A quantification of discharge readiness after outpatient anaesthesia: patients' vs nurses' assesment

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Abstract

Objectives: *Criteria for discharge after outpatient surgery do not take into consideration the patients' assessment of discharge readiness. Our aim was to compare discharge readiness as determined by nurses with that determined by patients against the modified Aldrete score as a benchmark.* ***Design and setting:*** *In this prospective study, a single observer followed 194 outpatients in the PACU. A modified Aldrete score was assigned and further assessments were made at 15-min intervals in parallel with those made by nursing staff. Nurses and patients were blinded to each other's assessments . Discharge readiness was quantified according to three different approaches: 1) time to reach a modified Aldrete score of >9, 2) time to discharge readiness according to the patient's own evaluation and, 3) time to discharge readiness according to nursing assessments.* ***Results:*** *All three times were significantly different from each other. a) Time to achieve a modified Aldrete score >9 was 8.3+7.6 min, b) Time the patient felt discharge ready was 45.3+39.5 min, c) Time the patient was actually discharged by nurses was 86.8+45.8 min.* ***Conclusions:*** *Nursing staff tend to keep patients an additional 41.5 + 36.6 min in the PACU compared to the patients' own evaluation. Significant cost saving could be potentially realised if outpatients who achieve a modified Aldrete score >9 are allowed some freedom in the determination of their own discharge readiness.*

INTRODUCTION

The question of appropriate length of stay in a surgical facility after outpatient anaesthesia and surgery is crucial to the future growth of ambulatory surgery.[1] In many units, a post-anaesthesia recovery score (for example, a modified Aldrete score [2,3]) is determined in Phase I PACU. When the patients attain a score of > 9, they are transferred to Phase II. Discharge home from Phase II is based on clinical discharge criteria which require the patient to be clinically stable but also take into consideration factors such as the availability of an adult escort, ability to understand postoperative instructions, ability to tolerate oral fluids, to void and walk unassisted.[1] Neither Phase I nor Phase II discharge criteria take into consideration the opinion of the patient. Recently, it has been

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Appendix 1
Modified Aldrete Score

Level of Consciousness	2	Fully awake, orientated in place and time
	1	Rousable on calling name
	0	Not responding
Activity	2	Moving all four limbs on command
	1	Moving two limbs spontaneously
	0	Not moving at all
Respiration	2	Breathes and coughs well
	1	Dyspnoea or tachypnoea
	0	Apnoea
Circulation	2	BP +/- 20% of pre-anaesthetic value
	1	BP +/- 20 – 49% of pre-anaesthetic value
	0	BP +/- 50% of pre-anaesthetic value
Saturation	2	SpO2 > 92% on room air
	1	O2 required to keep SpO2 at 90%
	0	SpO2 < 90% with O2

shown that after outpatient laparoscopic cholecystectomy, there was disagreement between patients and nurses - a majority of patients felt they were not home ready while nursing staff held the opposite view.[4] There is little information on how patients' assessment of discharge readiness compares with nurses' assessments of discharge readiness after other types of outpatient procedures.

The aim of this study was to compare discharge readiness as determined by nurses with that determined by patients against the modified Aldrete score as a benchmark.

METHODS

The study was conducted in the Surgical Day Care Centre (SDCC) at Vancouver General Hospital, an 800-bed tertiary-care academic hospital. Approximately 8-10,000 outpatient anaesthetics are performed in our SDCC per annum. The SDCC facility consists of four operating rooms performing procedures that represent most day care surgical specialities. The PACU consists of a Phase I and Phase II area. At our institution, in order to discharge patients from Phase I, nurses use the following clinical criteria:

a) completely alert and oriented;
b) stable vital signs within 20% of preoperative values;
c) no surgical complications;
d) absence of side effects such as nausea, vomiting and dizziness; e) adequate pain control with oral analgesics;
f) resolution of sensory and motor block after neuraxial anaesthesia, and
g) able to walk. Patients leaving our Phase 1 area are considered home-ready.

Our Phase 2 PACU is a lounge area where patients await a ride home or final instructions.

It is not an area to which our patients have been fast-tracked to date, unlike in other North American Institutions. Input from anaesthesiologists is not a requirement for discharge home unless the attending staff specifically requests this. In the PACU, patients were monitored as per established protocols. Assessments of pain and nausea/vomiting were performed by the nurses according to the standard of care in the PACU. Rescue analgesia and anti-emetic therapy was administered at any time at the request of the patient or physician. The choice of analgesics and anti-emetic was left to the discretion of the attending anaesthesiologist.

Discharge time determined by nurses in this study refers to the total time in Phase I. Once patients leave the Phase I area, they are transferred to a Phase II area. Discharge home from the Phase II area is dependent on multiple factors such as availability of transport, escort etc and is therefore not suitable for precise quantitative analysis. The institutional ethics committee approved the study and individual patient consent was not required. All patients and nurses were blinded to the goals of the study.

Patients were tracked through the SDCC over consecutive days. Only one physician observer (KC) was involved in the evaluation of patient recovery and discharge time for this study. On each day, the patient observation period started with the first patient admitted to the PACU each morning and ended with the last patient discharged at the end of each day. The observer filled out a data sheet for each patient that was admitted to the PACU. For each patient tracked in the study, the following information was obtained: patient's hospital ID number, age, gender, ASA score, race, surgical service, surgical procedure and anaesthetic technique. Immediately upon each patient reaching the PACU, the admission time was noted and a modified Aldrete score assigned by the observer. Each patient was then evaluated at 15-min intervals in parallel with nursing assessments until the patient was discharged from Phase I. At each assessment, the observer documented the modified Aldrete score, the nurses' assessment of discharge readiness, and the patients' assessment of discharge readiness. Both the patient and nursing staff were queried at each 15-min period regarding whether the patient was ready for discharge. Nurses and patients were blinded to the modified Aldrete score and each other's assessments with respect to discharge readiness.

Groupings for anaesthetic technique were :-

1) regional
2) general with facemask or laryngeal mask airway (GA-LMA/Mask)
3) general endotracheal anaesthetic (GA-ETT)
4) local
5) other.

General anesthetic techniques used in these patients were:

a) induction – propofol,
b) maintenance – sevoflurane, isoflurane or propofol with oxygen and nitrous oxide,
c) relaxants – mivacurium, atracurium or rocuronium,
d) analgesics – fentanyl or alfentanil,
e) reversal agents – glycopyrrolate and edrophonium or neostigmine.

Duration of anesthesia and surgery was not assessed in relation to discharge time in this study.

A standardized data collection form was used for each patient. Data was entered into a spreadsheet program. Statistical analysis was performed with the Statistical Analysis Software system. Data are expressed as means + SD and paired sample statistics and, single factor ANOVA were used to identify significant differences. A P value of < 0.05 was considered significant.

RESULTS

A total of 194 patients was enrolled in the study. The demographics of the study population are summarised in Table I. The mean age was 41+18yr (Range 14-92 years). The modified Aldrete scores on arrival in PACU are summarised in

Table I. Demographics

	N	%
Male/ Female	69/125	36/64
Ethnicity:		
Caucasian	132	68
Asian	48	24.7
African-American	3	1.5
Hispanic	1	0.5
Other	10	5.1
ASA Class:		
I/II/III	121/59/14	62/30/7
Anaesthetic Technique:		
General (LMA/FM)	93	48
General (ETT)	64	33
Local	31	16
Regional	6	1.5
Surgical Speciality:		
Gynaecology	73	37
Urology	52	27
ENT	22	11
Orthopaedics	14	7
Dental	12	6
Opthamology	9	4.6
General Surgery	6	3
Vascular Surgery	4	2
Plastics	2	1

Figure 1.Modified Aldrete Scores on arrival in PACU

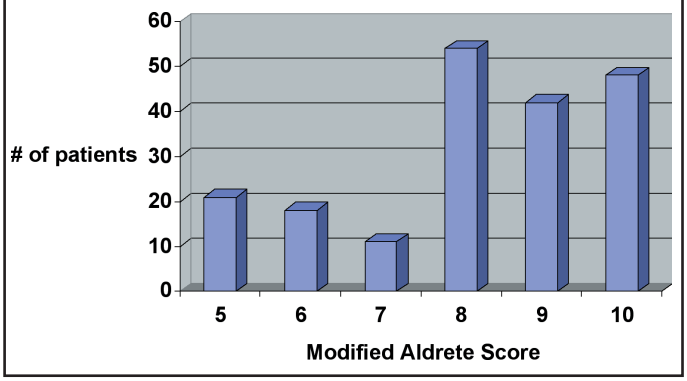

Figure 1. The three times (time to reach a modified Aldrete score > 9, the time that patients felt discharge ready, and the time that patients were discharged by nursing staff) calculated for the whole study are summarised in Table II and Fig 2. Subgroup analysis of the mean difference between the time the patient was discharged and the time when the patient felt discharge ready is shown in Table III. Seventy patients were discharged before 1 PM and 124 patients were discharged after 1 PM - time of discharge did not influence the study results.

For the total study population, the extra time spent in PACU (time patients discharged minus time patients felt discharge ready) was: 134 + 118 hr.

Table II. Summary for various times

	Mean + SD (mins)
Time to achieve modified Aldrete >9 (A)	8.3 + 7.6
Time patients felt discharge ready (B)	45.3 + 39.5*
Time nurses discharged the patients (C)	86.8 + 45.8*
B minus A	36.9 + 39.2**
C minus B	41.5 + 36.6**

*P < 0.001
** P < 0.0001

Figure 2. Differences over time in % of patients with respect to: times to achieve a modified Aldrete score >9, time the patient felt ready for discharge and time when nurses actually discharged the patients. All times are from arrival in PACU.

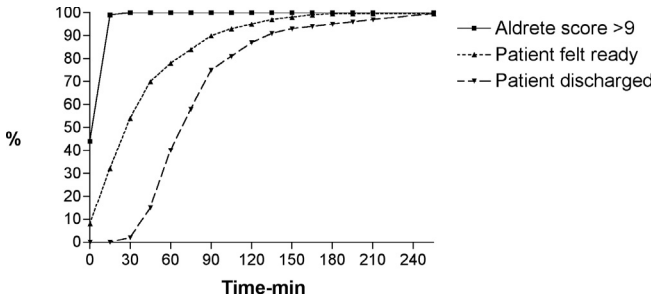

Table III. Mean differences in time patient discharged minus time patient felt ready for discharge by subgroup.

Subgroup	Mean + SD	P value
GA-ETT	44.5 + 41.3	
GA- LMA/Mask	35.4 + 30.3	
Other regional	37.5 + 25.9	0.063
ENT surgery	38.1 + 26.8	
Urology surgery	39.2 + 39	
Gynaecology surgery	36.1 + 30	
ASA Class I	39.5 + 30.8	
ASA Class II	37.3 + 33.7	
ASA Class III	76 + 68.7	0.001

DISCUSSION

This study has demonstrated that actual discharge time after outpatient surgery (86.8 + 45.8 min) was significantly longer than the time that patients felt discharge ready (45.3 + 39.5 min), which in turn was significantly longer than discharge readiness time assessed by objective criteria such as the modified Aldrete score (8.3 + 7.6). These differences were still present when subgroup analysis by anaesthetic type, surgery type and ASA score were performed. The total extra time (de-

fined as the time that the patient was discharged minus the time that the patient felt discharge ready) spent in PACU for the seven days of the study was found to be 134 + 118 hr.

Modern anaesthetic agents such as propofol, desflurane and sevoflurane have been shown to be associated with such a rapid recovery that patients have achieved a modified Aldrete score of > 9 within 10 to 15 min of termination of anesthesia.[3] On arrival in the PACU, 75% and 90% of patients managed with sevoflurane and desflurane respectively were found to be fast-track eligible compared with 26% of patients receiving propofol.[3] Our results were comparable to these because the time to achieve a modified Aldrete score of >9 in the present study was 8.3 + 7.6 min. This time does not include the time to transfer the patient from the operating room to the PACU. In addition, 22% and 25% of our patients had a modified Aldrete score of 9 and 10 respectively on arrival in PACU. Thus, a total of 47% of our patients were fast-track eligible. This lower fast- track eligibility reflects the variety of anaesthetics used in our SDCC.

It has been demonstrated that >20% of patients experienced a delayed PACU discharge accounting for 8% of total PACU time.[5] Delayed discharge was defined as a patient being discharged >30 min after a physician determined that discharge was medically appropriate. Causes of discharge delays were administrative or non-medical factors. The present study was not designed to examine reasons for delayed discharge in our day-care unit. However, the investigators were absolutely assured that none of the delays were due to medical reasons. The fact that all patients in this study were exposed to delays when compared to an objective standard (Modified Aldrete score) and to the patients' own assessment suggests that greater scrutiny needs to be directed at decision-making by nurses.

Since patients are delayed by approximately 41 min (Table 2), our unit could achieve substantial cost savings per year based on a census of 10,000 annual cases, if patients were discharged when they felt ready. Such a large potential for cost savings suggests that a prospective study, allowing patients freedom to determine their own discharge times, needs to be considered. However, reducing length of stay alone is not enough to substantially reduce cost. The peak levels of patients numbers in the PACU needs to be reduced by 25% before staffing levels may be reduced and therefore significant savings be realised.[6]

Optimizing patient turnover in the PACU may lead to less disruption in operating room schedules because if the admission rate to the PACU is higher than the discharge rate, the result is that the operating room is held up.[6]

One of the single most important factors in patient delay postoperatively is the subjectivity associated with nursing decision making.[5]

There may be concerns that patients may not be good judges of their own discharge readiness and that nursing staff may adopt a more cautious and hence, safer approach to determination of discharge. However, the reverse appears to be the case. Fleisher et al have demonstrated that after outpatient laparoscopic cholecystectomy, only 29% of patients felt they were ready to be discharged home compared with 79% that were felt by nursing staff to be acceptable for home discharge.[4] It seems that the determinants of patient's assessment of discharge readiness appear to take into consideration factors in the home environment that are beyond the purview of nurses but which are nevertheless of considerable importance from the safety perspective.

There may be a perception that a longer stay in the PACU would be essential in order to identify complications such as surgical bleeding. Whereas minimum times of observation in the PACU have been defined arbitrarily to detect complications such as bleeding after procedures such as tonsillectomy, there is little objective data to support such empirical guidelines.[7] On the contrary, bleeding is a complication that occurs on a continuum from the end of surgery over several day of the ensuing postoperative period depending on the type of surgery.[4,7-8] Most patients at risk of postoperative bleeding can be identified by observation in the PACU for 30 - 45 min.[8] Increasing the PACU observation period beyond this would increase the yield at the expense of decreased efficiency of the PACU.[8] Any patient at high risk of a postoperative complication as determined by a physician will clearly warrant a more conservative approach in planning their discharge. Patient education prior to discharge including the distribution of information sheets with detailed instructions should any untoward effects occur at home, are paramount in any discharge policy in ambulatory units.

Prevention of minor complications such as postoperative nausea and vomiting (PONV) may be another reason for delaying a patient's discharge from PACU. In this study, we did not assess complication rates or timing of postoperative events. Indeed, there is no assurance that a patient who has remained symptom free in the PACU will remain so after discharge. This problem was illustrated in a study by Michaloliakou et al.[9] Outpatients were randomised to receive either multimodal analgesia (treatment group) or single modality analgesia (controls) and both groups received droperidol at induction. In the PACU, the incidence of PONV was 4.7% in the treatment group and 29.7% in the control group. However, following discharge from the PACU, the incidence of PONV was high and similar in both groups (treatment 23.8%, control 33.8%). The cumulative probability of being complication (PONV) free, decreases over time after surgery.[4] This type of behaviour may also apply to other complications seen after outpatient surgery.[7,8]

The medico-legal implications of allowing patients to determine their own discharge should not deter the formulation of new and safe discharge guidelines. Some parallels may be worthwhile considering. Fasting guidelines in outpatients have been changed in many institutions from 'NPO after midnight' to 'clear fluids up to 3 hr before surgery' – in this case pa-

tients have been given more autonomy over their preoperative intake without distraction from medico-legal considerations. Such a change in practice has been found to be safe and beneficial to patients.

There are some design aspects of this study that also need to be considered. Sampling bias[10] could have occurred because it was not possible to track all patients admitted to the PACU and only 5 patients could be tracked consecutively due to the constraints of having to closely follow each one. However, the demographic, surgical and anaesthetic diversity suggest that a wide cohort was sampled and it was representative of our day unit. The exclusion of some patients was based on whether the investigator was able to follow them closely and did not coincide with times when the PACU was busy. Exclusion of some of these patients may have introduced some errors in the correct estimation of discharge readiness. Bias could also have occurred in the determination of discharge readiness by the anaesthesiologist. A gold standard (Modified Aldrete score) was utilised to minimise error from subjective assessments. The Aldrete score may no longer be the objective score of choice as it disregards postoperative complications such as bleeding, postoperative nausea and pain. It is a suitable scoring system to determine bypassing Phase [1] in an institution where fast-tracking is undertaken. An alternative scoring system might have been better employed. However, a single anaesthesiologist was used for all assessments of the modified Aldrete score to minimise inter-observer error. Our inability to blind the anaesthesiologist may still leave room for observer bias based on the patient's condition, type of surgery and anaesthetic. However, it is difficult to determine if a study where the anaesthesiologist was blinded would yield additional useful information because the determination of discharge readiness requires knowledge of the patients' comorbid status, type of surgery and anaesthetic. With respect to nursing assessments, there was less room for bias because the nursing staff were unaware of the Aldrete scores or the patients' assessments. Similarly, the patients were blinded to the Aldrete scores and the assessments made by nurses.

The population studied was from that of a large academic centre. Some of our patients may therefore be unique in terms of physical condition and type or extent of surgery. However, the demographics suggest that our patients and hence our findings are comparable to other centres.

In conclusion, it was found that when patients determined their own discharge readiness, the time they felt discharge-ready was significantly shorter than the actual time they were discharged based on nursing assessments. In the light of these findings, we suggest that perhaps the patients' subjective input into their own discharge should also be considered as well the subjective nursing discharge criteria which are commonly employed. The considerable economic consequences of the discrepancy demonstrated suggest a prospective multicenter study is warranted before any changes in discharge policy are made.

References

1. *Chung FC. Discharge requirements. In: White PF (Ed) Ambulatory Anesthesia and Surgery, 1st ed. Philadelphia, PA: W.B.Saunders, 1997: 518-25.*
2. *Aldrete JA. The post-anesthesia recovery score revisited. J Clin Anesth 1995;7:89-91.*
3. *Song D, Joshi GP, White PF. Fast-track eligibility after ambulatory anesthesia: a comparison of desflurane, sevoflurane, and propofol. Anesth Analg 1998; 86: 267-73.*
4. *Fleisher LA, Kelvin Y, Lillemoe KD, et al. Is Outpatient Laparoscopic Cholecystectomy Safe and Cost-effective? Anesthesiology 1999; 90: 1746-55.*
5. *Pavlin DJ, Rapp SE, Polissar NL, et al. Factors affecting discharge time in adult outpatients. Anesth Analg 1998; 87: 816-26.*
6. *Dexter F, Tinker JH. Analysis of strategies to decrease post anesthetic care unit costs. Anesthesiology 1995; 82:1534-1535*
7. *Rakover Y, Almog R, Rosen G. The risk of postoperative haemorrhage in tonsillectomy as an outpatient procedure in children. Int J Pediatr Otorhinolaryngol 1997; 41: 29-36.*
8. *Vaghadia H, Scheepers L, Merrick PM. Readmission for bleeding after outpatient surgery. Can J Anesth 1998; 45: 1079-83.*
9. *Michaloliakou C, Chung F, Sharma S. Preoperative multimodal analgesia facilitates recovery after laparoscopic cholecystectomy. Anesth Analg 1996;82:44-51.*
10. *Waddle JP, Evers AS, Piccirillo JF. Postanesthesia care unit length of stay: quantifying and assessing dependent factors. Anesth Analg 1998; 87: 628-33.*