a setting for the detection and treatment of early post-operative complications. These areas vary considerably in the level of staffing and monitoring available from the “ideal” fully staffed, fully equipped modern recovery facility to the somewhat less than perfect dimly lit corridor just outside theatre.

The commonest causes of recovery room mishaps all result from unidentified changes in a patient’s airway, breathing or circulation and these can almost always be rectified if identified at an early stage.

In 1993 the Association of Anaesthetists of Great Britain and Ireland published recommendations for the provision of equipment necessary for a modern day recovery area. These are shown in table 1.

These facilities may not all be available in many recovery areas throughout the world and some thought is necessary to determine the relative merits of each item on this long list.

Certainly the two most important pre-requisites of any recovery area should be the provision of good lighting together with a suitably trained recovery nurse available to recover each unconscious patient on a one-to-one basis. The nurse must be available to stay with the patient constantly until awake and able to maintain their own airway.

### *Clinical patient monitoring*

Clinical monitoring can be divided into assessment of airway, breathing and circulation.

---

**Table 1: Association of Anaesthetists of Great Britain and Ireland Guidelines 1993**

---

Position of recovery	situated as close as possible to the operating theatre to minimise the risks of transporting unstable patients
Size and temperature	an average of 1.5 recovery bays per operating theatre (9.3m <sup>2</sup> per bay) room temperature 21-22°C, relative humidity 38 - 45% and fifteen changes of air per minute gas scavenging system and six 13 ampere electricity outlets per bay well lit with lighting approximating to the daylight spectrum
Equipment in each bay	oxygen outlets, face masks and breathing systems pulse oximetry availability of blood pressure monitoring and ECG suction units with Yankaur ends a fully equipped anaesthetic machine with ventilator drugs and intravenous fluids a paediatric equipment trolley containing facemasks, airways, endotracheal tubes and connectors in a range of paediatric sizes

---

**The patient's airway** can be assessed by observing for signs of obstruction such as chest wall or supraclavicular inward movement on inspiration and/or the presence of noisy breathing. A patent airway is most easily maintained with the patient in the left lateral ('recovery') position (figure 1) as this allows the tongue and soft palate to fall forwards away from the oropharyngeal opening. This will also prevent any blood or secretions pooling in the oropharynx and causing aspiration or laryngospasm. In patients at risk of further oropharyngeal soiling, drainage of secretions can be increased by placing a pillow beneath the patient's chest ('tonsillar position'). If the patient has to remain supine for any reason then the use of jaw thrust or an oropharyngeal (Guedel) airway can be invaluable in airway maintenance. **Maintenance of a patent airway is probably the single most important aspect of immediate post-operative care.** Although few patients in the UK are now taken to recovery with an endotracheal tube in-situ this depends to some extent on the anaesthetic agents available. Where slowly eliminated agents are used (ether and halothane) the endotracheal tube is sometimes best left in-situ until full return of the laryngeal reflexes. When to extubate is a matter of clinical judgment, but as a rule it is safer to leave the tube as long as possible as this ensures airway patency. In children it is common practice to wait until they can remove it themselves. Suctioning of the oropharynx should be performed before tube removal to avoid aspiration of any blood or mucus present. The anaesthetist should always be on hand until a patient is awake and maintaining their own airway in case of severe laryngospasm necessitating re-intubation.

**Respiration** can be assessed by monitoring abdominal excursion, chest movement or by feeling for expiration with a cupped hand at the patient's mouth or nose. Oxygenation can also be assessed to some degree by examining the

patient's colour. A dusky, bluish hue suggests hypoxia, and is often most easily noted around the lips or tongue. This does, however, require natural daylight or good quality artificial lighting as some systems produce monochromatic light which makes the appreciation of colour difficult. Bradypnoea will usually be due to intra-operative opioid use and if so will be associated with pinpoint pupils. This may resolve spontaneously as the other anaesthetic agents are eliminated and the patient wakes up. If treatment is indicated (respiratory rate less than 8 bpm or hypoxia) then first try to rouse the patient and if this fails consider naloxone (400 microgram diluted into 10 ml saline administering 2 ml boluses intravenously). Where available doxapram (1 mg/kg) is a useful respiratory stimulant and will not reverse the analgesic effects of opioids. Tachypnoea can be associated with certain volatile agents (particularly ether), acidosis, hypovolaemia, pain, hypoxia or other respiratory problem.

**Circulation** can be assessed by palpating the pulse (thready pulse or tachycardia suggesting volume depletion) and by feeling the peripheries (cold poorly perfused hands also suggest hypovolaemia or hypothermia following long operations). Heart rate should normally be between 60-90 bpm. Bradycardia is usually associated with deep anaesthesia or vagally stimulating surgery and may need treating if the heart rate is less than 40-50bpm or if associated with hypotension (give atropine 200-400mcg). Tachycardia is likely to be due to poor pain control or hypovolaemia, but may rarely be due to atrial fibrillation or a supraventricular tachycardia. Primary treatment should be directed at the cause (morphine or a 250ml fluid challenge). As with respiratory monitoring it is useful to chart the heart rate and blood pressure so that trends over time can be more easily seen. A developing tachycardia is often an early sign of unrecognised blood

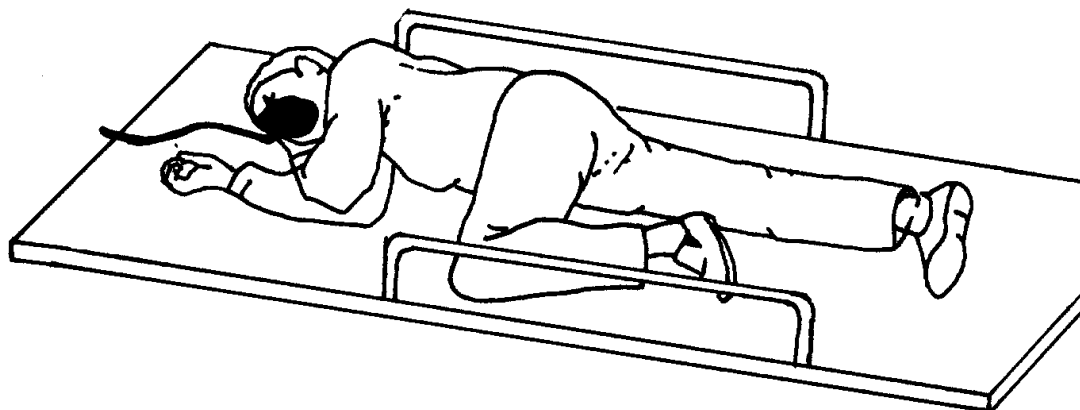


Figure 1: The recovery position

loss. The wound site must also be observed every few minutes to ensure that any bleeding or haematoma formation is noted early. Drainage from surgical drains should also be charted.

**Conscious level** should be monitored by observing the return of reflexes such as the eyelash reflex, swallowing and the start of vocalisation and response to commands. Where the patient has undergone regional anaesthesia (spinal or epidural) the height of the block must be assessed until it is seen to be regressing. This is most easily tested by measuring the point at which cold can no longer be appreciated (using ethyl chloride or ice). It is safer not to sit these patients up too early as marked postural hypotension can occur.

Once the patient is vocalising and is reasonably awake pain levels should be assessed. Recovery nurses should be capable of administering intravenous analgesia and achieving adequate analgesia should be a primary goal once airway reflexes have returned. Pain is most easily treated by administering morphine 1-2 mg aliquots every 3-5 minutes until comfortable. It is very unusual to overdose patients using this regime, but intravenous naloxone should be available. See also Update in Anaesthesia 1997; 7.

#### *Supplemental oxygen therapy*

Whenever possible all patients recovering from anaesthesia should be given supplemental oxygen (4l/min by face mask). Where facilities are limited, provided the airway and breathing is monitored closely, young, fit individuals having relatively minor procedures can often recover without supplemental oxygen. However it should be given whenever possible in the less fit population having major surgery. Anaesthesia, particularly halothane, obtunds, or in some cases abolishes, the hypoxic respiratory drive so that hypoxia no longer stimulates increased ventilation. Coupled with this is a much increased tendency for hypoxaemia to occur due to a variety of reasons including airway obstruction due to an obtunded conscious level, hypoventilation secondary to opioids and anaesthetic agents, diffusional hypoxia caused by nitrous oxide diffusing into the lungs faster than nitrogen can diffuse in the opposite direction and many different causes of ventilation/perfusion mismatching. These include atelectasis (absorption collapse, mucus trapping, prolonged hypoventilation), a decrease in functional residual capacity with anaesthesia and supine posture, poor mucus clearance (absent/impaired cough reflex and poor ciliary function), and possibly hypovolaemia or pulmonary oedema. Patients particularly at risk of postoperative hypoxia include those

who have received nitrous oxide or opioids, and those with pre-existing pulmonary disease. Where oxygen can be administered, even 2 litres per minute via nasal spectacles or face mask may be sufficient to prevent desaturation associated with most of the causes listed above. It is also important to realise that the tendency for hypoxaemia extends long into the postoperative period and is particularly likely to occur on the first postoperative night. If possible, high risk patients undergoing major surgery should receive supplemental oxygen for 48-72 hours.

#### *Monitoring Equipment*

The most useful monitors in the recovery area are the *pulse oximeter* and the *sphygmomanometer*. The latter is obviously considerably cheaper, more widely available and doesn't need electricity to function. It provides valuable information about a patient's cardiovascular status. Postoperatively patients are often mildly hypotensive due to the sedative effects of drugs and the likelihood of blood loss or intraoperative fluid redistribution (coupled with some degree of dehydration due to preoperative fasting). More marked levels of hypotension (or even more seriously a downward trend in blood pressure) often herald an unrecognised blood loss, an adverse cardiac event or may follow spinal anaesthesia. For these reasons it is prudent to monitor blood pressure every five minutes or so until it is stable and within normal limits. This also demonstrates why it is important to document the vital signs over a period of time, so that these trends can more easily be spotted and acted upon.

Since its widespread introduction in the 1980's the pulse oximeter has become one of the mainstays of post anaesthetic monitoring. Where available these machines will give a fairly reliable indicator of systemic oxygenation, together with some indication of cardiovascular status. Oxygen saturation levels should remain above 93% and desaturation below this level in recovery is most commonly caused by airway obstruction and poor or inadequate ventilation. The presence of a good quality pulsatile signal usually denotes adequate peripheral circulation, although vasodilatation and hypotension can still be present, so the blood pressure should still be monitored. See p11 for further reading regarding the use of pulse oximeters.

Apart from the above minimal monitoring, further assessment must be tailored to a patient's particular needs. Urine output should be assessed where an indwelling urinary catheter is sited and ECG monitoring may be necessary where a patient is at risk of arrhythmias.

**Table 2 Routine postoperative observations on patients undergoing major surgery**

- oxygen administration
- oxygen saturation
- respiratory frequency
- blood pressure and heart rate
- conscious level
- pain score
- operation site review
- temperature and urine output where necessary
- any drugs or fluids administered

Temperature should also be checked following long operations (particularly in the elderly) where hypothermia is a risk. Lack of attention to temperature maintenance in theatre can lead to major problems in recovery. Patients tend to lose heat rapidly under anaesthesia due to obtunding of homeothermic mechanisms and prolonged surgical exposure. Hypothermia (even a small reduction to 35 degrees centigrade) can have a major impact on postoperative recovery. As temperature decreases drug metabolism and excretion also decreases thereby prolonging recovery. Poor metabolism of neuromuscular blocking agents can be a particular problem. Blood clotting is also affected early, with a much increased tendency to postoperative bleeding. Shivering also causes increased oxygen utilization, increasing the tendency to hypoxaemia,

and is best treated with body surface warming or intravenous pethidine (10-20 mg).

Where possible the observations in table 2 should be routinely charted on all patients who have undergone major surgery:

#### *Discharge Criteria*

The patient should continue to be observed until fit for discharge to the ward area. Discharge criteria vary, but should include the return of preoperative conscious level and protective reflexes, maintenance of a clear airway, satisfactory breathing and oxygenation (oxygen saturation > 93% on air), stable pulse and blood pressure, acceptable temperature and adequate analgesia (table 3).

**Table 3 Discharge criteria**

- patient conscious and maintaining a clear airway
- return of protective airway reflexes
- satisfactory breathing and oxygenation (oxygen saturation > 93% on air)
- stable pulse and blood pressure
- good peripheral perfusion
- acceptable temperature
- adequate analgesia

#### **Reference**

Immediate Postanaesthetic Recovery, 1993. The Association of Anaesthetists of Great Britain and Ireland, 9 Bedford Square, London WC1B 3RA.