

Review

AMBULATORY ANAESTHESIA

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Ambulatory (outpatient) surgery refers to the admittance into hospital on the day of surgery of carefully selected and prepared patients for a planned surgical procedure and their discharge within hours. About 65% of all surgical procedures are performed on an outpatient basis. There are many benefits of ambulatory surgery: cost reduction up to 25–75%, efficiency, shorter waiting lists, lower cancellation rate, patient convenience, low morbidity/mortality, less infections and respiratory complications and less medication. All patients should follow a sequential pathway and be pre-assessed according to a set of ambulatory case criteria (health status, age, complexity of surgery, transport, and social support). An anaesthesia plan is developed by an anaesthesiologist, then accepted by the patient after discussion and documented. Anaesthetic management includes the usage of local anaesthetic or short-acting general anaesthetic drugs with fewer residual psychomotor effects and low incidence of postoperative malaise. Medical discharge criteria as well as the discharge organisation are also important. The readmission rate after outpatient surgery is about 1%. Nausea/vomiting, pain and operative site bleeding are the most common causes. Extended stay or inpatient facilities should be available for patients who cannot be discharged after a reasonable stay in the post-anaesthesia care unit areas.

Key words: patient selection, anaesthetic management, discharge criteria.

INTRODUCTION

Advances in surgical and anaesthesia technologies became sufficient at the time of increase of the number of patients, with quite complex medical problems as well, to undergo safely a variety of surgical procedures in ambulatory settings. This proportion of outpatient operations has grown several times in the last 30 years. Most of the surgical procedures are performed in hospital-based ambulatory surgical units, freestanding ambulatory surgery centres or office-based surgery facilities.

Advantages of ambulatory surgery facilities include more privacy and convenience for the patients, controlled scheduling, increased efficiency and consistency in nursing staff, and reduced costs. Improvement of patient outcome while achieving cost savings is a key target for modern healthcare service. Although expenses for anaesthetic drugs amount to less than 5 percent of a hospital pharmacy budget (Brown *et al.*, 2013), quite often they are under scrutiny for reducing costs. Shorter medical procedures and fewer complications allow discharging patients earlier.

Despite numerous benefits of ambulatory surgery, constitutional risks associated with any surgical care environment still are an issue for patient safety. Growing demand for ambulatory surgery services has promoted research on outpatient safety problems. The majority of clinical studies published on ambulatory surgery have been completed in the

hospital-based ambulatory surgical unit setting (Keyes *et al.*, 2004). Safety measures of these practices were described in recent studies. (Haeck *et al.*, 2009). Anaesthesiology is focused on providing safe and effective anaesthesia during surgery and other procedures. Both surgery and anaesthesia have to comply to highest standards in day surgery units, even if routine or simple procedures are performed (Allman and Wilson, 2011). Organisation is essential for efficient good-quality day surgery. It has to ensure close cooperation between all the parties involved: surgeons, anaesthetists, day case unit staff, general practitioners, and patients themselves (Morris *et al.*, 2012).

PATIENT SELECTION

In all the cases when a patient needs anaesthesia, the anaesthesiologist performs a preoperative evaluation. This evaluation for simple low-risk procedures in completely healthy young patients may take place on the day of surgery. However, often the anaesthetist has to evaluate the patient a few days before the procedure. Such evaluation helps to reduce cancellation rate to $\leq 2\%$, but cost-effectiveness of earlier assessments of outpatients should be considered by hospitals (Dexter *et al.*, 2014). Most of the ambulatory surgery cancellations can be avoided by selecting patients carefully. The evaluation and selection also depends on anaesthetic and surgical technique planned. Patient question-

naires are indispensable for the assessment of the patients for ambulatory surgery. The main dilemmas met in patient selection are: morbid obesity, breastfeeding, no-one at home, the patient in custody, hearing impairment, antiplatelet and anticoagulant drugs, language and translation issues, preoperative fasting, postoperative wound care — surgical site infection, and alcohol abuse (Twersky and Philip, 2008). Patients must understand that they should not drive or take alcohol for a minimum of 24 hours after their anaesthetic. SAMBA's Office Based Anaesthesia Committee (Society for Ambulatory Anaesthesia, USA) has explored particular issues related to administering anaesthesia in a physician's office, outside of a hospital or surgery centre. Some patients who fall outside the guidelines are treated better in a day-case environment, compared to hospital inpatients (for example, chemotherapy patients). Stable asthmatics and epileptics on medication, also well-motivated and well-controlled diabetics can undergo day surgery with either general or local anaesthesia. Patients inappropriate for outpatient surgery are: infants (premature or with respiratory diseases and signs of recent onset and worsening upper respiratory tract infection, also with cardiovascular disorders) and adults American Society of Anaesthesiologists (ASA) classes III and IV who require complex or extended monitoring or postoperative treatment.

The main outpatient selection criteria according to guidelines (Haeck *et al.*, 2009; Anonymous, 2007) are: physical status classification according to the ASA, age, body mass index (BMI), obstructive sleep apnea (OSA), cardiovascular conditions, risk of thrombosis or embolism, complexity of surgery, type of anaesthesia, transport and social support.

ASA classes. ASA class I and II patients are generally considered as the best candidates for an ambulatory surgery setting. ASA class III patients may also be considered for outpatient surgery facilities when local anaesthesia, with or without sedation, is planned. ASA class IV patients are appropriate candidates for ambulatory surgery only when local anaesthesia without sedation is planned (Friedman *et al.*, 2004).

Age. Patients should be older than six months. There is no upper age limit; patients over 60 can be considered for ambulatory surgery, but there is an increased risk of cardiac events, other complications, and unanticipated admissions. Cardiovascular monitoring is important; the level of monitoring depends on the patient's overall health, the presence and severity of cardiovascular disease, and the nature of the surgical procedure (Fleisher, 2009).

Body Mass Index. Comorbidities of obese patients, especially with respiratory abnormalities, may complicate their management. Proper patient monitoring should be ensured and usage of semi-upright position in a chair is recommended, as well as shorter operation times and lighter levels of sedation. Hospital setting should be considered if deeper anaesthesia is required. It should be kept in mind that calculations of initial doses of pharmacologic agents are based on ideal body weight (Chacon *et al.*, 2004; Joshi *et al.*, 2013).

Hemorrhage. The risk of bleeding and thromboembolism should be evaluated, medications such as aspirin, warfarin, or clopidogrel adjusted and specialised preoperative evaluation and treatment performed (Kirkorian *et al.*, 2007; Szalat *et al.*, 2007). If blood loss > 500 ml is predicted, procedures should be performed only in facilities where adequate blood components are available (Junger *et al.*, 2001). Prophylaxis against deep vein thrombosis (low-dose heparin, compression devices) should be considered (Friedman *et al.*, 2004; Chacon *et al.*, 2004).

Obstructed Sleep Apnea. Patients with diagnosed or suspected OSA are not good candidates for ambulatory surgery. The risk depends on sleep apnea status, anatomical and physiologic abnormalities, the status of coexisting diseases, the nature of the surgery and anaesthesia, predicted need for postoperative opioids, and adequacy of post-discharge observation. Patients with OSA can be discharged when they are no longer at risk of postoperative respiratory depression and are able to maintain their baseline oxygen saturation while breathing room air (Friedman *et al.*, 2004).

Duration. Longer procedures should be planned earlier in the day in order to provide sufficient recovery time before discharge (Gordon and Koch, 2006; Fleisher *et al.*, 2007). Operations lasting more than 90 min and those associated with a risk of significant postoperative pain or prolonged immobility should not be performed in non-hospital settings (Allman and Wilson, 2011).

All patients must be escorted home by a responsible adult. They should be supervised at home for a minimum of 24 hours. Patients must have suitable home conditions and accessible telephone for advice in an emergency. The patient should live within 1 hour travelling distance from the hospital.

PREPARATION

The anaesthesia plan is developed by an anaesthesiologist, then discussed and accepted by the patient. It should be documented properly; current medical records should be accurate and confidential. Pertinent tests based on the patient's preoperative history and physical examination results should be performed: electrocardiogram for patients over 45 years or when known cardiac conditions are present, and complete blood count/blood chemistries and/or additional tests if needed for detailed evaluation of specific diagnosis.

Patients should be provided with clear preoperative verbal and written fasting instructions: for morning patients — no solid food after midnight (or six hours before elective surgery), and clear fluids (water, pulp-free juice and tea or coffee without milk) up to 6 a.m. (or two hours before intervention). For afternoon patients — no solid food after 6 a.m., and clear fluids up to 11 a.m. Patients with obesity, gastro-esophageal reflux, diabetes and pregnant women not in labour can safely follow all the instructions above. Infants or children may have breast-feeding up to four hours

before surgery, and other milk composite or solid food up to six hours before surgery. Clear liquids should be given not later than two hours before surgery (Wilton *et al.*, 2010; Smith *et al.*, 2011).

ANAESTHETIC MANAGEMENT

The American Society of Anaesthesiologists (ASA) endorses the concept of Ambulatory Anaesthesia and Surgery. ASA encourages the anesthetist to play a leadership role as the perioperative physician in hospitals and ambulatory surgical facilities, and to participate in standardisation and improving the quality of patient care (Anonymous, 2013a).

General anaesthesia, moderate sedation, or regional anaesthesia can be used safely in the ambulatory setting. The choice of anaesthesia depends on the invasiveness of the procedure and the health status of the patient (Shirakami *et al.*, 2006; Fleisher *et al.*, 2007). The ideal outpatient technique involves the use of agents with rapid onset (to minimise case delay) and short duration (to facilitate quick recovery and discharge).

Premedication should be avoided if possible. Usually, discussion, explanation and reassurance are sufficient. If necessary, oral midazolam may be administered. Routine use of antacid drugs is probably unnecessary, except in those with history of regurgitation. Patients with morbid obesity, diabetic gastroparesis, and symptomatic hiatal hernias are at higher risk of pulmonary aspiration; therefore they should be premedicated with oral ranitidine or omeprazole. Non-steroid anti-inflammatory drugs, given orally, reach peak effect after 1–2 hours and are useful adjunct to anaesthesia with minor side effects (Wilton *et al.*, 2010; Allman and Wilson, 2011). Local anaesthetic or short-acting general anaesthetic drugs have very few residual psychomotor effects and a low incidence of postoperative nausea or vomiting (PONV).

Total Intravenous Anaesthesia (TIVA) with propofol is widely used because of its short duration, depression of pharyngeal reflexes and reduced incidence of PONV. TIVA method is well tolerated and perceived by patient, giving him good quality care with rapid, clear-headed awakening. Brown *et al.* (2013) had showed improved post-anaesthetic outcome of TIVA with propofol against volatile anaesthesia. TIVA is more cost-effective than alternative techniques of anaesthesia, but these advantages depend also on the individual patient perioperative conditions and those proceeding (Eikaas and Raeder, 2009). The use of laryngeal or Hudson face mask airway management, avoiding intubation, muscle relaxants and reversal agents are strongly recommended. Titration of feeble doses of fentanyl or remifentanyl could be acceptable and safe. Supplemental **local anaesthesia** provided by the surgeon reduces general anaesthetic requirements and provides early postoperative analgesia.

Regional anaesthesia is widely used during the last ten years in ambulatory surgery. The majority of regional techniques can be performed on awake or lightly sedated adult patients with minimal discomfort for them. Verbal contact with patients allows noticing the likelihood of inadvertent events and to recognise and manage them. This technique reduces PONV and ensures better postoperative pain control. However, the time spent in the operating room may be prolonged by waiting for onset of anaesthesia; and sometimes additional sedation may be necessary while using separate block techniques (like epidurals).

Spinal analgesia is a fast, reliable technique providing adequate conditions for lower-abdominal, pelvic, perineal, and lower-extremity surgery. The duration can be adjusted by appropriate selection of local anaesthetic dosage (bupivacaine ≤ 10 mg, ropivacaine ≤ 12 mg). This can help to avoid the delayed return of bladder tonus and subsequent urinary retention. It is advised to reduce intravenous administration of crystalloids. Intrathecal opioids are not recommended (Bonnet and Lambert, 2006).

The advantages of the **peripheral nerve blocks** include simplicity, high reliability, and early recovery and discharge. Selective regional anaesthesia for the upper-extremity is used most widely. However, each block needs special consideration and superior location of the nerve-target is very important for the optimisation of regional anaesthesia performance. New techniques on needle tip guidance under ultrasound imaging improve the visualisation and allow using lower volumes of local anaesthetic. Continuous perineural infusions, especially if a patient-controlled bolus regimen is incorporated, can provide better analgesia (Momeni *et al.*, 2007). It is possible to titrate the drug concentration and rate of infusion, adapting them to different patient responses when using this technique. Some patient controlled regional analgesia techniques can also be applied in ambulatory patients for treatment of postoperative pain at the patient's home (Souron, 2003).

MONITORING

Standard monitoring includes noninvasive blood pressure, heart rate and electrocardiography, respiratory rate and pulse oximetry. Qualified anaesthesia personnel should be present in the room during all general, regional and monitored anaesthesia care. Standard monitoring can be extended at any time, basing on the decision of the responsible anaesthesiologist (Anonymous, 2011).

Comfort and intimacy are very important for patients operated in regional anaesthesia (Antangana *et al.*, 2005). Perioperative physiological stresses associated with surgical procedures (sounds and techniques), patient's position and shivering/hypothermia are badly tolerated (see Fig. 1). It is recommended for hypothermia prevention to pre-warm patients, monitor core temperature, cover as much of body surface as possible, warm intravenous fluids, and aggres-

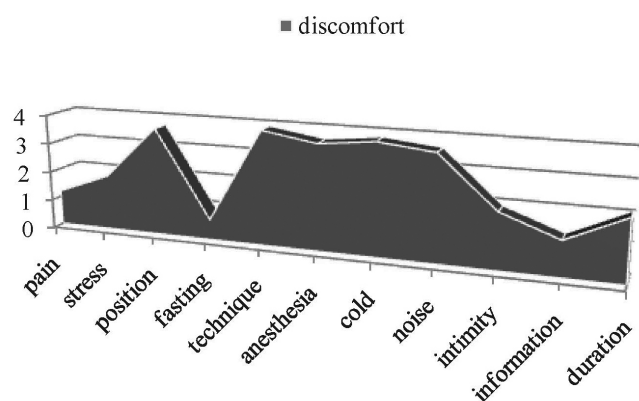


Fig. 1. Level of discomfort (0–10) according to patients, operated under regional anaesthesia (with general satisfaction $94 \pm 2\%$).

sively treat postoperative shivering (Cavallini *et al.*, 2005; Robles-Cervantes *et al.*, 2005).

POSTOPERATIVE CARE AND PATIENT DISCHARGE

Postanaesthetic period. Patients are usually admitted from the operating room to a postanesthesia care unit (PACU). Acute pain is the first reason of patient dissatisfaction. The proper control of pain, dizziness and postoperative bleeding is essential for postoperative recovery and discharge time. Pain management should correlate to BMI and procedure performed. Postoperative analgesia includes both residual effects of regional blocks and non-opioid analgesics perorally. Morphine may worsen nausea; it also has a longer elimination period and secondary side effects. Predisposing factors of postoperative nausea/vomiting include a previous history of vomiting after anaesthesia, use of large doses of narcotics as part of the anaesthetic technique, pelvic procedures in young females, gastric distention, and severe postoperative pain (Junger *et al.*, 2001). A multimodal preventive analgesic therapy and good hydration therapy should be used. Dexamethasone is an effective and cheap prophylactic agent. Ondansetron may be administered in case of a high risk of PONV (Gan *et al.*, 2013). Sufficient medication for the pain control and adequate instructions on the usage of this medication should be provided to the patient on discharge (Tham and Koh, 2002; Mandal *et al.*, 2005; Shirakami *et al.*, 2005). Maintenance of general condition

and early mobilisation with physical therapy is a main part of patient's rehabilitation after surgery (Ting *et al.*, 2014).

Discharge. Evaluating specific discharge criteria and medications used, as well as the discharge organisation, are the physician's responsibility. Discharge criteria are shown in Table 1 (Bonnet and Lambert, 2006; Allman and Wilson, 2011).

The rate of the unanticipated readmission after outpatient surgery is about 1% (Wilton *et al.*, 2010). Most common anaesthetic reasons are inadequate recovery, nausea/vomiting and pain. Surgical causes like operative site bleeding, perforated bowel, and extensive techniques still are three to five times greater. Outcome events, like cardiovascular and respiratory complications requiring treatment (arrhythmias; hypotension, hypertension), common postoperative sequel (sore throat, muscle pain), post-dural puncture headache or new nervous deficit, need for reversal agents or reintubation, pulmonary aspiration of gastric contents or pulmonary embolus, local anaesthetic toxicity or anaphylaxis, and unplanned transfusion or return to operating room, may necessitate the patient to stay or transfer to other unit with continuous survey (Anonymous, 2013b).

More than one-third of major morbidity occurs 48 hours or later after ambulatory surgery. Overall morbidity and mortality rates, however, are very low (Warner *et al.*, 1993). Standards and guidelines of the Societies of Anaesthesiologists (<http://www.asahq.org/For-Members/Clinical-Information/Standards-Guidelines-and-Statements.aspx>; www.bads.co.uk; www.sambahq.org) encourage and describe high quality patient care, but respecting the rules cannot guarantee specific patient outcome. We usually admit patients with higher risk of complications to the hospital's day-case settings for the same type of surgical procedure. These settings have inpatient facilities and possibility to leave the patient for prolonged hospital stay. The situation regarding extended stay after a day-case surgery in different departments of Republican Vilnius University Hospital (LT) during the last year (2013) is shown in Figure 2.

Given the overall low morbidity and mortality rates, it is likely that incidence of ambulatory surgery will continue to grow in the future.

Table 1

DISCHARGE CRITERIA AFTER AMBULATORY SURGERY¹

General criteria	Specific for regional anaesthesia	Organisational points
<ul style="list-style-type: none"> - stable vital signs - fully awake and oriented - able to take fluids by mouth - able to urinate - regained mobility - pain well controlled (NRS≤4) - nausea well controlled - no hematoma or bleeding of operative site 	<p>Central neuraxial blocks:</p> <ul style="list-style-type: none"> - full recovery of motor power and proprioception - ability to urinate <p>Peripheral nerve blocks:</p> <ul style="list-style-type: none"> - some regression of motor block - protection of partially blocked limb 	<ul style="list-style-type: none"> - reviewed by surgeon and anaesthetist - written and verbal information given - discharge medication - wound binding organized - epicrisis for general practitioner prepared - patient's contacts - accompanying person

¹ Bonnet and Lambert, 2006; Allman and Wilson, 2011

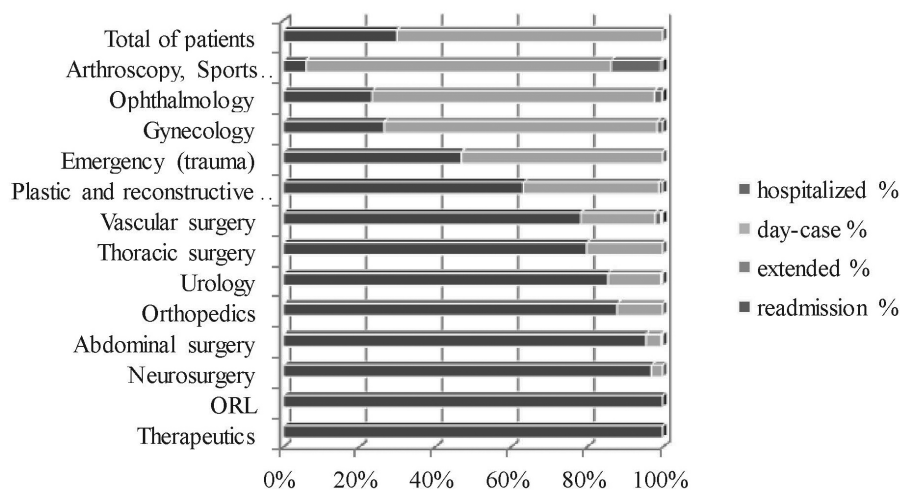


Fig. 2. Statistics of the day-case surgery in Republican Vilnius University Hospital, 2013.

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ANESTĒZIJA AMBULATORAJĀ ĶIRURĢIJĀ

Ar jēdzienu ambulatorā anestēzija apzīmē anestezioloģisko aprūpi rūpīgi atlasītiem pacientiem, kas tiek uzņemti stacionārā operācijas dienā un izrakstīti dažu stundu laikā pēc operācijas. Kopumā ambulatori veic aptuveni 65% no visām ķirurģiskajām operācijām. Ambulatorajai ķirurģijai ir daudz priekšrocību: izmaksu samazināšanās par 25–75%, efektivitāte, īsākas rindas uz operācijām, retāk notiek operāciju atcelšana, ērtāk pacientam, mazāka saslimstība/mirstība, mazāk infekciozo, respiratoro komplikāciju, mazāks medikamentu patēriņš. Ambulatorās ķirurģijas pacientiem ir nepieciešama secīga vairāksolņu aprūpe, kas ietver pirmsoperācijas vizīti, kurā tiek izvērtēta atbilstība ambulatorās aprūpes kritērijiem (vecums, veselības stāvoklis, transporta pieejamība, sociālie apstākļi). Anestēziologs izstrādā aprūpes plānu, ko apspriež ar pacientu un dokumentē. Anestēzijā jālieto lokālās anestēzijas metodes un īsas darbības vispārējie anestētiķi bez reziduālām psihomotorām blaknēm un zemu pēcoperācijas vemšanas potenciālu. Ir svarīgi izstrādāt izrakstīšanas kritērijus, un izrakstīšanas procesam jābūt labi organizētam. 1% pacientu nepieciešams atkārtoti hospitalizēt sakarā ar vemšanu vai asiņošanu no brūces. Ir jābūt pieejamai iespējai ambulatoros pacientus hospitalizēt, ja pēc novērošanas perioda netiek sasniegti izrakstīšanas kritēriji.