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Highlights from ASA panels on anaesthesia for ambulatory surgery

Anaesthesia for ambulatory surgery: postanaesthesia care unit issues

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Physicians involved in the care of the outpatient have recognized that the level of medical services rendered in the postoperative period impact on patient outcome and must be addressed with the same level of intensity as preoperative and intraoperative management. The Panel on Ambulatory Surgery: Postanaesthesia Care Unit Issues highlighted concerns related to malignant hyperpyrexia, postoperative nausea and vomiting, pain management and regional techniques, discharge criteria and patient outcome following ambulatory surgery.

Key words: Anaesthesia, postoperative recovery, ambulatory, surgery, malignant hyperpyrexia, pain, outcome

Introduction

At the recent American Society of Anesthesiologists Annual Meeting held on 15–19 October, 1994 in San Francisco, California, four panels were devoted to issues related to anaesthesia for ambulatory surgery, reflecting the increased interest in this area. Physicians involved in the care of the outpatient have recognized that the level of medical services rendered in the postoperative period impact on patient outcome and must be addressed with the same level of intensity as preoperative and intraoperative management. It is no wonder, therefore, that the Panel on Anaesthesia for Ambulatory Surgery: Postanaesthesia Care Unit (PACU) Issues, was very well attended. Chaired by Surinder K Kallar MD, Professor and Interim Chair, Department of Anesthesiology at the Medical College of Virginia, she and six other speakers discussed various topics related to this subject.

Malignant hyperpyrexia – could it be a PACU problem?

Henry Rosenberg MD, Professor and Chairman, Department of Anesthesiology at the Hahnemann University, Philadelphia, Pennsylvania addressed the issue of malignant hyperpyrexia – can it be a PACU problem? Malignant hyperpyrexia (MH) is defined as a sustained, significant hypermetabolic state, inherited as an autosomal dominant trait. In response to triggering agents, the clinical manifestations of MH are characterized by a hypermetabolic response with an increase in CO_2 production. Intraoperatively this could be detected with the use of capnography. However, in the PACU this monitoring is not routinely present. Other signs and symptoms of MH are nonspecific and the patient must be evaluated and other conditions considered in the differential diagnosis.

Does this event represent true MH or a recrudescence of MH? True malignant hyperthermia, manifesting solely in the postoperative period, was reported by the North American MH Registry in 18% of MH cases[1]. Their data suggested that patients with isolated unexplained postoperative fever may be at risk for MH-susceptibility (MHS). None of the factors examined discriminated MH negative and MHS patients. In contrast, another study reported that of 30 patients that developed postoperative fever none tested positive on muscle biopsy for MH[2]. MH muscle biopsy, although having a specificity of 80%, also has false positives. When dantrolene is administered it should be continued for 24 h intravenously because of the high incidence of recrudescence. These patients must be admitted follow-

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ing ambulatory surgery. The presence of a high fever postoperatively may be due to an infectious or noninfectious process. Causes include sepsis, central nervous system (CNS) disturbances, endocrine and muscle disease, blood transfusion or contaminated drugs. The patient should be evaluated and appropriate laboratory tests conducted to assist in the differential diagnosis of infectious vs. noninfectious causes. A venous blood gas may show a more marked increase in CO_2. Changes in creative phosphokinase (CPK) and liver enzymes happen later in the postoperative period (4–12 h) and are not helpful in the PACU. If no triggering agents were administered during the anaesthetic, then this event was probably not MH. If the patient responded to nonspecific measures, it probably was not MH. Sudden cardiac arrest in a young patient may raise the suspicion of MH. Myoglobinuria, as the sole presenting symptom for MH, is rare. An isolated case of myoglobinuria in a paediatric outpatient raised concern about the appropriateness of performing ambulatory surgery in a MH-susceptible patient. This particular patient had a myopathy[3]. MHS (malignant hyperthermia susceptible) children may be safely discharged home after ambulatory surgery following a 4 h observation period to exclude an impending MH reaction. This could be done provided that clear guidelines regarding follow-up and management are given to parents[4].

Other conditions that may be included in the differential diagnosis of MH are: failure to awaken from anaesthesia, postoperative seizures, neuroleptic malignant syndrome and drug fever; and ascending tonic clonic seizures after myelogram. Certain dyes may cause tonic-clonic seizures after myelogram and their occurrence had not been correlated with MH. Pulmonary oedema and hypertension without a history of cardiac disease pointed more to other disorders such as pheochromocytoma, cocaine and amphetamine overdose and reversal of naloxone. Hypertension and tachycardia in an otherwise healthy patient may also be associated with cardiomyopathy. MH and MH-like syndromes could occur and differential diagnosis may be a problem. Dr Rosenberg felt that patients that are MH-susceptible receiving non-triggering agents could be discharged after ambulatory surgery.

Did the choice of anaesthesia affect the PACU stay?

The duration of stay in the PACU following ambulatory surgery was influenced both by anaesthetic choice and the facility policies dictating discharge. Rebecca S Twersky MD, Associate Professor of Anesthesiology at SUNY Health Science Center at Brooklyn addressed the effects of anaesthesia on common PACU side effects and treatments that affected the PACU stay. When regional anaesthesia was compared to general anaesthesia, less postoperative narcotics were used and the incidence of postoperative nausea and vomiting (PONV) was lower. However, no difference in actual recovery times were reported[5]. This suggested that facility factors were important determinants of PACU length of stay. The common PACU side effects following general anaesthesia of pain, dizziness, nausea and vomiting, cardiovascular alterations, urinary retention and sore throat could be modulated by anaesthetic choices. The intravenous and inhalational agents were compared for their purported advantages and disadvantages, particularly for their effects on emergence, ambulation and emetic symptoms.

Comparing midazolam and propofol for outpatient sedation, times to immediate recovery including eye opening, orientation, response to verbal command and recovery of cognitive function were faster in the propofol group with no difference in cardiorespiratory profile or time to discharge. Additionally, patients reported less pain on injection and more effective intraoperative amnesia with midazolam[6]. With the availability of flumazenil, the benzodiazepine antagonist, midazolam's use had been broadened. Recovery of cognitive function was similar at 60 min when use of midazolam-flumazenil was compared to propofol. Psychomotor function and recovery improved after flumazenil, however, patients receiving propofol had better performance on psychomotor tests and less impairment of memory[7]. There was concern about resedation following treatment with flumazenil and patients should be observed longer postoperatively, resulting in more prolonged discharge. Propofol's clear-headed emergence and faster discharge following general anaesthesia contrasted to thiopental and other sedative-hypnotics was responsible for re-assessing the mandated time spent in the PACU. Many facilities appreciated cost savings when reduced PACU stay could be translated into manpower reduction.

As expected from their lower blood gas solubilities, both desflurane and sevoflurane produced a more rapid emergence and recovery of cognitive function compared to isoflurane, halothane and enflurane[8–12]. Intravenous agents with the desirable pharmacokinetic properties of small volume of distribution, high clearance rate and short context-sensitive half-lives would result in a rapid recovery profile and potentially faster discharge.

Numerous studies have compared the intravenous and inhalational agents. When ranking the agents for their rapid emergence, orientation and time to ambulation, propofol, sevoflurane and desflurane had similar profiles compared to the longer recovery with thiopental, midazolam, isoflurane and halothane. Shorter-acting opioids like alfentanil and remifentanil (still under investigation), resulted in faster emergence than fentanyl[13,14]. However, the disadvantage of selecting a short-acting opioid was the lack of residual postoperative analgesia.

Postoperative nausea and vomiting was influenced by many factors, including surgical procedure, anaesthetic technique, pain, gender, age, time of menses cycle, previous history, or susceptibility to motion sickness. Certain anaesthetics, e.g. opioids, etomidate. N_2O and inhaled agents (including desflurane and sevoflurane) were associated with a higher incidence of PONV. The antiemetic properties of propofol[15] were clearly recog-

nized when compared to the newer inhaled agents, desflurane[16,17] and sevoflurane[18,19]. Recent research has identified receptors for neurotransmitters in the medulla that serve as mediators of nausea and vomiting. The role of serotonin or specifically, 5HT (5-hydroxytryptamine) receptors in activating the chemoreceptor trigger zone has led to the pharmacological development of antagonists of these pathways. Ondansetron and its related compounds (granisetron, and still under investigation, dolasetron) have been investigated for the prophylaxis and treatment of PONV in outpatients. In children undergoing tonsillectomy, ondansetron 0.15 mg kg^{-1} given prophylactically, significantly reduced the incidence of PONV compared to metoclopramide 0.5 mg kg^{-1} or droperidol 0.075 mg kg^{-1} [20]. Less sedation occurred with the use of ondansetron. When emetic symptoms did occur following treatment, the severity and duration of PONV were reduced. In the adult population, 4 mg iv or 16 mg orally was more effective than placebo or metoclopramide and less sedating than droperidol[21–23]. Dr Twersky concluded by saying that anaesthetic choices influenced PACU stay and the selection of the ideal ambulatory anaesthetic needed to factor in both cost considerations and desired postoperative outcome.

Postoperative pain – could we control it effectively?

Providing effective and safe analgesia postoperatively could be accomplished by using inexpensive and simple techniques. Dr Surinder Kallar and Dr Linda Jo Rice, Director of Anesthesia Research at Newington Children's Hospital, Hartford, Connecticut addressed the importance of postoperative pain management in adults and children. The incidence and severity of pain following a wide variety of ambulatory surgical procedures was recently reported by Payne et al.[24]. Twenty-six per cent of patients experienced moderate to severe pain at the time of discharge, 71% in the first 24 h following discharge. Inadequate postoperative analgesia occurred because of variability in patients' perception, reluctance to request medication, lack of preoperative education and lack of accountability for adequate pain management. Identifying variables that were correlated with postoperative pain and pain-related outcomes would allow physicians to target pain-specific therapies to ambulatory surgery patients and improve outcomes. The role of the PACU nurse had become increasingly important. Correlations were noted between pain at discharge and worst pain following discharge. Preoperative anxiety, preoperative pain expectations, preoperative sleep medication usage and preoperative pain medication usage were also correlated with worst pain following discharge. As healthcare professionals were educated about acute pain management, more effective treatments would be instituted.

Commonly-used postoperative opioids included fentanyl and alfentanil. Opioid agonist-antagonists such as butorphanol, nalbuphine and dezocine were comparable analgesics but their use was limited due to a higher incidence of nausea and vomiting. The nonsteroidal antiinflammatory drugs (NSAIDs) were currently the most studied group. Lack of respiratory depression, nausea and vomiting and physical dependence topped the list of NSAIDs' advantages over opioid analgesics. However, whether they offered narcotic-sparing effects postoperatively remains inconclusive. No difference in postoperative pain scores, narcotic requirements or length of stay in the PACU was reported when oral ibuprofen was compared to ketorolac following a variety of ambulatory procedures[25]. Higgins et al. recently reported that no difference was found in analgesic requirements or incidence of PONV when either 800 mg oral ibuprofen or 60 mg im ketorolac was compared to placebo during gynaecological laparoscopic procedures[26].

Pain management in the paediatric population required recognition of both the physical and emotional components of pain. Dr Rice emphasized that pain management was not an option, it was only a matter of what technique was utilized to achieve the desired result. Treatment choices, timing and recognizing the emotional component of pain were the keys to successful analgesic options. EMLA cream (eutectic mixture of local anaesthetics) might reduce the analgesic requirements, but the emotional component of a venipuncture or biopsy was still present. Pain treatment in children required multimodal analgesia. Regional blocks provided good analgesia, however some treatment must be in place when the analgesia wore off. Regional analgesia with or without sedation resulted in decreased PONV and faster discharge. The disadvantage of regional analgesia in children was that it might require general anaesthesia or sedation for its placement, it was limited in duration, the child might be uncomfortable about the 'numb' feeling and motor weakness might not be tolerated. Timely pain control was a shared responsibility as both nurses and physicians became educated in the options.

Preemptive analgesia could be applied by instituting analgesic modalities that were intended to inhibit nociceptive pathways of pain transmission and prevent spinal cord wind-up. What constituted effective preemptive analgesia remained controversial. The use of regional and local anaesthetic techniques was excellent for controlling postoperative pain. When compared with general anaesthesia, plasma epinephrine and serum cortisol levels and visual analogue pain scores were measurably lower at 1 h following regional anaesthesia[27]. Effective and simple regional techniques for many ambulatory procedures included splash, or wound-edge infiltrations, caudal, ilioinguinal block and upper and lower extremity blocks. Most surgical procedures could incorporate local anaesthesia wound infiltration and should be strongly encouraged. Administering local anaesthesia and/or opioids into intraarticular knee and shoulder joints, and instillation into the mesosalpinx have been evaluated. Intraarticular administration of 1 mg morphine in 0.25% bupivacaine with 1 : 200 000 epinephrine following knee arthroscopy produced lower

pain scores and less consumption of postoperative analgesics for 24 h[28]. Newer techniques reported included the use of a subphrenic catheter for postoperative analgesia after laparoscopic cholecystectomy with 0.25% bupivacaine and 1% prilocaine. This technique provided superior postoperative analgesia than systemic analgesics and patients showed faster recovery and higher vigilance scores[29]. Intercostal nerve blocks for lumpectomy with bupivacaine, or 1.5–2% lidocaine with epinephrine provided superior postoperative pain relief to general anaesthesia[30]. A multimodal or balanced analgesic therapy was the best approach for perioperative pain management (see Table 1). Intraoperatively administering a strong opioid, non-opioid, regional anaesthetic with or without adjuvants, could then be followed in the PACU by a non-opioid, weak opioid or other adjuvants. Acetaminophen, NSAIDs and opioids were used to supplement regional anaesthesia. At discharge, a modality consisting of an opioid and non-opioid, with or without adjuvants should be considered. Alternative methods included nonpharmacological methods, which were not as costly and were simple to perform. In paediatrics, these included the presence of parents, holding and rocking the child and the use of pacifiers and distraction techniques. In the adult population, alternatives included thermal packs, relaxation techniques and transcutaneous electrical stimulation.

Discharge criteria – what was the new trend?

How do you judge when a patient could be safely discharged home? Various legal and institutional requirements needed to be met. Assessing the ambulatory patient for discharge differed from the conventional inpatient evaluation. Criteria such as ambulation, hydration and voiding were not generally considered in the inpatient population. The first phase recovery generally followed the conventional Aldrete score. However, it had been suggested that the Aldrete score should replace 'colour' with oxygen saturation. Dr Frances Chung, Associate Professor of Anesthesiology and Director of Toronto Western Division Toronto Hospital, described the score she designed, intended to be a standardized approach to assessing a patient's home readiness. The Post Anaesthesia Discharge Score (PADS) was a simple cumulative index similar in concept to the Aldrete or Apgar score, which assigned a maximum of 2 points on a scale of 0–2 for the following five parameters:

1. Vital signs (blood pressure, heart rate, respiratory rate, and temperature)
2. Activity and mental status
3. Pain, nausea and/or vomiting
4. Surgical bleeding, and
5. Intake and output.

When patients had a score ≥9, they were considered to be fit for home discharge. Using the commonly-observed physical signs would avoid any additional duties for the PACU nurses. By assigning objective numerical values to these parameters, progress or lack of it became more apparent. This scoring system provided a uniform assessment for all patients and might have added medicolegal value. Using this PADS system, Chung reported that 80% of patients were able to be discharged within 1–2 h and 90% within 3 h. Further modification of the scoring system was appropriate when drinking and voiding were not required. Schreiner et al.[31] found that the incidence of vomiting was greater in children that drank postoperatively and therefore, many facilities had eliminated this criteria for discharge.

Discharge after regional anaesthesia should follow the same criteria as that for general anaesthesia. Dr Chung reported that in her institution, patients receiving spinal anaesthesia recovered within 3 h. Many patients could actually have been discharged faster, however prolonged postoperative stay occurred because of urinary retention. The patient must be fully informed about when to call a physician or return to the facility for complications such as postdural puncture headache or urinary retention. Following spinal anaesthesia, discharge could occur when there was no motor block, normal perianal pinprick sensation, plantar flexion of the foot and proprioception of the big toe.

After discharge assessment: patient's perception

Dr Beverly Philip, Associate Professor for Anesthesiology and Director, Day Surgery Unit at the Brigham and Women's Hospital, Harvard Medical School, discussed outcome after ambulatory surgery. In the largest study to date, Warner et al. reported that major morbidity and mortality within 30 days of ambulatory surgery was exceedingly rare[32]. Over 96% of the 38 598 patients were contacted for follow up. Two patients died following a myocardial infarction (MI), yielding a mortality rate of 1 : 22 545. Morbid events were reported in 31 patients: MI, 14; CNS deficits, 7; pulmonary embolism, 5; respiratory failure, 5. MI resulting in death occurred within

Table 1. Multimodal pain therapy for ambulatory surgery

Operating Room	*PACU*	*At discharge*
Strong opioids (parenteral)	Opioids (parenteral or oral)	Oral opioids
Non-opioids (NSAIDs)	Non-opioids (NSAIDs)	Oral non-opioids
Regional technique	—	—
Adjuvants (sedatives, anxiolytics)	Adjuvants	Adjuvants

7 days of surgery, one intraoperatively and the other 4 days postoperatively. Gold et al.[33] reported an unanticipated hospital admission rate of 0.9%. Pain, bleeding and intractable vomiting accounted for over 50% of admissions. Factors that were independently associated with unanticipated admission included: general anaesthesia, emesis, abdominal surgery, operating time greater than 1 h and age. Laparoscopic procedures and distance greater than 1 h from the hospital were also independently associated with hospital admission. Of patients that were discharged home the same day, Philip reported that only 38% of patients were able to return to their usual activities the day after surgery; the remainder required 3.2 ± 2.0 additional days[34]. Eighty-six per cent had more than one symptom that persisted after discharge, which included general malaise and pain. Aches, sore throat, drowsiness persisted for >3 days. Awareness was reported in 0.3% of cases. Nonetheless, 97% of patients found their ambulatory surgery experience satisfying. These findings underscored the need for better preoperative teaching and informed consent that should more carefully address common postanaesthesia sequelae. Patients and providers needed to recognize that full recovery required additional time at home. Dizziness, headache, drowsiness, sore throat and incisional pain occurred frequently, and although considered minor occurrences, were common and sometimes alarming to patients. Better preoperative education was needed to target patient, anaesthesia and surgical factors.

Aftercare – 23 h recovery, hotels, recovery centres

Dr Louis Freeman, Medical Director of the Fresno Surgery Center, Fresno, California shared his experiences in establishing alternatives for recovery and discharge following ambulatory and same day admit surgery. Recovery care centres could be incorporated into a hotel, home healthcare model, free-standing recovery centre, or an integrated ambulatory surgery unit with hospital integrated recovery. Home health models and recovery care centres could provide health services at 25% less the cost of hospitals. Home health models depended on the family, and therefore the quality was inconsistent due to the lack of continuous professional care. These cost savings did not factor in the expense to the family. Hotel plans utilized minimal professional staff and were also dependent on the family. However, the hotel plan provided more centralized equipment and availability of pharmaceuticals. The liability to facility owners made this a less attractive venture. In 1986, California licensed six recovery care facilities. They were limited to a maximum of 20 beds, geared for ASA PS 1 and 2 patients undergoing elective surgery requiring postoperative care up to 48 h. Recovery care centres provided the ambience of a residential hotel combined with professional qualified staff. In his facility all staff registered nurses must have PACU or intensive care unit (ICU) experience and were certified in advanced cardiac life support. Because the postoperative stay was limited to 48 h, it was important for anaesthesia to be consistently directed towards a rapid recovery. Pain control was addressed early and treated judiciously throughout the patient's stay. In his facility, almost all patients received patient-controlled analgesia (PCA) with fentanyl and antiemetic prophylaxis was frequently administered. Dietary advancement occurred rapidly and early ambulation and discharge was encouraged. The nursing staff's attitude was to anticipate problems and aggressively problem-solve. There was an active role for the anaesthesiologists, who remained in-house until the PACU was empty. The medical director performed daily rounds and managed analgesia, PONV and other sequelae. Hospital transfer occurred in 2.1% of patients. Dr Freeman commented that recovery care centres now seemed to have basically transformed themselves from free-standing surgery centres into licensed hospitals and may be losing the advantages of a free-standing centre. Therefore, facilities must evaluate the most cost-effective approach for providing extended postoperative care following ambulatory and same-day surgeries.

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