

Review article
Discharge following ambulatory surgery

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Abstract

With increasing numbers of patients being treated on an ambulatory basis it is important to ensure that patients are being discharged safely, and are followed up appropriately. This article reviews the current literature on the subject of discharge from ambulatory surgical units, and complications that occur following discharge. We conclude that patients can be discharged rapidly and safely if a scoring system such as the modified post-anaesthetic discharge scoring system is used. We also conclude that pain control following discharge is inadequate, and is an area that merits further investigation. © 1997 Elsevier Science B.V.

Keywords: Ambulatory surgery; Discharge criteria

1. Introduction

Throughout the developed world there is a trend towards performing more and more surgery on an ambulatory basis. At present approximately 66% [1] of all elective operations in the United States are performed on an out-patient basis, and other countries are aiming to produce similar numbers. This trend is driven by a variety of factors including economic considerations, governmental pressure and patient demands.

As the proportion of operations performed on an ambulatory basis increases, longer and more complex cases are being conducted in the out-patient setting. While this general trend is welcomed it is important to ensure that patients are being discharged into the community safely, and that they have access to appropriate follow-up and emergency referral mechanisms. The key to this is identifying suitable criteria by which to judge the 'home readiness' of the patient.

2. Definition of recovery

Recovery following anaesthesia is defined as occurring in three phases (Table 1) [2]. Early recovery is that period during which patients emerge from anaesthesia and recover their protective reflexes and motor function. This is the stage of recovery that usually occurs in the Post Anaesthesia Care Unit (PACU).

The Aldrete scoring system (Table 2) [3] is used widely as a practical tool by which PACU staff can judge when a patient has completed this early stage of recovery and is fit to be transferred to a phase 2 recovery area, usually ambulatory surgical unit (ASU).

Table 1
Stages of recovery

Stage of recovery	Clinical definition
Early recovery	Awakening and recovery of vital reflexes
Intermediate recovery	Immediate clinical recovery
Late recovery	Home readiness Full recovery Psychological recovery

Taken from [2].

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Patients will remain in the phase 2 recovery area until they are coordinated, ambulating and judged to be home ready — that is until intermediate recovery is complete.

The late recovery period extends from hospital discharge until the patient returns to their pre-operative state and can safely resume activities such as work and driving. This phase may last for many days. The decision as to when a patient is fit to be discharged home is vital to the success of any ambulatory surgery program. As well as jeopardizing patient safety, inappropriate discharge procedures can also cause medico-legal problems for the anaesthetist.

3. Criteria for discharge

It is imperative that patients who have undergone ambulatory surgery are released into the community at the appropriate time. Premature discharge of patients who later require readmission to the hospital or emergency room for treatment of postoperative complications should be viewed as a failure of care, and should happen very rarely, or not at all.

The ultimate responsibility for ordering the discharge of a patient from ASU is that of the physician looking after the patient, however 'a written policy establishing specific discharge criteria is a sound basis for a legally sufficient discharge decision' [4]. What criteria need to be met in that written policy in order to ensure safe discharge with an acceptable incidence of complications? There are a large number of psychomotor tests which have been devised that can assess the recovery of a patient, but these tests are too complex and laborious to be of use in routine clinical practice. They are of much more value as research tools. Minimum acceptable discharge criteria for use in the clinical setting have been suggested (Table 3) [1].

Although the incidence of unanticipated admission rate should ideally be less than 1%, patients who have persistent problems should not be sent home, but should be admitted to an in-patient bed. In practice the most common reasons for admission postoperatively are related to surgical complications rather than anaesthesia [5].

The need to tolerate oral fluids prior to discharge has recently been questioned. It is obviously unacceptable to send a patient out of the hospital if he or she is actively vomiting. However if a patient is comfortable, not nauseated and not dehydrated, but does not feel able to tolerate oral fluids, should they be detained in hospital until they drink?

One study has shown that requiring children to drink before allowing them to be discharged home led to prolonged stay in the ASU and to a higher incidence of nausea and vomiting during the stay [6]. Discharging patients home without insisting that they drink did not

Table 2
Aldrete scoring system

Activity: able to move voluntarily or on command	
4 extremities	2
2 extremities	1
0 extremities	0
Respiration	
Able to deep breathe and cough freely	2
Dyspnoea, shallow or limited breathing	1
Apnoeic	0
Circulation	
BP \pm 20 mm of pre-anaesthetic level	2
BP \pm 20–50 mm of pre-anaesthesia level	1
BP \pm 50 mm of pre-anaesthesia level	0
Consciousness	
Fully awake	2
Arousable on calling	1
Not responding	0
Colour	
Normal	2
Pale, dusky, blotchy	1
Cyanotic	0

Maximum score = 10.

Patients scoring 9 or more are fit to be discharged.

lead to an increased incidence of postoperative complications.

With the exception of patients who have undergone central neural blockade, it also appears unnecessary to require that patients have urinated before they can be discharged. However, if patients have not urinated prior to discharge, they need to be given instructions on when to contact their family physician, or return to the day surgery unit if they run into difficulty.

These considerations led Chung et al. to develop the modified Post Anaesthesia Discharge Scoring System (PADSS) (Table 4) [7]. As its name implies, this scoring

Table 3
Guidelines for safe discharge after ambulatory surgery

- (1) Vital signs must have been stable for at least 1 h
- (2) The patient must be:
 - oriented to person, place and time
 - able to retain orally administered fluids
 - able to void
 - able to dress
 - able to walk without assistance
- (3) The patient must not have:
 - more than minimal nausea and vomiting
 - excessive pain
 - bleeding
- (4) The patient must be discharged by both the person who administered anaesthesia and the person who performed surgery, or by their designates. Written instructions for the post-operative period at home, including a contact place and person, need to be reinforced.
- (5) The patient must have a responsible 'vested' adult escort them home and stay with them at home.

Taken from [1].

Table 4
Modified post-anaesthesia discharge scoring system (modified PADSS)

Vital signs
2 = within 20% of preoperative value
1 = 20–40% of preoperative value
0 = 40% of preoperative value
Ambulation
2 = steady gait/no dizziness
1 = with assistance
0 = none/dizziness
Nausea and vomiting
2 = minimal
1 = moderate
0 = severe
Pain
2 = minimal
1 = moderate
0 = severe
Surgical bleeding
2 = minimal
1 = moderate
0 = severe

Taken from [7].

system superseded an earlier model which included an input/output criterion and had required as a minimum that the patient had either drunk or voided prior to discharge [8]. Subsequent investigation however confirmed that removing these criteria meant that more patients could be discharged earlier, without compromising the safety of that discharge.

The modified PADSS is based on five criteria: vital signs, ambulation, nausea and vomiting, pain and surgical bleeding. Each of these areas is assessed independently and is assigned a numerical score of 0–2 and thus the overall score has a maximum value of 10. Patients are judged to be fit for discharge when their score is 9 or greater.

The modified PADSS is a very simple index to calculate. It relies on straightforward clinical observations which can easily be performed by PACU staff. It puts a numerical value on the degree of a patient's recovery, and allows progress (or lack of progress) to be assessed objectively. It has been demonstrated that the implementation of this scoring system as a criterion for discharge from ASU allows for patients to be discharged earlier, with 80% able to be discharged within 1–2 h (Fig. 1). The main reasons for delays in discharge of patients were related to non-medical problems, such as responsible escorts being late in turning up to collect patients [9].

4. Influence of anaesthetic techniques

The anaesthetic technique chosen can have a marked effect on the quality of the patients recovery from their

ambulatory surgical procedure. It is not only the choice of drugs which is important in this respect, but the overall conduct of the anaesthetic and attention to detail. One simple measure which can effectively reduce the incidence of nausea, thirst, dizziness and drowsiness for up to 24 h postoperatively is to give patients 20 ml/kg of fluid intraoperatively [10].

4.1. Regional anaesthesia

Regional anaesthesia has been used extensively for ambulatory surgical procedures. A whole variety of blocks have been used, and many authors have reported good results. Some studies have demonstrated reduced recovery times with regional techniques when compared to general anaesthesia [11]. Regional anaesthesia provides a number of advantages over general anaesthesia for the ambulatory care setting. These include a lower incidence of postoperative nausea and vomiting, dizziness, disorientation and somnolence, as well as better postoperative analgesia. Regional anaesthesia can also be used as a supplement to general anaesthesia, in which case it will lead to a reduction in postoperative analgesic demands and to faster discharge times [12].

Patients who have received a regional anaesthetic need to meet the same discharge criteria as patients who have undergone general anaesthesia. Their discharge however does not need to be delayed until the full return of sensation, but they do nonetheless need to have an anaesthetic limb properly protected and be given adequate written instructions about care of any insensitive areas.

Spinal anaesthesia offers all the advantages of other regional techniques but it does have its own unique problems in the ambulatory setting. The major drawbacks of spinal anaesthesia for ambulatory patients are the occurrence of post-dural puncture headache (PDPH) and the incidence of urinary retention. Recent studies have demonstrated that the newer pencil point needles produce an acceptable incidence of PDPH which is mild and seldom requires any treatment other than simple analgesics [13]. Another study showed that a combined spinal epidural technique (CSE) with a starting spinal dose of 40 mg of Lidocaine allowed patients to be successfully discharged within 3 h of surgery [14].

Patients who have received a spinal or epidural anaesthetic need to demonstrate full return of sensory, motor, and sympathetic function before they can be safely discharged into the community and all patients who have had a regional block need to be contacted the following day to ensure full return of neurological function.

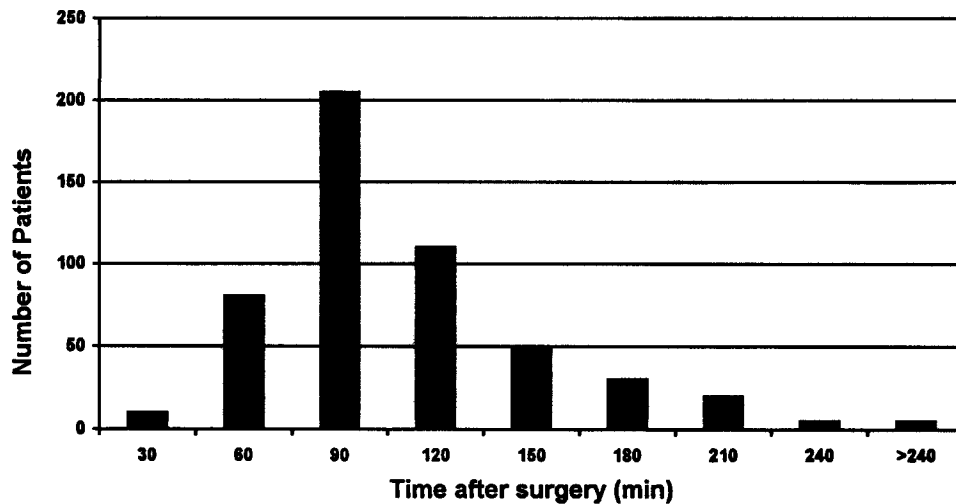


Fig. 1. Number of patients who satisfied Post-Anesthetic Discharge Scoring System home-readiness criteria at each 30 min interval after surgery. Taken from [9].

4.2. General anaesthetic agents

4.2.1. Intravenous agents

Propofol at the present time is the most popular intravenous induction agent for out-patient anaesthetic procedures, because of its rapid recovery characteristics and lower incidence of nausea and vomiting than other intravenous agents [15]. Indeed a continuous intravenous infusion of propofol supplemented with N₂O may be the ideal out-patient general anaesthetic, as it provides recovery characteristics which are indistinguishable from those of the newer inhalational agents but with less postoperative nausea and vomiting (PONV).

4.2.2. Inhalational agents

The familiarity of most anaesthetists with inhalational anaesthesia, its proven track record and its ease of use mean that it is still the most popular form of general anaesthesia for ambulatory patients. The availability of newer less soluble volatile agents mean that recovery characteristics should be better. Studies comparing sevoflurane with isoflurane reveal that although patients recover consciousness more quickly following anaesthesia with sevoflurane, there is no difference to the time of home readiness or in the recovery of cognitive and psychomotor function [16]. Comparing sevoflurane with halothane in paediatric practice confirms these findings. Children anaesthetized with sevoflurane complete the early phase of recovery more rapidly, however their time to discharge is not significantly different [17].

Nitrous oxide, because of its physical characteristics, allows for rapid recovery from inhalational anaesthesia, and when it is used to supplement a propofol infusion it reduces the amount of propofol required and reduces

recovery times [18]. Despite earlier concerns it does not seem to increase the rate of PONV [18], it therefore retains an important place in out-patient anaesthetic techniques.

4.2.3. Opiates

Although widely used as analgesics, opiates are associated with a high incidence of PONV. Morphine is a worse offender in this regard than fentanyl, but avoiding fentanyl in the anaesthetic technique will reduce the incidence of PONV even further [19]. The use of local blocks and non-steroidal inflammatory drugs (NSAIDs) may allow the use of opiates to be minimized, or even avoided altogether for many procedures. If opiates are to be used, then the newer agent remifentanyl may offer some advantages. It is rapidly metabolized by non-specific esterases and allows a more rapid recovery than with other opiates [20].

4.2.4. Muscle relaxants

Suxamethonium is known to cause postoperative myalgias and this is a particular problem in an ambulatory patient population, its use is therefore best avoided in this situation. The newer non-depolarizing relaxants seem to have little effect on recovery in their own right, however the use of neostigmine as a reversal agent is associated with an increased incidence of PONV. The rapid recovery characteristics of mivacurium obviates the need for reversal, and allows neostigmine to be eliminated from the anaesthetic technique [21].

4.2.5. Non-steroidal anti-inflammatory drugs (NSAID)

The NSAIDs as a group are relatively potent analgesics which can replace, or reduce the need for opiates in the treatment of postoperative pain. When used in the out-patient setting NSAIDs can reduce patient dis-

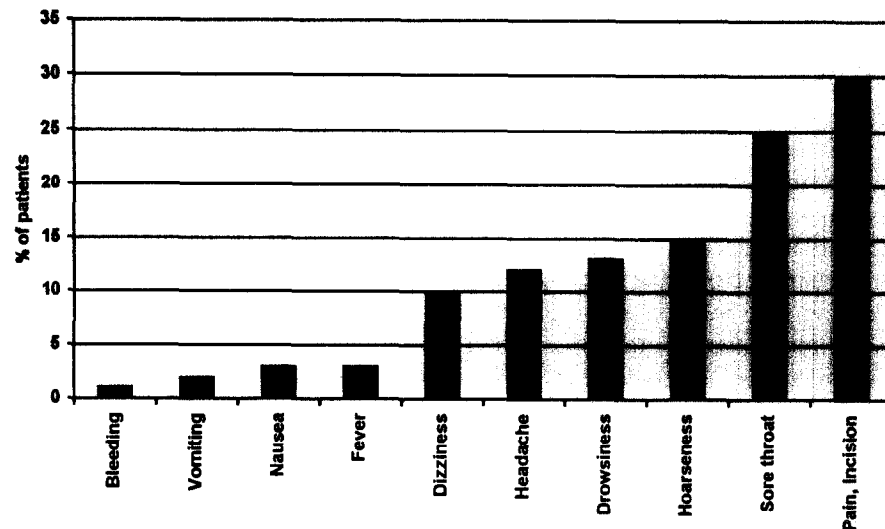


Fig. 2. Overall percentage of patients with postoperative symptoms 24 h after surgery. Taken from [9].

comfort, reduce the incidence of PONV and shorten recovery times when comparisons are made with patients who have received fentanyl [22]. When used as part of a balanced technique in combination with small doses of opiates and local anaesthetics, the NSAIDs reduce the analgesic requirements and shorten discharge times [23].

5. Post-discharge

Discharge from hospital is not the end of the process of recovery as far as the patient is concerned, they still have to go through the late stage, and it may be days or even weeks before they return to their preoperative physiological status. In this late recovery period the patient may also run into complications of anaesthesia and surgery which require further contact with the hospital or with their own family practitioner.

Pain is a major problem following ambulatory surgery, with 26.9% of patients experiencing wound pain 24 h postoperatively [24]. The incidence of wound pain is related to the surgical procedure, with the highest incidences being recorded in patients following laparoscopic, orthopaedic or general surgical procedures. Not surprisingly patients who are in pain at 24 h postoperatively have less functional recovery, and take longer to resume their normal activities. Other significant problems found at 24 h are drowsiness, dizziness and nausea and vomiting, although the numbers reported in studies over time are declining, suggesting that the use of newer agents may be leading to a lower incidence of these symptoms (Fig. 2).

These studies highlight the need for adequate patient education about problems in the postoperative period, and specific instructions about who to contact in the event of any difficulty. It is well known that patients do

not remember oral instructions well, and therefore post-discharge written instructions should be given to the patient and their escort. There has been some interest in the place of standardized instructional videotapes as teaching aids for surgical patients. However, a recent study failed to demonstrate a significant difference in knowledge or expectations in a group of patients who were shown a video preoperatively as compared to those given a routine pre-op visit [25]. For the present, the recommendation must remain that patients are given written instructions that should include the telephone number of an emergency contact at the hospital or freestanding surgical facility.

The recovery process ends when the patient is able to return to their normal daily activities, including driving an automobile. When is it safe to resume driving following an out-patient general anaesthetic? It is possible to detect prolonged reaction times for up to 2 days following repair of an inguinal hernia under general anaesthesia as an out-patient procedure [1]. However this work was done with patients who had received halothane anaesthesia and so it may be that the newer agents will prove to have advantages in this area. However this is an area which remains to be adequately investigated [1].

The current recommendations are that patients who have had an anaesthetic lasting less than 60 min should not drive for 24 h, whereas patients who have had longer procedures should be advised against driving for 48 h [1].

6. Summary

The growth of ambulatory surgery and anaesthesia is such that it will become an increasingly significant part of most anaesthetists' workload as time progresses. It is

vital to ensure that the increasing number of ambulatory patients are discharged into the community at an appropriate time, with effective follow-up and referral procedures. The implementation of objective, standardized scoring systems such as the modified PADSS will allow for early discharge from ambulatory units without compromising patient safety.

Modern general anaesthetic agents allow for rapid recovery and early discharge from the ambulatory units, however recovery may be more rapid if general anaesthetics are avoided and patients are given a regional block. Following discharge, patients need to be followed up appropriately and given specific written guidelines on referral procedures in the event of complications. Pain is a problem in the post-discharge period, and consideration should be given to providing adequate analgesia. Patients should be advised against driving for 24–48 h depending on the duration of the procedure.

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