Discharge from Recovery Room in Ambulatory Surgery Centers

Rajeev Dalal, Sadie Smith, Justin Pachuski, David Fanelli, Patrick McQuillan, Alan David Kaye, and Henry Liu

Abstract

Ambulatory surgery has gained tremendous popularity within the last 2–3 decades. More and more surgeries are performed on outpatient basis at ambulatory surgery centers. The understanding of how the postanesthesia care unit (PACU) functions is important in the appropriate care and discharge of the patients. Multiple phases of recovery exist and patients can be triaged based on their emergence from anesthesia. PACU discharge scoring systems have been implemented to progress a patient through the stages of recovery until discharge. The scoring systems initially developed by Aldrete, later modified by Chung and White, are still being used today. Discharge from ambulatory surgery centers has unique concerns when compared with discharge from PACU to hospital wards. This chapter will discuss the special considerations when discharging patients from PACU in ambulatory surgery centers.

Introduction

Ambulatory surgery centers (ASCs) are facilities that provide same-day surgical care for diagnostic and therapeutic procedures. They function similar to hospital outpatient departments and must comply with federal rules and regulations. Various types of procedures are typically performed in ASCs by specialties of orthopedics, urology, ophthalmology, gastroenterology, plastic surgery, otolaryngology, dentistry, interventional pain, and more. Established in response to challenges in scheduling, operating room availability, and hospital policies, the first freestanding ASC opened in early 1970. The American Society of Anesthesiologists released its very first guideline for postanesthesia care unit (PACU) discharge in ASCs few years later, and a rapid growth in ASCs ensued nationwide [1]. By the mid-1980s, ambulatory surgery accounted for almost 50% of all surgical volume in the nation [2]. Fast forward to the latest decade, around 48.3 million procedures, both surgical and nonsurgical, were performed...
with almost half occurring in ASCs in 2010. About 95% of those ambulatory surgery patients in hospitals and ASCs were routinely discharged at the same day, while the other 5% were either admitted to the hospital, placed under observation status, or other options [3]. Despite attempting to optimize patients for discharge at ASCs, some patients will need to be transferred for admission to a nearby hospital for further care. Justifications for doing so include acute coronary syndromes, unstable arrhythmias, need for blood transfusions, and other lifesaving interventions. In concordance with the growth of ambulatory centers, the complexity of surgeries and patient comorbidities have been on the rise as well. The essence of ambulatory anesthesia involves rapid but safe discharge and return to daily function, so the anesthesiologists should be cognizant of the process patients face from arrival to discharge [4].

PACU and PACU Discharge

It is the national standard that patients who undergo general anesthesia, regional anesthesia, or monitored anesthesia care receive postanesthesia management in PACU, with the exception of critically ill patients who may go to the intensive care unit (ICU) directly. Upon arrival to the PACU, vital signs immediately monitored include blood pressure, heart rate, oxygen saturation, respiratory rate, and temperature. These vital signs are measured every 5 minutes for the first 15 minutes, then every 15 minutes. Airway patency, level of consciousness, and pain levels, among others, are also important characteristics that are assessed regularly. During this time of transition from anesthesia provider to PACU nurse, a handoff report must be given. This report includes essential perioperative factors; specifically, the preoperative history, intraoperative process and pertinent issues, assessment and report of current status, and postoperative instructions for the patient. Patients emerging from anesthesia require frequent monitoring as complications may arise and lifesaving measures may be required in a timely fashion [5].

In order for patients to receive individualized care following anesthesia, there must be an appropriate triage. Thus, PACU care is often divided into phases which are commonplace between hospitals and ASCs. Phase I represents the immediate recovery of a patient from anesthesia until hemodynamically stable. Specific criteria based on discharge scoring systems must be met before the patient progresses to Phase II. Phase II focuses on preparing patients for discharge along with postoperative education and instructions. At times, a patient may bypass phase I and head directly from the operating room to Phase II, a process referred to as “fast-tracking” [6]. This process improves efficiency in ASCs and allows for faster discharge. Practice models and logistics vary among institutions; Phase I and Phase II may be in the same location or they may be in separate locations. This is important in terms of staffing. Nurses take care of multiple patients simultaneously, so the RN ratio may alter in distinct phases. As well, if the phases are in separate areas, coordination must exist for the patient to be transported and monitored appropriately to the desired location. This creates additional planning in ensuring a smooth process for patients.

The determination of advancing a patient through the stages of the recovery process was initially time-based; in some countries this is still commonly practiced [7]. However, more recently, criteria-based scoring systems have been developed in guiding PACU personnel whether a patient may be discharged from PACU or progress to the subsequent phase of recovery. The first PACU discharge scoring system was developed in the 1970s by Dr. Antonio Aldrete [8]. His goal was to provide objective information on the condition of patients after anesthesia, analogous to the Apgar scoring system. It was called Postanesthetic recovery score (PARS). The following components were identified: activity, respiration, circulation, consciousness, and color (Fig. 26.1). A score of 0, 1, or 2 was given to each category, with a total maximum score of 10. A score of 7 was indicative for further monitoring and scores of 8–9 were acceptable for discharge; an ideal score was 10.

Systematic reviews were conducted to elucidate the reliability of the criteria used in several
discharge systems. Investigations published in databases in the last 40 years were searched, 8 studies were included. An important recommendation they made was assessing pain, nausea, and vomiting before the patient is discharged. This suggests the original Aldrete scoring system was incomplete as it did not take into account those components. Studies also found that there were limited investigations to validate the criteria used to evaluate PACU discharge readiness [9, 10].

The American Society of Anesthesiologists (ASA) published practice guidelines in 2013 on postanesthetic care. These guidelines addressed the protocol for discharge from the PACU. They were intended to assist the practitioner in making healthcare decisions (Table 26.1).

Table 26.1 ASA Task Force Discharge Protocol

1. Urination before discharge should not be universal and should be evaluated for select patients.
2. Requirement to drink clear fluids should not be universal and should be evaluated for select patients.
3. Every patient should have a responsible individual accompany them home.
4. Observation is needed until patients have no increased risk of cardiorespiratory consequences.
5. A minimum stay is not needed.
6. Discharge criteria should be created in a way to minimize risk of CNS or cardiorespiratory depression following discharge.

ASA American Society of Anesthesiologists, CNS Central nervous system

Difference in Discharge Criteria in ASC

The care of patients at ASCs presents unique challenges throughout the perioperative process. The main goal is to ascertain the patients can be safely discharged to their residence following their scheduled surgical/diagnostic procedure in the ASCs. Since the forthcomimg of the original Aldrete’s PACU discharge criteria scoring system, there have been various developments and revisions to scoring systems. Dr. Aldrete modified his scoring system in 1995, changing the criteria of color to oxygen saturation. In addition, he also created a PACU discharge score specifically for ambulatory surgery patients due to increased popularity in ambulatory surgery. In this scoring system, specifically designed for PACU in ASCs, five components were added: dressing, pain, ambulation, urine output, and feeding [11]. This system now doubled its criteria, and the recommendation at that time was to discharge patients when their score was 18 or greater.

The Post-Anesthetic Discharge Scoring System (PADSS) is another scoring system developed by Dr. Frances Chung in 1995 [12]. Essential to the creation of this system was the determination of home readiness. The criteria included vital signs, activity, mental status, pain or nausea or vomiting, surgical bleeding, and intake and output. Tolerating
fluids and ability to void have long been a controversy surrounding discharge, but there is no universal acceptance for these components to be satisfied at the time of discharge. The practice guidelines published by the American Society of Anesthesiologists recommend these criteria should be evaluated on a case-by-case basis. Thus, the PADSS system was later modified (Fig. 26.2). In fact, this scoring system was used to assess home readiness in patients undergoing colonoscopy and concluded that modified PADSS allowed for earlier discharge after the procedure [13].

Understanding modified PADSS can influence how the anesthesiologist devises the perioperative anesthetic plan. Knowledge of the type of surgery and its invasiveness can determine whether certain methods are employed to minimize postoperative pain, such as regional anesthesia. For example, regional anesthesia has been used in the outpatient setting to minimize postoperative pain. Broadly speaking, orthopedic total knee arthroplasties are commonly performed at outpatient centers and peripheral nerve blocks have been shown to reduce postoperative pain [14]. Some factors that come into consideration include using continuously infusing local anesthetic catheters versus single-shot nerve blocks. Single-shot blocks eliminate the requirement of follow-up, but the disadvantage is the relatively short amount of analgesic time. On the other spectrum is nerve catheters that provide analgesia for a few days postoperatively, but the disadvantage is follow-up may be required if complications arise. Neuraxial anesthesia, a form of regional anesthesia, is another option for ambulatory surgeries, but slow recession of the block may preclude strength, mobility, and urination. As with peripheral nerve blocks, some factors that come into consideration include the type of local anesthetic used with or without the addition of opioids. Using opioids improves analgesia with the risk of respiratory depression which can be problematic after discharge. A specific scoring tool called the W AKE score evaluated the needs of regional anesthesia patients and their ability to bypass PACU. It was modeled after the modified Aldrete system and included “zero tolerance criteria,” which were pain, PONV, shivering, pruritus, and orthostatic symptoms [15, 16]. This tool may allow fast-tracking of these patients in an outpatient setting. For some patients, even more burdensome than pain is postoperative nausea and vomiting (PONV). Use of the Apfel scoring system has been validated for identifying high-risk patients for PONV [17]. Using alternative methods such as total intravenous anesthesia can be used to minimize risk of prolonged stay from PONV for same-day surgery patients. The last component of modified PADSS is surgical bleeding. Surgical selection is an important factor to

![Fig. 26.2 Adapted from Modified Postanesthesia Discharge Scoring System [12]](image-url)
consider as intra-abdominal, vascular, and orthopedic surgeries carry higher risk of perioperative bleeding. In certain cases, and in conjunction with the surgeon, the anesthesiologist can give pharmacologic interventions such as tranexamic acid to decrease the risk of bleeding [18]. The caveat is that ASCs might not have the availability to transfuse blood, so appropriate surgical and patient selection must be utilized in outpatient settings. As with managing any patient, risks and benefits must be weighed in the setting of patient comorbidities.

Various other factors can lead to prolonged PACU stay which influences the anesthetic choice, especially in ambulatory surgery patients. A predictive model was utilized to optimize case sequencing and revealed morbid obesity, hypertension, surgical specialty (ENT, gastroenterology), anesthesia type (general), and case duration led to higher odds of prolonged PACU stay [19]. These are not contraindications, but allow for cases involving patients with these risk factors to be performed earlier in the day in anticipation for a prolonged PACU stay. These factors also play a role in the type of anesthetic. For example, for short outpatient procedures in morbid obesity patients, it may be feasible to administer monitored anesthesia care if appropriate to allow for faster discharge home, as opposed to general anesthesia. Overall, physiologic-based scoring systems, anesthetic choice, and unique concerns in the ambulatory surgery patient are all important factors for discharge.

**Recent Research**

In the current day, discharge criteria for PACUs in the hospital and outpatient ASCs is primarily based on physiological criteria. A recent prospective study compared PACU discharge times based on physiological criteria, using the PARS and PADSS scoring systems by Aldrete and Chung, versus time-based criteria. A statistically significant difference was found to suggest physiological-based criteria enhances the speed of transit of pediatric ambulatory surgery patients through the PACU [20]. Another recent study compared general anesthesia with total intravenous anesthesia with a secondary outcome to compare discharge scoring systems of White’s fast-tracking scoring system and the modified Aldrete scoring system. Dr. White created a scoring system in the 1990s in comparison to the modified Aldrete’s scoring system with a focus on time to fast-track eligibility. This study revealed the fast track ratio was greater for the patient cohort assigned to the modified Aldrete scoring system [21]. Furthermore, the International Association for Ambulatory Surgery published guidelines quite similar to the modified PADSS. The guidelines stress the importance of vital signs, minimal nausea/vomiting, tolerable pain, micturition especially following neuraxial anesthesia, and more. Recent studies are also being performed about implementing a discharge checklist that informs patients of signs and symptoms post discharge to improve safety [22].

Despite many institutions still utilizing variants of PACU discharge scoring systems, there are select circumstances in which discharge from ASCs may require more than an established protocol. The rise in spine surgery at ASCs has been unprecedented. Given the concern for patient safety, the surgeon, anesthesiologist, and nurses should ultimately dictate the final disposition for these spinal surgery patients, not discharge criteria and safety check points [23].

Lastly, the role of ASCs is quickly evolving. Coronavirus Disease 2019 (COVID-19) has resulted in a global pandemic, affecting many ASCs as elective diagnostic and therapeutic procedures have been delayed. The hospital system nationwide has encountered an unimaginable surge in capacity. ASCs have the potential to assist acute care hospitals in performing urgent and emergent surgeries. Hospital beds for critically ill COVID-19 patients can be conserved if ASCs have the appropriate staffing and resources for performing such procedures. ASCs have adapted to the needs of the current time and now have the potential to serve a greater role [24].
Summary

Since the 1970s, ambulatory anesthesia has become more popular and many surgical and nonsurgical procedures are being performed at ASCs. Many institutions have PACUs with progressive phases of recovery. The first ever PACU discharge scoring system was developed by Dr. Aldrete in order to evaluate patients emerging from anesthesia. Since his creation, modifications and other newly developed discharge scoring systems were studied and implemented. Given the nature of ASCs, discharge criteria had to be streamlined to the needs of patients undergoing same-day surgery. Appropriate hemodynamics and vitals, adequate analgesia, minimal PONV, ambulation, surgical bleeding, and others are some of the factors accounted for in these criteria. Factors that prolong PACU stay such as morbid obesity and type of surgery are also important in the efficiency of discharging patients from ASCs. These discharge criteria systems are still in use today and provide guidelines for anesthesia-trained personnel for safely managing a patient throughout the perioperative process.

References

1. Hedley-Whyte J, Milamed DR. The evolution of sites of surgery. Ulster Med J. 2006;75(1):46–53. PMID 16457404.
2. Pregler JL, Kapur PA. The development of ambulatory anesthesia and future challenges. Anesth Clin North Am. 2003;21(2):207–28. PMID 12812391.
3. Hall MJ, Schwartzman A, Zhang J, Liu X. Ambulatory surgery data from hospitals and ambulatory surgery centers: United States, 2010. Natl Health Stat Rep. 2017;(102):1–15. PMID 28256998.
4. Lee JH. Anesthesia for ambulatory surgery. Korean J Anesthesiol. 2017;70(4):398–406. PMID 28794834.
5. Kellner DB, Urman RD, Greenberg P, Browman EY. Analysis of adverse outcomes in the post-anesthesia care unit based on anesthesia liability data. J Clin Anesth. 2018;50:48–56. PMID 29979999.
6. Duncan PG, Shandro J, Bachand R, Ainsworth L. A pilot study of recovery room bypass (“fast-track protocol”) in a community hospital. Can J Anaesth. 2001;48(7):630–6. PMID 11495868.
7. Jain A, Muralidhar V, Aneja S, Sharma AK. A prospective observational study comparing criteria-based discharge method with traditional time-based discharge method for discharging patients from post-anaesthesia care unit undergoing ambulatory or outpatient minor surgeries under general anaesthesia. Indian J Anaesth. 2018;62(1):61–5. PMID 29416152.
8. Aldrete JA, Kroulik D. A postanesthetic recovery score. Anesth Analg. 1970;49(6):924–34. PMID 5534693.
9. Phillips NM, Street M, Kent B, Haesler E, Cadeddu M. Post-anaesthetic discharge scoring criteria: key findings from a systematic review. Int J Evid Based Healthc. 2013;11(4):275–84. PMID 24298921.
10. Hegarty J, Burton A. Post anaesthetic care units in the Republic of Ireland: a survey of discharge criteria. J Perioper Pract. 2007;17(2):58–66. PMID 17319567.
11. Aldrete JA. The post-anesthesia recovery score revisited. J Clin Anesth. 1995;7(1):89–91. PMID 7772368.
12. Chung F, Chan VW, Ong D. A post-anesthetic discharge scoring system for home readiness after ambulatory surgery. J Clin Anesth. 1995;7(6):500–6. PMID 8534468.
13. Trevisani L, Cifalà V, Gilli G, Matarese V, Zelante A, Sartori S. Post-Anaesthetic Discharge Scoring System to assess patient recovery and discharge after colonoscopy. World J Gastrointest Endosc. 2013;5(10):502–7. PMID 24147194.
14. Cullom C, Weed JT. Anesthetic and analgesic management for outpatient knee arthroplasty. Curr Pain Headache Rep. 2017;21(5):23. PMID 28283810.
15. Williams BA. For outpatients, does regional anesthesia truly shorten the hospital stay, and how should we define postanesthesia care unit bypass eligibility? Anesthesiology. 2004;101(1):3–6. PMID 15220763.
16. Williams BA, Kentor ML. The WAKE® score: patient-centered ambulatory anesthesia and fast-tracking outcomes criteria. Int Anesthesiol Clin. 2011;49(3):33–43. PMID 21697668.
17. Weilbach C, Rahe-meyer N, Raymondots K, Weissig A, Scheinichen D, Piepenbrock S. Postoperative nausea and vomiting (PONV) : usefulness of the Apfel-score for identification of high risk patients for PONV. Acta Anaesthesiol Belg. 2006;57(4):361–3. PMID 17236637.
18. Ghadimi K, Levy JH, Welsby JJ. Perioperative management of the bleeding patient. Br J Anaesth. 2016;117(suppl 3):iii18–30. PMID 27940453.
19. Gabriel RA, Waterman RS, Kim J, Ohno-Machado L. A predictive model for extended postanesthesia care unit length of stay in outpatient surgeries. Anesth Analg. 2017;124(5):1529–36. PMID 28079580.
20. Armstrong J, Forrest H, Crawford MW. A prospective observational study comparing a physiological scoring system with time-based discharge criteria in
pediatric ambulatory surgical patients. Can J Anaesth. 2015;62(10):1082–8. PMID 26149598.

21. Çaparlar C, Özhan M, Süzer MA, Yazıcıoğlu D, Eşkin MB, Şenkal S, et al. Fast-track anesthesia in patients undergoing outpatient laparoscopic cholecystectomy: comparison of sevoflurane with total intravenous anesthesia. J Clin Anesth. 2017;37:25–30. PMID 28235523.

22. Jakobsson JG. Recovery and discharge criteria after ambulatory anesthesia: can we improve them? Curr Opin Anaesthesiol. 2019;32(6):698–702. PMID 34125193.

23. Witiw CD, Wilson JR, Fehlings MG, Traynelis VC. Ambulatory surgical centers: improving quality of operative spine care? Global Spine J. 2020;10(1 Suppl):29S–35S. PMID 31934517.

24. Rajan N, Joshi GP. COVID-19: role of ambulatory surgery facilities in this global pandemic. Anesth Analg. 2020;131(1):31–6. PMID 32243288.