



ELSEVIER

J. of Ambulatory Surgery 10 (2003) 167–170

Ambulatory  
Surgery

www.elsevier.com/locate/ambsur

## New concepts in recovery after ambulatory surgery

Girish P. Joshi\*

Department of Anesthesiology and Pain Management, University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard, Dallas, TX 75235-9068, USA

### Abstract

The recovery care after ambulatory surgery is in a state of flux. There is increasing emphasis on rapid discharge home after ambulatory surgery. Discharge after surgery should be based on clinical criteria rather than based on time. Recent studies suggest that the insistence on oral intake and voiding before discharge is unnecessary and can delay discharge. This article reviews the recent developments in the recovery process after ambulatory surgery.

© 2003 Elsevier B.V. All rights reserved.

*Keywords:* Surgery; ambulatory; Anaesthesia; recovery; Postanaesthesia care

### 1. Introduction

The exponential growth in surgical procedures performed on an outpatient basis has forced ambulatory surgical facilities to be more efficient with respect to rapid-turnover of patients. One of the important factors in the success of ambulatory surgery is safe and expeditious recovery and discharge home. Therefore, assessment of patient needs and time spent in the hospital is becoming an increasingly relevant issue from both a clinical and cost standpoint. Unnecessary delay in discharge reduces the effectiveness and efficiency of an outpatient setting. On the other hand, premature discharge from the hospital may increase the incidence of readmission, postoperative complications, and may have legal repercussions. Therefore, it is necessary to assure a smooth transition to the home setting.

### 2. Recovery process after ambulatory surgery

The time course of recovery after ambulatory surgery can be divided into early or immediate recovery (occurs in the postanaesthesia care unit [PACU]) during which patients emerge from anesthesia and recover their

protective reflexes and motor function; intermediate recovery (occurs in the phase II unit) during which the patient recovers coordination and physiologic function and is considered ready for discharge home; and late recovery (occurs after discharge from the hospital) during which the patient recovers completely from both anesthesia and surgery and is ready for routine daily activities.

The recovery care after ambulatory surgery is in a state of flux. The length and the need for PACU stay are in question [1,2]. With improved anesthesia and surgical techniques it is possible to have patients who are awake, alert and comfortable in the operating room. This has resulted in a trend towards transferring these patients from the operating room directly to the phase II unit (i.e. bypassing the PACU). This concept is known as fast tracking [1,2]. The process of fast tracking can be further extended to the phase II unit stay resulting in an early discharge home.

### 3. Discharge protocol

Traditionally, discharge from an ambulatory setting has been time-based with ambulatory facilities requiring a minimum mandatory stay in recovery. However, the value of minimum stay requirements is questioned as it may prolong the recovery process unnecessarily. The American Society of Anesthesiologists (ASA) practice guidelines for post anesthetic care state that a manda-

\* Tel.: +1-214-590-7259; fax: +1-214-590-6945.

E-mail address: girish.joshi@utsouthwestern.edu (G.P. Joshi).

tory minimum stay is not necessary and that the length of stay should be determined on a case-by-case basis [3]. Thus, there is a move away from time-based discharge to clinical-based discharge [4].

Utilization of appropriate scoring systems allows the patients to be safely discharged from the PACU (or bypass the PACU) and to be discharged home [5–7]. The modified Aldrete criteria are commonly utilized to determine if the patient is ready for discharge from the PACU to the phase II unit [5] (Table 1). The Aldrete's criteria have been further modified to evaluate the eligibility of patients for fast tracking, which include awake and oriented patient with stable vital signs (hemodynamic and respiratory stability), minimal pain, and minimal nausea and no vomiting [6] (Table 2).

The postanesthesia discharge scoring system (PADS) is the most commonly used tool to determine home readiness [7]. This scoring system requires that the patients have stable vital signs, can ambulate at preoperative level, and have minimal postoperative nausea and vomiting (PONV), pain, and bleeding, as well as can tolerate oral fluids and void before being allowed home. However, the need for mandatory oral intake and voiding before discharge has been challenged. Recent studies report that 10–20% of outpatients can be discharged earlier if drinking and voiding are eliminated from the discharge criteria [3,8] (Table 3).

Table 1  
Modified Aldrete scoring system for determining discharge from the PACU

<i>Activity</i> : able to move voluntarily or on command	
4 Extremities	2
2 Extremities	1
0 Extremities	0
<i>Respiration</i>	
Able to deep breathe and cough freely	2
Dyspnea, shallow or limited breathing	1
Apneic	0
<i>Circulation</i>	
Blood pressure $\pm 20$ mmHg of preanesthetic level	2
Blood pressure $\pm 20$ –50 mmHg of preanesthetic level	1
Blood pressure $\pm 50$ mmHg of preanesthetic level	0
<i>Consciousness</i>	
Fully awake	2
Arousable on calling	1
Not responding	0
<i>Oxygen saturation</i>	
Able to maintain SaO <sub>2</sub> > 92% on room air	2
Needs supplemental oxygen to maintain SaO <sub>2</sub> > 90%	1
SaO <sub>2</sub> < 90% even with supplemental oxygen	0

Score  $\geq 9$  required for discharge Ref. [5].

Table 2  
Criteria for determining ability to bypass the PACU

<i>Level of consciousness</i>	
Awake and oriented	2
Arousable with minimal stimulation	1
Responsive only to tactile stimulation	0
<i>Physical activity</i>	
Able to move all extremities on command	2
Some weakness in movement of extremities	1
Unable to voluntarily move extremities	0
<i>Hemo-dynamic stability</i>	
Mean arterial pressure < 15% of baseline value	2
Mean arterial pressure 15–30% of baseline value	1
Mean arterial pressure > 30% below baseline value	0
<i>Respiratory stability</i>	
Able to breathe deeply	2
Tachypnea with good cough	1
Dyspneic with weak cough	0
<i>Oxygen saturation status</i>	
Maintains value > 90% on room air	2
Requires supplemental oxygen (nasal cannula)	1
Saturation < 90% with supplemental oxygen	0
<i>Postoperative pain assessment</i>	
None or mild discomfort	2
Moderate to severe pain controlled with IV analgesics	1
Persistent severe pain	0
<i>Postoperative emetic symptoms</i>	
None to mild nausea with no active vomiting	2
Transient vomiting or retching	1
Persistent moderate to severe nausea and vomiting	0

Score  $\geq 12$  required for fast tracking Ref. [6].

Table 3  
Modified PADS for determining home-readiness

<i>Vital signs</i>	
Blood pressure and pulse within 20% of preoperative value	2
Blood pressure and pulse 20–40% of preoperative value	1
Blood pressure and pulse > 40% of preoperative value	0
<i>Activity level</i>	
Steady gait, no dizziness, or meets preoperative level	2
Requires assistance	1
Unable to ambulate	0
<i>Nausea and/or vomiting</i>	
Minimal: successfully treated with oral medication	2
Moderate: successfully treated with intra-muscular medication	1
Severe: continues after repeated treatment	0
<i>Pain</i>	
Acceptable	2
Not acceptable	1
<i>Surgical bleeding</i>	
Minimal: does not require dressing change	2
Moderate: up to two dressing changes required	1
Severe: more than three dressing changes required	0

Score  $\geq 9$  required for discharge Ref. [4].

#### 4. Oral intake before discharge

The insistence on tolerance to oral fluids before discharge is probably due to concerns of dehydration after discharge home. However, administration of oral fluids to a nauseated patient may further increase the incidence of PONV.

Schreiner et al. [9] compared the effect of mandatory drinking to voluntary drinking prior to discharge from hospital on the incidence of PONV and the time to home-readiness in 989 healthy children. In the immediate postoperative period children were randomized to one of two groups with one group requiring to drink clear fluids prior to discharge ('mandatory drinkers') whereas the other group was not required to drink ('elective drinkers'). Parents in the elective drinkers group were instructed not to offer food or drink unless the child asked for it. Except for the difference in this discharge criterion, the two groups were treated similarly. All children were allowed drink clear fluids until 2 h prior to surgery and were well hydrated intra-operatively. The results of the study showed that 78% of the elective drinkers chose to drink voluntarily before discharge [9]. In this group, there was no difference in the duration of stay between the children who chose to drink and those who were discharge without drinking. However, mandatory drinkers stayed in the PACU significantly longer than the elective drinkers (mean  $\pm$  S.D.,  $101 \pm 58$  vs.  $84 \pm 40$  min). The duration of stay in the day surgery unit was also longer in the mandatory drinkers (mean  $\pm$  S.D.,  $98 \pm 55$  vs.  $83 \pm 39$  min). In the day surgery unit, significantly fewer children in the elective drinker group vomited (14 vs. 23%). Post-discharge complication rate was similar in the two groups with no patient requiring re-admission to the hospital for dehydration or intractable vomiting. Experience with approximately 20000 children undergoing ambulatory surgery at the Children's Hospital of Philadelphia, PA has further verified the safety of elective drinking prior to discharge [10].

Another large study ( $n = 726$ ) evaluated the effects of withholding oral fluids from adult outpatients before discharge home [11]. These investigators also found that patients who were required to drink fluids had a longer hospital stay than those who were discharged home without drinking. In addition, patients in the mandatory drinkers group required more time to ambulation and void. However, there was no difference in the incidence of PONV between the mandatory drinkers and the non-drinkers. The investigators conclude that eliminating oral fluid intake from the discharge criteria can shorten the hospital stay without any adverse effects [11]. Of note, the patients in this study received large infusion of fluids (20 ml/kg) intra-operatively, which has been shown to reduce the incidence of postoperative nausea, thirst, dizziness and drowsiness [12].

The ASA practice guidelines recommend that the ability to tolerate oral fluids should not be part of a routine discharge protocol but may appropriate for in selected patients (e.g. likelihood of complications if fluids are not taken) [3].

#### 5. Voiding before discharge

Another criterion, which is currently being challenged, is the need for voiding prior to discharge. Voiding has traditionally been considered a prerequisite to discharge home because of the concern that patients might develop urinary retention after discharge. Over distention of the bladder due to urinary retention can cause bladder atony and lead to significant renal complications. Furthermore, recent studies recommend liberal fluid administration in the intra-operative period because of reduced incidence of postoperative complications (e.g. nausea, dizziness, and drowsiness) [12]. However, there is concern of increased incidence of postoperative urinary retention with this practice.

There is increasing evidence suggesting that insistence on voiding before discharge in all patients is unnecessary and can delay discharge [3,8,13]. The incidence of postoperative urinary retention in outpatients is reported to be 0% after non-pelvic surgery under general or local anesthesia, 4% after gynecological surgery, 18% after hernia surgery and 25% after anorectal surgery [8]. These observations suggest that voiding before discharge may not be necessary in patients at low-risk of urinary retention (e.g. patients undergoing non-pelvic surgery).

Pavlin et al [13] designed a study to evaluate the need for voiding prior discharge after ambulatory surgery. Outpatients were stratified into risk categories for urinary retention. Patients at low-risk of urinary retention (i.e. non-pelvic or gynecologic surgery,  $n = 267$ ) were discharged home without being required to void. Patients at high risk of urinary retention (i.e. history of prior retention, hernia or anal surgery,  $n = 62$ ) were required to void before discharge. The patients in the low-risk group were further randomized to receive high intra-operative fluid administration (10 ml/kg bolus) or low fluid administration (2 ml/kg bolus) [13]. Bladder volumes were measured using ultrasound at various time points in the postoperative period. They investigators found that patients at low-risk of urinary retention can be safely discharged home without the prerequisite for voiding. This practice saved the recovery time by approximately 75 min in 12% of patients [13]. They also found that although liberal fluid administration increased postoperative bladder volume, the incidence of urinary retention or time to void was not increased. However, patients at high risk for retention should

receive perioperative fluids judiciously to avoid over distending the bladder before they are ready to void.

The investigators conclude that in patients at low risk of retention, voiding before discharge is unnecessary. On the other hand, patients at high risk should have their bladder evacuated if they are unable to void when otherwise ready for discharge. All patients should be cautioned to return to the medical facility if they are unable to void within 8–12 h of discharge. Patients at risk of postoperative urinary retention include those undergoing inguinal or anal surgery, patients with a prior history of urinary retention and patients receiving neuraxial anesthesia [13].

A large study of 1719 consecutive outpatients identified 30 patients who were at high risk for retention and were unable to void despite fulfillment of other discharge criteria [14]. These patients were discharged home and followed-up home healthcare nurse. They found that only three patients (10%) required catheterization at home. These patients had undergone either hernia repair or anorectal surgery under spinal anesthesia. The investigators concluded that even high-risk patients could be discharged home without voiding; however, they need appropriate follow-up by home nurses and catheterization if necessary [14]. Furthermore, the cost of providing homecare nurses must be balanced against any saving from early discharge in this patient population.

The ASA practice guidelines recommend that routine requirement for voiding before discharge should not be a part of a discharge protocol and may only be necessary in selected patients (e.g. the type of surgery performed, prior history of urinary retention and anesthetic technique used) [3].

## 6. Summary

The use of specific criteria, which are simple, clear, objective and reproducible provide reliable guide for safe discharge of outpatients. Each institution should modify the established criteria according to their patient population, surgical case mix, and availability of nursing care. Appropriate modifications of the current discharge

criteria based upon the recent literature should allow us to discharge patients expeditiously without compromising their safety. It is important to recognize that home-readiness is not synonymous with street fitness. Therefore, patients should be given clear instructions and cautioned against performing functions that require complete recovery of cognitive ability.

## References

- [1] Joshi GP. Fast tracking in outpatient surgery. *Curr Opin Anaesthesiol* 2001;14:635–9.
- [2] Joshi GP, Twersky RS. Fast tracking in ambulatory surgery. *Ambulatory Surg* 2000;8:185–90.
- [3] Practice guidelines for postanesthesia care. A report by the American Society of Anesthesiologists Task Force on postanesthesia care. *Anesthesiology* 2002; 96: 742–752.
- [4] Marshall SI, Chung F. Discharge criteria and complications after ambulatory surgery. *Anesth Analg* 1999;88:508–17.
- [5] Aldrete JA. The post-anesthesia recovery score revisited. *J Clin Anesth* 1995;7:89–91.
- [6] White PF, Song D. New criteria for fast-tracking after outpatient anesthesia: a comparison with modified Aldrete's scoring system. *Anesth Analg* 1999;88:1069–72.
- [7] Chung F, Chen VWS, Ong D. A post-anesthetic discharge scoring system for home readiness after ambulatory surgery. *J Clin Anesth* 1995;7:500–6.
- [8] Pavlin DJ, Rapp SE, Polissar NL, Malmgren JA, Koerschgen ME, Keyers H. Factors affecting discharge time in adult outpatients. *Anesth Analg* 1998;87:816–26.
- [9] Schreiner MS, Triebwasser A, Keom TP. Ingestion of liquids compared with postoperative fasting in pediatric outpatients. *Anesthesiology* 1990;72:593–7.
- [10] Schreiner MS, Nicolson SC. Pediatric ambulatory anesthesia: NPO-before and after surgery? *J Clin Anesth* 1995;7:589–96.
- [11] Jin F, Norris A, Chung F, Ganeshram T. Should adult patients drink fluids before discharge from ambulatory surgery? *Anesth Analg* 1998;87:306–11.
- [12] Yogendran S, Asokumar B, Cheng DCH, Chung F. A prospective randomized double-blinded study of the effect of intravenous fluid therapy on adverse outcomes on outpatient surgery. *Anesth Analg* 1995;80:682–6.
- [13] Pavlin DJ, Pavlin EG, Fitzgibbon DR, Koerschgen ME, Plitt TM. Management of bladder function after outpatient surgery. *Anesthesiology* 1999;91:42–50.
- [14] Fritz WT, George L, Krull J. Utilization of a home nursing protocol allows ambulatory surgery patients to be discharged prior to voiding. *Anesth Analg* 1997;84:S6 (abstract).